

2023-24
English Medium

SSC- MATHEMATICS

**CHAPTERWISE
SOLVED PAPERS**

**Youth
Competition
Times**

STAFF SELECTION COMMISSION

MATHEMATICS

SSC

2023-24

CGL (TIER I & II), CHSL (10+2),
CPO-SI, MTS, GD, Selection Post

**CHAPTERWISE
Solved Papers**

**CHAPTERWISE &
SUB TOPICWISE**

Computer
Based Test

10150⁺
OBJECTIVE
QUESTIONS

Include Chapterwise Presentation of **353** Online Question Papers (All Sets)

Staff Selection Commission

SSC

Maths

Chapterwise Solved Papers

(Computer Based Test)

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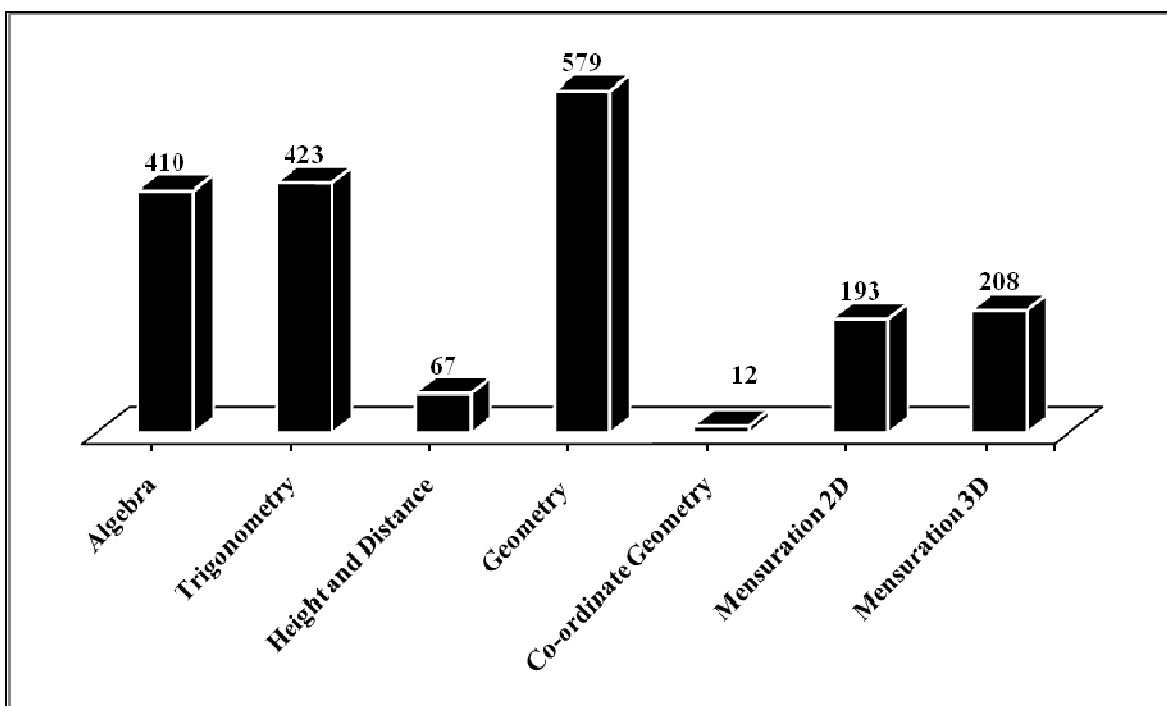
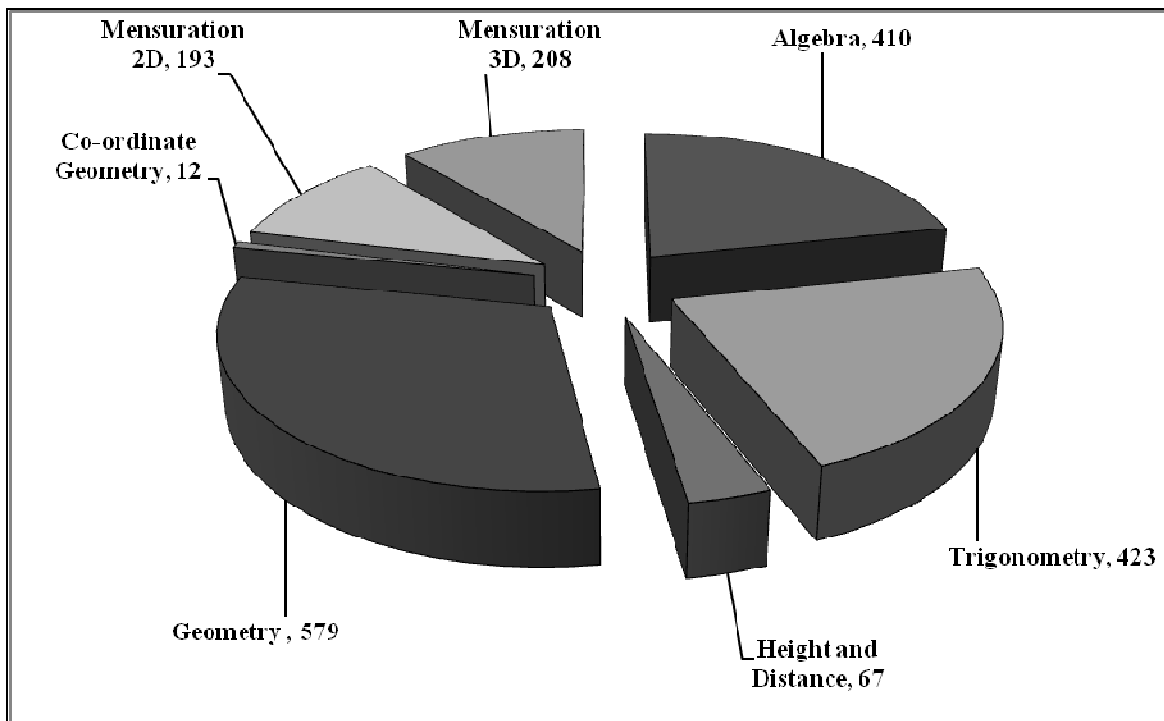
Analysis Chart of Question Papers of Various Previous Exam of SSC

Sr. No.	Exam	Exam Year	Total Questions	Total Question of Maths
1.	SSC CGL	2022	21	$21 \times 25 = 525$
2.	SSC CHSL	2022	42	$42 \times 25 = 1050$
3.	SSC MTS	2021	42	$42 \times 25 = 1050$
4.	SSC CPO-SI	2020	6	$6 \times 50 = 300$
5.	SSC Selection Post Phase VIII (Graduate Level)	2020	4	$4 \times 25 = 100$
6.	SSC Selection Post Phase VIII (H.S. Level)	2020	3	$3 \times 25 = 75$
7.	SSC Selection Post Phase VIII (Matriculation Level)	2020	5	$5 \times 25 = 125$
8.	SSC CGL (Tier-II)	2020	3	$3 \times 100 = 300$
9.	SSC CHSL	2020	36	$36 \times 25 = 900$
10.	SSC CGL (Tier-I)	2020	18	$18 \times 25 = 450$
11.	SSC CPO-SI	2019	8	$8 \times 50 = 400$
12.	SSC Selection Post Phase VII (Graduate Level)	2019	4	$4 \times 25 = 100$
13.	SSC Selection Post Phase VII (H.S. Level)	2019	4	$4 \times 25 = 100$
14.	SSC Selection Post Phase VII (Matriculation Level)	2019	4	$4 \times 25 = 100$
15.	SSC CGL (Tier-II)	2019	3	$3 \times 100 = 300$
16.	SSC CGL (Tier-I)	2019	22	$22 \times 25 = 550$
17.	SSC MTS	2019	39	$39 \times 25 = 975$
18.	SSC GD	2019	40	$40 \times 25 = 1000$
19.	SSC CHSL	2019	25	$25 \times 25 = 625$
20.	SSC CGL (Tier-II)	2017	7	$7 \times 100 = 700$
21.	SSC MTS	2017	17	$17 \times 25 = 425$
	Total		353	10,150

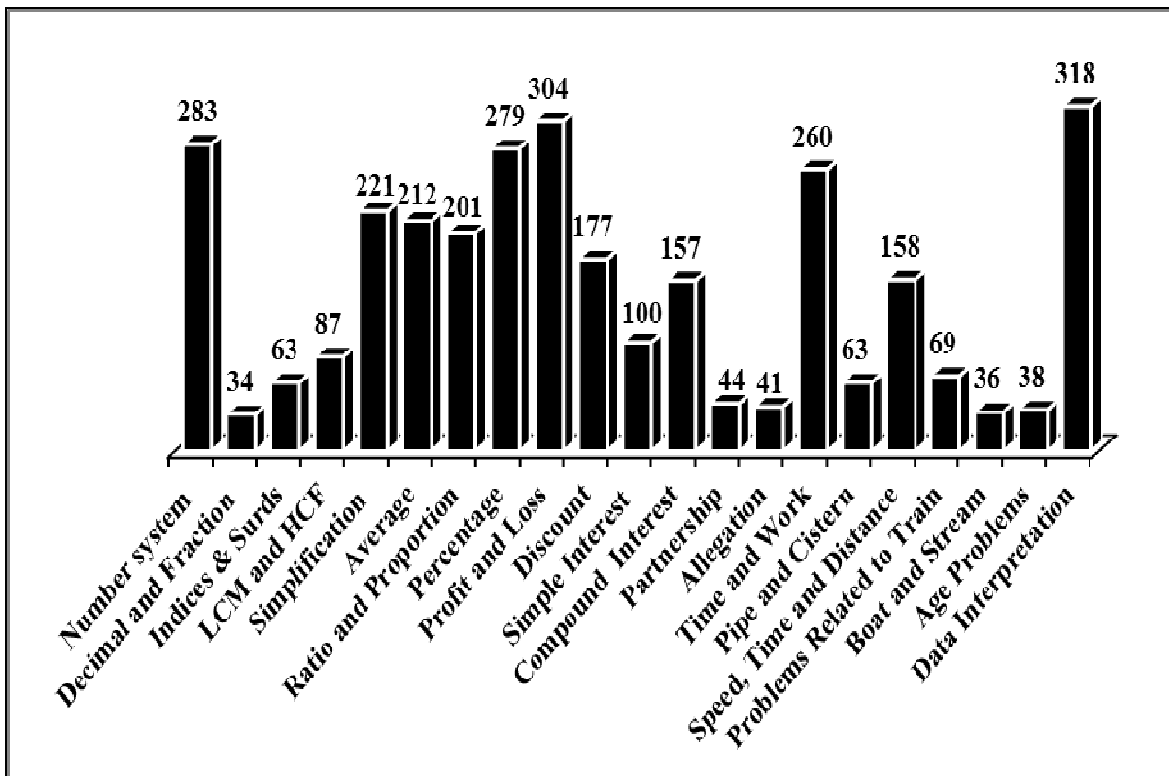
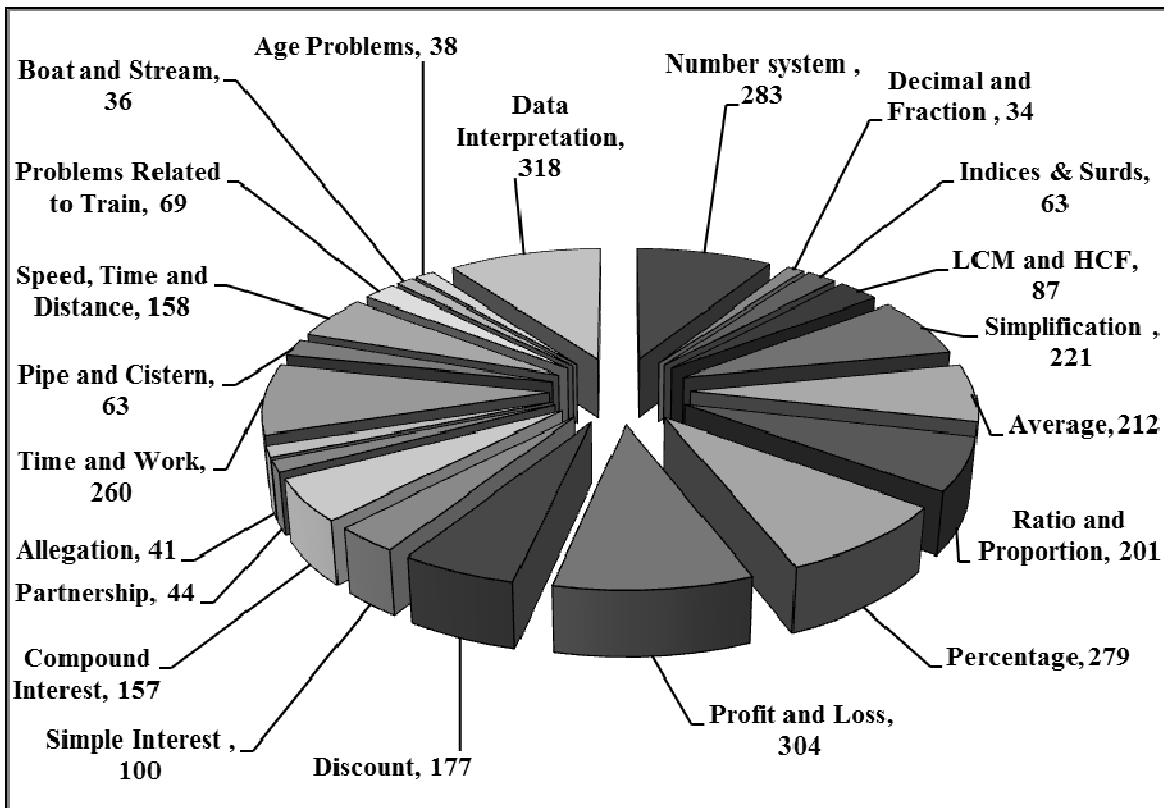
Note-Chapterwise compilation of total 10,150 questions of Quantitive Aptitude has been presented out of total 353 question papers of total 21 examinations conducted by Staff Selection Commission (SSC). Out of total 10150 questions asked from Quantitive Aptitude, total 5113 question of General Behavior have been removed and chapterwise compilation of 5037 questions of different types has been presented. In this book, every effort has been made by the Examination Special Committee to accommodate maximum variety of questions, so that examines can be made aware of the variety of questions asked by SSC.

Trend Analysis of Previous Year SSC Exams Papers Through Pie Chart and Bar Graph

SECTION-1



SECTION-2



(I) Problems based on Linear Equations

1. If $2x + 3y - 5z = 18$, $3x + 2y + z = 29$ and $x + y + 3z = 17$, then what is the value of $xy + yz + zx$?

- (a) 32 (b) 52
(c) 64 (d) 46

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given,

$$2x + 3y - 5z = 18 \dots\dots (i)$$

$$3x + 2y + z = 29 \dots\dots (ii)$$

$$x + y + 3z = 17 \dots\dots (iii)$$

Multiplying by 5 in equation (ii) and adding it to equation (i),

$$2x + 3y - 5z = 18$$

$$15x + 10y + 5z = 145$$

$$17x + 13y = 163 \dots\dots (iv)$$

Again, on multiplying by 3 in equation (ii) and subtracting it to equation (iii) get-

$$8x + 5y = 70 \dots\dots (v)$$

By solving the equation (iv) and (v)

$$x = 5, y = 6$$

On putting the value of $x = 5$ and $y = 6$ in equation (ii),

$$15 + 12 + z = 29$$

$$\Rightarrow z = 2$$

$$\therefore xy + yz + zx = (5 \times 6) + (6 \times 2) + (2 \times 5)$$

$$= 30 + 12 + 10 = \boxed{52}$$

2. If $a - b = 3$ and $a^3 - b^3 = 999$, then find the value of $a^2 - b^2$.

- (a) 60 (b) 62
(c) 64 (d) 63

SSC CHSL 03/06/2022 (Shift- II)

Ans. (d) : $a - b = 3$

$$a^3 - b^3 = 999$$

$$(a - b) [(a - b)^2 + 3ab] = 999$$

$$3[9 + 3ab] = 999$$

$$3ab = 333 - 9$$

$$ab = 108$$

$$(a + b)^2 = (a - b)^2 + 4ab$$

$$(a + b)^2 = 9 + 4 \times 108$$

$$(a + b)^2 = 441$$

$$a + b = 21$$

$$a^2 - b^2 = (a - b)(a + b)$$

$$= 3 \times 21 = 63$$

3. If x, y, z are three integers such that $x + y = 8$, $y + z = 13$ and $z + x = 17$, then the value of $\frac{x^2}{yz}$ is:

- (a) 1 (b) $\frac{18}{11}$
(c) 0 (d) $\frac{7}{5}$

SSC CGL (Tier-I)-2019-03/03/2020 (Shift-I)

Ans. (b) : Given, $x + y = 8 \dots\dots (1)$

$$y + z = 13 \dots\dots (2)$$

$$z + x = 17 \dots\dots (3)$$

On adding the equation (i), (ii), and (iii)

$$2(x + y + z) = 38 \dots\dots (iv)$$

$$x + y + z = 19$$

$$\therefore x = 6, y = 2, z = 11$$

$$\therefore \frac{x^2}{yz} = \frac{36}{22} = \frac{18}{11}$$

Trick:

Put, $a = 6, y = 2, z = 11$

$$\therefore \frac{x^2}{y^2} = \frac{6^2}{2 \times 11} = \frac{18}{11}$$

4. If $3x + 6y + 9z = \frac{20}{3}$, $6x + 9y + 3z = \frac{17}{3}$ and $18x + 27y - z = \frac{113}{9}$, then what is the value of $75x + 113y$?

$$+ 113y ?$$

- (a) 163/3 (b) 143/6
(c) 218/9 (d) 311/3

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

$$3x + 6y + 9z = \frac{20}{3} \dots\dots (1)$$

$$6x + 9y + 3z = \frac{17}{3} \dots\dots (2)$$

$$18x + 27y - z = \frac{113}{9} \dots\dots (3)$$

On Multiplying by 3 in equation (iii) and adding it in equation (ii),

$$54x + 81y - 3z + 6x + 9y + 3z = \frac{113}{3} + \frac{17}{3}$$

$$60x + 90y = \frac{130}{3}$$

$$6x + 9y = \frac{13}{3} \dots\dots (4)$$

Multiplying by 3 in equation (2) and subtracting it from equation 1,

$$3x + 6y + 9z - 18x - 27y - 9z = \frac{20}{3} - 17$$

$$-15x - 21y = \frac{-31}{3}$$

$$15x + 21y = \frac{31}{3} \dots\dots (5)$$

Multiplying by 5 and 2 in equation (4) and equation (5) respectively then subtracting equation (5) from equation (4).

$$30x + 45y = \frac{65}{3}$$

$$30x + 42y = \frac{62}{3}$$

$$\frac{\quad}{3y = 1}$$

$$y = \frac{1}{3}$$

From equation (4),

$$6x + 3 = \frac{13}{3}$$

$$6x = \frac{13}{3} - 3$$

$$6x = \frac{4}{3}$$

$$x = \frac{2}{9}$$

$$\therefore 75x + 113y = 75 \times \frac{2}{9} + 113 \times \frac{1}{3}$$

$$= \frac{50}{3} + \frac{113}{3} = \frac{163}{3}$$

Trick:

$$(eq^n (i) + eq^n (ii)) \times \frac{1}{3} + eq^n (iii) \times 4$$

$$(9x + 15y + 12z) \times \frac{1}{3} + (72x + 108y - 4z)$$

$$= \frac{37}{9} + \frac{452}{9}$$

$$75x + 113y = \frac{489}{9} = \frac{163}{3}$$

5. If $3x + 4y - 2z + 9 = 17$, $7x + 2y + 11z + 8 = 23$ and $5x + 9y + 6z - 4 = 18$, then what is the value of $x + y + z - 34$?
- (a) -28 (b) -14
(c) -31 (d) -45

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : $3x + 4y - 2z + 9 = 17$ (i)
 $7x + 2y + 11z + 8 = 23$ (ii)
 $5x + 9y + 6z - 4 = 18$ (iii)

By adding the equation (i), (ii) and (iii)

$$15x + 15y + 15z = 45$$

$$x + y + z = 3$$

$$\therefore x + y + z - 34 = 3 - 34 = -31$$

6. If $x + 3y - \frac{2z}{4} = 6$, $x + \frac{2}{3}(2y + 3z) = 33$ and $\frac{1}{7}(x + y + z) + 2z = 9$, then what is the value of $46x + 131y$?
- (a) 414 (b) 364
(c) 384 (d) 464

SSC CGL (Tier-II) 20-02-2018

Ans. (a) $x + 3y - \frac{2z}{4} = 6$
 $4x + 12y - 2z = 24$ -----(i)
 $x + \frac{2}{3}(2y + 3z) = 33$

$$3x + 4y + 6z = 99$$
 -----(ii)

$$\frac{1}{7}(x + y + z) + 2z = 9$$

$$x + y + z + 14z = 63$$

$$x + y + 15z = 63$$
 -----(iii)

From Equation (i) $\times \frac{21}{2}$ + Equation (ii) + Equation (iii),

$$42x + 126y - 21z + 3x + 4y + 6z + x + y + 15z = 252 + 99 + 63$$

$$46x + 131y = 414$$

7. If $3x + 4y - 11 = 18$ and $8x - 6y + 12 = 6$, then what is the value of $5x - 3y - 9$?
- (a) 18 (b) -9
(c) -27 (d) -18
- SSC CGL (Tier-II) 19-02-2018

Ans. (b) : $3x + 4y = 29$ (i)
 $8x - 6y = -6$ (ii)
 $4x - 3y = -3$ (ii)

On solving the equation (i) and (ii),
 $x = 3, y = 5$
 $\therefore 5x - 3y - 9 = 15 - 15 - 9 = -9$

8. If $a + b + c = 7/12$, $3a - 4b + 5c = 3/4$ and $7a - 11b - 13c = -7/12$, then what is the value of $a + c$?
- (a) 1/2 (b) 5/12
(c) 3/4 (d) 1/4
- SSC CGL (Tier-II) 19-02-2018

Ans. (b) : $a + b + c = \frac{7}{12}$ (1)
 $3a - 4b + 5c = \frac{3}{4}$ (2)
 $7a - 11b - 13c = -\frac{7}{12}$ (3)

Multiplying by 4 in equation (1) then adding it in equation (2)

$$4a + 4b + 4c + 3a - 4b + 5c = \frac{7}{3} + \frac{3}{4}$$

$$7a + 9c = \frac{37}{12}$$
(4)

On multiplying by 11 in equation (1) then adding it in equation (3)

$$11a + 11b + 11c + 7a - 11b - 13c = \frac{77}{12} - \frac{7}{12}$$

$$18a - 2c = \frac{35}{6}$$

$$9a - c = \frac{35}{12}$$
(5)

On multiplying by 9 in equation (5) then adding it in equation (4),

$$81a - 9c + 7a + 9c = \frac{315}{12} + \frac{37}{12}$$

$$88a = \frac{352}{12}$$

$$a = \frac{1}{3}$$

From equation (5),

$$3 - c = \frac{35}{12}$$

$$c = \frac{1}{12}$$

$$\text{thus } a + c = \frac{1}{3} + \frac{1}{12} = \frac{4+1}{12} = \frac{5}{12}$$

9. If $x - 4y = 0$ and $x + 2y = 24$, then what is the value of $(2x + 3y)/(2x - 3y)$?

- (a) $9/5$ (b) $11/5$
(c) $13/7$ (d) $9/7$

SSC CGL (Tier-II) 18-02-2018

Ans. (b):
Given,
 $x - 4y = 0$ (i)
 $x + 2y = 24$ (ii)
On putting the value $x = 4y$ in equation (ii).....
 $6y = 24$
 $y = 4$
 $\therefore x = 16$
As per question,
 $\frac{2x + 3y}{2x - 3y} = \frac{32 + 12}{32 - 12} = \frac{44}{20} = \frac{11}{5}$

10. If $3x + 5y + 7z = 49$ and $9x + 8y + 21z = 126$, then what is the value of y ?

- (a) 4 (b) 2
(c) 3 (d) 5

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : $3x + 5y + 7z = 49$ (i)
 $9x + 8y + 21z = 126$ (ii)
On multiplying by 3 in equation (i),
 $9x + 15y + 21z = 147$ (iii)

From equation (iii) – Equation (ii)
 $7y = 21$
 $y = 3$

11. Cost of 8 pencils, 5 pens and 3 erasers is Rs. 111. Cost of 9 pencils, 6 pens and 5 erasers is Rs. 130. Cost of 16 pencils, 11 pens and 3 erasers is Rs. 221. What is the cost (in Rs.) of 39 pencils 26 pens and 13 erasers ?

- (a) 316 (b) 546
(c) 624 (d) 482

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Let, the price of 1 pencil, 1 pen and 1 eraser are x , y and z respectively.
As per question,
 $8x + 5y + 3z = 111$ (i)
 $9x + 6y + 5z = 130$ (ii)
 $16x + 11y + 3z = 221$ (iii)
By adding equations (i), (ii) and (iii)
 $33x + 22y + 11z = 462$ (iv)
On dividing by 11,
 $3x + 2y + z = 42$ (v)
From equation (v) $\times 13$
 $39x + 26y + 13z = 546$

12. A man buys 2 apples and 3 kiwi fruits for ₹37. If he buys 4 apples and 5 kiwi fruits for ₹67, then what will be the total cost of 1 apple and 1 kiwi fruit?

- (a) ₹20 (b) ₹18
(c) ₹15 (d) ₹28

SSC CHSL –17/03/2020 (Shift-II)

Ans. (c) : Let the cost price of an apple and a kiwi be x and y respectively.

As per question,

$$2x + 3y = 37 \text{(i)}$$

$$4x + 5y = 67 \text{(ii)}$$

By solving the equation (i) and (ii),

$$4x + 6y = 74 \text{ {multiplying by 2 in equation (i)}}$$

$$4x + 5y = 67$$

$$\begin{array}{r} - \quad - \quad - \\ \hline y = 7 \end{array}$$

From equation (i)–

$$2x + 3 \times 7 = 37$$

$$2x = 16$$

$$x = 8$$

Hence, the cost price of an apple and a kiwi = $8 + 7 = ₹15$

13. If $(1.25)(1 - 6.4 \times 10^{-5}) = 1.2496 + a$, then a equals :

- (a) 0.00032 (b) 0.0032
(c) 0.00016 (d) 0.0016

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (a) : $(1.25)(1 - 6.4 \times 10^{-5}) = 1.2496 + a$
 $(1.25)\left(1 - 6.4 \times \frac{1}{10^5}\right) = 1.2496 + a$
 $(1.25)(1 - 0.000064) = 1.2496 + a$
 $1.25 \times 0.999936 = 1.2496 + a$
 $1.24992 - 1.2496 = a$
 $a = 0.00032$

14. If $u + v = 84$ and $u - v = 4$, then $u : v$ is equal to?

- (a) 11 : 10 (b) 10 : 11
(c) 10 : 9 (d) 9 : 10

SSC MTS 19/08/2019 (Shift-II)

Ans. (a) : Given,
 $u + v = 84$ (i)
 $u - v = 4$ (ii)
By solving the equation (i) and (ii)
 $2u = 88$
 $u = 44$
 $\therefore v = 40$
 $u : v = 44 : 40$
 $= 11 : 10$

15. The sum and difference of two numbers is 27 and 3 respectively. What is the ratio of two numbers?

- (a) 5 : 3 (b) 2 : 1
(c) 4 : 7 (d) 5 : 4

SSC MTS 16/08/2019 (Shift-III)

Ans. (d) : Let the numbers are x and y respectively.
As per question,
 $x + y = 27$ (i)
 $x - y = 3$ (ii)
By solving the equations (i) and (ii)
 $x = 15, y = 12$
Ratio of numbers $x : y = 15 : 12 = 5 : 4$

16. If the difference of two numbers is 7 and the difference of their squares is 203, then what is the smaller number?
- (a) 10 (b) 9
(c) 12 (d) 11

SSC MTS 9-10-2017 (Shift-II)

Ans. (d) : Let the numbers are x and y

As per question,

$$x - y = 7 \text{ ----- (i)}$$

$$x^2 - y^2 = 203$$

$$(x + y)(x - y) = 203$$

$$7(x + y) = 203$$

$$x + y = 29 \text{(ii)}$$

By solving the equation (i) and (ii)

$$x = 18, y = 11$$

(II) Problems based on Algebraic Identities

17. If $2x - y = 2$ and $xy = \frac{3}{2}$, then what is the value of $x^3 - \frac{y^3}{8}$?

- (a) $\frac{9}{2}$ (b) $-\frac{5}{4}$
(c) $\frac{5}{2}$ (d) $\frac{13}{4}$

SSC CGL (Tier-II) 29/01/2022

Ans : (d) Given, $2x - y = 2$ ------(i)

$$xy = \frac{3}{2}, x^3 - \frac{y^3}{8} = ?$$

On dividing by 2 and cubing both sides in eqⁿ, (i)

$$\left(x - \frac{y}{2}\right)^3 = (1)^3$$

$$x^3 - \frac{y^3}{8} - 3 \times \frac{xy}{2} \times 1 = 1$$

$$x^3 - \frac{y^3}{8} = \frac{13}{4}$$

18. If $x + \frac{16}{x} = 8$, then the value of $x^2 + \frac{32}{x^2}$ is:

- (a) 24 (b) 16
(c) 20 (d) 18

SSC CGL (Tier-II)-2019-18/11/2020

Ans. (d) : $x + \frac{16}{x} = 8$ ------(Given)

$$\therefore x^2 - 8x + 16 = 0$$

$$(x - 4)^2 = 0$$

$$x = 4$$

$$\text{Hence, } x^2 + \frac{32}{x^2}$$

$$= 4^2 + \frac{32}{4^2} = 16 + \frac{32}{16}$$

$$= 16 + 2 = 18$$

Trick:

Put, $x = 4$

$$x + \frac{16}{x} = 8 \text{ (equation satisfies)}$$

$$\therefore x^2 + \frac{32}{x^2} = 16 + 2 = 18$$

19. If $(5\sqrt{5}x^3 - 81\sqrt{3}y^3) \div (\sqrt{5}x - 3\sqrt{3}y) = (Ax^2 + By^2 + Cxy)$, then the value of $(6A + B - \sqrt{15}C)$

is?

- (a) 10 (b) 15
(c) 9 (d) 12

SSC CGL (TIER-I)-2018 - 04.06.2019 (Shift-I)

Ans. (d) :

$$\frac{5\sqrt{5}x^3 - 81\sqrt{3}y^3}{\sqrt{5}x - 3\sqrt{3}y} = Ax^2 + By^2 + Cxy$$

$$a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$$

$$\frac{(\sqrt{5}x - 3\sqrt{3}y)(5x^2 + 27y^2 + 3\sqrt{15}xy)}{(\sqrt{5}x - 3\sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

$$5x^2 + 27y^2 + 3\sqrt{15}xy = Ax^2 + By^2 + Cxy$$

By comparing the coefficient of x^2 , y^2 and xy , we get-

$$A = 5, B = 27, C = 3\sqrt{15}$$

$$6A + B - \sqrt{15}C = 30 + 27 - \sqrt{15} \times \sqrt{15} \times 3 = 57 - 45 = 12$$

20. If $x + 2y = 10$ and $2xy = 9$, then one of the value of $x - 2y$ is:

- (a) 8 (b) 6
(c) 10 (d) 12

SSC CHSL 10/06/2022 (Shift- II)

Ans. (a) : Given that -

From formula -

$$(a + b)^2 - (a - b)^2 = 4ab$$

$$(10)^2 - (x - 2y)^2 = 4 \times 9$$

$$100 - 36 = (x - 2y)^2$$

$$64 = (x - 2y)^2$$

$$\therefore x - 2y = 8$$

Hence, option (a) is correct.

21. If $4x - 3y = 12$ and $xy = 5$, then find the value of $16x^2 + 9y^2$

- (a) 33 (b) 18
(c) 3 (d) 44

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (c) $4x - 3y = 12$

On squaring both side

$$16x^2 + 9y^2 - 24xy = 144$$

$$16x^2 + 9y^2 = 144 - 120 \text{ (divide by 8 on both side)}$$

$$16x^2 + 9y^2 = 24$$

$$\frac{16x^2 + 9y^2}{8} = 3$$

22. If $\left(x + \frac{1}{x}\right) = \frac{11}{5}$, what is the value of

$$\left(x^3 + \frac{1}{x^3}\right)?$$

- (a) $4\frac{6}{125}$ (b) $5\frac{101}{125}$
 (c) $10\frac{81}{125}$ (d) $17\frac{31}{125}$

SSC CHSL 26/05/2022 (Shift- III)

Ans. (a) : Given,

$$x + \frac{1}{x} = \frac{11}{5}, \quad x^3 + \frac{1}{x^3} = ?$$

We know that :-

$$\text{If } x + \frac{1}{x} = a, \text{ then } x^3 + \frac{1}{x^3} = a^3 - 3a$$

$$\therefore a = 11/5$$

$$\therefore x^3 + \frac{1}{x^3} \Rightarrow \left(\frac{11}{5}\right)^3 - 3 \times \frac{11}{5}$$

$$\Rightarrow \frac{1331}{125} - \frac{33}{5} \Rightarrow \frac{1331 - 825}{125}$$

$$\Rightarrow \frac{506}{125} = 4\frac{6}{125}$$

23. If $x + \frac{1}{x} = -2\sqrt{3}$, what is the value of $x^5 + \frac{1}{x^5}$?

- (a) $-178\sqrt{3}$ (b) $-182\sqrt{3}$
 (c) $182\sqrt{3}$ (d) $-180\sqrt{3}$

SSC CHSL 24/05/2022 (Shift- III)

Ans. (a) : Given,

$$x + \frac{1}{x} = -2\sqrt{3} \text{ ----- (i)}$$

$$x^5 + \frac{1}{x^5} = ?$$

On cubing both sides of equation (i), we get-

$$x^3 + \frac{1}{x^3} + 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right) = -8 \times 3\sqrt{3}$$

$$x^3 + \frac{1}{x^3} - 6\sqrt{3} = -24\sqrt{3}$$

$$\Rightarrow x^3 + \frac{1}{x^3} = -18\sqrt{3} \text{ (ii)}$$

Again on squaring both sides of equation (i), we get-

$$x^2 + \frac{1}{x^2} + 2 = 12$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 10 \text{ (iii)}$$

\therefore We know that,

$$x^5 + \frac{1}{x^5} = \left(x^3 + \frac{1}{x^3}\right) \left(x^2 + \frac{1}{x^2}\right) - \left(x + \frac{1}{x}\right)$$

From equation (i), (ii) & (iii), we get-

$$\begin{aligned} x^5 + \frac{1}{x^5} &= (-18\sqrt{3})(10) - (-2\sqrt{3}) \\ &= -180\sqrt{3} + 2\sqrt{3} \\ &= -178\sqrt{3} \\ \Rightarrow x^5 + \frac{1}{x^5} &= -178\sqrt{3} \end{aligned}$$

24. If $\left(a + \frac{1}{a} + 3\right) = 6$ where a is a non-zero real

number, then find the value of $a^2 + \frac{1}{a^2}$.

- (a) 3 (b) 47
 (c) 49 (d) 7

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

$$\text{Ans : (d) } \left(a + \frac{1}{a} + 3\right) = 6$$

$$a + \frac{1}{a} = 3$$

On squaring both sides

$$a^2 + \frac{1}{a^2} + 2 \times a \times \frac{1}{a} = 3^2$$

$$a^2 + \frac{1}{a^2} = 9 - 2$$

$$a^2 + \frac{1}{a^2} = 7$$

25. If $a^2 + b^2 = 65$ and $ab = 8$, $a > b > 0$, then find the value of $a^2 - b^2$.

- (a) 72 (b) 63
 (c) 65 (d) 53

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (b) Given,

$$a^2 + b^2 = 65, ab = 8, a^2 - b^2 = ?$$

$$\begin{aligned} \text{Put, } a &= 8, b = 1 \\ a^2 - b^2 &= 8^2 - 1^2 \\ &= 64 - 1 = 63 \end{aligned}$$

26. If $x^4 + x^{-4} = 194$, $x > 0$ then the value of $(x-2)^2$ is?

- (a) 6 (b) 3
 (c) 2 (d) 1

SSC CGL (TIER-I)-2018 - 04.06.2019 (Shift-I)

$$\text{Ans. (b) } x^4 + \frac{1}{x^4} = 194$$

On adding 2 in both side

$$x^4 + \frac{1}{x^4} + 2 = 194 + 2$$

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 196$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 14$$

On adding 2 in both sides

$$x^2 + \frac{1}{x^2} + 2 = 14 + 2$$

$$\left(x + \frac{1}{x}\right)^2 = 16$$

$$\Rightarrow x + \frac{1}{x} = 4$$

$$x^2 + 1 = 4x$$

$$x^2 - 4x + 1 = 0$$

On adding 3 in both sides

$$x^2 - 4x + 1 + 3 = 3$$

$$x^2 - 4x + 4 = 3$$

$$\boxed{(x-2)^2 = 3}$$

27. The expression $(a + b - c)^3 + (a - b + c)^3 - 8a^3$ is equal to:

- (a) $6a(a-b+c)(c-a-b)$ (b) $3a(a+b-c)(a-b+c)$
 (c) $6a(a+b-c)(a-b+c)$ (d) $3a(a-b+c)(c-a-b)$

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-II)

Ans. (a) : $(a+b-c)^3 + (a-b+c)^3 - 8a^3$
 $= (a+b-c)^3 + (a-b+c)^3 + (-2a)^3 = 0$
 $\therefore A + B + C = a + b - c + a - b + c - 2a = 0$
 $\therefore A^3 + B^3 + C^3 = 3ABC$
 $\therefore (a+b-c)^3 + (a-b+c)^3 + (-2a)^3 = 3(a+b-c)(a-b+c)(-2a)$
 $= 6a(a-b+c)(c-a-b)$

Trick:

$$a = b + c = 1$$

Taken,

$$(a + b - c)^3 + (a - b + c)^3 - (2a)^3 = -6$$

From option (a)

$$6a(a - b + c)(c - a - b) = -6 \text{ equation satisfy}$$

28. If $x^4 - 79x^2 + 1 = 0$, then the value of $x + x^{-1}$ can be:

- (a) 9 (b) 5
(c) 7 (d) 8

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans. (a) $x^4 - 79x^2 + 1 = 0$
 On dividing by x^2 on both sides
 $x^2 - 79 + \frac{1}{x^2} = 0, x^2 + \frac{1}{x^2} = 79$
 Add 2 on both sides,
 $x^2 + \frac{1}{x^2} + 2 = 79 + 2$
 $\left(x + \frac{1}{x}\right)^2 = 81, x + \frac{1}{x} = 9$

29. If $a^3 + 3a^2 + 9a = 1$, then what is the value of $a^3 + (3/a)$?

- (a) 31 (b) 26
(c) 28 (d) 24

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : $a^3 + 3a^2 + 9a = 1$
 $a^2 + 3a + 9 = \frac{1}{a}$
 Multiplying by $(a-3)$ in both side
 $(a-3)(a^2 + a \times 3 + 3^2) = \frac{1}{a} \times (a-3)$
 $a^3 - 3^3 = \frac{a-3}{a}$
 $a^3 + \frac{3}{a} = 1 + 27 = 28$

30. If $5x - \frac{1}{4x} = 6, x > 0$, then find the value of $25x^2 - \frac{1}{16x^2}$.

- (a) $6\sqrt{41}$ (b) 36
(c) $\sqrt{246}$ (d) $6\sqrt{31}$

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans. (a) Given-

$$5x - \frac{1}{4x} = 6 \text{ ----- (i)}$$

From formula $(a + b)^2 = (a - b)^2 + 4ab$

$$\therefore \left(5x + \frac{1}{4x}\right)^2 = \left(5x - \frac{1}{4x}\right)^2 + 4 \times 5x \times \frac{1}{4x}$$

$$\Rightarrow \left(5x + \frac{1}{4x}\right)^2 = \left(5x - \frac{1}{4x}\right)^2 + 5$$

$$\Rightarrow \left(5x + \frac{1}{4x}\right)^2 = (6)^2 + 5$$

$$\left(5x + \frac{1}{4x}\right) = \sqrt{41} \text{ ----- (ii)}$$

$$\therefore 25x^2 - \frac{1}{16x^2} = \left(5x - \frac{1}{4x}\right) \left(5x + \frac{1}{4x}\right)$$

$$= 6\sqrt{41} \quad \{\text{from eq}^n \text{ (i) \& (ii)}\}$$

31. If $x + y + z = 2, xy + yz + zx = -11$, and $xyz = -12$, then what is the value of $x^3 + y^3 + z^3$?

- (a) 36 (b) 38
(c) 40 (d) 42

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans. (b) Given,

$$x + y + z = 2, xy + yz + zx = -11, xyz = -12$$

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x + y + z)^2 - 3(xy + yz + zx)]$$

$$x^3 + y^3 + z^3 - 3 \times (-12) = 2[4 + 33]$$

$$x^3 + y^3 + z^3 = 74 - 36$$

$$x^3 + y^3 + z^3 = 38$$

32. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$, then the value of $(A^2 + B^2 + C^2)$ is:

- (a) 16 (b) 11
(c) 19 (d) 18

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans. (c)

$$2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$$

$$(\sqrt{2}x - \sqrt{3}y)(2x^2 + \sqrt{6}xy + 3y^2) = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$$

$$Ax^2 - Bxy + Cy^2 = (2x^2 + \sqrt{6}xy + 3y^2)$$

$$A = 2, B = -\sqrt{6}, C = 3$$

$$A^2 + B^2 + C^2 = 2^2 + 6 + 3^2$$

$$= 4 + 6 + 9$$

$$= 19$$

33. If $a + b + c = 11$ and $ab + bc + ca = 28$, then find the value of $a^3 + b^3 + c^3 - 3abc$.
- (a) 1639 (b) 407
(c) 2255 (d) 1093

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b) $a + b + c = 11$, $ab + bc + ca = 28$
 $a^3 + b^3 + c^3 - 3abc = (a + b + c) [(a + b + c)^2 - 3(ab + bc + ca)]$
 $a^3 + b^3 + c^3 - 3abc = 11(121 - 84)$
 $a^3 + b^3 + c^3 - 3abc = 11 \times 37$
 $a^3 + b^3 + c^3 - 3abc = 407$

34. If $a^2 + b^2 + 49c^2 + 18 = 2(b + 28c - a)$, then the value of $(2a - b + 7c)$ is:
- (a) 5 (b) -3
(c) -4 (d) 1

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (d) Given,
 $a^2 + b^2 + 49c^2 + 18 = 2(b + 28c - a)$
 $a^2 + b^2 + 49c^2 + 18 = 2b + 56c - 2a$
 $(a^2 + 2a + 1) + (b^2 - 2b + 1) + (49c^2 - 56c + 16) = 0$
 $(a + 1)^2 + (b - 1)^2 + (7c - 4)^2 = 0$
 $a + 1 = 0, b - 1 = 0, 7c - 4 = 0$
 $a = -1, b = 1, c = \frac{4}{7}$
 $\therefore (2a - b + 7c) = 2 \times (-1) - (1) + 7 \times \frac{4}{7} = 1$

35. If $x + y + z = 7$, $xy + yz + zx = 8$, then what is the value of $x^3 + y^3 + z^3 - 3xyz$?
- (a) 200 (b) 150
(c) 125 (d) 175

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (d) Given, $x + y + z = 7$, $xy + yz + zx = 8$
 Now,
 $x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x + y + z)^2 - 3(xy + yz + zx)]$
 $= 7 [49 - 3 \times 8]$
 $= 7 \times 25$
 $= 175$

36. If $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$, then what is the value of

$$x^4 + \frac{1}{x^4} ?$$

- (a) 531 (b) 7
(c) 623 (d) 527

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (d) From question,

$$\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$$

On squaring both sides,

$$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = (\sqrt{3})^2$$

$$\Rightarrow x + \frac{1}{x} - 2 \times \sqrt{x} \times \frac{1}{\sqrt{x}} = 3$$

$$\Rightarrow x + \frac{1}{x} = 3 + 2$$

$$\Rightarrow x + \frac{1}{x} = 5$$

Again, on squaring both sides

$$\left(x + \frac{1}{x}\right)^2 = 5^2$$

$$x^2 + \frac{1}{x^2} + 2 = 25$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 23$$

Again, squaring on both sides

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (23)^2$$

$$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 529$$

$$\therefore x^4 + \frac{1}{x^4} = 527$$

37. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$, then the value of $\sqrt{(A^2 + B^2 + C^2)}$ is:

- (a) $\sqrt{19}$ (b) $\sqrt{11}$
(c) $\sqrt{17}$ (d) $\sqrt{21}$

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (a) $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$,

$$(\sqrt{2}x - \sqrt{3}y)(2x^2 + \sqrt{6}xy + 3y^2) = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$$

$$(2x^2 + \sqrt{6}xy + 3y^2) = (Ax^2 - Bxy + Cy^2)$$

On comparing,

$$A = 2, B = -\sqrt{6}, C = 3$$

$$\sqrt{(A^2 + B^2 + C^2)} = \sqrt{2^2 + (-\sqrt{6})^2 + (3)^2} = \sqrt{4 + 6 + 9} = \sqrt{19}$$

38. If $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$, then the value of $(a - b - 7c)$ is:

- (a) 4 (b) 3
(c) 2 (d) 1

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (c) $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$

$$(a + 1)^2 + (b - 1)^2 + (7c + 4)^2 = 0$$

$$a = -1, b = 1, c = -4/7$$

$$\text{Now, } (a - b - 7c) = (-1 - 1 + 7 \times \frac{4}{7}) = (-2 + 4) = 2$$

39. If $\left(x^2 + \frac{1}{x^2}\right) = 23$, $x > 0$ What is the value of

$$\left(x^3 + \frac{1}{x^3}\right) = ?$$

- (a) 140 (b) 110
(c) -110 (d) -140

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (b) $\left(x^2 + \frac{1}{x^2}\right) = 23$

On adding 2 both sides,

$$x^2 + \frac{1}{x^2} + 2 = 23 + 2$$

$$= \left(x + \frac{1}{x}\right)^2 = 5^2$$

$$x + \frac{1}{x} = 5$$

On cubing both sides

$$x^3 + \frac{1}{x^3} + 3 \times 5 = 125$$

$$\therefore x^3 + \frac{1}{x^3} = (5)^3 - 3 \times 5 = 125 - 15 = 110$$

40. If $x + y + z = 18$, $xyz = 81$ and $xy + yz + zx = 90$, then the value of $x^3 + y^3 + z^3 + xyz$ is:

- (a) 1321 (b) 1296
(c) 1225 (d) 1250

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (b) Given,

$$x + y + z = 18, xyz = 81, xy + yz + zx = 90$$

From the formula,

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x + y + z)^2 - 3(xy + yz + zx)]$$

$$x^3 + y^3 + z^3 - 3xyz = 18 [(18)^2 - 3(90)]$$

$$x^3 + y^3 + z^3 + xyz = 18(324 - 270) + 4xyz$$

$$= 18 \times 54 + 4 \times 81$$

$$= 972 + 324$$

$$x^3 + y^3 + z^3 + xyz = 1296$$

41. If $a^2 + b^2 + c^2 = 6.25$ and $(ab + bc + ca) = 0.52$, what is the value of $(a+b+c)$, if $(a + b + c) < 0$?

- (a) ± 2.7 (b) -2.7
(c) -2.8 (d) ± 2.8

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (b) Given,

$$a^2 + b^2 + c^2 = 6.25$$

$$ab + bc + ca = 0.52$$

$$\text{Let } a + b + c = y$$

On squaring both sides,

$$a^2 + b^2 + c^2 + 2(ab + bc + ca) = y^2$$

$$6.25 + 2 \times (0.52) = y^2$$

$$6.25 + 1.04 = y^2$$

$$y^2 = 7.29$$

$$y = \pm \sqrt{7.29}$$

$$\text{If } a + b + c < 0$$

$$\text{Then, } a + b + c = -2.7$$

42. If $x + y + 3 = 0$, then find the value of $x^3 + y^3 - 9xy + 9$.

- (a) -18 (b) -36
(c) 18 (d) 36

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

Ans. (a) $x + y + 3 = 0$

$$x + y = -3$$

On cubing both sides

$$(x + y)^3 = -3^3$$

$$x^3 + y^3 + 3xy(x + y) = -27$$

$$x^3 + y^3 + 3xy(-3) = -27$$

$$x^3 + y^3 - 9xy = -27$$

$$x^3 + y^3 - 9xy + 9 = -27 + 9 = -18$$

43. If $(4x + 2y)^3 + (4x - 2y)^3 = 16(Ax^3 + Bxy^2)$, then what is the value of $\frac{1}{2}(\sqrt{A^2 + B^2})$?

- (a) 8 (b) 3
(c) 5 (d) 7

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (c) $(4x + 2y)^3 + (4x - 2y)^3 = 16(Ax^3 + Bxy^2)$
 $64x^3 + 8y^3 + 24xy(4x + 2y) + 64x^3 - 8y^3 - 24xy(4x - 2y) = 16(Ax^3 + Bxy^2)$

$$128x^3 + 96xy^2 = 16(Ax^3 + Bxy^2)$$

$$16(8x^3 + 6xy^2) = 16(Ax^3 + Bxy^2)$$

On comparing both sides

$$A = 8 \quad B = 6$$

Then,

$$\frac{1}{2}(\sqrt{A^2 + B^2}) = \frac{1}{2}(\sqrt{8^2 + 6^2}) = 5$$

44. If $x = 4 + \sqrt{15}$, What is the value of

$$\left(x^2 + \frac{1}{x^2}\right)?$$

- (a) 48 (b) 54
(c) 72 (d) 62

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (d) Given,

$$x = 4 + \sqrt{15}$$

$$\frac{1}{x} = \frac{1}{4 + \sqrt{15}} = \frac{1}{4 + \sqrt{15}} \times \frac{4 - \sqrt{15}}{4 - \sqrt{15}} = 4 - \sqrt{15}$$

$$x + \frac{1}{x} = 4 + \sqrt{15} + 4 - \sqrt{15}$$

$$x + \frac{1}{x} = 8$$

On squaring both sides

$$x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = 64$$

$$x^2 + \frac{1}{x^2} = 62$$

45. If $x + \frac{1}{x} = 3$, $x \neq 0$, then the value of $x^7 + \frac{1}{x^7}$ is:

- (a) 749 (b) 843
(c) 746 (d) 849

SSC CGL (Tier-II) 03/02/2022

Ans : (b) $x + \frac{1}{x} = 3$

$$x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 18$$

Again,

$$x + \frac{1}{x} = 3$$

On squaring both sides

$$x^2 + \frac{1}{x^2} = 7$$

On squaring both sides

$$x^4 + \frac{1}{x^4} = 7^2 - 2 = 47$$

$$x^7 + \frac{1}{x^7} = \left(x^3 + \frac{1}{x^3}\right)\left(x^4 + \frac{1}{x^4}\right) - \left(x + \frac{1}{x}\right)$$

$$= (18)(47) - 3$$

$$= 846 - 3 = 843$$

46. If $x^2 - 3x + 1 = 0$, then the value of

$$\frac{\left(x^4 + \frac{1}{x^2}\right)}{(x^2 + 5x + 1)} \text{ is:}$$

- (a) $\frac{9}{4}$ (b) $\frac{27}{8}$
(c) $\frac{5}{2}$ (d) 2

SSC CGL (Tier-II) 03/02/2022

Ans : (a) $x^2 - 3x + 1 = 0$

$$x\left(x - 3 + \frac{1}{x}\right) = 0$$

$$x + \frac{1}{x} = 3$$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3 \times 3 = 27$$

$$x^3 + \frac{1}{x^3} = 3^3 - 9 = 18$$

$$\frac{x^4 + \frac{1}{x^2}}{x^2 + 5x + 1}$$

$$x\left(x^3 + \frac{1}{x^3}\right)$$

$$x\left[\left\{x + \frac{1}{x}\right\} + 5\right]$$

$$\frac{18}{3+5} = \frac{9}{4}$$

47. If $a + b = 8$, $ab = 10$, then the value of $a^3 + b^3$ is:

- (a) 312 (b) 215
(c) 272 (d) 111

SSC CGL (Tier-II) 29/01/2022

Ans : (c) Given

$$a + b = 8$$

$$ab = 10$$

$$a^3 + b^3 = ?$$

we know that,

$$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$$

$$= (8)[(8)^2 - 3 \times 10]$$

$$= 8[64 - 30]$$

$$= 8 \times 34 = 272$$

48. If $a + b + c = 1$, $ab + bc + ca = -22$ and $abc = -40$, then what is the value of $a^3 + b^3 + c^3$?

- (a) 67 (b) -53
(c) -51 (d) 27

SSC CGL (Tier-II) 29/01/2022

Ans : (b) Given,

$$a + b + c = 1$$

$$ab + bc + ca = -22$$

$$abc = -40$$

$$a^3 + b^3 + c^3 = ?$$

$$\therefore a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$$

$$a^3 + b^3 + c^3 + 120 = (1)[(1)^2 + 3(22)]$$

$$= 1 \times 67$$

$$\Rightarrow a^3 + b^3 + c^3 = 67 - 120$$

$$\Rightarrow a^3 + b^3 + c^3 = -53$$

49. If $27x^3 - 64y^3 = (Ax + By)(Cx^2 + Dy^2 - Exy)$, then value of $(A - B + C - D + E)$ will be:

- (a) -12 (b) 18
(c) 15 (d) -20

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) : $27x^3 - 64y^3 = (Ax + By)(Cx^2 + Dy^2 - Exy)$ --- (Given)

$$(3x - 4y)(9x^2 + 16y^2 + 12xy) = (Ax + By)(Cx^2 + Dy^2 - Exy)$$

On comparing both sides, we get,

$$A = 3, B = -4, C = 9, D = 16, E = -12$$

Hence

$$A - B + C - D + E = 3 + 4 + 9 - 16 + (-12)$$

$$= 16 - 16 - 12$$

$$= -12$$

50. If $(3x + 2y)^3 + (3x - 2y)^3 = 3kx(3x^2 + 4y^2)$, then the value of k will be:

- (a) 18 (b) 9
(c) 3 (d) 6

SSC CHSL 09/08/2021 (Shift-I)

Ans. (d) : $(3x + 2y)^3 + (3x - 2y)^3 = 3kx(3x^2 + 4y^2)$

$$\therefore a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

So,

$$(3x + 2y + 3x - 2y)[(3x + 2y)^2 + (3x - 2y)^2 - (3x + 2y)(3x - 2y)]$$

$$= 3kxy(3x^2 + 4y^2)$$

$$6x[(9x^2 + 4y^2) \times 2 - (9x^2 - 4y^2)] = 3kx(3x^2 + 4y^2)$$

$$6x[18x^2 + 8y^2 - 9x^2 + 4y^2] = 3kx(3x^2 + 4y^2)$$

$$6x[9x^2 + 12y^2] = 3kx(3x^2 + 4y^2)$$

$$3 \times 6x(3x^2 + 4y^2) = 3kx(3x^2 + 4y^2)$$

$$6x = kx$$

$$k = 6$$

51. If $x + 2y = 19$ and $x^3 + 8y^3 = 361$, then xy is equal to:

- (a) 57 (b) 56
(c) 55 (d) 58

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) : $x + 2y = 19$... (i)
 $x^3 + 8y^3 = 361$... (ii)

On cubing both sides of equation (i),

$$x^3 + 8y^3 + 6xy(x + 2y) = 6859$$

By equation (i) and (ii),

$$361 + 6xy(19) = 6859$$

$$6xy \times 19 = 6859 - 361 = 6498$$

$$xy = \frac{6498}{114} = 57$$

52. If $x^2 + 4y^2 + 3z^2 + \frac{19}{4} = 2\sqrt{3}(x+y+z)$, then the value of $(x - 4y + 3z)$ is:

- (a) $\frac{\sqrt{3}}{3}$ (b) $2\sqrt{3}$
 (c) $\sqrt{3}$ (d) $\frac{\sqrt{3}}{2}$

SSC CHSL 05/08/2021 (Shift-I)

Ans. (c) : Given,

$$x^2 + 4y^2 + 3z^2 + \frac{19}{4} = 2\sqrt{3}(x+y+z)$$

$$x^2 - 2\sqrt{3}x + 3 + 4y^2 - 2\sqrt{3}y + \frac{3}{4} + 3z^2 - 2\sqrt{3}z + 1 = 0$$

$$(x - \sqrt{3})^2 + \left(2y - \frac{\sqrt{3}}{2}\right)^2 + (\sqrt{3}z - 1)^2 = 0$$

$$x = \sqrt{3}, \quad 2y = \frac{\sqrt{3}}{2}, \quad \sqrt{3}z = 1, \Rightarrow y = \frac{\sqrt{3}}{4}, z = \frac{1}{\sqrt{3}}$$

Hence,

$$\begin{aligned} x - 4y + 3z &= \sqrt{3} - 4 \times \frac{\sqrt{3}}{4} + 3 \times \frac{1}{\sqrt{3}} \\ &= \sqrt{3} - \sqrt{3} + \sqrt{3} \\ &= \sqrt{3} \end{aligned}$$

53. If $x + y + z = 13$, $x^2 + y^2 + z^2 = 91$ and $xz = y^2$, then the difference between z and x is:

- (a) 3 (b) 8
 (c) 5 (d) 9

SSC CHSL 05/08/2021 (Shift-I)

Ans. (b) : Given,

$$x + y + z = 13 \quad x^2 + y^2 + z^2 = 91 \text{ and } xz = y^2$$

$$x + y + z = 13$$

On squaring both sides,

$$x^2 + y^2 + z^2 + 2(xy + yz + zx) = 169$$

$$91 + 2(xy + yz + y^2) = 169$$

$$2(x+y+z)y = 169 - 91$$

$$y = \frac{39}{13} = 3$$

$$x + z = 13 - 3$$

$$x + z = 10$$

$$xz = 9$$

$$z = \frac{9}{x}$$

$$x + \frac{9}{x} = 10$$

$$x(10-x) = 9$$

$$x = 1$$

Hence, $z - x = 9 - 1 = 8$

54. If $x + y = 5$ and $\frac{1}{x} + \frac{1}{y} = \frac{20}{9}$, then the value of $(x^3 + y^3)$ will be:

- (a) $\frac{635}{8}$ (b) $\frac{365}{4}$
 (c) $\frac{205}{4}$ (d) $\frac{635}{4}$

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : $x + y = 5$ (i)

$$\frac{1}{x} + \frac{1}{y} = \frac{20}{9}$$

$$\frac{x+y}{xy} = \frac{20}{9}$$

$$\frac{5}{xy} = \frac{20}{9} \quad [\text{On putting the value of } x + y = 5]$$

$$xy = \frac{9}{4}$$

$$(x+y)^3 = x^3 + y^3 + 3xy(x+y)$$

$$(5)^3 = x^3 + y^3 + 3 \times \frac{9}{4} \times 5$$

$$125 - \frac{135}{4} = x^3 + y^3$$

$$x^3 + y^3 = \frac{500 - 135}{4} = \frac{365}{4}$$

55. If $x + y + z = 5$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$, $xyz = 12$ and $x^3 + y^3 + z^3 = 151$, then the value of $(x^2 + y^2 + z^2)$ is:

- (a) 23 (b) 24
 (c) 21 (d) 22

SSC CHSL 15/04/2021 (Shift-I)

Ans. (a) : Given $x+y+z = 5$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$, $xyz = 12$

$$x^3 + y^3 + z^3 = 151$$

$$\therefore \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$$

$$yz + zx + xy = 0$$

$$x^3 + y^3 + z^3 - 3xyz = (x+y+z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$151 - 3 \times 12 = 5[x^2 + y^2 + z^2 - (xy + yz + zx)]$$

$$115 = 5(x^2 + y^2 + z^2 - 0)$$

$$x^2 + y^2 + z^2 = \frac{115}{5} = 23$$

56. If $49a^2 + 25b^2 = 30$ and $ab = 1$, $a, b > 0$, then the value of $(7a + 5b)$ is:

- (a) 14 (b) 10
 (c) 8 (d) 12

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : $49a^2 + 25b^2 = 30$

On adding $70ab$ both sides,

$$49a^2 + 25b^2 + 70ab = 30 + 70ab$$

$$(7a)^2 + (5b)^2 + 2 \times 7 \times 5ab = 30 + 70ab \quad (\because ab = 1)$$

$$(7a + 5b)^2 = 30 + 70$$

$$7a + 5b = \sqrt{100} = 10$$

57. If $x^4 + \frac{1}{x^4} = 727, x > 1$, then what is the value of

$$\left(x - \frac{1}{x}\right) ?$$

- (a) 6 (b) 5
(c) -5 (d) -6

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (b) : Given that- $x^4 + \frac{1}{x^4} = 727, x > 1$

Adding 2 on both sides, $x^4 + \frac{1}{x^4} + 2 = 727 + 2$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = (27)^2$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 27$$

Subtracting 2 from both sides,

$$x^2 + \frac{1}{x^2} - 2 = 27 - 2$$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} = 25$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 5^2$$

Taking square root both sides,

$$\boxed{x - \frac{1}{x} = 5}$$

Hence, option (b) is correct.

58. If $x - \frac{1}{x} = 1$, then what is the value of $x^8 + \frac{1}{x^8}$?

- (a) 119 (b) -1
(c) 3 (d) 47

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (d) : From question,

$$x - \frac{1}{x} = 1$$

On squaring both sides,

$$\left(x - \frac{1}{x}\right)^2 = 1^2$$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 = 1$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 3$$

Again on squaring both sides,

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 3^2$$

$$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 9, \Rightarrow x^4 + \frac{1}{x^4} = 7$$

Again on squaring both sides,

$$\left(x^4 + \frac{1}{x^4}\right)^2 = 7^2$$

$$\Rightarrow x^8 + \frac{1}{x^8} + 2 = 49$$

$$\therefore \boxed{x^8 + \frac{1}{x^8} = 47}$$

59. If $2x^2 - 7x + 5 = 0$, then what is the value of

$$x^3 + \frac{125}{8x^3} ?$$

- (a) $12\frac{5}{8}$ (b) $16\frac{5}{8}$
(c) $10\frac{5}{8}$ (d) $18\frac{5}{8}$

SSC CGL-(Tier-I) 2308/2021 (Shift I)

Ans. (b) : $2x^2 - 7x + 5 = 0$

On dividing by $2x$, on both sides

$$x - \frac{7}{2} + \frac{5}{2x} = 0$$

$$x + \frac{5}{2x} = \frac{7}{2}$$

On cubing both sides,

$$x^3 + \frac{125}{8x^3} + 3 \times x \times \frac{5}{2x} \left(x + \frac{5}{2x}\right) = \frac{343}{8}$$

$$x^3 + \frac{125}{8x^3} + \frac{15}{2} \times \frac{7}{2} = \frac{343}{8}$$

$$x^3 + \frac{125}{8x^3} = \frac{343}{8} - \frac{105}{4} = \frac{133}{8}$$

$$= 16\frac{5}{8}$$

60. If $2x + 3y + 1 = 0$, then what is the value of $(8x^3 + 8 + 27y^3 - 18xy)$?

- (a) -7 (b) 7
(c) -9 (d) 9

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) : If $a + b + c = 0$

$$\therefore a^3 + b^3 + c^3 - 3abc = 0$$

$$\therefore 2x + 3y + 1 = 0$$

$$\therefore 8x^3 + 27y^3 + (1)^3 - 3 \times 2x \times 3y \times 1 = 0$$

$$8x^3 + 27y^3 + 1 - 18xy = 0 \text{ (adding +7 to Both sides)}$$

$$8x^3 + 27y^3 + 8 - 18xy = 7$$

61. If $a^4 + b^4 + a^2b^2 = 273$ and $a^2 + b^2 - ab = 21$,

then one of the values of $\left(\frac{1}{a} + \frac{1}{b}\right)$ is :

- (a) $-\frac{9}{4}$ (b) $-\frac{3}{4}$
(c) $\frac{9}{8}$ (d) $\frac{3}{2}$

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) : $\therefore (a^2 + b^2 + ab)(a^2 + b^2 - ab) = a^4 + b^4 + a^2b^2$

$$\therefore a^2 + b^2 + ab = \frac{273}{21} = 13 \dots\dots(1)$$

$$\text{Given } a^2 + b^2 - ab = 21 \dots\dots(2)$$

From eqⁿ (1) - (2),
 $2ab = -8$
 From eqⁿ (1) + (2),
 $2(a^2 + b^2) = 34$
 $a^2 + b^2 = 17$
 $\therefore (a+b)^2 = 17 - 8 = 9$
 $a + b = 3$
 $\therefore \frac{1}{a} + \frac{1}{b} = \frac{b+a}{ab} = \frac{3}{-4} = -\frac{3}{4}$

62. If $(54\sqrt{2}x^3 + 24\sqrt{3}y^3) \div (\sqrt{18}x + \sqrt{12}y) = Ax^2 + By^2 + Cxy$, then what is the value of $A^2 - (B^2 + C^2)$?

- (a) 12 (b) -36
 (c) -24 (d) 24

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (b) :

$$\frac{[(3\sqrt{2}x)^3 + (2\sqrt{3}y)^3] \div (3\sqrt{2}x + 2\sqrt{3}y)}{= Ax^2 + By^2 + Cxy}$$

$$\therefore a^3 + b^3 = (a+b)(a^2 + b^2 - ab)$$

$$\frac{(3\sqrt{2}x + 2\sqrt{3}y)(18x^2 + 12y^2 - 6\sqrt{6}xy)}{(3\sqrt{2}x + 2\sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

On comparing:

$$Ax^2 + By^2 + Cxy = 18x^2 + 12y^2 - 6\sqrt{6}xy$$

$$A = 18, B = 12, C = -6\sqrt{6}$$

$$\therefore A^2 - (B^2 + C^2) = 18^2 - (144 + 216)$$

$$= 324 - 360$$

$$= -36$$

63. If $x + y + z = 7$, $x^2 + y^2 + z^2 = 85$ and $x^3 + y^3 + z^3 = 913$, then the value of $\sqrt[3]{xyz}$ is:

- (a) 1 (b) 2
 (c) 4 (d) 8

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (c) : Given,

$$x + y + z = 7, x^2 + y^2 + z^2 = 85, x^3 + y^3 + z^3 = 913$$

$$\therefore x^3 + y^3 + z^3 - 3xyz = (x+y+z)[x^2 + y^2 + z^2 - xy - yz - zx]$$

$$\therefore (x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$$

$$\therefore x^2 + y^2 + z^2 + 2(xy + yz + zx) = 49$$

$$2(xy + yz + zx) = -36$$

$$(xy + yz + zx) = -18$$

$$x^3 + y^3 + z^3 - 3xyz = 7 \times [85 + 18]$$

$$3xyz = 913 - 721 = 192$$

$$xyz = 64$$

$$\sqrt[3]{xyz} = \sqrt[3]{64} = 4$$

64. If $x^4 + y^4 + x^2y^2 = 21$ and $x^2 + y^2 - xy = 7$, then what is the value of $\frac{x}{y} + \frac{y}{x}$?

- (a) $\frac{5}{4}$ (b) $\frac{3}{4}$

- (c) $-\frac{3}{2}$ (d) $-\frac{5}{2}$

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (d) : $x^4 + y^4 + x^2y^2 = 21$
 given $x^2 + y^2 - xy = 7$ (i)
 $(x^2 + y^2 + xy)(x^2 + y^2 - xy) = x^4 + y^4 + x^2y^2$
 $(x^2 + y^2 + xy) \times 7 = 21$
 $x^2 + y^2 + xy = 3$(ii)
 Equation (i) + Equation (ii),
 $x^2 + y^2 + xy = 3$
 $\frac{x^2 + y^2 - xy = 7}{x^2 + y^2 + xy = 3}$
 $2(x^2 + y^2) = 10$
 $x^2 + y^2 = 5$
 $x^2 + y^2 + xy = 3$
 $xy = -2$
 $\frac{x}{y} + \frac{y}{x} = \frac{x^2 + y^2}{xy} = \frac{-5}{2}$

65. If $x - y = 11$ and $\frac{1}{x} - \frac{1}{y} = \frac{11}{24}$, then what is the value of $x^3 - y^3 + x^2y^2$?

- (a) 1331 (b) 1105
 (c) 1307 (d) 1115

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (d) Given,

$$x - y = 11 \text{ and } \frac{1}{x} - \frac{1}{y} = \frac{11}{24}, \frac{y-x}{xy} = \frac{11}{24}$$

$$xy = -1 \times 24$$

$$xy = -24$$

$$x^3 - y^3 + x^2y^2 = ?$$

$$= (x-y)[(x-y)^2 + 3xy] + (-24)^2$$

$$= 11 \times [121 - 72] + 576$$

$$= 11 \times 49 + 576$$

$$= 539 + 576 = 1115$$

66. If $(16\sqrt{2}x^3 + 81\sqrt{3}y^3) \div (2\sqrt{2}x + 3\sqrt{3}y) = Ax^2 + By^2 + Cxy$, then find the value of $2A - 3B - 2\sqrt{6}C$.

- (a) 25 (b) 7
 (c) 137 (d) 79

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (b) : From question,

$$\frac{(16\sqrt{2}x^3 + 81\sqrt{3}y^3)}{(2\sqrt{2}x + 3\sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

From formula : $(a^3 + b^3) = (a + b)(a^2 + b^2 - ab)$

$$\frac{(2\sqrt{2}x + 3\sqrt{3}y)(8x^2 + 27y^2 - 6\sqrt{6}xy)}{(2\sqrt{2}x + 3\sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

$$\Rightarrow 8x^2 + 27y^2 - 6\sqrt{6}xy = Ax^2 + By^2 + Cxy$$

On comparing both sides,
 A = 8
 B = 27
 C = $-6\sqrt{6}$

Then,

$$\begin{aligned} 2A - 3B - 2\sqrt{6}C &= 2 \times 8 - 3 \times 27 - 2\sqrt{6} \times (-6\sqrt{6}) \\ &= 16 - 81 + 12 \times 6 \\ &= 16 - 81 + 72 \\ &= 88 - 81 \\ &= 7 \end{aligned}$$

$$\therefore \boxed{2A - 3B - 2\sqrt{6}C = 7}$$

67. If $4x^4 - 37x^2 + 9 = 0$, $x > \sqrt{\frac{3}{2}}$, then what is the value of $8x^3 - \frac{27}{x^3}$?

- (a) 35 (b) 215
(c) -215 (d) -35

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (b) : $4x^4 - 37x^2 + 9 = 0$

Let us consider $x^2 = a$

then, $4a^2 - 37a + 9 = 0$

$4a^2 - 36a - a + 9 = 0$

$4a(a-9) - 1(a-9) = 0$

$4a(a-9) - 1(a-9) = 0$

$a = 1/4$ or $a = 9$

On putting the value of $a = x^2$

$x^2 = 1/4$ not acceptable as $x > \sqrt{\frac{3}{2}}$

$x^2 = 9$ then $x = 3$ or $x = -3$

$$\left(x = -3 \text{ not valid as } x > \sqrt{\frac{3}{2}} \right)$$

Then put $x = 3$,

$$8x^3 - \frac{27}{x^3} = ?$$

$$? = 8 \times (3)^3 - \frac{27}{(3)^3}$$

$$? = 8 \times 27 - \frac{27}{27}$$

$$? = 216 - 1, \boxed{? = 215}$$

68. If $x + y + z = 1$, $xy + yz + zx = xyz = -4$, then what is the value of $(x^3 + y^3 + z^3)$?

- (a) 8 (b) -8
(c) 1 (d) -1

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,

$x + y + z = 1$, $xy + yz + zx = xyz = -4$

$(x^3 + y^3 + z^3) = ?$

$$\boxed{(x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)}$$

$$(1)^2 = x^2 + y^2 + z^2 + 2 \times (-4)$$

$$x^2 + y^2 + z^2 = 9$$

$$\therefore [x^3 + y^3 + z^3 - 3xyz = (x + y + z)[x^2 + y^2 + z^2 - xy - yz - zx]]$$

$$x^3 + y^3 + z^3 - 3 \times -4 = 1[9 - (-4)]$$

$$x^3 + y^3 + z^3 = 9 + 4 - 12$$

$$x^3 + y^3 + z^3 = 1$$

69. If $x + y = 2$ and $\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$, then the value of $(x^3 + y^3)$ is :

- (a) $4\frac{2}{3}$ (b) $4\frac{3}{5}$
(c) $3\frac{1}{5}$ (d) $3\frac{1}{3}$

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (a) : Given:- $x + y = 2$ -----(i),

$$\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$$

$$\frac{x+y}{xy} = \frac{18}{5}$$

On putting the value of $x + y$ from equation (i)

$$\frac{2}{xy} = \frac{18}{5}$$

$$xy = \frac{2 \times 5}{18} = \frac{5}{9} \text{ ----- (ii)}$$

On cubing of equation (i),

$$x^3 + y^3 + 3xy(x + y) = (2)^3$$

On putting the value of $xy = \frac{5}{9}$,

$$x^3 + y^3 + 3 \times \frac{5}{9} (2) = 8$$

$$x^3 + y^3 + \frac{10}{3} = 8$$

$$x^3 + y^3 = 8 - \frac{10}{3} = \frac{24 - 10}{3} = \frac{14}{3} = 4\frac{2}{3}$$

$$x^3 + y^3 = 4\frac{2}{3}$$

70. If $x - \frac{1}{x} = \sqrt{77}$, then one of the values of $x^3 + \frac{1}{x^3}$ is :

- (a) $80\sqrt{77}$ (b) 702
(c) $77\sqrt{77}$ (d) $3\sqrt{77}$

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (b) : Given :- $x - \frac{1}{x} = \sqrt{77}$

From formula $(a - b)^2 = (a + b)^2 - 4ab$

$$(\sqrt{77})^2 = \left(x + \frac{1}{x}\right)^2 - 4$$

$$\left(x + \frac{1}{x}\right)^2 = 77 + 4 = 81$$

$$x + \frac{1}{x} = 9 \text{ -----(ii)}$$

On cubing both side of equation (ii),

$$\left(x + \frac{1}{x}\right)^3 = (9)^3$$

$$x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left(x + \frac{1}{x} \right) = 729$$

$$x^3 + \frac{1}{x^3} + 3 \times (9) = 729$$

$$x^3 + \frac{1}{x^3} = 729 - 27 = 702$$

$$x^3 + \frac{1}{x^3} = 702$$

71. If $x + y + z = 3$, $xy + yz + zx = -12$ and $xyz = -16$, then the value of $\sqrt{x^3 + y^3 + z^3 + 13}$ is :
 (a) 9 (b) 8 (c) 10 (d) 11

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (c) : From formula :-

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) [(a+b+c)^2 - 3(ab+bc+ca)]$$

$$x^3 + y^3 + z^3 - 3xyz = (x+y+z) [(x+y+z)^2 - 3(xy+yz+zx)]$$

As per question

$$x^3 + y^3 + z^3 - 3 \times (-16) = 3 [(3)^2 - 3(-12)]$$

$$x^3 + y^3 + z^3 + 48 = 3(9 + 36)$$

$$x^3 + y^3 + z^3 + 48 = 135$$

$$x^3 + y^3 + z^3 + 13 = 135 - 35 = 100$$

On taking square root both sides,

$$\sqrt{x^3 + y^3 + z^3 + 13} = \sqrt{100}$$

$$\sqrt{x^3 + y^3 + z^3 + 13} = 10$$

72. If $x^8 - 433x^4 + 16 = 0$, $x > 0$, then what is the value of $\left(x + \frac{2}{x}\right)$?

- (a) 7 (b) 4 (c) 5 (d) 9

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) : Given equation- $x^8 - 433x^4 + 16 = 0$

$$x^4 + \frac{16}{x^4} = 433$$

On adding +8 at both side

$$x^4 + \frac{16}{x^4} + 8 = 441$$

$$\left(x^2 + \frac{4}{x^2}\right)^2 = 21^2$$

$$x^2 + \frac{4}{x^2} = 21$$

$$x^2 + \frac{4}{x^2} + 4 = 21 + 4$$

$$\left(x + \frac{2}{x}\right)^2 = 25$$

$$x + \frac{2}{x} = 5$$

{ $\therefore x > 0$ }

73. If $(x+y)^3 + 27(x-y)^3 = (Ax-2y)(Bx^2+Cxy+13y^2)$, then the value of $A-B-C$ is :

- (a) 27 (b) 13
(c) 15 (d) 20

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (b) : Given that,

$$(x+y)^3 + 27(x-y)^3 = (Ax-2y)(Bx^2+Cxy+13y^2)$$

$$\text{LHS} = (x+y)^3 + (3x-3y)^3$$

$$(x+y+3x-3y)[(x+y)^2 + (3x-3y)^2 - (x+y)(3x-3y)]$$

$$\{ \therefore a^3 + b^3 = (a+b)(a^2 + b^2 - ab) \}$$

$$= (4x-2y)[10x^2 + 10y^2 - 16xy - 3(x^2 - y^2)]$$

$$= (4x-2y)[10x^2 + 10y^2 - 16xy - 3x^2 + 3y^2]$$

$$= (4x-2y)[7x^2 + 13y^2 - 16xy]$$

After comparing LHS with RHS,

$$(4x-2y)[7x^2 + 13y^2 - 16xy] = (Ax-2y)(Bx^2 + Cxy + 13y^2)$$

$$A = 4, B = 7 \text{ \& } C = -16$$

$$\therefore (A - B - C) = (4 - 7 + 16) = 13$$

74. If $\left(2x - \frac{3}{x}\right) = 2$, then what is the value of

$$\left(16x^4 + \frac{81}{x^4}\right) ?$$

- (a) 328 (b) 180
(c) 184 (d) 220

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (c) : $\left(2x - \frac{3}{x}\right) = 2$

On squaring both sides,

$$4x^2 + \frac{9}{x^2} = 4 + 12$$

$$4x^2 + \frac{9}{x^2} = 16$$

Again on squaring both sides,

$$16x^4 + \frac{81}{x^4} = 256 - 72$$

$$16x^4 + \frac{81}{x^4} = 184$$

75. $x + y + z = 2$ and $xy + yz + zx = -11$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is:

- (a) 78 (b) 71
(c) 74 (d) 69

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (c) : $x + y + z = 2$

$$x^2 + y^2 + z^2 + 2(xy + yz + zx) = 4$$

$$x^2 + y^2 + z^2 = 4 + 22 = 26$$

$$\therefore x^3 + y^3 + z^3 - 3xyz = (x+y+z)[x^2 + y^2 + z^2 - (xy + yz + zx)]$$

$$= 2 \times [26 + 11]$$

$$= 2 \times 37 = 74$$

76. If $x + \frac{1}{x} = 4$, then the value of $x^5 + \frac{1}{x^5}$ is :

- (a) 776 (b) 684
(c) 724 (d) 736

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (c) : Given,

$$x + \frac{1}{x} = 4 \Rightarrow x^2 + \frac{1}{x^2} = 14, x^3 + \frac{1}{x^3} = 52$$

$$x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right) \left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$$

$$= 14 \times 52 - 4$$

$$= 728 - 4 = 724$$

77. If $x + y = 4$ and $\frac{1}{x} + \frac{1}{y} = \frac{16}{15}$, then what is the value of $(x^3 + y^3)$?

- (a) 18 (b) 16
(c) 19 (d) 21

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (c) :

Ans. (c) :

$$\frac{1}{x} + \frac{1}{y} = \frac{16}{15}$$

$$\frac{x+y}{xy} = \frac{16}{15}$$

$$\frac{4}{xy} = \frac{16}{15} \quad \dots(\text{Given } x + y = 4)$$

$$xy = \frac{15}{4}$$

$$\therefore x^3 + y^3 = (x+y)^3 - 3xy(x+y)$$

$$= 4^3 - 3 \times \frac{15}{4} \times 4$$

$$= 64 - 45 = 19$$

78. If $x + y + z = 3$, $x^2 + y^2 + z^2 = 45$ and $x^3 + y^3 + z^3 = 69$, then what is the value of xyz ?

- (a) -40 (b) 40
(c) -30 (d) 30

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : Given,

$$x + y + z = 3, x^2 + y^2 + z^2 = 45, x^3 + y^3 + z^3 = 69, xyz = ?$$

$$(x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy+yz+zx)$$

$$9 = 45 + 2(xy+yz+zx)$$

$$2(xy+yz+zx) = -36$$

$$xy+yz+zx = -18$$

$$x^3 + y^3 + z^3 - 3xyz = (x+y+z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$69 - 3xyz = 3 \times [45 - (-18)]$$

$$-3xyz = 63 \times 3 - 69$$

$$xyz = \frac{189 - 69}{-3} = -40$$

79. If $x + \frac{1}{x} = \sqrt{7}$, then what is the value of $(x^2 + 1)$

$$\div \left[x^4 + \left(\frac{1}{x^2} \right) \right] ?$$

- (a) $2\sqrt{7}$ (b) $3\sqrt{7}$
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

SSC CHSL 19/04/2021 (Shift-I)

Ans. (d) : Given,

$$x + \frac{1}{x} = \sqrt{7}$$

$$x^3 + \frac{1}{x^3} = (\sqrt{7})^3 - 3\sqrt{7} = 4\sqrt{7}$$

$$\frac{x^2 + 1}{x^4 + \frac{1}{x^2}} = ?$$

On dividing by x ,

$$? = \frac{x + \frac{1}{x}}{x^3 + \frac{1}{x^3}}$$

$$? = \frac{\sqrt{7}}{4\sqrt{7}} = \frac{1}{4}$$

80. If $x^6 - 6\sqrt{6}y^6 = (x^2 + Ay^2)(x^4 + Bx^2y^2 + Cy^4)$, then what will be the value of $(A^2 - B^2 + C^2)$?

- (a) 27 (b) 42
(c) 36 (d) 18

SSC CHSL 10/08/2021 (Shift-I)

Ans. (c) : $x^6 - 6\sqrt{6}y^6 = (x^2 + Ay^2)(x^4 + Bx^2y^2 + Cy^4)$

$$(x^2)^3 - (\sqrt{6}y^2)^3 = (x^2 + Ay^2)(x^4 + Bx^2y^2 + Cy^4)$$

$$(x^2 - \sqrt{6}y^2) [x^4 + \sqrt{6}x^2y^2 + 6y^4]$$

$$= (x^2 + Ay^2)(x^4 + Bx^2y^2 + Cy^4)$$

On comparing both sides,

$$\therefore A = -\sqrt{6}, \quad B = \sqrt{6}, \quad C = 6$$

$$\therefore A^2 - B^2 + C^2 = (-\sqrt{6})^2 - (\sqrt{6})^2 + (6)^2$$

$$= 6 - 6 + 36 = 36$$

81. If $x + \frac{1}{15x} = 3$, then the value of $9x^3 + \frac{1}{375x^3}$

will be:

- (a) 237.6 (b) 376.2
(c) 273.6 (d) 367.2

SSC CHSL 10/08/2021 (Shift-I)

Ans. (a) : $x + \frac{1}{15x} = 3$

On multiplying by 3 in both side,

$$3x + \frac{1}{5x} = 9$$

Taking cube on both sides,

$$27x^3 + \frac{1}{125x^3} + 3 \times 3x \times \frac{1}{5x} \left(3x + \frac{1}{5x} \right) = 729$$

$$27x^3 + \frac{1}{125x^3} + \frac{9}{5} \times 9 = 729$$

On multiplying by $\frac{1}{3}$ of both side

$$9x^3 + \frac{1}{375x^3} + 5.4 = 243$$

$$9x^3 + \frac{1}{375x^3} = 237.6$$

82. If $x - y = 4$ and $xy = 3$, then what is the value of $x^3 - y^3$?

- (a) 88 (b) 28
(c) 100 (d) 64

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : $x - y = 4, \quad xy = 3$
 $\therefore x^3 - y^3 = (x-y)(x^2 + y^2 + xy) \quad [(x^2 + y^2 = (x-y)^2 + 2xy)]$
 $= 4 \times [(x-y)^2 + 2xy + xy]$
 $= 4 \times [4^2 + 3 \times 3]$
 $= 4 \times [16 + 9]$
 $= 4 \times 25 = 100$

83. If $x^2 - 6\sqrt{3}x + 1 = 0$, then the value of $x^3 + \frac{1}{x^3}$ will be:

- (a) $666\sqrt{3}$ (b) $630\sqrt{3}$
(c) $234\sqrt{3}$ (d) $216\sqrt{3}$

SSC CHSL 12/04/2021 (Shift-I)

Ans. (b) $x^2 - 6\sqrt{3}x + 1 = 0$ ----- [Given]

$$x - 6\sqrt{3} + \frac{1}{x} = 0$$

$$x + \frac{1}{x} = 6\sqrt{3}$$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 6 \times 6 \times 6 \times 3\sqrt{3}$$

$$x^3 + \frac{1}{x^3} = 648\sqrt{3} - 3 \times 6\sqrt{3}$$

$$= 630\sqrt{3}$$

84. If $a + b = p$, $ab = q$, then $(a^4 + b^4)$ is equal to

- (a) $p^4 - 2p^2q^2 + q^2$ (b) $p^4 - 4p^2q^2 + 2q^2$
(c) $p^4 - 4p^2q + q^2$ (d) $p^4 - 4p^2q + 2q^2$

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : Given—
 $a + b = p, ab = q \quad [a^4 + b^4 = ?]$
 $(a + b) = p \quad (\text{On squaring both sides})$
 $a^2 + b^2 + 2ab = p^2$
 $a^2 + b^2 = p^2 - 2q \quad (\text{On squaring both sides})$
 $a^4 + b^4 + 2q^2 = p^4 + 4q^2 - 2p^2 \times 2q$
 $a^4 + b^4 = p^4 - 4p^2q + 2q^2$

85. If $x^4 + y^4 + x^2y^2 = 117$ and $x^2 + y^2 - xy = 3(4 + \sqrt{3})$, then the value of $(x^2 + y^2)$ will be:

- (a) $6\sqrt{3}$ (b) 12
(c) 9 (d) $13\sqrt{3}$

SSC CHSL 12/04/2021 (Shift-I)

Ans. (b) $x^4 + y^4 + x^2y^2 = 117, x^2 + y^2 - xy = 3(4 + \sqrt{3})$
 $x^4 + y^4 + x^2y^2 = (x^2 + y^2 + xy)(x^2 + y^2 - xy)$

$$117 = (x^2 + y^2 + xy) [3(4 + \sqrt{3})]$$

$$x^2 + y^2 + xy = \frac{117}{3(4 + \sqrt{3})} \times \frac{(4 - \sqrt{3})}{(4 - \sqrt{3})}$$

$$= \frac{39(4 - \sqrt{3})}{13} = 3(4 - \sqrt{3})$$

$$x^2 + y^2 + xy = 3(4 - \sqrt{3}) \quad \dots(i)$$

$$x^2 + y^2 - xy = 3(4 + \sqrt{3}) \quad \dots(ii)$$

From eqⁿ (i) and eqⁿ (ii),

$$2(x^2 + y^2) = 24$$

$$x^2 + y^2 = 12$$

86. If $\left(x + \frac{1}{x}\right)^2 = 27$, then what is the value of

$\left(x^2 + \frac{1}{x^2}\right)$? Given that x is real.

- (a) 11 (b) 25
(c) 7 (d) 9

SSC CHSL 04/08/2021 (Shift-I)

Ans. (b) $\left(x + \frac{1}{x}\right)^2 = 27$

$$x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = 27$$

$$x^2 + \frac{1}{x^2} = 27 - 2$$

$$x^2 + \frac{1}{x^2} = 25$$

87. If $\left(x + \frac{2}{x}\right) = 7$, then what is the value of

$\left(2x^2 + \frac{8}{x^2}\right)$?

- (a) 90 (b) 44
(c) 50 (d) 94

SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) : Given, $x + \frac{2}{x} = 7$

On squaring both sides,

$$x^2 + \frac{4}{x^2} + 4 = 49$$

$$x^2 + \frac{4}{x^2} = 45$$

On multiplying by 2 on both sides,

$$2x^2 + \frac{8}{x^2} = 90$$

88. If $x - 3 = \frac{1}{2x}$, then what is the value of

$\left(x^4 + \frac{1}{16x^4}\right)$?

- (a) 11 (b) $99\frac{1}{2}$
 (c) 98 (d) 10

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : $x - 3 = \frac{1}{2x}$

$$x - \frac{1}{2x} = 3$$

On squaring both sides,

$$x^2 + \frac{1}{4x^2} - 2 \times x \times \frac{1}{2x} = 9$$

$$x^2 + \frac{1}{4x^2} = 10$$

Again on squaring both sides,

$$x^4 + \frac{1}{16x^4} + 2 \times x^2 \times \frac{1}{4x^2} = 100$$

$$x^4 + \frac{1}{16x^4} = 100 - \frac{1}{2} = \frac{199}{2} = 99\frac{1}{2}$$

89. Given that $3\sqrt{3}x^3 - 8y^3 = (\sqrt{3}x + Ay)(3x^2 + By^2 + Cxy)$, the value of $(A^2 + B^2 - C^2)$ is:
 (a) 0 (b) 12
 (c) 8 (d) 4

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : $3\sqrt{3}x^3 - 8y^3 = (\sqrt{3}x + Ay)(3x^2 + By^2 + Cxy)$
 $(\sqrt{3}x - 2y)(3x^2 + 2\sqrt{3}xy + 4y^2)$
 $= (\sqrt{3}x + Ay)(3x^2 + By^2 + Cxy)$

$\therefore a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

\therefore On comparing both sides,
 $A = -2, B = 4, C = 2\sqrt{3}$

So, $A^2 + B^2 - C^2 = (-2)^2 + (4)^2 - (2\sqrt{3})^2$
 $= 4 + 16 - 12 = 8$

90. If $3x - 2y + 3 = 0$, then what will be the value of $27x^3 + 54xy + 30 - 8y^3$?
 (a) 3 (b) -27
 (c) -57 (d) 57

SSC CHSL 12/08/2021 (Shift-I)

Ans. (a) : $3x - 2y + 3 = 0$
 Let, $x = 1, y = 3$
 Then, $3x - 2y + 3 = 3 \times 1 - 2 \times 3 + 3 = 0$ L.H.S = R.H.S.
 On putting $x = 1$ and $y = 3$,
 $27x^3 + 54xy + 30 - 8y^3 = 27 + 54 \times 1 \times 3 + 30 - 8 \times 27$
 $= 27 + 162 + 30 - 216$
 $= 219 - 216 = 3$

91. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 2\sqrt{3}$, then what will be the value of $x^4 + \frac{1}{x^4}$?

- (a) 10406 (b) 9602
 (c) 9606 (d) 10402

SSC CHSL 12/08/2021 (Shift-I)

Ans. (b) : $\sqrt{x} + \frac{1}{\sqrt{x}} = 2\sqrt{3}$

On squaring both sides,

$$x + \frac{1}{x} + 2 = 12$$

$$x + \frac{1}{x} = 10$$

Again, on squaring both sides,

$$x^2 + \frac{1}{x^2} = 98$$

Again on squaring both sides,

$$x^4 + \frac{1}{x^4} = (98)^2 - 2 = 9604 - 2 = 9602$$

92. If $3u + 2v = 7$ and $uv = 2$, then the value of $(3u - 2v)$ is:
 (a) 2 (b) 0
 (c) 1 (d) 5

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : $\therefore (a-b)^2 = (a+b)^2 - 4ab$
 $(3u - 2v)^2 = (3u + 2v)^2 - 4 \times 3u \times 2v$
 $= 49 - 24 \times 2 = 1$
 $3u - 2v = 1$

93. If $2x^2 - 6x = 1$, then $x^2 + \frac{1}{4x^2} = ?$
 (a) 8 (b) 12
 (c) 9 (d) 10

SSC CHSL 13/04/2021 (Shift-I)

Ans. (d) : $2x^2 - 6x = 1$

On dividing by $2x$,

$$x - 3 = \frac{1}{2x}$$

$$x - \frac{1}{2x} = 3$$

On squaring both sides,

$$\left(x - \frac{1}{2x}\right)^2 = 9$$

$$x^2 + \frac{1}{4x^2} - 2 \times x \times \frac{1}{2x} = 9$$

$$x^2 + \frac{1}{4x^2} = 10$$

94. If $a + b + c = 5$ and $a^3 + b^3 + c^3 - 3abc = 185$, then the value of $ab + bc + ca$ lies between:
 (a) -7 and -3 (b) 1 and 5
 (c) -3 and 1 (d) 5 and 9

SSC CHSL 13/04/2021 (Shift-I)

Ans. (a) :
 $a^3 + b^3 + c^3 - 3abc = (a+b+c) [(a+b+c)^2 - 3(ab+bc+ca)]$
 $185 = 5[25 - 3(ab+bc+ca)]$
 $37 - 25 = -3(ab+bc+ca)$
 $ab + bc + ca = -4$
 $\therefore -4$ lies between -7 and -3 .
 Hence option (a) will be right.

95. If $3x + 5y = 14$ and $xy = 6$, then what is the value of $9x^2 + 25y^2$?

- (a) 16 (b) 14
(c) 20 (d) 182

SSC CHSL 11/08/2021 (Shift-I)

Ans. (a) : $3x + 5y = 14$, $xy = 6$ (Given)

On squaring both sides,

$$(3x + 5y)^2 = 14^2$$

$$9x^2 + 25y^2 + 30xy = 196 \quad (\because xy = 6)$$

So, $9x^2 + 25y^2 = 196 - 30 \times 6 = 196 - 180 = 16$

96. If $a^2 + b^2 + c^2 + 48 = 8(a + b + c)$, then what is the value of $\sqrt[3]{a^3 - b^3 + c^3}$?

- (a) 6 (b) 4
(c) 3 (d) 2

SSC CHSL 11/08/2021 (Shift-I)

Ans. (b) : $a^2 + b^2 + c^2 + 48 = 8(a + b + c)$

$$a^2 - 8a + 16 + b^2 - 8b + 16 + c^2 - 8c + 16 = 0$$

$$(a-4)^2 + (b-4)^2 + (c-4)^2 = 0$$

$$\therefore (a-4)^2 = 0, \quad a = 4$$

$$(b-4)^2 = 0, \quad b = 4$$

$$(c-4)^2 = 0, \quad c = 4$$

So, $\sqrt[3]{a^3 - b^3 + c^3} = \sqrt[3]{4^3 - 4^3 + 4^3} = 4$

97. If $x^4 + x^{-4} = 47$, $x > 0$, then the value of $(2x - 3)^2$ is:

- (a) 9 (b) 3
(c) 5 (d) 7

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : $x^4 + \frac{1}{x^4} = 47$

$$x^2 + \frac{1}{x^2} = 7$$

$$\left(x + \frac{1}{x}\right)^2 = 7 + 2 = 9$$

$$x + \frac{1}{x} = 3$$

$$x^2 + 1 - 3x = 0$$

$$x^2 - 3x + 1 = 0$$

Multiply by 4 on both sides,

$$4x^2 - 12x + 4 = 0$$

After adding 5 on both sides,

$$4x^2 - 12x + 4 + 5 = 5$$

$$4x^2 - 12x + 9 = 5$$

$$(2x - 3)^2 = 5$$

98. If $x - \frac{2}{x} = 4$, then what will be the value of

$$x^2 + \frac{4}{x^2}?$$

- (a) 8 (b) 20
(c) 18 (d) 12

SSC CHSL 04/08/2021 (Shift-II)

Ans. (b) : $x - \frac{2}{x} = 4$

$$x^2 + \frac{4}{x^2} - 2 \times x \times \frac{2}{x} = 16 \text{ (on squaring both sides)}$$

$$x^2 + \frac{4}{x^2} = 16 + 4 = 20$$

99. If $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$, then the value of $x^6 + \frac{1}{x^6}$ will

be:

- (a) 2712 (b) 2270
(c) 2502 (d) 2702

SSC CHSL 04/08/2021 (Shift-II)

Ans. (d) : $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$

On squaring both sides,

$$x + \frac{1}{x} + 2 = 6$$

$$x + \frac{1}{x} = 4$$

$$x^2 + \frac{1}{x^2} = 14$$

Again on cubing both sides,

$$x^6 + \frac{1}{x^6} = (14)^3 - 3 \times 14$$

$$= 2744 - 42 = 2702$$

100. If $x^4 + \frac{1}{x^4} = 3842$, then the positive value of

$x + \frac{1}{x}$ will be:

- (a) 10 (b) 8
(c) 12 (d) 6

SSC CHSL 04/08/2021 (Shift-II)

Ans. (b) : $x^4 + \frac{1}{x^4} = 3842$

$$x^2 + \frac{1}{x^2} = \sqrt{3842 + 2} = \sqrt{3844} = 62$$

$$x + \frac{1}{x} = \sqrt{62 + 2} = \sqrt{64} = 8$$

Hence, $x + \frac{1}{x} = 8$

101. If $x + \frac{1}{3x} = 5$, then the value of $27x^3 + \frac{1}{x^3}$ will

be:

- (a) 3042 (b) 3024
(c) 3420 (d) 3240

SSC CHSL 10/08/2021 (Shift-II)

Ans. (d) : Given

$$x + \frac{1}{3x} = 5$$

On multiplying by 3 of both side

$$3x + \frac{1}{x} = 5 \times 3 = 15$$

On cubing both sides,

$$\left(3x + \frac{1}{x}\right)^3 = (15)^3$$

$$27x^3 + \frac{1}{x^3} + 3 \times 3x \times \frac{1}{x} \left(3x + \frac{1}{x}\right) = 3375$$

$$27x^3 + \frac{1}{x^3} + 9(15) = 3375$$

$$27x^3 + \frac{1}{x^3} = 3375 - 135$$

$$27x^3 + \frac{1}{x^3} = 3240$$

102. If $1 + 4x^2 + 16x^4 = 512$, and $1 - 2x + 4x^2 = 64$, then the value of $1 - 2x + 4x^2$ is:

- (a) 6 (b) 8
(c) 10 (d) 12

SSC CHSL 10/082021 (Shift-II)

Ans. (b) : Given :-

$$1 + 4x^2 + 16x^4 = 512 \text{ -----(i)}$$

$$\text{And } 1 - 2x + 4x^2 = 64 \text{ ----- (ii)}$$

On dividing equation (i) by equation (ii)

$$\frac{1 + 4x^2 + 16x^4}{1 - 2x + 4x^2} = \frac{512}{64}$$

$$\frac{(1 + 2x + 4x^2)(1 - 2x + 4x^2)}{1 - 2x + 4x^2} = 8$$

$$1 + 2x + 4x^2 = 8$$

103. If $x^4 - 12x^2 + 1 = 0$, then what will be the value of $x^4 + \frac{1}{x^4}$?

- (a) 142 (b) 146
(c) 10 (d) 144

SSC CHSL 06/08/2021 (Shift-III)

Ans. (a) : Given :- $x^4 - 12x^2 + 1 = 0$

$$x^4 + 1 = 12x^2$$

On dividing by x^2 of both side

$$x^2 + \frac{1}{x^2} = 12$$

On squaring both side

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (12)^2$$

$$x^4 + \frac{1}{x^4} + 2 = 144$$

$$x^4 + \frac{1}{x^4} = 144 - 2$$

$$x^4 + \frac{1}{x^4} = 142$$

104. If $x + \frac{81}{x} = 18$ where $x > 0$, then the value of

$x^2 + \frac{162}{x^2}$ is:

- (a) 78 (b) 83
(c) 85 (d) 81

SSC CHSL 06/08/2021 (Shift-III)

Ans. (b) : From question,

$$x + \frac{81}{x} = 18$$

$$\Rightarrow x^2 + 81 = 81x$$

$$\Rightarrow x^2 - 18x + 81 = 0$$

$$\Rightarrow x^2 - (9+9)x + 81 = 0$$

$$\Rightarrow x^2 - 9x - 9x + 81 = 0$$

$$\Rightarrow x(x-9) - 9(x-9) = 0$$

$$\Rightarrow (x-9)(x-9) = 0$$

$$\therefore x = 9$$

$$\text{So, } x^2 + \frac{162}{x^2} = 9^2 + \frac{162}{9^2}$$

$$= 81 + \frac{162}{81}$$

$$= 81 + 2$$

$$= 83$$

105. If $x^3 + y^3 = 468$ and $x + y = 12$, then the value of $x^4 + y^4$ will be:

- (a) 3026 (b) 2036
(c) 3620 (d) 3025

SSC CHSL 13/04/2021 (Shift-III)

Ans.(a) : Given :- $x^3 + y^3 = 468$

$$(x + y)(x^2 + y^2 - xy) = 468$$

$$x^2 + y^2 - xy = \frac{468}{12} \text{ ----- } [\because \text{on putting the value of } (x+y) = 12]$$

$$x^2 + y^2 - xy = 39 \text{ -----(i)}$$

$$\text{And } x + y = 12$$

On squaring both sides

$$x^2 + y^2 + 2xy = 144 \text{ ----(ii)}$$

On subtracting equation (i) from equation (ii)

$$xy = 144 - 39 = \frac{105}{3} = 35 \text{ ----(iii)}$$

On putting the value of xy in equation (ii)

$$x^2 + y^2 + 2 \times 35 = 144$$

$$x^2 + y^2 = 144 - 70 = 74$$

Again, on squaring both sides,

$$x^4 + y^4 + 2x^2y^2 = (74)^2$$

On putting the value of $xy = 35$,

$$x^4 + y^4 + 2 \times (35)^2 = 5476$$

$$x^4 + y^4 = 5476 - 2450 = 3026$$

Hence, $x^4 + y^4 = 3026$

106. If $x^2 - 3\sqrt{2}x + 1 = 0$, then what is the value of $x^3 + \left(\frac{1}{x^2}\right)$?

- (a) $30\sqrt{6}$ (b) $45\sqrt{2}$
 (c) $15\sqrt{6}$ (d) $30\sqrt{2}$

SSC CHSL 04/08/2021 (Shift-III)

Ans. (b) : $x^2 - 3\sqrt{2}x + 1 = 0$

$$x^2 + 1 = 3\sqrt{2}x$$

On dividing by x both sides,

$$x + \frac{1}{x} = 3\sqrt{2}$$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 54\sqrt{2}$$

$$x^3 + \frac{1}{x^3} + 3 \times 3\sqrt{2} = 54\sqrt{2}$$

$$x^3 + \frac{1}{x^3} = 54\sqrt{2} - 9\sqrt{2}$$

$$x^3 + \frac{1}{x^3} = 45\sqrt{2}$$

107. If $x^2 + 1 - 2x = 0$, $x > 0$, then $x^2(x^2 - 2) = \dots\dots\dots$

- (a) 1 (b) $\sqrt{2}$
 (c) -1 (d) 0

SSC CHSL 04/08/2021 (Shift-III)

Ans. (c) : $x^2 + 1 - 2x = 0$ ($x > 0$)

$$(x-1)^2 = 0$$

$$x = 1$$

$$x^2(x^2 - 2) = 1(1 - 2) = -1$$

108. If $a + b = 24$ and $a^2 + b^2 = 306$, where $a > b$, then the value of $4a - 5b$ is:

- (a) 18 (b) 20
 (c) 12 (d) 15

SSC CHSL 05/08/2021 (Shift-III)

Ans. (d) : $(a + b) = 24$ -----(i) [Given]

On squaring both sides,

$$a^2 + b^2 + 2ab = 576$$

$$2ab = 576 - (a^2 + b^2)$$

$$2ab = 576 - 306 = 270$$

$$ab = \frac{270}{2} = 135$$

$$ab = 135 \dots\dots(ii)$$

From equations (i) and (ii)

$$a = 15, b = 9$$

Then, $4a - 5b = 4 \times 15 - 5 \times 9 = 15$, $4a - 5b = 15$

109. If $x - y = 4$ and $x^3 - y^3 = 316$, then the value of $x^4 + y^4$ is:

- (a) 2248 (b) 2482
 (c) 2428 (d) 2284

SSC CHSL 05/08/2021 (Shift-III)

Ans. (b) : Given :- $x - y = 4$ and $x^3 - y^3 = 316$

From, $x^3 - y^3 = 316$

$$(x - y)(x^2 + y^2 + xy) = 316$$

$$x^2 + y^2 + xy = \frac{316}{4} = 79 \dots\dots\dots(i)$$

From, $x - y = 4$

On squaring both sides,

$$x^2 + y^2 - 2xy = 16 \dots\dots\dots(ii)$$

From equation (i) and (ii),

$$xy = 21 = 7 \times 3$$

On taking $x = 7$ and $y = 3$,

Now, $x^4 + y^4 = (7)^4 + (3)^4 = 2401 + 81$

$$x^4 + y^4 = 2482$$

109. If $a + b + c = 5$, $a^2 + b^2 + c^2 = 27$ and $a^3 + b^3 + c^3 = 125$ then the value of $\frac{abc}{5}$ is:

125 then the value of $\frac{abc}{5}$ is:

- (a) -1 (b) -5
 (c) 1 (d) 5

SSC CHSL 10/08/2021 (Shift-III)

Ans. (a) : Given :-

$a + b + c = 5$, $a^2 + b^2 + c^2 = 27$ and $a^3 + b^3 + c^3 = 125$

On squaring both sides of $a + b + c = 5$

$$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 25$$

$$2(ab + bc + ca) = 25 - 27 = -2$$

$$ab + bc + ca = \frac{-2}{2} = -1 \dots\dots(i)$$

Now from formula :

$$a^3 + b^3 + c^3 - 3abc = (a + b + c) [(a+b+c)^2 - 3(ab+bc+ca)]$$

As per question

$$a^3 + b^3 + c^3 - 3abc = 5 [(5)^2 - 3(-1)]$$

$$125 - 3abc = 5(25 + 3)$$

$$3abc = 125 - 140$$

$$abc = \frac{-15}{3} = -5$$

On dividing by 5 both sides,

$$\frac{abc}{5} = \frac{-5}{5} = -1$$

$$\frac{abc}{5} = -1$$

110. If $a + b + c = 11$ and $ab + bc + ca = 15$ then what is the value of $a^3 + b^3 + c^3 - 3abc$?

- (a) 368 (b) 386
 (c) 638 (d) 836

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Ans. (d) : From formula :-

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) [(a+b+c)^2 - 3(ab+bc+ca)]$$

$$a^3 + b^3 + c^3 - 3abc = 11 [(11)^2 - 3(15)]$$

$$= 11(121 - 45)$$

$$a^3 + b^3 + c^3 - 3abc = 11 \times 76 = 836$$

Hence, $a^3 + b^3 + c^3 - 3abc = 836$

111. If $(x-1.5)^3 + (x-4)^3 + (x-3.5)^3 = 3(x-1.5)(x-4)(x-3.5)$, then what is the value of x?

- (a) 9 (b) 3
 (c) 6 (d) 1

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Ans. (b) :

$$(x-1.5)^3 + (x-4)^3 + (x-3.5)^3 = 3(x-1.5)(x-4)(x-3.5)$$

Now from the formula

$$\text{When, } a^3 + b^3 + c^3 = 3abc$$

$$\text{Then, } a + b + c = 0$$

$$\text{Hence } x-1.5 + x-4 + x-3.5 = 0$$

$$3x - 9 = 0$$

$$3x = 9$$

$$x = \frac{9}{3} = 3$$

112. If $a^3 + b^3 + c^3 - 3abc = 250$ and $a + b + c = 10$, then what will be the value of $\frac{1}{5}(ab + bc + ca)$?

(a) 10

(b) 25

(c) 15

(d) 5

SSC CHSL 16/04/2021 (Shift-III)

Ans.(d) : Given :- $a^3 + b^3 + c^3 - 3abc = 250$

$$\text{and } a+b+c = 10$$

From formula,

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) [(a+b+c)^2 - 3(ab+bc+ca)]$$

$$250 = 10 [(10)^2 - 3(ab+bc+ca)]$$

$$100 - 3(ab+bc+ca) = \frac{250}{10} = 25$$

$$3(ab+bc+ca) = 100 - 25 = 75$$

$$ab+bc+ca = \frac{75}{3} = 25$$

Hence

$$\frac{1}{5}(ab+bc+ca) = \frac{1}{5} \times 25 = 5$$

113. If $x^2 + y^2 = 45$ and $x-y = 5$ then what is the value of $x^3 - y^3$?

(a) -25

(b) 250

(c) 275

(d) 150

SSC CHSL 16/04/2021 (Shift-III)

Ans.(c) : Given :-

$$x-y=5$$

On squaring both sides,

$$x^2 + y^2 - 2xy = 25$$

On putting the value of $x^2 + y^2 = 45$

$$2xy = 45 - 25 = 20$$

$$xy = \frac{20}{2} = 10$$

$$\text{Now } x^3 - y^3 = (x-y)(x^2 + y^2 + xy)$$

$$= 5(45+10)$$

$$= 5 \times 55 = 275$$

$$\therefore x^3 - y^3 = 275$$

114. If $a^2 + 49b^2 + c^2 + 18 = 2(28b - c - a)$ then the value of $(a + 7b - c)$ is:

(a) 4

(b) 2

(c) -1

(d) 6

SSC CHSL 19/04/2021 (Shift-III)

Ans. (a) : Given :-

$$a^2 + 49b^2 + c^2 + 18 = 2(28b - c - a)$$

$$a^2 + 2a + 49b^2 - 56b + c^2 + 2c + 18 = 0$$

$$a^2 + 2a + 1 + (7b)^2 - 56b + 16 + c^2 + 2c + 1 = 0$$

$$(a+1)^2 + (7b-4)^2 + (c+1)^2 = 0$$

Hence,

$$a = -1$$

$$b = \frac{4}{7},$$

and $c = -1$

On putting the value of a, b and c in $a + 7b - c$,

$$-1 + 7 \times \frac{4}{7} + 1$$

$$-1 + 4 + 1 = 4$$

Hence,

$$\boxed{a + 7b - c = 4}$$

115. If $x - y - z = 0$, then the value of $(x^2 + y^2 + z^2) \div (y^2 + xz)$ is:

(a) -1

(b) 2

(c) 1

(d) -2

SSC CHSL 12/04/2021 (Shift-III)

Ans : (b) Given :- $x - y - z = 0$

On taking, $x = 2, y = 1$ and $z = 1$

$$x - y - z = 2 - 1 - 1 = 0$$

Hence,

$$(x^2 + y^2 + z^2) \div (y^2 + xz)$$

$$[(2)^2 + (1)^2 + (1)^2] \div [(1)^2 + 2 \times 1]$$

$$6 \div 3 = 2$$

$$(x^2 + y^2 + z^2) \div (y^2 + xy) = 2$$

116. If $x^4 + \frac{1}{x^4} = 6887$, then the positive value of $x - \frac{1}{x}$ is ?

(a) 9

(b) 8

(c) 12

(d) 15

SSC CHSL 12/04/2021 (Shift-III)

Ans : (a) Given :-

$$x^4 + \frac{1}{x^4} = 6887$$

On adding 2 at both sides,

$$x^4 + \frac{1}{x^4} + 2 = 6887 + 2 = 6889$$

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (83)^2$$

$$x^2 + \frac{1}{x^2} = 83$$

On subtracting 2 from both sides,

$$x^2 + \frac{1}{x^2} - 2 = 83 - 2 = 81$$

$$\left(x - \frac{1}{x}\right)^2 = (9)^2$$

$$x - \frac{1}{x} = 9$$

117. If $x^2 - 3x + 1 = 0$, then the value of

$$2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right) \text{ is:}$$

- (a) 4370 (b) 4279
(c) 4379 (d) 3479

SSC CHSL 12/04/2021 (Shift-III)

Ans : (c) Given :- $x^2 - 3x + 1 = 0$

$$x + \frac{1}{x} = 3$$

On squaring both sides,

$$x^2 + \frac{1}{x^2} = 9 - 2 = 7 \text{ -----(ii)}$$

Again, on squaring both sides,

$$x^4 + \frac{1}{x^4} = 49 - 2 = 47$$

Again, on squaring both sides,

$$x^8 + \frac{1}{x^8} = 2209 - 2 = 2207 \text{ -----(iii)}$$

From equation (ii) and (iii),

$$2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right) = 4414 - 35 = 4379$$

Hence, $2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right) = 4379$

118. If $(4x - 5)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(4x - 5)(x - 2)(2x - 5)$, then the value of $\left(x + \frac{3}{2}\right)$ will be:

- (a) $\frac{1}{2}$ (b) $\frac{3}{2}$
(c) $\frac{7}{2}$ (d) $\frac{5}{2}$

SSC CHSL 05/08/2021 (Shift-II)

Ans. (c) : Given :-

$$(4x-5)^3 + (x-2)^3 + 27(2x-5)^3 = 9(4x-5)(x-2)(2x-5)$$

Now, from formula

$$\text{When } a^3 + b^3 + c^3 = 3abc$$

$$\text{Then } a + b + c = 0$$

$$\text{Hence, } 4x - 5 + x - 2 + 3(2x - 5) = 0$$

$$4x - 5 + x - 2 + 6x - 15 = 0$$

$$11x - 22 = 0$$

$$11x = 22$$

$$x = \frac{22}{11} = 2$$

$$\left(x + \frac{3}{2}\right) = 2 + \frac{3}{2} = \frac{7}{2}$$

119. If $x^2 - 5\sqrt{2}x - 1 = 0$, then what will be the value of $x^3 - \frac{1}{x^3}$?

- (a) $250\sqrt{2}$ (b) $485\sqrt{2}$
(c) $265\sqrt{2}$ (d) $255\sqrt{2}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : Given :-

$$x^2 - 5\sqrt{2}x - 1 = 0$$

$$x^2 - 1 = 5\sqrt{2}x$$

$$x - \frac{1}{x} = 5\sqrt{2}$$

On cubing both sides,

$$x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right) = 250\sqrt{2}$$

$$x^3 - \frac{1}{x^3} - 3 \times 5\sqrt{2} = 250\sqrt{2}$$

$$x^3 - \frac{1}{x^3} - 15\sqrt{2} = 250\sqrt{2}$$

$$x^3 - \frac{1}{x^3} = 265\sqrt{2}$$

120. If $a^4 + b^4 + a^2b^2 = 133$ and $a^2 + b^2 - ab = 19$, then the value of ab will be:

- (a) -9 (b) 15
(c) -6 (d) 12

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : From the formula,

$$a^4 + b^4 + a^2b^2 = (a^2 + b^2 - ab)(a^2 + b^2 + ab)$$

As per question:-

$$133 = 19(a^2 + b^2 + ab)$$

$$a^2 + b^2 + ab = \frac{133}{19} = 7 \text{ -----(i)}$$

and $a^2 + b^2 - ab = 19$ ----- (ii) -----(Given)

On solving equation (i) and (ii),

$$2ab = -12$$

$$ab = \frac{-12}{2} = -6$$

121. If $x - y = \frac{7}{4}$ and $\frac{1}{x} - \frac{1}{y} = \frac{14}{3}$, then $x^3 - y^3$ is equal

to:

- (a) $\frac{433}{64}$ (b) $\frac{217}{32}$
(c) $\frac{217}{64}$ (d) $\frac{433}{32}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : From,

$$\frac{1}{x} - \frac{1}{y} = \frac{14}{3}$$

$$3(y - x) = 14xy$$

On putting the value of $x - y = \frac{7}{4}$,

$$3\left(\frac{-7}{4}\right) = 14xy$$

$$xy = \frac{-21}{4} \times \frac{1}{14} = \frac{-21}{56}$$

And $x - y = \frac{7}{4}$

On squaring both sides,

$$x^2 + y^2 - 2xy = \frac{49}{16}$$

$$x^2 + y^2 + xy = \frac{49}{16} + 3xy$$

$$x^2 + y^2 + xy = \frac{49}{16} + 3 \times \left(\frac{-21}{56} \right)$$

$$x^2 + y^2 + xy = \frac{49}{16} - \frac{63}{56} = \frac{49 - 18}{16} = \frac{31}{16}$$

Now, $x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$
 $= \frac{7}{4} \times \frac{31}{16} = \frac{217}{64}$

Hence, $x^3 - y^3 = \frac{217}{64}$

122. If $x = 555$, $y = 556$ and $z = 557$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

- (a) 5006 (b) 5002
 (c) 5004 (d) 5008

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : From formula

$$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$$

$$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(555 + 556 + 557)[(555 - 556)^2 + (556 - 557)^2 + (557 - 555)^2]$$

$$= \frac{1}{2} \times 1668 \times (1 + 1 + 4)$$

$$= \frac{1}{2} \times 1668 \times 6 = 5004$$

Hence $x^3 + y^3 + z^3 - 3xyz = 5004$

123. If $a + 5b = 25$ and $ab = 20$, then one of the values of $(a - 5b)$ is:

- (a) 14 (b) 13
 (c) 15 (d) 16

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : From formula:-

$$(a + b)^2 - 4ab = (a - b)^2$$

$$(a + 5b)^2 - 4 \times a \times 5b = (a - 5b)^2$$

$$(25)^2 - 20 \times ab = (a - 5b)^2$$

$$625 - 20 \times 20 = (a - 5b)^2$$

$$(a - 5b)^2 = 225$$

$$a - 5b = \sqrt{225} = 15$$

$$a - 5b = 15$$

124. If $3a - b = 1$ and $ab = 4$, then the value of $(9a^2 - b^2)$ is:

- (a) 7 (b) 8
 (c) 5 (d) 6

SSC CHSL 11/08/2021 (Shift-III)

Ans. (a) : From formula,

$$(x - y)^2 + 4xy = (x + y)^2$$

$$(3a - b)^2 + 4 \times 3a \times b = (3a + b)^2$$

$$(1)^2 + 12 \times 4 = (3a + b)^2$$

$$3a + b = \sqrt{49} = 7 \text{ ----- (i)}$$

Now, $9a^2 - b^2 = (3a)^2 - (b)^2$

$$9a^2 - b^2 = (3a + b)(3a - b)$$

$$9a^2 - b^2 = 7 \times 1 = 7$$

Hence, $9a^2 - b^2 = 7$

125. If $3x + y = 12$ and $xy = 9$, then the value of $(3x - y)$ is:

- (a) 4 (b) 5
 (c) 6 (d) 3

SSC CHSL 09/08/2021 (Shift-III)

Ans. (c) : Given

$$3x + y = 12 \text{ and } xy = 9$$

Now, from $(3x + y)^2 - 4 \times 3x \times y = (3x - y)^2$

$$(12)^2 - 12 \times 9 = (3x - y)^2$$

$$144 - 108 = (3x - y)^2$$

$$36 = (3x - y)^2$$

$$3x - y = \sqrt{36} = 6$$

Hence, $3x - y = 6$

126. If $a^2 + b^2 + c^2 = 576$ and $(ab + bc + ca) = 50$, then what is the value of $(a + b + c)$, if $(a + b + c) < 0$?

- (a) ± 26 (b) -24
 (c) -26 (d) ± 24

SSC CHSL 09/08/2021 (Shift-III)

Ans. (c) : From formula,

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$$(a + b + c)^2 = 576 + 2 \times 50$$

[Given $a^2 + b^2 + c^2 = 576$]
 [$(ab + bc + ca) = 50$]

$$(a + b + c)^2 = 676$$

$$a + b + c = \sqrt{676} = \pm 26$$

$\therefore a + b + c < 0$

Hence, $a + b + c = -26$

127. If $\left(2x + \frac{1}{2x} \right) = 5$, then what is the value of

$$\left(8x^3 + \frac{1}{8x^3} \right) ?$$

- (a) 110 (b) 120
 (c) 100 (d) 125

SSC CHSL 09/08/2021 (Shift-III)

Ans. (a) : Given $\therefore 2x + \frac{1}{2x} = 5$

On cubing both sides,

$$\left(2x + \frac{1}{2x} \right)^3 = (5)^3$$

$$8x^3 + \frac{1}{8x^3} + 3 \times 2x \times \frac{1}{2x} \left(2x + \frac{1}{2x} \right) = 125$$

$$8x^3 + \frac{1}{8x^3} + 3(5) = 125$$

$$8x^3 + \frac{1}{8x^3} = 125 - 15$$

$$8x^3 + \frac{1}{8x^3} = 110$$

128. If $x + y = 27$ and $x^2 + y^2 = 425$, then the value of $(x - y)^2$ will be:

- (a) 225 (b) 169
(c) 121 (d) 144

SSC CHSL 09/08/2021 (Shift-II)

Ans. (c) : Given:- $x + y = 27$ and $x^2 + y^2 = 425$

On squaring both side of $x + y = 27$,

$$(x + y)^2 = (27)^2$$

$$x^2 + y^2 + 2xy = 729$$

$$2xy = 729 - 425 = 304 \text{ -----(i)}$$

Now, $(x - y)^2 = x^2 + y^2 - 2xy$
 $= 425 - 304$

$$(x - y)^2 = 121$$

129. If $(40\sqrt{5}x^3 - 2\sqrt{2}y^3) \div (2\sqrt{5}x - \sqrt{2}y) = Ax^2 + By^2 - Cxy$

then find the value of $A + 3B - \sqrt{10}C$

- (a) 34 (b) 46
(c) 6 (d) 28

SSC CHSL 09/08/2021 (Shift-II)

Ans. (b) :

$$(40\sqrt{5}x^3 - 2\sqrt{2}y^3) \div (2\sqrt{5}x - \sqrt{2}y) = Ax^2 + By^2 - Cxy$$

$$\frac{(2\sqrt{5}x)^3 - (\sqrt{2}y)^3}{2\sqrt{5}x - \sqrt{2}y} = Ax^2 + By^2 - Cxy$$

$$\frac{(2\sqrt{5}x - \sqrt{2}y)(20x^2 + 2y^2 + 2\sqrt{10}xy)}{(2\sqrt{5}x - \sqrt{2}y)} = Ax^2 + By^2 - Cxy$$

$$20x^2 + 2y^2 + 2\sqrt{10}xy = Ax^2 + By^2 - Cxy$$

On comparing both sides,

$$A = 20, B = 2 \text{ and } C = -2\sqrt{10}$$

$$\text{Now } A + 3B - \sqrt{10}C$$

$$= 20 + 3 \times 2 - \sqrt{10} \times (-2\sqrt{10})$$

$$= 20 + 6 + 2 \times 10$$

$$= 26 + 20 = 46$$

130. If $x^4 + \frac{1}{x^4} = 1154, x > 0$, then what will be the value of $x + \frac{1}{x}$?

- (a) $\sqrt{34}$ (b) 18
(c) $\sqrt{32}$ (d) 6

SSC CHSL 09/08/2021 (Shift-II)

Ans. (d) : Given :-

$$x^4 + \frac{1}{x^4} = 1154$$

$$x^4 + \frac{1}{x^4} + 2 = 1154 + 2$$

$$\left(x^2 + \frac{1}{x^2} \right)^2 = 1156$$

$$\left(x^2 + \frac{1}{x^2} \right) = \sqrt{1156} = 34$$

Now, again adding 2 both sides,

$$x^2 + \frac{1}{x^2} + 2 = 34 + 2$$

$$\left(x + \frac{1}{x} \right)^2 = 36$$

$$x + \frac{1}{x} = \sqrt{36} = 6$$

$$x + \frac{1}{x} = 6$$

131. The value of $a^3 + b^3 + c^3 - 3abc$, when $a = 125, b = 127$ and $c = 129$, is:

- (a) 4725 (b) 4752
(c) 3752 (d) 4572

SSC CHSL 12/08/2021 (Shift-II)

Ans. (d) : From the formula :-

$$a^3 + b^3 + c^3 - 3abc = \frac{(a+b+c)}{2} [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$= \left(\frac{125+127+129}{2} \right) [(125-127)^2 + (127-129)^2 + (129-125)^2]$$

$$= 190.5 \times (4+4+16)$$

$$= 190.5 \times 24$$

$$= 4572$$

132. If $(7x + 3)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(7x + 3)(x - 2)(2x - 5)$, then the value of $5x + 3$ is:

- (a) 2 (b) 10
(c) 6 (d) 8

SSC CHSL 15/04/2021 (Shift-II)

Ans : (d) Given :-

$$(7x + 3)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(7x + 3)(x - 2)(2x - 5)$$

From formula

If $a^3 + b^3 + c^3 = 3abc$ then $a + b + c$ will be zero

Hence,

$$(7x + 3) + (x - 2) + 3(2x - 5) = 0$$

$$7x + 3 + x - 2 + 6x - 15 = 0$$

$$14x = -3 + 2 + 15 = 14$$

$$x = \frac{14}{14} = 1$$

Now, $5x + 3 = 5 \times 1 + 3 = 8$

$$5x + 3 = 8$$

133. If $(3p - 5m) = 5$ and $pm = 6$, then what is the value of $(9p^2 - 25m^2)$?

- (a) $\pm 30\sqrt{10}$ (b) $30\sqrt{10}$
 (c) $\pm 5\sqrt{385}$ (d) $5\sqrt{385}$

SSC CHSL 15/04/2021 (Shift-II)

Ans. (d) Given:- $(3p - 5m) = 5$, $pm = 6$
 $(3p-5m)^2 + 4 \times 3p \times 5m = (3p+5m)^2$
 $(5)^2 + 60 \times pm = (3p+5m)^2$
 $(3p+5m)^2 = 25 + 360 = 385$

Now, $9p^2 - 25m^2 = (3p)^2 - (5m)^2$
 $= (3p+5m)(3p-5m)$
 $= \sqrt{385} \times 5$

Hence, $9p^2 - 25m^2 = 5\sqrt{385}$

134. If $a + b + c = 2$ and $ab + bc + ca = -1$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

- (a) 14 (b) 2
 (c) 5 (d) 10

SSC CHSL 06/08/2021 (Shift-II)

Ans. (a) : Given,

$a + b + c = 2 \rightarrow a^2 + b^2 + c^2 + 2(ab+bc+ca) = 4$
 $a^3 + b^3 + c^3 - 3abc = (a+b+c)[a^2 + b^2 + c^2 - ab - bc - ca]$
 $= 2 \times [4 - (ab + bc + ca) \times 2 - (ab+bc+ca)]$
 $= 2 \times [4 - 3(ab+bc+ca)]$
 $= 2 \times [4 + 3]$
 $= 14$

135. If $\left(x^2 + \frac{1}{49x^2}\right) = 15\frac{5}{7}$, then what is the value of

$$\left(x + \frac{1}{7x}\right)?$$

- (a) 7 (b) ± 7
 (c) ± 4 (d) 4

SSC CHSL 06/08/2021 (Shift-II)

Ans. (c) : $x^2 + \frac{1}{49x^2} = 15\frac{5}{7}$

$$\left(x + \frac{1}{7x}\right)^2 = x^2 + \frac{1}{49x^2} + \frac{2}{7} = \frac{110}{7} + \frac{2}{7}$$

$$= \frac{112}{7} = 16$$

$$\therefore \left(x + \frac{1}{7x}\right) = \pm 4$$

136. If $x + \frac{1}{x} = \sqrt{13}$ then findout the value of

$$x^3 - \frac{1}{x^3}.$$

- (a) 32 (b) 36
 (c) $4\sqrt{11}$ (d) $4\sqrt{11}$

SSC CHSL 12/08/2021 (Shift-III)

Ans. (b) : Given

$$x + \frac{1}{x} = \sqrt{13}$$

From formula :-

$$\left(x + \frac{1}{x}\right)^2 - 4 = \left(x - \frac{1}{x}\right)^2$$

$$\left(x - \frac{1}{x}\right)^2 = (\sqrt{13})^2 - 4$$

$$x - \frac{1}{x} = 3$$

On cubing both sides,

$$\left(x - \frac{1}{x}\right)^3 = (3)^3$$

$$x^3 - \frac{1}{x^3} - 3\left(x - \frac{1}{x}\right) = 27$$

$$x^3 - \frac{1}{x^3} - 3 \times 3 = 27$$

$$x^3 - \frac{1}{x^3} = 27 + 9 = 36$$

$$x^3 - \frac{1}{x^3} = 36$$

137. If $x^4 + \frac{16}{x^4} = 27217$, $x > 0$, then the value of $x + \frac{2}{x}$ is:

- (a) 15 (b) 11
 (c) 17 (d) 13

SSC CHSL 15/04/2021 (Shift-III)

Ans.(d) : Given:-

$$x^4 + \frac{16}{x^4} = 27217$$

On adding 8 both sides,

$$\left(x^2\right)^2 + \left(\frac{4}{x^2}\right)^2 + 8 = 27217 + 8$$

$$\left(x^2 + \frac{4}{x^2}\right)^2 = 27225$$

$$x^2 + \frac{4}{x^2} = \sqrt{27225} = 165$$

Again, on adding 4 both sides,

$$\left(x^2\right)^2 + \left(\frac{2}{x}\right)^2 + 4 = 165 + 4 = 169$$

$$\left(x + \frac{2}{x}\right)^2 = 169$$

$$x + \frac{2}{x} = \sqrt{169} = 13$$

Hence $x + \frac{2}{x} = 13$

138. If $8a^3 + b^3 = 16$ and $2a + b = 4$, then find the value of $16a^4 + b^4$.

- (a) 36 (b) 38
(c) 32 (d) 28

SSC CHSL 15/04/2021 (Shift-III)

Ans.(c) : Given:- $8a^3 + b^3 = 16$ -----(i)
and $2a + b = 4$ -----(ii)
From equation (i) and (ii) we will put the value of
 $a = 1$ and $b = 2$
Now $16a^4 + b^4$
 $= 16 \times (1)^4 + (2)^4$
 $= 16 + 16 = 32$
Hence $16a^4 + b^4 = 32$

139. If $x - \frac{1}{2x} = 4$, then the value of $x^3 - \frac{1}{x^3}$ will

- be:**
(a) 480 (b) 540
(c) 520 (d) 560

SSC CHSL 15/04/2021 (Shift-III)

Ans.(d) : Given that- $x - \frac{1}{2x} = 4$
On multiplying by 2 in both sides,
 $2x - \frac{1}{x} = 8$ _____(i)
On cubing both sides,
 $8x^3 - \frac{1}{x^3} - 3 \times 2x \times \frac{1}{x} \left(2x - \frac{1}{x}\right) = 512$
 $\Rightarrow 8x^3 - \frac{1}{x^3} - 6 \times 8 = 512$ [From eqⁿ (i)]
 $\Rightarrow 8x^3 - \frac{1}{x^3} = 512 + 48$
 $8x^3 - \frac{1}{x^3} = 560$

140. If $x^2 + \frac{1}{x^2} = 83$, $x > 0$ then find the value of

- $x^3 - \frac{1}{x^3}$?
(a) 657 (b) 746
(c) 756 (d) 576

SSC CHSL 12/08/2021 (Shift-III)

Ans. (c) : Given, $x^2 + \frac{1}{x^2} = 83$
On subtracting 2 from both sides,
 $x^2 + \frac{1}{x^2} - 2 = 83 - 2 = 81$
 $x - \frac{1}{x} = 9$
On cubing both sides,
 $x^3 - \frac{1}{x^3} = 729 + 27 = 756$

141. If $x^2 + (4 - \sqrt{3})x - 1 = 0$ then find the value of $x^2 + \frac{1}{x^2}$?

- (a) $21 - 12\sqrt{3}$ (b) $17 - 8\sqrt{3}$
(c) $21 - 8\sqrt{3}$ (d) $9 - 8\sqrt{3}$

SSC CHSL 12/08/2021 (Shift-III)

Ans. (c) : Given
 $x^2 + (4 - \sqrt{3})x - 1 = 0$
On multiplying by $\frac{1}{x}$ both sides,
 $x - \frac{1}{x} = 4 - \sqrt{3}$
On squaring both sides,
 $x^2 + \frac{1}{x^2} - 2 = (4 - \sqrt{3})^2 = 16 + 3 - 8\sqrt{3}$
 $x^2 + \frac{1}{x^2} = 19 - 8\sqrt{3} + 2 = 21 - 8\sqrt{3}$
Hence, $x^2 + \frac{1}{x^2} = 21 - 8\sqrt{3}$

142. Given that $(2x+y)^3 - (x+2y)^3 = (x-y)[A(x^2+y^2) + Bxy]$, the value of $(2A - B)$ is:

- (a) 0 (b) 7
(c) 1 (d) 6

SSC CHSL 13/04/2021 (Shift-II)

Ans. (c) : Given:-
 $(2x+y)^3 - (x+2y)^3 = (x-y)[A(x^2+y^2) + Bxy]$
From formula,
 $a^3 - b^3 = (a-b)(a^2 + b^2 + ab)$
 $(2x+y)^3 - (x+2y)^3 = (2x+y - x-2y)[(2x+y)^2 + (x+2y)^2 + (2x+y)(x+2y)]$
 $= (x-y)(5x^2 + 5y^2 + 8xy + 2x^2 + 2y^2 + 5xy)$
 $(x-y)[7(x^2+y^2) + 13xy] = (x-y)[A(x^2+y^2) + Bxy]$
On comparing both sides,
 $A = 7$ and $B = 13$
Now $2A - B = 2 \times 7 - 13$
 $= 14 - 13 = 1$
Hence, $2A - B = 1$

143. If $x^4 - 142x^2 + 1 = 0$, then the value of $x^3 + \frac{1}{x^3}$ is:

- (a) 1592 (b) 1692
(c) 1952 (d) 1962

SSC CHSL 13/04/2021 (Shift-II)

Ans. (b) : Given :-
 $x^4 - 142x^2 + 1 = 0$
 $x^4 + 1 = 142x^2$
 $x^2 + \frac{1}{x^2} = 142$
On adding 2 to both sides -
 $x^2 + \frac{1}{x^2} + 2 = 142 + 2 = 144$

$$\left(x + \frac{1}{x}\right)^2 = (12)^2$$

$$x + \frac{1}{x} = 12$$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 1728$$

$$x^3 + \frac{1}{x^3} + 3 \times 12 = 1728$$

$$x^3 + \frac{1}{x^3} = 1728 - 36$$

$$x^3 + \frac{1}{x^3} = 1692$$

144. If $x^8 - 2599x^4 + 1 = 0$, then the positive value of $x - \frac{1}{x}$ will be:

- (a) 8 (b) 6
(c) 12 (d) 7

SSC CHSL 19/04/2021 (Shift-III)

Ans. (d) : Given, $x^8 - 2599x^4 + 1 = 0$
 $x^8 + 1 = 2599x^4$

On multiplying by $\frac{1}{x^4}$ both sides,

$$x^4 + \frac{1}{x^4} = 2599$$

On adding 2 to both sides,

$$x^4 + \frac{1}{x^4} + 2 = 2599 + 2$$

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (51)^2$$

$$x^2 + \frac{1}{x^2} = 51$$

On subtracting 2 from both sides,

$$x^2 + \frac{1}{x^2} - 2 = 51 - 2 = 49$$

$$\left(x - \frac{1}{x}\right)^2 = (7)^2$$

$$x - \frac{1}{x} = 7$$

145. If $x^2 + \frac{1}{x^2} = 7$, then the value of $x^3 + \frac{1}{x^3}$ where $x > 0$ is equal to :

- (a) 16 (b) 18
(c) 15 (d) 12

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Ans. (b) : $x^2 + \frac{1}{x^2} = 7$, $x > 0$

$$x^2 + \frac{1}{x^2} + 2 = 9 \quad (\text{adding 2 both side})$$

$$x + \frac{1}{x} = 3$$

$$x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 27 - 9$$

$$\therefore x^3 + \frac{1}{x^3} = 18$$

146. If $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$ then the value of $x^3 - \frac{1}{x^3}$ is equal to?

- (a) $\frac{8}{27}$ (b) $\frac{52}{27}$
(c) $\frac{62}{27}$ (d) $\frac{61}{27}$

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Ans. (c) : $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$

$$3x - 2 = \frac{3}{x}$$

$$x - \frac{1}{x} = \frac{2}{3}$$

From formula if the $x - \frac{1}{x} = K$

$$x^3 - \frac{1}{x^3} = K^3 + 3K$$

Hence,

$$x^3 - \frac{1}{x^3} = \left(\frac{2}{3}\right)^3 + 3 \times \frac{2}{3} \\ = \frac{8}{27} + 2 = \frac{62}{27}$$

147. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 3$, then the value of $x^3 + \frac{1}{x^3}$ is:

- (a) 324 (b) 326
(c) 322 (d) 422

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Ans. (c) : Let, $\sqrt{x} + \frac{1}{\sqrt{x}} = 3 = K$

$$\therefore x + \frac{1}{x} = K^2 - 2$$

$$x + \frac{1}{x} = 3^2 - 2 = 7$$

$$\therefore x^3 + \frac{1}{x^3} = K^3 - 3K \\ = 7^3 - 3 \times 7 \\ = 343 - 21 = 322$$

148. If $x - \frac{3}{x} = 6$, $x \neq 0$, then the value of

$$\frac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3}$$

- (a) 90 (b) 80
(c) 270 (d) 54

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Ans. (a) : $x - \frac{3}{x} = 6, \quad x \neq 0$

$$\left(x - \frac{3}{x}\right)^3 = 6^3 \text{ (On cubing both sides)}$$

$$x^3 - \frac{27}{x^3} - 3 \times x \times \frac{3}{x} \times \left(x - \frac{3}{x}\right) = 216$$

$$x^3 - \frac{27}{x^3} - 9 \times 6 = 216$$

$$x^3 - \frac{27}{x^3} = 270$$

$$\frac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3} = \frac{x^3 - \frac{27}{x^3}}{x - 3 - \frac{3}{x}}$$

$$= \frac{270}{6-3} = 90$$

149. If $\frac{3(x^2+1)-7x}{3x} = 6, x \neq 0$, then the value of $\sqrt{x} + \frac{1}{\sqrt{x}}$ is ?

- (a) $\sqrt{\frac{35}{3}}$ (b) $\sqrt{\frac{31}{3}}$
(c) $\sqrt{\frac{11}{3}}$ (d) $\sqrt{\frac{25}{3}}$

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$$\frac{3(x^2+1)-7x}{3x} = 6$$

$$x + \frac{1}{x} - \frac{7}{3} = 6$$

$$x + \frac{1}{x} = \frac{25}{3}$$

$$x + \frac{1}{x} + 2 = \frac{25}{3} + 2$$

$$\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 = \frac{31}{3}$$

$$\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{\frac{31}{3}}$$

150. If $x+y=3$, then what is the value of x^3+y^3+9xy ?

(a) 15 (b) 81
(c) 27 (d) 9

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Given,
 $x + y = 3$
On cubing both sides
 $x^3 + y^3 + 3xy(x+y) = 27$
 $x^3 + y^3 + 3xy(3) = 27$
 $x^3 + y^3 + 9xy = 27$

Trick:
 $x = 0, y = 3$
 $x + y = 3$
 $0 + 3 = 3$
 $3 = 3$ (equation satisfies)

Now,
 $x^3 + y^3 + 9xy = (0)^3 + (3)^3 + 9 \times 0 \times 3 = 27$

151. If $a^4 + 1 = \left[\frac{a^2}{b^2}\right](4b^2 - b^4 - 1)$, then what is the value of $a^4 + b^4$?

- (a) 2 (b) 16
(c) 32 (d) 64

SSC CGL (Tier-II) 20-02-2018

Ans. (a)

$$a^4 + 1 = \frac{a^2}{b^2}(4b^2 - b^4 - 1)$$

$$a^2 + \frac{1}{a^2} = 4 - b^2 - \frac{1}{b^2}$$

$$a^2 + \frac{1}{a^2} - 2 + b^2 + \frac{1}{b^2} - 2 = 0$$

$$\left(a - \frac{1}{a}\right)^2 + \left(b - \frac{1}{b}\right)^2 = 0$$

$$\left(a - \frac{1}{a}\right) = 0, \quad \left(b - \frac{1}{b}\right) = 0$$

$$a^2 - 1 = 0, \quad b^2 - 1 = 0$$

$$a = 1, \quad b = 1$$

According to the question

$$a^4 + b^4 = 1 + 1 = 2$$

Trick:
Put, $a = 1, b = 1$

$$a^4 + 1 = \left[\frac{a^2}{b^2}\right][4b^2 - b^4 - 1]$$

$$1 + 1 = 1(4 - 2)$$

$$2 = 2$$

(equation satisfies)

$$\therefore a^4 + b^4 = 1$$

$$\therefore a^4 + b^4 = 1 + 1 = 2$$

152. If $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7Cyx$, then the value of $(4A - B + 5C)$ is:

- (a) 3 (b) 1
(c) 0 (d) 2

SSC CGL (TIER-I) - 04.06.2019 (Shift-III)

Ans. (d) : $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7Cyx + 7Cyx$

$$a^3 - b^3 = (a-b)(a^2 + b^2 + ab)$$

$$\frac{(3x - 7y)(9x^2 + 49y^2 + 21xy)}{(3x - 7y)} = Ax^2 + By^2 + 7Cyx$$

$$9x^2 + 49y^2 + 21xy = Ax^2 + By^2 + 7Cyx$$

On comparing equation

$$A = 9, B = 49, C = \frac{21}{7} = 3$$

$$4A - B + 5C = 4 \times 9 - 49 + 5 \times 3 = 51 - 49 = 2$$

153. If $a^2 + b^2 + 64c^2 + 16c + 3 = 2(a+b)$, then the value of $4a^7 + b^7 + 8c^2$ is?

- (a) $3\frac{7}{8}$ (b) $5\frac{1}{8}$
 (c) $4\frac{1}{8}$ (d) $4\frac{7}{8}$

SSC CGL (TIER-I)– 04.06.2019 (Shift-III)

Ans. (b) : $a^2 + b^2 + 64c^2 + 16c + 1 + 1 + 1 - 2a - 2b = 0$
 $a^2 - 2a + 1 + b^2 - 2b + 1 + 64c^2 + 16c + 1 = 0$
 $(a-1)^2 + (b-1)^2 + (8c+1)^2 = 0$

$(a-1)^2 = 0$	$(b-1)^2 = 0$	$(8c+1)^2 = 0$
$a = 1$	$b = 1$	$8c = -1$
$c = -\frac{1}{8}$		

$\Rightarrow 4a^7 + b^7 + 8c^2 = 4 \times 1 + 1 + 8 \times \frac{1}{64}$
 $= 4 + 1 + \frac{1}{8} = 5\frac{1}{8}$

154. If $x + y = 1$ and $xy(xy - 2) = 12$, then the value of $x^4 + y^4$ is:

- (a) 19 (b) 23
 (c) 25 (d) 20

SSC CGL (TIER-I) – 04.06.2019 (Shift-III)

Ans. (c) : $x + y = 1$
 On squaring both sides
 $x^2 + y^2 + 2xy = 1$
 $x^2 + y^2 = 1 - 2xy$
 Again, on squaring both sides
 $x^4 + y^4 + 2x^2y^2 = 1 + 4x^2y^2 - 4xy$
 $x^4 + y^4 = 1 + 2xy(xy - 2)$ [$\because xy(xy - 2) = 12$]
 $= 1 + 2 \times 12$
 $= 25$

155. If $a^2 + b^2 + c^2 = 21$, and $a + b + c = 7$, then $(ab + bc + ca)$ is equal to?

- (a) 14 (b) 8
 (c) 12 (d) 28

SSC CGL (TIER-I) – 04.06.2019 (Shift-III)

Ans. (a) : $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
 $49 = 21 + 2(ab + bc + ca)$
 $\frac{28}{2} = (ab + bc + ca)$
 $(ab + bc + ca) = 14$

156. If $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$, then the value of $(xy + 2z)$ is:

- (a) 1 (b) 2
 (c) 5 (d) 3

SSC CGL (TIER-I) – 04.06.2019 (Shift-II)

Ans. (c) : Given that,
 $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$
 $[xy + 2z = ?]$
 $16x^2 + 9y^2 + 4z^2 - 24x + 24y - 24z + 61 = 0$
 $(16x^2 - 24x + 9) + (9y^2 + 24y + 16) + (4z^2 - 24z + 36) = 0$

$$(4x - 3)^2 + (3y + 4)^2 + (2z - 6)^2 = 0$$

$$4x - 3 = 0 \quad | \quad 3y + 4 = 0 \quad | \quad 2z - 6 = 0$$

$$x = 3/4 \quad | \quad y = -4/3 \quad | \quad z = 3$$

$$\Rightarrow xy + 2z = \frac{3}{4} \times \left(-\frac{4}{3}\right) + 2 \times 3$$

$$= -1 + 6 = 5$$

157. If $[8(x + y)^3 - 27(x - y)^3] \div (5y - x) = Ax^2 + Bxy + Cy^2$, then the value of $(A + B + C)$ is?

- (a) 26 (b) 19
 (c) 13 (d) 16

SSC CGL (TIER-I)– 04.06.2019 (Shift-II)

Ans. (d) :
 $[8(x + y)^3 - 27(x - y)^3] \div (5y - x) = Ax^2 + Bxy + Cy^2$
 $[A + B + C = ?]$
 $a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$
 $[2(x + y)]^3 - [3(x - y)]^3 \div (5y - x) = Ax^2 + Bxy + Cy^2$
 $\Rightarrow \frac{(5y - x)[2(x + y)]^2 + [3(x - y)]^2 + 2(x + y) \times (3(x - y))}{(5y - x)}$
 $= Ax^2 + Bxy + Cy^2$
 $\Rightarrow \frac{(5y - x)[2(x + y)]^2 + [3(x - y)]^2 + 6(x^2 - y^2)}{(5y - x)}$
 $= Ax^2 + Bxy + Cy^2$
 $= 4(x + y)^2 + 9(x - y)^2 + 6(x^2 - y^2) = Ax^2 + Bxy + Cy^2$
 $4(x^2 + y^2) + 9(x^2 + y^2) + 6(x^2 - y^2) + 8xy - 18xy = Ax^2 + Bxy + Cy^2$
 $19x^2 + 7y^2 - 10xy = Ax^2 + Bxy + Cy^2$
 On comparing both sides with the respective term
 $A = 19$
 $B = -10$
 $C = 7$
 $\Rightarrow A + B + C = 19 + 7 - 10 = 16$

158. If $x + y + z = 19$, $xy + yz + zx = 114$, then the value of $\sqrt{x^3 + y^3 + z^3 - 3xyz}$ is:

- (a) 17 (b) 13
 (c) 19 (d) 21

SSC CGL (TIER-I) – 04.06.2019 (Shift-II)

Ans. (c) : $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
 $361 = x^2 + y^2 + z^2 + 2 \times 114$
 $361 - 228 = x^2 + y^2 + z^2$
 $x^2 + y^2 + z^2 = 133$
 $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
 $= 19 \times (133 - 114)$
 $\sqrt{x^3 + y^3 + z^3 - 3xyz} = \sqrt{19 \times 19}$
 $\sqrt{x^3 + y^3 + z^3 - 3xyz} = 19$

159. If $x + y + z = 19$, $x^2 + y^2 + z^2 = 133$ and $xz = y^2$, then the difference between z and x is:

- (a) 6 (b) 5
 (c) 3 (d) 4

SSC CGL (TIER-I)– 04.06.2019 (Shift-I)

Ans. (b) $x + y + z = 19$ (i)
 $x^2 + y^2 + z^2 = 133$ (ii)
 $xz = y^2$ (iii)
 $z - x = ?$
 $(x+y+z) = 19$ (On squaring both sides)
 $x^2 + y^2 + z^2 + 2xy + 2yz + 2xz = 361$
 $133 + 2(xy + yz + zx) = 361$
 $2(xy + yz + zx) = 361 - 133$
 $xy + yz + zx = 114$
 $xz = y^2$ (On putting the value) from equation (iii)
 $xy + yz + y^2 = 114$
 $y(x+y+z) = 114$ ($x+y+z = 19$ From equation (i))
 $y \times 19 = 114$
 $y = 6$
 $y^2 = xz$
 $36 = x \times z$
 $36 = 4 \times 9$
 $36 = 36$
Hence, we will put the value of x and z in such a way that the equation $x + y + z = 19$ is satisfied.
 $x = 4$
 $y = 6$
 $z = 9$
 $\therefore z - x = 9 - 4 = 5$

OR

$x + y + z = 19$, $x^2 + y^2 + z^2 = 133$, $xz = y^2$, $z - x = ?$
Equation is satisfied from the value of $x = 4$, $y = 6$, $z = 9$
 $x + y + z = 19$
 $4 + 6 + 9 = 19$
 $19 = 19$
 $\therefore z - x = 9 - 4 = 5$

160. If $3\sqrt{3}x^3 - 2\sqrt{2}y^3 = (\sqrt{3}x - \sqrt{2}y)(Ax^2 + By^2 + Cxy)$,
then the value of $(A \times B) \div C$ is?
(a) $\sqrt{3}$ (b) $\sqrt{6}$
(c) $6\sqrt{6}$ (d) $6\sqrt{3}$
SSC CGL (TIER-I) - 06.06.2019 (Shift-III)

Ans. (b) :
 $3\sqrt{3}x^3 - 2\sqrt{2}y^3 = (\sqrt{3}x - \sqrt{2}y)(Ax^2 + By^2 + Cxy)$
 $(\sqrt{3}x)^3 - (\sqrt{2}y)^3 = (\sqrt{3}x - \sqrt{2}y)(Ax^2 + By^2 + Cxy)$
 $(\sqrt{3}x - \sqrt{2}y)(3x^2 + 2y^2 + \sqrt{6}xy) = (\sqrt{3}x - \sqrt{2}y)(Ax^2 + By^2 + Cxy)$
 $3x^2 + 2y^2 + \sqrt{6}xy = Ax^2 + By^2 + Cxy$
By comparing
 $A = 3$, $B = 2$, $C = \sqrt{6}$
Hence $(A \times B) \div C = (3 \times 2) \div \sqrt{6} = \sqrt{6}$

161. If $a + b + c = 2$, $a^2 + b^2 + c^2 = 26$, then the value of $a^3 + b^3 + c^3 - 3abc$ is?
(a) 71 (b) 74
(c) 78 (d) 69
SSC CGL (TIER-I) - 06.06.2019 (Shift-III)

Ans. (b) : $\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
 $4 = 26 + 2(ab + bc + ca)$
 $ab + bc + ca = -11$
 $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
 $= 2(26 + 11)$
 $= 2 \times 37 = 74$

162. If $a + \frac{1}{a} = 3$, then $\left(a^4 + \frac{1}{a^4}\right)$ is equal to:
(a) 47 (b) 27
(c) 77 (d) 81
SSC CGL (TIER-I) - 06.06.2019 (Shift-III)

Ans. (a) : $a + \frac{1}{a} = 3$
 $\left(a + \frac{1}{a}\right)^2 = 9$ (On squaring both sides)
 $a^2 + \frac{1}{a^2} + 2 = 9$
 $a^2 + \frac{1}{a^2} = 7$ (Again, on squaring both side)
 $\left(a^2 + \frac{1}{a^2}\right)^2 = 49$
 $a^4 + \frac{1}{a^4} + 2 = 49$
 $a^4 + \frac{1}{a^4} = 47$

163. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$ then $\sqrt{x^4 + y^4 - 2x^2y^2}$ is equal to?
(a) $16a^2$ (b) $\frac{8}{a^2}$
(c) 4 (d) 8
SSC CGL (TIER-I) - 06.06.2019 (Shift-I)

Ans. (c) : $\sqrt{x^4 + y^4 - 2x^2y^2}$
 $= \sqrt{(x^2 - y^2)^2}$
 $= x^2 - y^2$
 $= (x + y)(x - y)$
 $= 2a \times \frac{2}{a} = 4$

164. If $ab + bc + ca = 8$ and $a^2 + b^2 + c^2 = 20$, then a possible value of $\frac{1}{2}(a + b + c) \left[(a - b)^2 + (b - c)^2 + (c - a)^2 \right]$ is:
(a) 84 (b) 56
(c) 72 (d) 80
SSC CGL (TIER-I) - 06.06.2019 (Shift-I)

Ans. (c) : $\because (a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)$
 $= 20 + 2 \times 8 = 36$
 $a+b+c = 6$
 $\therefore \frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$
 $= (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$
 $= 6 \times [20 - 8]$
 $= 6 \times 12 = 72$

165. If $\frac{6x}{(2x^2 + 5x - 2)} = 1, x > 0$, then the value of $x^3 + \frac{1}{x^3}$ is?
- (a) $\frac{3}{8}\sqrt{17}$ (b) $\frac{5\sqrt{17}}{8}$
(c) $\frac{5\sqrt{17}}{16}$ (d) $\frac{3}{4}\sqrt{17}$

SSC CGL (TIER-I)-07.06.2019 (Shift-III)

Ans. (b) : Given, $\frac{6x}{(2x^2 + 5x - 2)} = 1$
 $\Rightarrow \frac{6}{2x + 5 - \frac{2}{x}} = 1 \Rightarrow 2\left(x - \frac{1}{x}\right) = 1$
 $\Rightarrow \left(x - \frac{1}{x}\right) = \frac{1}{2}$
 $\therefore \left(x + \frac{1}{x}\right) = \sqrt{\left(x - \frac{1}{x}\right)^2 + 4}$
 $= \sqrt{\left(\frac{1}{2}\right)^2 + 4} = \frac{\sqrt{17}}{2}$
 $\therefore x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)\left[x^2 + \frac{1}{x^2} - 1\right]$
 $= \left(x + \frac{1}{x}\right)\left[\left(x + \frac{1}{x}\right)^2 - 2\right] - 1$
 $= \left(\frac{\sqrt{17}}{2}\right)\left[\left(\frac{\sqrt{17}}{2}\right)^2 - 3\right]$
 $= \frac{\sqrt{17}}{2}\left[\frac{17-12}{4}\right]$
 $= \frac{5\sqrt{17}}{8}$

166. If $x^2 - 3x - 1 = 0$, then the value of $(x^2 + 8x - 1)(x^3 + x^{-1})^{-1}$ is?

- (a) 8 (b) $\frac{3}{8}$
(c) 1 (d) 3

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-II)

Ans. (c) : $x^2 - 3x - 1 = 0$
 $x^2 - 1 = 3x$ (i)
 $(x^2 - 1)^2 = (3x)^2$ (On squaring both sides)
 $x^4 + 1 - 2x^2 = 9x^2$
 $x^4 + 1 = 11x^2$ (ii)
 $(x^2 + 8x - 1)\left(\frac{x^4 + 1}{x}\right)^{-1}$

From question,

$(11x)\left(\frac{11x^2}{x}\right)^{-1} \quad [\because x^2 - 1 = 3x]$
 $(11x) \times \left(\frac{1}{11x}\right) = 1$

167. If $(135\sqrt{5}x^3 - 2\sqrt{2}y^3) \div (3\sqrt{5}x - \sqrt{2}y) = Ax^2 + By^2 + \sqrt{10}Cxy$, then the value of $(A + B - 9C)$ is?

- (a) 18 (b) 12
(c) 10 (d) 20

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-II)

Ans. (d) : $(135\sqrt{5}x^3 - 2\sqrt{2}y^3) \div (3\sqrt{5}x - \sqrt{2}y)$
 $= Ax^2 + By^2 + \sqrt{10}Cxy$
 $\left[(3\sqrt{5}x)^3 - (\sqrt{2}y)^3\right] \div (3\sqrt{5}x - \sqrt{2}y)$
 $= Ax^2 + By^2 + \sqrt{10}Cxy$
 $\therefore a^3 - b^3 = (a-b)(a^2 + b^2 + ab)$
 $(3\sqrt{5}x - \sqrt{2}y)(45x^2 + 2y^2 + 3\sqrt{10}xy) \div (3\sqrt{5}x - \sqrt{2}y)$
 $= Ax^2 + By^2 + \sqrt{10}Cxy$
 $45x^2 + 2y^2 + 3\sqrt{10}xy = Ax^2 + By^2 + \sqrt{10}Cxy$
By comparing
 $A = 45, B = 2, C = 3$
 $(A + B - 9C) = 45 + 2 - 27$
 $= 47 - 27$
 $= 20$

168. If $9a^2 + 4b^2 + c^2 + 21 = 4(3a + b - 2c)$, then the value of $(9a + 4b - c)$ is?

- (a) 12 (b) 2
(c) 16 (d) 6

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-II)

Ans. (a) : $9a^2 + 4b^2 + c^2 + 21 = 4(3a + b - 2c)$
 $(9a^2 - 12a + 4) + (4b^2 - 4b + 1) + (c^2 + 8c + 16) = 0$
 $(3a - 2)^2 + (2b - 1)^2 + (c + 4)^2 = 0$
 $3a - 2 = 0 \quad 2b - 1 = 0 \quad c + 4 = 0$

$$\Rightarrow a = 2/3 \Rightarrow b = 1/2 \Rightarrow c = -4$$

$$9a + 4b - c$$

$$= 9 \times \frac{2}{3} + 4 \times \frac{1}{2} - (-4)$$

$$= 6 + 2 + 4 = 12$$

169. If $x = 2 - p$, then $x^3 + 6xp + p^3$ is equal to?

- (a) 12 (b) 6
(c) 8 (d) 4

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (c) : $x = 2 - p$

$$x + p = 2$$

On cubing both sides

$$(x + p)^3 = (2)^3$$

$$x^3 + p^3 + 3xp(x + p) = 8$$

$$x^3 + p^3 + 3xp(2) = 8$$

$$\boxed{x^3 + p^3 + 6xp = 8}$$

170. If $x^4 - 6x^2 - 1 = 0$, then the value of

$$x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5 \text{ is?}$$

- (a) 239 (b) 204
(c) 209 (d) 219

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (c) :

$$x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5$$

$$x^6 - \frac{1}{x^6} - 5\left(x^2 - \frac{1}{x^2}\right) + 5 \quad \dots\dots\dots(A)$$

$$\therefore x^4 - 6x^2 - 1 = 0$$

$$x^4 - 1 = 6x^2$$

$$x^2 - \frac{1}{x^2} = 6 \quad \dots\dots\dots(B)$$

$$\left(x^2 - \frac{1}{x^2}\right)^3 = (6)^3$$

$$x^6 - \frac{1}{x^6} - 3\left(x^2 - \frac{1}{x^2}\right) = 216$$

$$x^6 - \frac{1}{x^6} - 3(6) = 216$$

$$x^6 - \frac{1}{x^6} = 216 + 18$$

$$\boxed{x^6 - \frac{1}{x^6} = 234} \quad \dots\dots\dots(C)$$

By putting the value of equation B and equation (C) in equation (A)

$$= 234 - 5(6) + 5$$

$$= 234 - 30 + 5$$

$$= \boxed{209}$$

171. If $a + b + c = 11$ and $ab + bc + ca = 38$, then $a^3 + b^3 + c^3 - 3abc$ is equal to?

- (a) 44 (b) 77
(c) 55 (d) 66

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) : $a + b + c = 11 \dots\dots\dots(i)$

Given

$$\therefore ab + bc + ca = 38$$

From equation (i)

$$(a + b + c)^2 = (11)^2 = 121$$

$$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 121$$

$$a^2 + b^2 + c^2 = 121 - 2 \times 38 = 121 - 76 = 45$$

$$\therefore a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$$

$$\therefore a^3 + b^3 + c^3 - 3abc = 11 \times (45 - 38)$$

$$= 11 \times 7$$

$$= 77$$

172. If $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$, then $x^2 + \frac{1}{x^2}$ is equal to?

- (a) 192 (b) 322
(c) 256 (d) 326

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (b) : Given,

$$\sqrt{x} - \frac{1}{\sqrt{x}} = 4$$

On squaring both sides

$$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = (4)^2$$

$$x + \frac{1}{x} - 2 = 16$$

$$\left(x + \frac{1}{x}\right) = 18 \quad \dots\dots\dots(i)$$

$$\therefore x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2$$

$$x^2 + \frac{1}{x^2} = (18)^2 - 2 \quad \text{(From equation (i))}$$

$$x^2 + \frac{1}{x^2} = 324 - 2$$

$$x^2 + \frac{1}{x^2} = 322$$

173. If $4x^2 - 6x + 1 = 0$, then the value of $8x^3 + (8x^3)^{-1}$ is:

- (a) 36 (b) 13
(c) 11 (d) 18

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (d) : $4x^2 - 6x + 1 = 0$

$$4x^2 + 1 = 6x$$

$$\frac{4x^2 + 1}{2x} = \frac{6x}{2x} \quad (\because \text{on dividing by } 2x)$$

$$2x + \frac{1}{2x} = 3 \quad \dots\dots\dots(i)$$

From equation (i)

$$\left(2x + \frac{1}{2x}\right)^3 = 8x^3 + \frac{1}{8x^3} + 3 \times 2x \times \frac{1}{2x} \left(2x + \frac{1}{2x}\right)$$

$$(3)^3 = 8x^3 + \frac{1}{8x^3} + 9$$

$$18 = 8x^3 + \frac{1}{8x^3}$$

or, $8x^3 + (8x^3)^{-1} = 18$

174. If $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$, then $x^3 + \frac{1}{x^3}$ is equal to?

- (a) 120 (b) 110
(c) 140 (d) 130

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (b) $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$

$$x + \frac{1}{x} + 2 = 7 \quad (\text{By squaring both sides})$$

$$x + \frac{1}{x} = 5$$

$$[(a+b)^3 = a^3 + b^3 + 3ab(a+b)]$$

$$\left(x + \frac{1}{x}\right)^3 = (5)^3$$

$$x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left(x + \frac{1}{x}\right) = 125$$

$$x^3 + \frac{1}{x^3} + 3(5) = 125, \quad \boxed{x^3 + \frac{1}{x^3} = 110}$$

175. If $a + b = 8$ and $ab = \frac{32}{3}$, then $(a^3 + b^3)$ is equal to:

- (a) 256 (b) 384
(c) 128 (d) 320

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (a) : We know that formula

$$[(a+b)^3 = a^3 + b^3 + 3ab(a+b)]$$

According to this formula

$$(8)^3 = a^3 + b^3 + 3 \times \frac{32}{3} (8)$$

$$512 = a^3 + b^3 + 256$$

$$a^3 + b^3 = 256$$

176. If $a + b + c = 4$ and $ab + bc + ca = 2$, then $a^3 + b^3 + c^3 - 3abc$ is equal to:

- (a) 36 (b) 32
(c) 48 (d) 40

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (d) : We know that:-

$$[(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)]$$

$$(4)^2 = a^2 + b^2 + c^2 + 2(2)$$

$$a^2 + b^2 + c^2 = 12$$

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) [a^2 + b^2 + c^2 - (ab + bc + ca)] = 4 [12 - 2]$$

$$a^3 + b^3 + c^3 - 3abc = 4 \times 10 = 40$$

177. If $(a + b) = 6$ and $ab = \frac{16}{3}$, then $(a^3 + b^3)$ is

equal to:

- (a) 150 (b) 190
(c) 220 (d) 120

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) : Given,

$$a + b = 6 \quad \dots(i)$$

$$ab = \frac{16}{3}$$

$$\therefore a^3 + b^3 = (a + b)(a^2 + b^2 - ab) \quad \dots(ii)$$

From equation (i)

$$(a + b)^2 = 36$$

$$a^2 + b^2 + 2ab = 36$$

$$a^2 + b^2 = 36 - 2 \times \frac{16}{3} = \frac{108 - 32}{3} = \frac{76}{3}$$

From equation (ii)

$$a^3 + b^3 = 6 \times \left(\frac{76}{3} - \frac{16}{3}\right) = 6 \times \frac{60}{3} = 120$$

178. If $a + b + c = 8$ and $ab + bc + ca = 12$, then $a^3 + b^3 + c^3 - 3abc$ is equal to:

- (a) 192 (b) 144
(c) 400 (d) 224

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (d) : $a + b + c = 8$, $ab + bc + ca = 12$ Given that

$$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 64$$

$$a^2 + b^2 + c^2 = 64 - 2(ab + bc + ca) \quad \dots(i)$$

Now,

$$a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

\therefore From equation (i)

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) [64 - 3(ab+bc+ca)]$$

$$= 8 \times [64 - 3 \times 12] = 8 \times [64 - 36]$$

$$= 8 \times 28$$

$$= 224$$

179. If $a - b = 5$ and $ab = 2$, then $a^3 - b^3$ is equal to?

- (a) 95 (b) 145
(c) 125 (d) 155

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (d) : $a - b = 5$, $ab = 2$

$$a^3 - b^3 = (a - b)^3 + 3ab(a - b)$$

$$a^3 - b^3 = (5)^3 + 3 \times 2 \times (5)$$

$$= 125 + 30$$

$$= 155$$

180. If $\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2}$, then $x^2 + \frac{1}{x^2}$ is equal to:

- (a) 100 (b) 98
(c) 102 (d) 104

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (b) :

$$\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2} \quad \dots(i)$$

On squaring equation (i)

$$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = (2\sqrt{2})^2$$

$$x + \frac{1}{x} - 2 = 8$$

$$x + \frac{1}{x} = 10 \quad \dots\dots(ii)$$

On squaring equation (ii)

$$\left(x + \frac{1}{x}\right)^2 = (10)^2$$

$$x^2 + \frac{1}{x^2} = 98$$

181. If $(a + b) = 6$ and $ab = 8$, then $(a^3 + b^3)$ is equal to?

- (a) 72 (b) 108
(c) 144 (d) 216

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (a) :

$$(a + b) = 6$$

by cubing both sides

$$(a+b)^3 = (6)^3$$

$$\Rightarrow a^3 + b^3 + 3ab(a+b) = 216$$

$$\Rightarrow a^3 + b^3 + 3 \times 8 \times 6 = 216 \quad [\because ab = 8]$$

$$\Rightarrow a^3 + b^3 = 216 - 144$$

$$\Rightarrow \boxed{a^3 + b^3 = 72}$$

182. If $x + \frac{1}{x} = 5$, then $x^3 + \frac{1}{x^3}$ is equal to:

- (a) 110 (b) 130
(c) 125 (d) 145

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (a) : Given-

$$x + \frac{1}{x} = 5$$

$$\therefore x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) \\ = 125 - 15 = 110$$

183. If $(x-5)^3 + (x-6)^3 + (x-7)^3 = 3(x-5)(x-6)(x-7)$ then what is the value of x ?

- (a) 18 (b) 6
(c) 5 (d) 7

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

$$\text{Ans. (b) : } (x-5)^3 + (x-6)^3 + (x-7)^3 \\ = 3(x-5)(x-6)(x-7)$$

$$a = x - 5, b = x - 6, c = x - 7$$

$$\therefore \boxed{a^3 + b^3 + c^3 = 3abc}$$

$$\therefore a + b + c = 0$$

$$x - 5 + x - 6 + x - 7 = 0$$

$$3x - 18 = 0$$

$$x = 6$$

184. If $a^3 - b^3 = 208$ and $a - b = 4$, then $(a + b)^2 - ab$ is equal to:

- (a) 32 (b) 38
(c) 52 (d) 42

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

$$\text{Ans. (c) : } a^3 - b^3 = 208$$

$$(a - b)(a^2 + b^2 + ab) = 208$$

$$4(a^2 + b^2 + ab) = 208$$

$$a^2 + b^2 + ab = 52$$

$$\therefore (a + b)^2 - ab = 52$$

185. If $a - b = 5$ and $ab = 6$, then $(a^3 - b^3)$ is equal to?

- (a) 215 (b) 155
(c) 90 (d) 225

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (a) : $a - b = 5$ and $ab = 6$

$$\boxed{a^3 - b^3 = (a - b)^3 + 3ab(a - b)}$$

$$a^3 - b^3 = 5^3 + 3 \times 6 \times 5$$

$$a^3 - b^3 = 125 + 90$$

$$a^3 - b^3 = 215$$

186. If $a - \frac{1}{a} = 3$, then $a^6 + \frac{1}{a^6}$ equal to :

- (a) 996 (b) 729
(c) 1298 (d) 1331

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$$\text{Ans. (c) : } a - \frac{1}{a} = 3 \dots\dots(i)$$

By squaring the equation (i)

$$a^2 + \frac{1}{a^2} - 2 = 9$$

$$a^2 + \frac{1}{a^2} = 11 \dots\dots(ii)$$

By cubing the equation (ii)

$$a^6 + \frac{1}{a^6} + 3\left(a^2 + \frac{1}{a^2}\right) = 1331$$

$$a^6 + \frac{1}{a^6} = 1331 - 33 = 1298$$

187. If $x + \frac{1}{x} = 4$, then $x^3 + \frac{1}{x^3}$ equal to :

- (a) 52 (b) 64
(c) 40 (d) 50

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

$$\text{Ans. (a) : } x + \frac{1}{x} = 4$$

$$\boxed{x^3 + \frac{1}{x^3} = a^3 - 3a}$$

On cubing both sides

$$x^3 + \frac{1}{x^3} = (4)^3 - 3 \times 4 = 64 - 12$$

$$\therefore x^3 + \frac{1}{x^3} = 52$$

188. If $a^3 - b^3 = 210$ and $a - b = 5$, then $(a+b)^2 - ab$ equal to:

- (a) 52 (b) 42
(c) 38 (d) 32

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

$$\text{Ans. (b) } \therefore a^3 - b^3 = 210, a - b = 5$$

$$(a - b)(a^2 + b^2 + ab) = 210$$

$$\therefore a - b = 5 \text{ Given}$$

$$\therefore 5 \times (a^2 + b^2 + ab) = 210$$

$$(a^2 + b^2 + 2ab) - ab = 42$$

$$(a + b)^2 - ab = 42$$

189. If $(x-4)^3 + (x-5)^3 + (x-3)^3 = 3(x-4)(x-5)(x-3)$, then what will be the value of x.

- (a) 7 (b) 4
(c) 18 (d) 6

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (b) $a^3 + b^3 + c^3 = 3abc$ It is possible only when $a + b + c = 0$
 $x-4 + x-5 + x-3 = 0$
 $3x - 12 = 0$
 $3x = 12 \quad x = 4$

IInd method

$$(x-4)^3 + (x-5)^3 + (x-3)^3 = 3(x-4)(x-5)(x-3)$$

∴ By option (b)

∴ x = 4 By taking the value of x = 4

$$(4-4)^3 + (4-5)^3 + (4-3)^3 = 3(4-4)(4-5)(4-3)$$

$$0 + (-1) + 1 = 3(0) \times (-1)(1)$$

$$0 = 0$$

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\therefore x = 4$$

190. If $x^2 + 3x + 1 = 0$, then what is the value of

$$x^6 + \frac{1}{x^6} ?$$

- (a) 324 (b) 327
(c) 322 (d) 318

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : $x^2 + 3x + 1 = 0$

Dividing by x to both sides

$$x + 3 + \frac{1}{x} = 0$$

$$x + \frac{1}{x} = -3$$

On cubing both sides,

$$\left(x + \frac{1}{x}\right)^3 = (-3)^3$$

$$x^3 + \frac{1}{x^3} + 3(x) \frac{1}{(x)} \left(x + \frac{1}{x}\right) = -27$$

$$x^3 + \frac{1}{x^3} + 3(-3) = -27$$

$$x^3 + \frac{1}{x^3} = -27 + 9$$

$$x^3 + \frac{1}{x^3} = -18$$

On squaring both sides

$$\left(x^3 + \frac{1}{x^3}\right)^2 = (-18)^2$$

$$x^6 + \frac{1}{x^6} + 2 = 324$$

$$x^6 + \frac{1}{x^6} = 324 - 2 = 322$$

191. The value of $27a^3 - 2\sqrt{2}b^3$ is equal to?

- (a) $(3a - \sqrt{2}b)(9a^2 + 2b^2 + 6\sqrt{2}ab)$
(b) $(3a - \sqrt{2}b)(9a^2 - 2b^2 - 3\sqrt{2}ab)$

$$(c) (3a - \sqrt{2}b)(9a^2 + 2b^2 + 3\sqrt{2}ab)$$

$$(d) (3a - \sqrt{2}b)(9a^2 - 2b^2 + 6\sqrt{2}ab)$$

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Ans. (c) : $\because A^3 - B^3 = (A - B)(A^2 + B^2 + AB)$

$$27a^3 - 2\sqrt{2}b^3 = (3a)^3 - (\sqrt{2}b)^3$$

$$= (3a - \sqrt{2}b)(9a^2 + 2b^2 + 3\sqrt{2}ab)$$

192. If $x^4 + x^2y^2 + y^4 = 21$ and $x^2 + xy + y^2 = 7$, then

the value of $\left(\frac{1}{x^2} + \frac{1}{y^2}\right)$ is?

$$(a) \frac{7}{4} \quad (b) \frac{5}{4}$$

$$(c) \frac{7}{3} \quad (d) \frac{5}{2}$$

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b) : $x^2 + xy + y^2 = 7$ (1)

$$\therefore (x^2 - xy + y^2)(x^2 + xy + y^2) = x^4 + x^2y^2 + y^4$$

$$x^2 - xy + y^2 = \frac{x^4 + x^2y^2 + y^4}{x^2 + xy + y^2}$$

$$= \frac{21}{7} = 3 \dots \dots \dots (2)$$

For equation (1) + (2),

$$2(x^2 + y^2) = 10$$

$$x^2 + y^2 = 5$$

For equation (1) - (2),

$$2xy = 4$$

$$xy = 2$$

$$\therefore \frac{1}{x^2} + \frac{1}{y^2} = \frac{x^2 + y^2}{x^2y^2} = \frac{5}{4}$$

193. If $x - y = 4$ and $xy = 45$, then the value of $x^3 - y^3$ is:

- (a) 82 (b) 604
(c) 151 (d) 822

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) : $\because x^3 - y^3 = (x - y)^3 + 3xy(x - y)$

$$= 64 + 3 \times 45 \times 4$$

$$= 64 + 540 = 604$$

194. If $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$, then the value of $(A^2 + B^2 - AB)$ is:

- (a) 16 (b) 6
(c) 18 (d) 14

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Ans. (d) :

$$2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$$

$$\left(-\sqrt{2}x + y + 2\sqrt{2}z\right)^2 = (Ax + y + Bz)^2$$

On comparing the coefficients,

$$A = -\sqrt{2}, \quad B = 2\sqrt{2}$$

$$\therefore A^2 + B^2 - AB = 2 + 8 + 4 = 14$$

195. If $12x^2 - 21x + 1 = 0$, then what is the value of $9x^2 + (16x^2)^{-1}$?

- (a) $\frac{465}{16}$ (b) $\frac{429}{8}$
 (c) $\frac{417}{16}$ (d) $\frac{453}{8}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (c) : $12x^2 - 21x + 1 = 0$

$$12x + \frac{1}{x} = 21$$

$$3x + \frac{1}{4x} = \frac{21}{4}$$

On squaring both sides,

$$9x^2 + \frac{1}{16x^2} + 2 \times 3x \times \frac{1}{4x} = \frac{441}{16}$$

$$9x^2 + (16x^2)^{-1} = \frac{441}{16} - \frac{3}{2} = \frac{417}{16}$$

196. If $30x^2 - 15x + 1 = 0$, then what is the value of $25x^2 + (36x^2)^{-1}$?

- (a) $6\frac{1}{4}$ (b) $\frac{65}{12}$
 (c) $\frac{9}{2}$ (d) $\frac{55}{12}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) : $30x^2 - 15x + 1 = 0$

$$30x + \frac{1}{x} = 15$$

Dividing by 6

$$5x + \frac{1}{6x} = \frac{15}{6} = \frac{5}{2}$$

On squaring both sides,

$$25x^2 + \frac{1}{36x^2} + 2 \times 5x \times \frac{1}{6x} = \frac{25}{4}$$

$$25x^2 + \frac{1}{36x^2} = \frac{25}{4} - \frac{5}{3} = \frac{55}{12}$$

197. If $a + b + c = 7$ and $ab + bc + ca = -6$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

- (a) 463 (b) 469
 (c) 479 (d) 472

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (b) : $a^2 + b^2 + c^2 = (a+b+c)^2 - 2(ab+bc+ca)$
 $= 49 + 12 = 61$

$a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$
 $= 7(61+6)$
 $= 7 \times 67 = 469$

198. If $P = \frac{x^4 - 8x}{x^3 - x^2 - 2x}$, $Q = \frac{x^2 + 2x + 1}{x^2 - 4x - 5}$ and $R = \frac{2x^2 + 4x + 8}{x - 5}$, then $(P \times Q) \div R$ is equal to:

- (a) $\frac{1}{2}$ (b) 2
 (c) 1 (d) 4

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (a) :

$$P = \frac{x^4 - 8x}{x^3 - x^2 - 2x} = \frac{x^3 - 8}{x^2 - x - 2} = \frac{(x-2)(x^2 + 2x + 4)}{(x-2)(x+1)}$$

$$= \frac{(x^2 + 2x + 4)}{(x+1)}$$

$$Q = \frac{x^2 + 2x + 1}{x^2 - 4x - 5} = \frac{(x+1)^2}{(x-5)(x+1)} = \frac{x+1}{x-5}$$

$$R = \frac{2(x^2 + 2x + 4)}{x - 5}$$

$$(P \times Q) \div R = \frac{x^2 + 2x + 4}{x+1} \times \frac{x+1}{x-5} \times \frac{x-5}{2(x^2 + 2x + 4)}$$

$$= \frac{1}{2}$$

199. If $5x + \frac{1}{3x} = 4$, then what is the value of $9x^2 + \frac{1}{25x^2}$?

- (a) $\frac{119}{25}$ (b) $\frac{174}{125}$
 (c) $\frac{144}{125}$ (d) $\frac{114}{25}$

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Ans. (d) :

$$5x + \frac{1}{3x} = 4$$

On multiplying by $\frac{3}{5}$

$$3x + \frac{1}{5x} = \frac{12}{5}$$

On squaring both sides

$$9x^2 + \frac{1}{25x^2} + 2 \times 3x \times \frac{1}{5x} = \frac{144}{25}$$

$$9x^2 + \frac{1}{25x^2} = \frac{144}{25} - \frac{6}{5} = \frac{114}{25}$$

200. If $a + b + c = 11$, $ab + bc + ca = 3$ and $abc = -135$, then what is the value of $a^3 + b^3 + c^3$?

- (a) 827 (b) 823
 (c) 925 (d) 929

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Ans. (a) : $\therefore a^3 + b^3 + c^3 - 3abc = (a+b+c)[(a+b+c)^2 - 3(ab+bc+ca)]$
 $a^3 + b^3 + c^3 + 405 = 11[121 - 9]$
 $a^3 + b^3 + c^3 = 1232 - 405 = 827$

201. On simplification,

$$\frac{x^3 - y^3}{x[(x+y)^2 - 3xy]} \div \frac{y[(x-y)^2 + 3xy]}{x^3 + y^3} \times \frac{(x+y)^2 - (x-y)^2}{x^2 - y^2}$$

is equal to:

- (a) $\frac{1}{4}$ (b) 1
 (c) 4 (d) $\frac{1}{2}$

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Ans. (c) :

$$\frac{x^3 - y^3}{x[(x+y)^2 - 3xy]} \div \frac{y[(x-y)^2 + 3xy]}{x^3 + y^3} \times \frac{(x+y)^2 - (x-y)^2}{x^2 - y^2}$$

$$= \frac{(x-y)(x^2 + xy + y^2)}{x(x^2 + y^2 - xy)} \times \frac{(x+y)(x^2 - xy + y^2)}{y(x^2 + y^2 + xy)} \times \frac{4xy}{(x+y)(x-y)}$$

$$= 4$$

202. If $x^4 + x^2y^2 + y^4 = 273$ and $x^2 - xy + y^2 = 13$, then the value of xy is:

- (a) 6 (b) 10
 (c) 8 (d) 4

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (d) : $x^2 + xy + y^2 = \frac{x^4 + x^2y^2 + y^4}{x^2 - xy + y^2}$

$$x^2 + xy + y^2 = \frac{273}{13}$$

$$x^2 + xy + y^2 = 21 \dots\dots\dots(i)$$

$$x^2 - xy + y^2 = 13 \dots\dots\dots(ii)$$

From equation (i) and equation (ii),

$$2xy = 8$$

$$xy = 4$$

203. If $20x^2 - 30x + 1 = 0$, then what is the value of

$$25x^2 + \frac{1}{16x^2} ?$$

- (a) $53\frac{1}{2}$ (b) $58\frac{3}{4}$
 (c) $58\frac{1}{2}$ (d) $53\frac{3}{4}$

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Ans. (d) : $20x^2 - 30x + 1 = 0$

$$20x + \frac{1}{x} = 30$$

$$5x + \frac{1}{4x} = \frac{15}{2}$$

On squaring both sides,

$$25x^2 + \frac{1}{16x^2} + 2 \times 5x \times \frac{1}{4x} = \frac{225}{4}$$

$$25x^2 + \frac{1}{16x^2} = \frac{225}{4} - \frac{5}{2} = \frac{215}{4} = 53\frac{3}{4}$$

204. If $16a^4 + 36a^2b^2 + 81b^4 = 91$ and $4a^2 + 9b^2 - 6ab = 13$, then what is the value of $3ab$?

- (a) $-\frac{3}{2}$ (b) $\frac{3}{2}$
 (c) 5 (d) -3

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (a) :

$$16a^4 + 36a^2b^2 + 81b^4 = (4a^2 + 9b^2 - 6ab)^2 \quad (4a^2 + 9b^2 + 6ab)$$

From formula

$$4a^2 + 9b^2 + 6ab = \frac{91}{13} = 7 \dots\dots\dots(i)$$

$$4a^2 + 9b^2 - 6ab = 13 \dots\dots\dots(ii)$$

From equation (i) – equation (ii)

$$12ab = -6$$

$$3ab = \frac{-6}{4} = \frac{-3}{2}$$

205. If $x^2 - 2\sqrt{5}x + 1 = 0$, then what is the value of $x^5 + \frac{1}{x^5}$?

- (a) $408\sqrt{5}$ (b) $612\sqrt{5}$
 (c) $406\sqrt{5}$ (d) $610\sqrt{5}$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) : $x^2 - 2\sqrt{5}x + 1 = 0$

$$x + \frac{1}{x} = 2\sqrt{5}$$

$$\therefore x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$$

$$\text{then, } x^2 + \frac{1}{x^2} = (2\sqrt{5})^2 - 2 = 18$$

$$x^3 + \frac{1}{x^3} = (2\sqrt{5})^3 - 3 \times 2\sqrt{5} = 34\sqrt{5}$$

$$\therefore \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) = 18 \times 34\sqrt{5}$$

$$\therefore x^5 + \frac{1}{x^5} = 612\sqrt{5} - 2\sqrt{5} = 610\sqrt{5}$$

206. Find the product of $(a+b+2c)(a^2+b^2+4c^2-ab-2bc-2ca)$.

- (a) $a^3 + b^3 + 8c^3 - 6abc$ (b) $a^3 + b^3 + 8c^3 - 2abc$
 (c) $a^3 + b^3 + 8c^3 - abc$ (d) $a^3 + b^3 + 6c^3 - 6abc$

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Ans. (a) : $(a+b+2c)(a^2+b^2+4c^2-ab-2bc-2ca)$

$$= (a+b+2c)[a^2+b^2+(2c)^2-ab-2bc-2ca]$$

$$\therefore a^3 + b^3 + (2c)^3 - 3 \times a \times b \times (2c)$$

$$= a^3 + b^3 + 8c^3 - 6abc$$

207. If $a^4 + \frac{1}{a^4} = 50$, $a > 0$, then find the value of

$$a^3 + \frac{1}{a^3}.$$

(a) $\sqrt{2(1-\sqrt{13})}(-1+2\sqrt{13})$

(b) $\sqrt{2(1+\sqrt{13})}(-1-2\sqrt{13})$

(c) $\sqrt{2(1+\sqrt{13})}(-1+2\sqrt{13})$

(d) $\sqrt{2(1+\sqrt{13})}+(-1+2\sqrt{13})$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (c) : $a^4 + \frac{1}{a^4} = 50$

$$a^2 + \frac{1}{a^2} = \sqrt{52}$$

$$\left(a + \frac{1}{a}\right)^2 = 2\sqrt{13} + 2$$

$$a + \frac{1}{a} = \sqrt{2(1 + \sqrt{13})}$$

if $a + \frac{1}{a} = k$ and $a^3 + \frac{1}{a^3} = k^3 - 3k$

$$\begin{aligned} \therefore a^3 + \frac{1}{a^3} &= 2(1 + \sqrt{13})\sqrt{2(1 + \sqrt{13})} - 3\sqrt{2(1 + \sqrt{13})} \\ &= \sqrt{2(1 + \sqrt{13})}(-1 + 2\sqrt{13}) \end{aligned}$$

208. If $a^2 + b^2 + c^2 = 300$ and $ab + bc + ca = 50$, then what is the value of $a + b + c$? (Given that a, b and c are all positive).

- (a) 15 (b) 20
(c) 22 (d) 25

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (b) : $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
 $= 300 + 100 = 400$
 $a + b + c = 20$

209. If $1 - 64x^3 - 12x + px^2 = (1-4x)^3$, then the value of p is:

- (a) 48 (b) -12
(c) -48 (d) 16

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (a) : $1 - 64x^3 - 12x + px^2 = (1-4x)^3$
 $1 - 64x^3 - 12x + px^2 = 1 - 64x^3 - 12x + 48x^2$
 On comparing both sides,
 $p = 48$

210. If $a^2 + b^2 - c^2 = 0$, then the value of $\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$ is:

- (a) 1 (b) 0
(c) 2 (d) 3

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (*) : $\because a^2 + b^2 - c^2 = 0$
 $a^2 + b^2 = c^2$ (i)
 On cubing both sides,
 $(a^2 + b^2)^3 = c^6$
 $a^6 + b^6 + 3a^2b^2(a^2 + b^2) = c^6$
 $a^6 + b^6 - c^6 = -3a^2b^2c^2$ ($\because a^2 + b^2 = c$)
 $\frac{a^6 + b^6 - c^6}{3a^2b^2c^2} = -1$
 On multiplying by 2 of both sides
 $\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2} = -2$

Note- SSC (Staff selection commission) has considered the answer to this question as 2, while the correct answer would be -2.

211. Expand : $(4a + 3b + 2c)^2$

- (a) $4a^2 + 3b^2 + 2c^2 + 24ab + 12bc + 16ca$
 (b) $16a^2 - 9b^2 + 4c^2 - 24ab + 12bc - 16ca$
 (c) $16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca$
 (d) $16a^2 + 9b^2 + 4c^2 - 24ab - 12bc - 16ca$

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Ans. (c) : We know that formula:-

$$\begin{aligned} \therefore (a + b + c)^2 &= (a^2 + b^2 + c^2 + 2ab + 2bc + 2ca) \\ (4a + 3b + 2c)^2 &= 16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca \end{aligned}$$

212. If $x + y = 10$ and $xy = 4$, then what is the value of $x^4 + y^4$?

- (a) 8464 (b) 8432
(c) 7478 (d) 6218

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given-

$x + y = 10$ (i)
 $xy = 4$ (ii)
 $\therefore x^4 + y^4 = (x^2 + y^2)^2 - 2x^2y^2$
 $\therefore x^4 + y^4 = [(x+y)^2 - 2xy]^2 - 2(xy)^2$ (iii)

By putting the value from equation (i) and (ii) in equation (iii)

$$\begin{aligned} x^4 + y^4 &= [(10)^2 - 2 \times 4]^2 - 2 \times (4)^2 \\ &= (92)^2 - 2 \times 16 \\ &= 8464 - 32 \\ &= \boxed{8432} \end{aligned}$$

213. If $a + b + c = 9$, $ab + bc + ca = 26$, $a^3 + b^3 = 91$, $b^3 + c^3 = 72$ and $c^3 + a^3 = 35$, then what is the value of abc ?

- (a) 48 (b) 24
(c) 36 (d) 42

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : $a^3 + b^3 = 91$ (i)
 $b^3 + c^3 = 72$ (ii)
 $c^3 + a^3 = 35$ (iii)

By adding

$$\begin{aligned} 2(a^3 + b^3 + c^3) &= 198 \\ a^3 + b^3 + c^3 &= 99 \end{aligned}$$

$$\begin{aligned} \therefore a^3 + b^3 + c^3 - 3abc &= (a+b+c)[(a+b+c)^2 - 3(ab+bc+ca)] \\ 99 - 3abc &= 9(81 - 78) \\ 3abc &= 99 - 27 = 72 \\ abc &= 24 \end{aligned}$$

214. If $x^3 - 4x^2 + 19 = 6(x-1)$, then what is the value of $[x^2 + (1/x - 4)]^2$?

- (a) 3 (b) 5
(c) 6 (d) 8

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : Given-

$$\begin{aligned} x^3 - 4x^2 + 19 &= 6(x-1) \\ \Rightarrow x^3 - 4x^2 &= 6x - 6 - 19 \\ \Rightarrow x^3 - 4x^2 &= 6x - 25 \text{ (i)} \end{aligned}$$

$$\therefore x^2 + \frac{1}{(x-4)} = \frac{x^3 - 4x^2 + 1}{x-4}$$

$$= \frac{6x-25+1}{x-4} \quad (\text{From equation (i)})$$

$$= \frac{6(x-4)}{(x-4)}$$

$$= \boxed{6}$$

215. If $x + y + z = 22$ and $xy + yz + zx = 35$, then what is the value of $(x-y)^2 + (y-z)^2 + (z-x)^2$?
- (a) 793 (b) 681
(c) 758 (d) 715

SSC CGL (Tier-II) 20-02-2018

Ans. (c) $(x-y)^2 + (y-z)^2 + (z-x)^2$
 $= [x^2+y^2-2xy+y^2+z^2-2yz+z^2+x^2-2zx]$
 $= 2(x^2+y^2+z^2-xy-yz-zx)$
 $= 2[(x+y+z)^2 - 3(xy+yz+zx)]$
 $= 2[(22)^2 - 3 \times 35]$
 $= 2[484 - 105]$
 $= 2 \times 379$
 $= 758$

216. If α and β are the roots of the equation $x^2+x-1=0$, then what is the equation whose roots are α^5 and β^5 ?
- (a) $x^2+7x-1=0$ (b) $x^2-7x-1=0$
(c) $x^2-11x-1=0$ (d) $x^2+11x-1=0$

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Ans. (d) : $x^2 + x - 1 = 0$
 $\alpha + \beta = -1$
 $\alpha \cdot \beta = -1$
 $\alpha^2 + \beta^2 = (-1)^2 + 2 = 3$
 $\alpha^3 + \beta^3 = (-1)^3 - 3 \times (-1) \times (-1) = -1 - 3 = -4$
 $(\alpha^2 + \beta^2)(\alpha^3 + \beta^3) = \alpha^5 + \alpha^2\beta^2 + \beta^2\alpha^3 + \beta^5$
 $3 \times (-4) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$
 $-12 = \alpha^5 + \beta^5 + 1 \times (-1)$
 $\alpha^5 + \beta^5 = -11$
 \therefore Quadratic equation
 $x^2 - (\alpha^5 + \beta^5)x + (\alpha\beta)^5 = 0$
 $x^2 + 11x - 1 = 0$

217. If $x + (1/x) = (\sqrt{3}+1)/2$, then what is the value of $x^4 + (1/x^4)$?
- (a) $(4\sqrt{3}-1)/4$ (b) $(4\sqrt{3}+1)/2$
(c) $(-4\sqrt{3}-1)/4$ (d) $(-4\sqrt{3}-1)/2$

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Ans. (c) : $x + \frac{1}{x} = \frac{\sqrt{3}+1}{2}$ (Squaring in both sides)

$$x^2 + \frac{1}{x^2} = \left(\frac{\sqrt{3}+1}{2}\right)^2 - 2$$

$$= \frac{4+2\sqrt{3}}{4} - 2 = \frac{2\sqrt{3}-4}{4} = \frac{\sqrt{3}-2}{2}$$

$$x^4 + \frac{1}{x^4} = \left(\frac{\sqrt{3}-2}{2}\right)^2 - 2$$

$$= \frac{7-4\sqrt{3}}{4} - 2 = \frac{-4\sqrt{3}-1}{4}$$

218. $A = (x^8-1)/(x^4+1)$ and $B = (y^4-1)/(y^2+1)$. If $x = 2$ and $y = 9$, then what is the value of $A^2 + 2AB + AB^2$?
- (a) 96475 (b) 98625
(c) 92425 (d) 89125

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Ans. (b) : Given-

$$A = \frac{x^8-1}{x^4+1} \quad \& \quad B = \frac{y^4-1}{y^2+1}$$

From formula

$$(a-b)(a+b) = a^2 - b^2$$

By solving the equation A and B

$$A = \frac{(x^4-1)(x^4+1)}{(x^4+1)} \quad \& \quad B = \frac{(y^2-1)(y^2+1)}{(y^2+1)}$$

$$A = (x^4-1) \quad \& \quad B = (y^2-1)$$

$$\text{If } x = 2, \quad \& \quad y = 9$$

Then-

$$A = 2^4 - 1 = 15$$

$$B = 9^2 - 1 = 80$$

By putting the value of A and B

$$\Rightarrow A^2 + AB^2 + 2AB$$

$$\Rightarrow (15)^2 + 15 \times (80)^2 + 2 \times 15 \times 80$$

$$= 225 + 96000 + 2400 = 98625$$

219. If $x = (\sqrt{5}+1)$ and $y = (\sqrt{5}-1)$ then what is the value of $(x^2/y^2) + (y^2/x^2) + 4\left(\frac{x}{y} + \frac{y}{x}\right) + 6$?

- (a) 31 (b) $23\sqrt{5}$
(c) $27\sqrt{5}$ (d) 25

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Ans. (d) : Given,

$$x = \sqrt{5} + 1 \dots \dots \dots (1)$$

$$y = \sqrt{5} - 1 \dots \dots \dots (2)$$

From equation (1) and (2)

$$x + y = 2\sqrt{5} \quad \& \quad xy = 4$$

$$x^2 + y^2 = (x+y)^2 - 2xy$$

$$= 20 - 2 \times 4$$

$$x^2 + y^2 = 12$$

$$= \frac{x^2}{y^2} + \frac{y^2}{x^2} + 4 \left[\left(\frac{x}{y}\right) + \left(\frac{y}{x}\right) \right] + 6$$

$$= \frac{x^4 + y^4}{x^2y^2} + 4 \left[\frac{x^2 + y^2}{xy} \right] + 6$$

$$= \frac{(x^2 + y^2)^2 - 2x^2y^2}{x^2y^2} + 4 \left[\frac{(x+y)^2 - 2xy}{xy} \right] + 6 \dots \dots \dots (3)$$

By putting the value in equation (3)

$$\Rightarrow \frac{(12)^2 - 2 \times 16}{16} + \frac{4 \times (12)}{4} + 6$$

$$= 7 + 18 = 25$$

220. If $x = 2 + \sqrt{3}$, $y = 2 - \sqrt{3}$ and $z = 1$, then what is the value of $(x/yz) + (y/xz) + (z/xy) + 2 [(1/x) + (1/y) + (1/z)]$?

- (a) 25 (b) 22
(c) 17 (d) 43

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Ans. (a) : Given-

$$x = 2 + \sqrt{3}, y = 2 - \sqrt{3}, z = 1$$

$$x \times y \times z = (2 + \sqrt{3}) \times (2 - \sqrt{3}) \times 1 = 1$$

$$x + y + z = 2 + \sqrt{3} + 2 - \sqrt{3} + 1 = 5$$

$$x^2 + y^2 + z^2 = (2 + \sqrt{3})^2 + (2 - \sqrt{3})^2 + 1$$

$$7 + 4\sqrt{3} + 7 - 4\sqrt{3} + 1$$

$$= 7 + 7 + 1$$

$$= 15$$

We know that

$$(x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$$

$$5^2 = 15 + 2(xy + yz + zx)$$

$$xy + yz + zx = \frac{10}{2} = 5$$

$$\frac{x}{yz} + \frac{y}{xz} + \frac{z}{xy} + 2 \left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z} \right]$$

$$\Rightarrow \frac{x^2 + y^2 + z^2}{xyz} + 2 \left[\frac{xy + yz + zx}{xyz} \right] \text{ (Putting the value)}$$

$$\frac{15}{1} + 2 \left[\frac{5}{1} \right] \Rightarrow 15 + 10 = 25$$

221. If $f(x) = (x-2)/(x^2 + Px + 4)$ and $(x-3)$ is a factor of $f(x)$, then what is the value of P ?

- (a) 4 (b) -4
(c) -13/3 (d) 13/3

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : $f(x) = (x-2)/(x^2 + Px + 4)$

$\therefore (x-3)$, is a factor of $f(x)$

Then putting the value of $x = 3$

Remainder = 0

$$(3-2)(9 + 3P + 4) = 0$$

$$3P = -13 \Rightarrow P = \frac{-13}{3}$$

222. If $[x - (1/x)] = 2$, then what is the value of $[x^6 - (1/x^6)]$?

- (a) $114\sqrt{3} + 1$ (b) $134\sqrt{2}$
(c) $142\sqrt{2} + 3$ (d) $140\sqrt{2}$

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$x - \frac{1}{x} = 2 \quad \text{(squaring both sides)}$$

$$x^3 - \frac{1}{x^3} = (2)^3 + 3 \times 2 = 14 \dots \dots (1)$$

$$\text{Again } x + \frac{1}{x} = \sqrt{(2)^2 + 4} = \sqrt{8}$$

$$x^3 + \frac{1}{x^3} = (\sqrt{8})^3 - 3\sqrt{8} = 5\sqrt{8} \dots \dots (2)$$

By multiplying the equation (i) and (ii)

$$x^6 - \frac{1}{x^6} = 70\sqrt{8} = 140\sqrt{2}$$

223. x, y and z are real numbers. If $x^3 + y^3 + z^3 = 13$, $x + y + z = 1$ and $xyz = 1$, then what is the value of $xy + yz + zx$?

- (a) -1 (b) 1
(c) 3 (d) -3

SSC CGL (Tier-II) 17-2-2018

Ans. (d)

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$13 - 3 \times 1 = 1 \left((x + y + z)^2 - 3(xy + yz + zx) \right)$$

$$10 = 1^2 - 3(xy + yz + zx)$$

$$3(xy + yz + zx) = 1 - 10 = -9$$

$$xy + yz + zx = -3$$

224. If $x^3 + y^3 + z^3 = 3(1 + xyz)$, $P = y + z - x$, $Q = z + x - y$ and $R = x + y - z$, then what is the value of $P^3 + Q^3 + R^3 - 3PQR$?

- (a) 9 (b) 8
(c) 12 (d) 6

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : From value putting,

$$y = z = 0$$

$$x^3 + 0 = 3(1 + 0)$$

$$x^3 = 3$$

$$P = 0 + 0 - x = -x$$

$$Q = 0 + x - 0 = x$$

$$R = x + 0 - 0 = x$$

$$P^3 + Q^3 + R^3 - 3PQR = (-x)^3 + x^3 + x^3 - 3 \times (-x) \times x \times x$$

$$= x^3 + 3x^3$$

$$= 4x^3$$

$$= 4 \times 3 = 12$$

225. The value of $\frac{(4.6)^4 + (5.4)^4 + (24.84)^2}{(4.6)^2 + (5.4)^2 + 24.84}$ is :

- (a) 24.42 (b) 25.48
(c) 24.24 (d) 25.42

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$$\frac{(4.6)^4 + (5.4)^4 + (24.84)^2}{(4.6)^2 + (5.4)^2 + 24.84}$$

$$\text{Hence } x = 4.6, y = 5.4$$

$$x^4 + y^4 + x^2y^2 = (x^2 + y^2 + xy)(x^2 + y^2 - xy)$$

$$= \frac{[(4.6)^2 + (5.4)^2 + 4.6 \times 5.4][(4.6)^2 + (5.4)^2 - 4.6 \times 5.4]}{(4.6)^2 + (5.4)^2 + 4.6 \times 5.4}$$

$$= (4.6 + 5.4)^2 - 3 \times 4.6 \times 5.4$$

$$= 100 - 74.52 = 25.48$$

226. Let $x = \sqrt[6]{27} - \sqrt{6\frac{3}{4}}$ and $y = \frac{\sqrt{45} + \sqrt{605} + \sqrt{245}}{\sqrt{80} + \sqrt{125}}$, then the value of $x^2 + y^2$ is?

(a) $\frac{223}{36}$ (b) $\frac{221}{36}$
(c) $\frac{221}{9}$ (d) $\frac{227}{9}$

SSC CGL (Tier-II) 13-09-2019

Ans. (a) :

$$x = \sqrt[6]{27} - \sqrt{6\frac{3}{4}}$$

$$= (3^3)^{\frac{1}{6}} - \sqrt{\frac{27}{4}}$$

$$= \sqrt{3} - \frac{3\sqrt{3}}{2} = \frac{-\sqrt{3}}{2}$$

$$y = \frac{\sqrt{45} + \sqrt{605} + \sqrt{245}}{\sqrt{80} + \sqrt{125}} = \frac{3\sqrt{5} + 11\sqrt{5} + 7\sqrt{5}}{4\sqrt{5} + 5\sqrt{5}} = \frac{7}{3}$$

$$x^2 + y^2 = \frac{3}{4} + \frac{49}{9} = \frac{27 + 196}{36} = \frac{223}{36}$$

227. If $8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$, then $(A + B + C - D)$ is equal to :

(a) -12 (b) 12
(c) 9 (d) 15

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Given,

$$8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

$$(2x - 3y)(4x^2 + 9y^2 + 6xy) = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

On comparing both sides,
A = 2, C = 4
B = -3, D = -9
 $\therefore (A+B+C-D) = 2 - 3 + 4 + 9 = 12$

228. If $x = \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$ and y is the reciprocal of x, then what is the value of $(x^3 + y^3)$?

(a) 504 (b) 476
(c) 472 (d) 488

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :

$$\therefore xy = 1$$

$$x + y = \frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}} + \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}}$$

$$= \frac{5 + 3 - 2\sqrt{15} + 5 + 3 + 2\sqrt{15}}{2} = 8$$

$$x^3 + y^3 = (x+y)^3 - 3xy(x+y)$$

$$= (x+y)[(x+y)^2 - 3xy]$$

$$= 8[64 - 3]$$

$$= 8 \times 61 = 488$$

229. If $x^4 - 83x^2 + 1 = 0$, then value of $x^3 - x^{-3}$ can be:

(a) 758 (b) 739
(c) 737 (d) 756

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : $x^4 - 83x^2 + 1 = 0$

$$x^4 + 1 = 83x^2 \Rightarrow x^2 + \frac{1}{x^2} = 83$$

$$\left(x - \frac{1}{x}\right)^2 = 81 \Rightarrow \left(x - \frac{1}{x}\right) = 9$$

\therefore On cubing both sides,

$$x^3 - \frac{1}{x^3} = 729 + 3 \times 9 = 729 + 27$$

$\therefore x^3 - x^{-3} = 756$

230. If $x + y + z = 2$, $xy + yz + zx = -11$ and $xyz = -12$, then what is the value of $\sqrt{x^3 + y^3 + z^3 - 2}$?

(a) 12 (b) 9
(c) 6 (d) 8

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Ans. (c) : Value putting,

$$\therefore xyz = -12 = 1 \times (-3) \times 4$$

Taking the value $x = 1, y = -3, z = 4$

$$x + y + z = 1 - 3 + 4 = 2$$

$$xy + yz + zx = -3 - 12 + 4 = -11$$

$$\therefore \sqrt{x^3 + y^3 + z^3 - 2} = \sqrt{1^3 + (-3)^3 + 4^3 - 2} = \sqrt{1 - 27 + 64 - 2} = \sqrt{63 - 27} = \sqrt{36} = 6$$

231. If $x + \frac{1}{16x} = 3$, then the value of $16x^3 + \frac{1}{256x^3}$ is:

(a) 423 (b) 441
(c) 414 (d) 432

SSC CGL (Tier-II) 12-09-2019

Ans. (a) :

$$x + \frac{1}{16x} = 3$$

On cubing both sides,

$$x^3 + \frac{1}{4096x^3} + 3 \times x \times \frac{1}{16x} \left(x + \frac{1}{16x}\right) = 27$$

$$x^3 + \frac{1}{4096x^3} + \frac{3}{16} \times 3 = 27$$

$$x^3 + \frac{1}{4096x^3} = 27 - \frac{9}{16} = \frac{432 - 9}{16} = \frac{423}{16}$$

Multiplying by 16 in both sides,

$$16x^3 + \frac{1}{256x^3} = 16 \times \frac{423}{16} = 423$$

232. If $a^2 + b^2 + c^2 + 96 = 8(a+b-2c)$, then $\sqrt{ab-bc+ca}$ is equal to?

- (a) $2\sqrt{2}$ (b) $2\sqrt{3}$
(c) 4 (d) 6

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : $a^2 + b^2 + c^2 + 96 = 8(a+b-2c)$
 $a^2 - 8a + 16 + b^2 - 8b + 16 + c^2 + 16c + 64 = 0$
 $(a-4)^2 + (b-4)^2 + (c+8)^2 = 0$
 It is possible only when
 $a-4 = 0, \quad b-4 = 0, \quad c+8 = 0$
 $a = 4, \quad b = 4, \quad c = -8$
 $\sqrt{ab-bc+ca} = \sqrt{16+32-32} = 4$

233. The value of $\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7}$ is

- 50×10^k , where the value of k is :
(a) 2 (b) 3
(c) -3 (d) 4

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Ans. (b) :

$$\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7} = 50 \times 10^k$$

$$\frac{10^3 \times [(25.3)^3 + (24.7)^3]}{(25.3)^2 - 25.3 + 24.7 \times (24.7)^2} = 50 \times 10^k$$

$$\frac{10^3 \times (25.3 + 24.7) [(25.3)^2 - 25.3 \times 24.7 + (24.7)^2]}{(25.3)^2 - 25.3 \times 24.7 + (24.7)^2} = 50 \times 10^k$$

$$10^3 \times 50 = 50 \times 10^k$$

$$10^3 = 10^k$$

$$k = 3$$

234. If $x^2 - 16x + 59 = 0$, then what is the value of $(x-6)^2 + [1/(x-6)^2]$?

- (a) 14 (b) 18
(c) 16 (d) 20

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given
 $x^2 - 16x + 59 = 0$
 $\Rightarrow x^2 - 16x + 64 - 5 = 0$
 $\Rightarrow x^2 - 16x + 64 = 5$
 $\Rightarrow (x-8)^2 = 5$
 $\Rightarrow x-8 = \sqrt{5}$
 $\Rightarrow (x-6) = \sqrt{5} + 2$
 $\frac{1}{(x-6)} = \sqrt{5} - 2$
 $(x-6)^2 + \frac{1}{(x-6)^2} = (\sqrt{5} + 2)^2 + (\sqrt{5} - 2)^2$
 $= 5 + 4 + 4\sqrt{5} + 5 + 4 - 4\sqrt{5}$
 $= 18$

235. If $a+b+c = 0$, then the value of $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab}$ is:

- (a) -1 (b) 3
(c) 0 (d) 1

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : Given—
 $a+b+c = 0$
 $\therefore a^3+b^3+c^3 = 3abc$ ----- (i)
 $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3}{abc} + \frac{b^3}{abc} + \frac{c^3}{abc}$
 $= \frac{a^3 + b^3 + c^3}{abc}$
 $= \frac{3abc}{abc}$ (From equation (i))
 $= 3$

236. The value of $\frac{427 \times 427 \times 427 + 325 \times 325 \times 325}{42.7 \times 42.7 + 32.5 \times 32.5 - 42.7 \times 32.5}$

- is:
(a) 7520 (b) 752
(c) 75200 (d) 75.2

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) :

$$\frac{427 \times 427 \times 427 + 325 \times 325 \times 325}{42.7 \times 42.7 + 32.5 \times 32.5 - 42.7 \times 32.5}$$

$$= \frac{(427)^3 + (325)^3}{(42.7)^2 + (32.5)^2 - 42.7 \times 32.5}$$

$$= \frac{(427+325) [(427)^2 + (325)^2 - 427 \times 325]}{\frac{1}{100} [(427)^2 + (325)^2 - 427 \times 325]}$$

$$= 752 \times 100 = \boxed{75200}$$

237. If $x+y+z = 19$, $xyz = 216$ and $xy+yz+zx = 114$, then the value of $\sqrt{x^3+y^3+z^3+xyz}$ is:

- (a) 30 (b) 32
(c) 28 (d) 35

SSC CHSL 01/07/2019 (Shift-III)

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (d)

$$\therefore \sqrt{x^3+y^3+z^3+xyz} = \sqrt{(x+y+z) [(x+y+z)^2 - 3(xy+yz+zx)] + 3xyz}$$

$$= \sqrt{19 [(19)^2 - 3 \times 114] + 4 \times 216}$$

$$= \sqrt{19 [361 - 342] + 864}$$

$$= \sqrt{19 \times 19 + 864}$$

$$= \sqrt{361 + 864}$$

$$= \sqrt{1225}$$

$$= 35$$

238. If $(5\sqrt{5}x^3 - 3\sqrt{3}y^3) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$, then what is the value of $(3A - B - \sqrt{15}C)$?
- (a) -3 (b) -5
(c) 12 (d) 8

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) :
$$\frac{(\sqrt{5}x)^3 - (\sqrt{3}y)^3}{(\sqrt{5}x - \sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

$$\frac{(\sqrt{5}x - \sqrt{3}y)(5x^2 + 3y^2 + \sqrt{15}xy)}{(\sqrt{5}x - \sqrt{3}y)} = Ax^2 + By^2 + Cxy$$

By comparing
A = 5, B = 3, C = $\sqrt{15}$
 $\therefore (3A - B - \sqrt{15}C) = 3 \times 5 - 3 - \sqrt{15} \times \sqrt{15}$
 $= 15 - 3 - 15$
 $= -3$

239. If $x^4 + x^{-4} = 194$, $x > 0$ then what is the value of $x + \frac{1}{x} + 2$?
- (a) 14 (b) 8
(c) 4 (d) 6

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : Given- $x^4 + x^{-4} = 194$

$$\Rightarrow x^4 + \frac{1}{x^4} = 194$$

$$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 196$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 14$$

$$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 16$$

$$\Rightarrow x + \frac{1}{x} = 4$$

$$\therefore x + \frac{1}{x} + 2 = 4 + 2 = 6$$

240. If $a^2 + b^2 + c^2 + 84 = 4(a - 2b + 4c)$, then $\sqrt{ab - bc + ca}$ is equal to:
- (a) $5\sqrt{10}$ (b) $4\sqrt{10}$
(c) $2\sqrt{10}$ (d) $\sqrt{10}$

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : $a^2 + b^2 + c^2 + 84 = 4(a - 2b + 4c)$
 $a^2 + b^2 + c^2 + 84 - 4a + 8b - 16c = 0$
 $a^2 - 4a + 4 + b^2 + 8b + 16 + c^2 - 16c + 64 = 0$
 $(a - 2)^2 + (b + 4)^2 + (c - 8)^2 = 0$
It is possible only when
 $a - 2 = 0, \quad b + 4 = 0 \quad \text{or} \quad c - 8 = 0$
 $\therefore a = 2, \quad b = -4 \quad \text{or} \quad c = 8$
 $\sqrt{ab - bc + ca} = \sqrt{-8 + 32 + 16} = \sqrt{40} = 2\sqrt{10}$

241. If $x + y + z = 13$, $x^2 + y^2 + z^2 = 133$ and $x^3 + y^3 + z^3 = 847$, then the value of $\sqrt[3]{xyz}$ is:
- (a) 7 (b) -9
(c) 8 (d) -6

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : $xy + yz + zx = \frac{(x + y + z)^2 - (x^2 + y^2 + z^2)}{2}$
 $= \frac{169 - 133}{2} = \frac{36}{2} = 18$
 $\therefore x^3 + y^3 + z^3 - 3xyz = (x + y + z)[x^2 + y^2 + z^2 - (xy + yz + zx)]$
 $847 - 3xyz = 13 [133 - 18]$
 $847 - 3xyz = 13 \times 115$
 $3xyz = 847 - 1495 = -648$
 $xyz = -216$
 $\sqrt[3]{xyz} = -6$

242. If $a^3 + b^3 = 217$ and $a + b = 7$, then the value of ab is:
- (a) -1 (b) 7
(c) 6 (d) -6

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : $\therefore (a + b)^3 = a^3 + b^3 + 3ab(a + b)$
 $(7)^3 = 217 + 3ab \times 7$
 $343 - 217 = 21ab$
 $126 = 21ab$
 $ab = 6$

243. If $x^2 - 3x + 1 = 0$, then the value of $\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$ is:
- (a) 9 (b) 5
(c) 7 (d) 6

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : $x^2 - 3x + 1 = 0$,
 $x + \frac{1}{x} = 3$
 $x^3 + \frac{1}{x^3} = (3)^3 - 3 \times 3 = 18$
 $\frac{\left(x^4 + \frac{1}{x^2}\right)}{x^2 + 1} = \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}} = \frac{18}{3} = 6$

244. If $x^2 + 8y^2 + 12y - 4xy + 9 = 0$, then the value of $(7x + 8y)$ is:
- (a) -33 (b) 9
(c) 33 (d) -9

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : $x^2 + 8y^2 + 12y - 4xy + 9 = 0$
 $x^2 + 4y^2 - 4xy + 4y^2 + 12y + 9 = 0$
 $(x - 2y)^2 + (2y + 3)^2 = 0$

$$x = 2y, 2y = -3$$

$$x = -3, y = -\frac{3}{2}$$

Then, $7x + 8y = 7(-3) + 8 \times \left(-\frac{3}{2}\right)$

$$= -21 - 12 = -33$$

245. The value of $\frac{0.325 \times 0.325 + 0.175 \times 0.175 + 25 \times 0.00455}{5 \times 0.0065 \times 3.25 - 7 \times 0.175 \times 0.025} + \frac{0.5}{1.5}$ is:

(a) $\frac{11}{3}$ (b) $\frac{7}{3}$
(c) 3 (d) 0

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) :

$$\frac{0.325 \times 0.325 + 0.175 \times 0.175 + 25 \times 0.00455}{5 \times 0.0065 \times 3.25 - 7 \times 0.175 \times 0.025} + \frac{0.5}{1.5}$$

$$= \frac{0.325 \times 0.325 + 0.175 \times 0.175 + 2 \times 0.325 \times 0.175}{0.325 \times 0.325 - 0.175 \times 0.175} + \frac{0.5}{1.5}$$

$$= \frac{(0.325 + 0.175)^2}{(0.325)^2 - (0.175)^2} + \frac{1}{3} \text{ [Formula } a^2 + b^2 + 2ab = (a+b)^2]$$

$$= \frac{0.325 + 0.175}{0.325 - 0.175} + \frac{1}{3}$$

$$= \frac{0.500}{0.150} + \frac{1}{3}$$

$$= \frac{10}{3} + \frac{1}{3} = \frac{11}{3}$$

246. If $x + y + z = 17$, $xyz = 171$ and $xy + yz + zx = 111$, then the value of $\sqrt[3]{(x^3 + y^3 + z^3 + xyz)}$ is:

- (a) -4 (b) -64
(c) 4 (d) 0

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) :

$$= \sqrt[3]{(x^3 + y^3 + z^3 + xyz)}$$

$$= \sqrt[3]{4xyz + x^3 + y^3 + z^3 - 3xyz}$$

$$= \sqrt[3]{4xyz + (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]}$$

$$= \sqrt[3]{4 \times 171 + 17[289 - 333]}$$

$$= \sqrt[3]{684 - 748} = \sqrt[3]{-64} = -4$$

247. If $x^2 - 5x + 1 = 0$, then the value of

$$\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1) \text{ is:}$$

- (a) 21 (b) 22
(c) 25 (d) 24

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : $x^2 - 5x + 1 = 0$
Dividing by x in both sides,
 $x + \frac{1}{x} = 5$

Then, $\frac{x^4 + \frac{1}{x^2}}{x^2 + 1} = \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}}$

$\therefore x + \frac{1}{x} = 5$

$\therefore x^3 + \frac{1}{x^3} = 5^3 - 3 \times 5 = 125 - 15 = 110$

Hence $\frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}} = \frac{110}{5} = 22$

248. If $X + Y + Z = 19$, $XYZ = 216$ and $XY + YZ + ZX = 114$, then the value of $X^3 + Y^3 + Z^3 + XYZ$ is:

- (a) 1225 (b) 1441
(c) 361 (d) 577

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : $x^3 + y^3 + z^3 - 3xyz$
 $= (x+y+z)[(x+y+z)^2 - 3(xy+yz+zx)]$
 $= 19[(19)^2 - 3(114)]$
 $= 19(361 - 342)$
 $x^3 + y^3 + z^3 - 3xyz = 19 \times 19 = 361$
Now, $x^3 + y^3 + z^3 + xyz = 361 + 4xyz$
 $= 361 + 4 \times 216 = 361 + 864 = 1225$
Hence $x^3 + y^3 + z^3 + xyz = 1225$

249. The value of $\frac{6.35 \times 6.35 \times 6.35 + 3.65 \times 3.65 \times 3.65}{63.5 \times 63.5 + 36.5 \times 36.5 - 63.5 \times 36.5}$ is equal to?

- (a) 0.1 (b) 1
(c) 0.01 (d) 10

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : $\frac{6.35 \times 6.35 \times 6.35 + 3.65 \times 3.65 \times 3.65}{63.5 \times 63.5 + 36.5 \times 36.5 - 63.5 \times 36.5}$
 $\therefore a^3 + b^3 = (a+b)(a^2 + b^2 - ab)$
 $\therefore \frac{(6.35)^3 + (3.65)^3}{(6.35)^2 + (3.65)^2 - 6.35 \times 3.65}$
 $= \frac{[(6.35) + (3.65)][(6.35)^2 + (3.65)^2 - 6.35 \times 3.65]}{100[(6.35)^2 + (3.65)^2 - 6.35 \times 3.65]}$
 $= \frac{10}{100} = 0.1$

250. If $a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$ then, $\sqrt{ab - bc + ca}$ is?

- (a) 6 (b) 8
(c) 3 (d) 4

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : As per question
 $a^2 + b^2 + c^2 + 216 = 12(a+b-2c)$
 $a^2 + b^2 + c^2 + 216 - 12(a+b-2c) = 0$
 $a^2 - 12a + 36 + b^2 - 12b + 36 + c^2 + 24c + 144 = 0$
 $(a-6)^2 + (b-6)^2 + (c+12)^2 = 0$
 $a = 6, b = 6, c = -12$
 thus $\sqrt{ab - bc + ca} = \sqrt{6 \times 6 - 6 \times (-12) - 12 \times 6}$
 $= \sqrt{36 + 72 - 72} = \sqrt{36} = 6$

- 251. If $x^2 - \sqrt{7}x + 1 = 0$, then $(x^3 + x^{-3}) = ?$**
 (a) $4\sqrt{7}$ (b) $10\sqrt{7}$
 (c) $7\sqrt{7}$ (d) $3\sqrt{7}$

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (a) $x^2 - \sqrt{7}x + 1 = 0$
 $x + \frac{1}{x} = \sqrt{7}$
 On cubing both sides,
 $\left(x + \frac{1}{x}\right)^3 = (\sqrt{7})^3$
 $x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left(x + \frac{1}{x}\right) = 7\sqrt{7}$
 $x^3 + \frac{1}{x^3} + 3\sqrt{7} = 7\sqrt{7}$
 $x^3 + x^{-3} = 4\sqrt{7}$

- 252. The value of**
 $\frac{0.325 \times 0.325 + 0.175 \times 0.175 - 25 \times 0.00455}{5 \times 0.0065 \times 3.25 - 7 \times 0.175 \times 0.025}$
between:

- (a) 0.05 and 0.15 (b) 0.15 and 0.25
 (c) 0.35 and 0.45 (d) 0.25 and 0.35

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) $\frac{0.325 \times 0.325 + 0.175 \times 0.175 - 25 \times 0.00455}{5 \times 0.0065 \times 3.25 - 7 \times 0.175 \times 0.025}$
 $= \frac{(0.325)^2 + (0.175)^2 - 2 \times 0.325 \times 0.175}{(0.325)^2 - (0.175)^2}$
 $= \frac{(0.325 - 0.175)^2}{(0.325 - 0.175)(0.325 + 0.175)}$
 $= \frac{0.325 - 0.175}{0.325 + 0.175}$
 $= \frac{150}{500} = 0.30$

- 253. If $x + y + z = 10$, $xy + yz + zx = 25$ and $xyz = 100$, then what is the value of $(x^3 + y^3 + z^3)$?**
 (a) 540 (b) 570
 (c) 450 (d) 550

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d)
 $x + y + z = 10$
 On squaring both sides,
 $(x + y + z)^2 = 10^2$
 $x^2 + y^2 + z^2 + 2(xy + yz + zx) = 100$

$$x^2 + y^2 + z^2 + 2 \times 25 = 100$$

$$x^2 + y^2 + z^2 = 50$$

$$\therefore x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x^2 + y^2 + z^2) - (xy + yz + zx)]$$

$$x^3 + y^3 + z^3 - 3 \times 100 = 10 \times (50 - 25)$$

$$x^3 + y^3 + z^3 = 250 + 300 = 550$$

- 254. If $(2x + 3y + 4)(2x + 3y - 5)$ is equivalent to $(ax^2 + by^2 + 2hxy + 2gx + 2fy + c)$, then what is the value of $(g + f - C)/abh$?**

- (a) $\frac{37}{216}$ (b) $\frac{35}{432}$
 (c) $\frac{19}{108}$ (d) $\frac{19}{108}$

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (b)
 $(2x + 3y + 4)(2x + 3y - 5)$
 $= 4x^2 + 6xy - 10x + 6xy + 9y^2 - 15y + 8x + 12y - 20$
 $= 4x^2 + 9y^2 + 12xy - 2x - 3y - 20$
 When compared to, $ax^2 + by^2 + 2hxy + 2gx + 2fy + c$
 $a = 4, b = 9, h = 6, g = -1, f = -\frac{3}{2}, c = -20$

$$\left\{ \frac{(g + f - c)}{abh} \right\} = \left\{ \frac{\left(-1 + \left(-\frac{3}{2} \right) - (-20) \right)}{4 \times 9 \times 6} \right\} = \frac{-\frac{5}{2} + 20}{216}$$

$$= \frac{35}{432}$$

- 255. If x and y are real numbers, then the least possible value of $4(x-2)^2 + (y-3)^2 - 2(x-3)^2$ is:**
 (a) -8 (b) -4
 (c) 1 (d) 3

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (b) $4(x-2)^2 + (y-3)^2 - 2(x-3)^2$
 $4(x-2)^2 - 2(x-3)^2 + (y-3)^2$
 $4(x^2 + 4 - 4x) - 2(x^2 + 9 - 6x) + (y-3)^2$
 $(2x^2 - 4x - 2) + (y-3)^2$
 $2(x^2 - 2x - 1) + (y-3)^2$
 $2\{(x-1)^2 - 2\} + (y-3)^2$
 $2(x-1)^2 - 4 + (y-3)^2$
 $2(x-1)^2 + (y-3)^2 - 4$

The minimum possible value of given expression = -4

- 256. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 3, x > 0$, then $x^2(x^2 - 47) = ?$**
 (a) -1 (b) -2
 (c) 2 (d) 0

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (a)

$$\sqrt{x} + \frac{1}{\sqrt{x}} = 3$$

$$x + \frac{1}{x} = (3)^2 - 2 = 7$$

$$x^2 + \frac{1}{x^2} = (7)^2 - 2 = 47$$

$$x^4 + 1 = 47x^2$$

$$x^4 - 47x^2 = -1$$

$$x^2(x^2 - 47) = -1$$

257. $\frac{0.74 \times 1.23 \times 0.13}{(0.37)^3 + (0.41)^3 - 8(0.39)^3}$ What is the value of

- (a) -1 (b) 1
(c) 1/3 (d) -1/3

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (d)

$$\frac{0.74 \times 1.23 \times 0.13}{(0.37)^3 + (0.41)^3 - 8(0.39)^3}$$

$$= \frac{0.37 \times 0.41 \times 0.78}{(0.37)^3 + (0.41)^3 + (-0.78)^3}$$

$$\therefore a + b + c = 0.37 + 0.41 - 0.78 = 0$$

$$\therefore a^3 + b^3 + c^3 = 3abc$$

$$= \frac{0.37 \times 0.41 \times 0.78}{-3 \times 0.37 \times 0.41 \times 0.78} = \frac{-1}{3}$$

258. If $(2x-5y)^3 - (2x+5y)^3 = y[Ax^2+By^2]$, then what is the value of $(2A - B)$?

- (a) 40 (b) 10
(c) 25 (d) 15

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (b) $(2x - 5y)^3 - (2x + 5y)^3 = y[Ax^2 + By^2]$

Formula- $a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$

$$(2x - 5y - 2x - 5y) [(2x - 5y)^2 + (2x + 5y)^2 + (2x - 5y)(2x + 5y)] = y[Ax^2 + By^2]$$

$$-10y[12x^2 + 25y^2] = y[Ax^2 + By^2]$$

$$A = -120, \quad B = -250$$

$$\therefore 2A - B = 2 \times (-120) + 250 = 10$$

259. If $a+b+c = 6$ and $a^2+b^2+c^2 = 38$, then what is the value of $a(b^2 + c^2) + b(c^2 + a^2) + c(a^2 + b^2) + 3abc$?

- (a) 3 (b) -3
(c) 6 (d) -6

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (d) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$ab + bc + ca = \frac{(6)^2 - 38}{2} = -1$$

Hence $a(b^2 + c^2) + b(c^2 + a^2) + c(a^2 + b^2) + 3abc$

$$= a(38 - a^2) + b(38 - b^2) + c(38 - c^2) + 3abc$$

$$= 38(a + b + c) - (a^3 + b^3 + c^3 - 3abc)$$

$$= 38 \times 6 - [6(38 + 1)]$$

$$= 6 \times (38 - 39) = -6$$

260. If $x = 5.51$, $y = 5.52$ and $z = 5.57$, then what is the value of $x^3 + y^3 + z^3 - 3xyz$?

- (a) 0.05146 (b) 5.146
(c) 0.5146 (d) 51.46

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (a)

$$\therefore x^3 + y^3 + z^3 - 3xyz$$

$$= \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$$

$$= \frac{1}{2}(5.51 + 5.52 + 5.57)[(-0.01)^2 + (-0.05)^2 + (0.06)^2]$$

$$= \frac{1}{2} \times 16.60 \times [0.0001 + 0.0025 + 0.0036]$$

$$= 8.3 \times 0.0062 = 0.05146$$

261. The value of

$$\frac{4.669 \times 4.669 - 9 \times (0.777)^2}{(4.669)^2 + (2.331)^2 + 14(0.667)(2.331)}$$
 is $(1-k)$,

where $k = ?$

- (a) 0.666 (b) 0.768
(c) 0.467 (d) 0.647

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (a)

$$\frac{4.669 \times 4.669 - 9 \times (0.777)^2}{(4.669)^2 + (2.331)^2 + 14(0.667)(2.331)} = 1 - k$$

$$\frac{(4.669)^2 - (2.331)^2}{(4.669)^2 + (2.331)^2 + 2 \times 4.669 \times 2.331} = 1 - k$$

$$\frac{(4.669 + 2.331)(4.669 - 2.331)}{(4.669 + 2.331)^2} = 1 - k$$

$$\frac{2.338}{7} = 1 - k$$

$$0.334 = 1 - k$$

$$k = 0.666$$

262. If $x^6 - 512y^6 = (x^2 + Ay^2)(x^4 - Bx^2y^2 + Cy^4)$, then what is the value of $(A + B - C)$?

- (a) 48 (b) 72
(c) -72 (d) -80

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) $x^6 - 512y^6 = (x^2 + Ay^2)(x^4 - Bx^2y^2 + Cy^4)$

$$\Rightarrow (x^2)^3 - (2\sqrt{2}y^2)^3 = (x^2 + Ay^2)(x^4 - Bx^2y^2 + Cy^4)$$

$$\therefore a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$\Rightarrow (x^2 - 8y^2)(x^4 + 8x^2y^2 + 64y^2)$$

$$= (x^2 + Ay^2)(x^4 - Bx^2y^2 + Cy^2)$$

By comparing

$$A = -8, B = -8, C = 64$$

$$\therefore A + B - C = -8 - 8 - 64$$

$$= -80$$

263. If $x^2 - 4x + 1 = 0$, then what is the value of $(x^6 + x^{-6})$?

- (a) 2716 (b) 2786
(c) 2702 (d) 2744

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c)

$$x^2 - 4x + 1 = 0$$

$$x + \frac{1}{x} = 4$$

$$x^2 + \frac{1}{x^2} = 14$$

Again, $x^6 + \frac{1}{x^6} = (14)^3 - 3 \times 14$

$$= 2744 - 42$$

$$x^6 + x^{-6} = 2702$$

264. If $\left(x^3 + \frac{1}{x^3} - k\right)^2 + \left(x + \frac{1}{x} - p\right)^2 = 0$, where k and p real numbers and $x \neq 0$, then k/p is equal to?

- (a) $p^2 - 1$ (b) $p^2 + 1$
 (c) $p^2 - 3$ (d) $p^2 + 3$

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c): $\left(x^3 + \frac{1}{x^3} - k\right)^2 + \left(x + \frac{1}{x} - p\right)^2 = 0$

It is possible only when,

$$x^3 + \frac{1}{x^3} = k \quad \text{And} \quad x + \frac{1}{x} = p$$

$$\therefore x^2 + \frac{1}{x^2} = p^2 - 2$$

$$\frac{k}{p} = \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}} = \left(x^2 + \frac{1}{x^2} - 1\right)$$

$$= p^2 - 2 - 1 = p^2 - 3$$

265. If $a = 500$, $b = 502$ and $c = 504$, then the value of $a^3 + b^3 + c^3 - 3abc$

- (a) 18072 (b) 15060
 (c) 12048 (d) 17040

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a) $a^3 + b^3 + c^3 - 3abc$

$$= \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$$

$$= \frac{1}{2}(500 + 502 + 504)[(-2)^2 + (-2)^2 + 4^2]$$

$$= \frac{1}{2} \times 1506 \times 24 = 18072$$

266. If $\frac{8x}{2x^2 + 7x - 2} = 1$, $x > 0$, then what is the value of $x^3 + \frac{1}{x^3}$?

- (a) $\frac{5}{8}\sqrt{17}$ (b) $\frac{3}{8}\sqrt{17}$
 (c) $\frac{5}{4}\sqrt{17}$ (d) $\frac{3}{4}\sqrt{17}$

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a) $\frac{8x}{2x^2 + 7x - 2} = 1$

$$8x = 2x^2 + 7x - 2$$

$$2x^2 - x - 2 = 0$$

$$2x - \frac{2}{x} = 1$$

$$x - \frac{1}{x} = \frac{1}{2}$$

$$x + \frac{1}{x} = \sqrt{\left(\frac{1}{2}\right)^2 + 4}$$

$$x + \frac{1}{x} = \sqrt{\frac{17}{4}}$$

$$x^3 + \frac{1}{x^3} = \left(\sqrt{\frac{17}{4}}\right)^3 - 3\sqrt{\frac{17}{4}}$$

$$= \frac{5}{4}\sqrt{\frac{17}{4}} = \frac{5\sqrt{17}}{8}$$

267. If $x^3 + 27y^3 + 64z^3 = 36xyz$, then the relationship between x, y and z is:

- (a) $x + 3y + 4z = 0$ (b) $x - 3y + 4z = 0$
 (c) $x + 3y - 4z = 0$ (d) $x + y + z = 0$

SSC CHSL -20/10/2020 (Shift-III)

Ans : (a) Given,

$$x^3 + 27y^3 + 64z^3 = 36xyz$$

$$x^3 + 27y^3 + 64z^3 - 36xyz = 0$$

$$x^3 + (3y)^3 + (4z)^3 - 36xyz = 0$$

From if the formula

$$\therefore a^3 + b^3 + c^3 - 3abc = 0$$

Then the value of $a + b + c$ will be zero

$$x + 3y + 4z = 0$$

268. If $\frac{4}{3}\left(x^2 + \frac{1}{x^2}\right) = 110\frac{2}{3}$, find $\frac{1}{9}\left(x^3 - \frac{1}{x^3}\right)$ where $x > 0$.

- (a) 74 (b) 85
 (c) 84 (d) 76

SSC CHSL -20/10/2020 (Shift-I)

Ans : (c) $\frac{4}{3}\left(x^2 + \frac{1}{x^2}\right) = 110\frac{2}{3}$

$$\left(x^2 + \frac{1}{x^2}\right) = \frac{332}{3} \times \frac{3}{4}$$

$$\left(x^2 + \frac{1}{x^2}\right) = 83$$

$$\left(x - \frac{1}{x}\right) = 9$$

$$\left(x^3 - \frac{1}{x^3}\right) = 9^3 + 3 \times 9 = 729 + 27 = 756$$

$$\therefore \frac{1}{9}\left(x^3 - \frac{1}{x^3}\right) = \frac{756}{9} = 84$$

269. If $x + y = 7$ and $xy = 10$, then the value of

$\left(\frac{1}{x^3} + \frac{1}{y^3}\right)$ is :

- (a) 0.543 (b) 0.131
(c) 0.133 (d) 0.453

SSC CHSL 01/07/2019 (Shift-III)

Ans. (c) : $x + y = 7, xy = 10$

$$\begin{aligned} \frac{1}{x^3} + \frac{1}{y^3} &= \frac{x^3 + y^3}{x^3 y^3} \\ &= \frac{(x+y)^3 - 3xy(x+y)}{(xy)^3} \\ &= \frac{7^3 - 3 \times 10 \times 7}{10^3} \\ &= \frac{343 - 210}{1000} \\ &= \frac{133}{1000} = 0.133 \end{aligned}$$

270. If $a + b + c = 4$ and $ab + bc + ca = 1$, then the value of $a^3 + b^3 + c^3 - 3abc$ is :

- (a) 47 (b) 60
(c) 52 (d) 50

SSC CHSL 02/07/2019 (Shift-II)

Ans. (c) : $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$\begin{aligned} (4)^2 &= a^2 + b^2 + c^2 + 2 \times 1 \\ 16 - 2 &= a^2 + b^2 + c^2 \\ 14 &= a^2 + b^2 + c^2 \\ a^3 + b^3 + c^3 - 3abc &= (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca) \\ &= 4(14 - 1) \\ &= 4 \times 13 = 52 \end{aligned}$$

271. If $40\sqrt{5}x^3 - 3\sqrt{3}y^3 = (2\sqrt{5}x - \sqrt{3}y) \times (Ax^2 + Bxy + Cy^2)$,

then what is the value of $\sqrt{B^2 + C^2} - A$?

- (a) 9 (b) 8
(c) 7 (d) 11

SSC CHSL 02/07/2019 (Shift-III)

Ans. (c) :

$$\begin{aligned} 40\sqrt{5}x^3 - 3\sqrt{3}y^3 &= (2\sqrt{5}x - \sqrt{3}y) \times (Ax^2 + Bxy + Cy^2) \\ (2\sqrt{5}x)^3 - (\sqrt{3}y)^3 &= (2\sqrt{5}x - \sqrt{3}y) \times (Ax^2 + Bxy + Cy^2) \\ (2\sqrt{5}x - \sqrt{3}y)(20x^2 + 3y^2 + 2\sqrt{5}x \times \sqrt{3}y) \\ &= (Ax^2 + Bxy + Cy^2)(2\sqrt{5}x - \sqrt{3}y) \end{aligned}$$

$$[20x^2 + 3y^2 + 2\sqrt{5}x \times \sqrt{3}y] = (Ax^2 + Bxy + Cy^2)$$

On comparing both sides,

$$A = 20, \quad B = 2\sqrt{15}, \quad C = 3$$

$$\sqrt{B^2 + C^2} - A = \sqrt{(2\sqrt{15})^2 + (3)^2} - 20$$

By putting the value

$$\begin{aligned} &= \sqrt{60 + 9} - 20 \\ &= \sqrt{49} - 20 \\ &= 7 - 20 = -13 \end{aligned}$$

272. If $x^2 + 1 = 3x$, then the value of $\frac{(x^4 + x^{-2})}{(x^2 + 5x + 1)}$ is?

- (a) $2\frac{1}{3}$ (b) $4\frac{1}{2}$
(c) $2\frac{1}{4}$ (d) $3\frac{1}{2}$

SSC CHSL 02/07/2019 (Shift-III)

Ans. (c) : $x^2 + 1 = 3x$

dividing by x both sides

$$x + \frac{1}{x} = 3$$

On cubing both sides,

$$x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \left(x + \frac{1}{x}\right) = 27$$

$$x^3 + \frac{1}{x^3} = 27 - 9$$

$$x^3 + \frac{1}{x^3} = 18$$

$$\frac{x^4 + x^{-2}}{x^2 + 5x + 1} = \frac{x^4 + \frac{1}{x^2}}{x^2 + 5x + 1}$$

$$= \frac{x \left(x^3 + \frac{1}{x^3}\right)}{x \left(x + \frac{1}{x} + 5\right)}$$

$$= \frac{18}{3+5} = \frac{18}{8} = \frac{9}{4}$$

$$= 2\frac{1}{4}$$

273. If $a^2 + 4b^2 + 49c^2 + 18 = 2(2b + 28c - a)$, then the value of $(3a + 2b + 7c)$ is-

- (a) 1 (b) 0
(c) 2 (d) 3

SSC CHSL 02/07/2019 (Shift-I)

Ans. (c) : Given,

$$a^2 + 4b^2 + 49c^2 + 18 = 2(2b + 28c - a)$$

$$\Rightarrow a^2 + 2a + 1 + 4b^2 - 4b + 1 + 49c^2 - 56c + 16 = 0$$

$$\Rightarrow (a+1)^2 + (2b-1)^2 + (7c-4)^2 = 0$$

$$\Rightarrow (a+1) = 0, \quad 2b-1 = 0, \quad 7c-4 = 0$$

$$a = -1, \quad b = \frac{1}{2}, \quad c = \frac{4}{7}$$

$$3a + 2b + 7c$$

$$= 3 \times (-1) + 2 \times \frac{1}{2} + 7 \times \frac{4}{7}$$

$$= -3 + 1 + 4 = 2$$

274. If $250\sqrt{2}x^3 - 5\sqrt{5}y^3 = (5\sqrt{2}x - \sqrt{5}y) \times (Ax^2 + Bxy + Cy^2)$, then the value of $(A + C - \sqrt{10}B)$ is?

- (a) 5 (b) $5\sqrt{2}$
(c) 10 (d) $2\sqrt{5}$

SSC CHSL 03/07/2019 (Shift-II)

Ans. (a) : $250\sqrt{2}x^3 - 5\sqrt{5}y^3 = (5\sqrt{2}x - \sqrt{5}y)(Ax^2 + Bxy + Cy^2)$

$$\Rightarrow (5\sqrt{2}x)^3 - (\sqrt{5}y)^3 = (5\sqrt{2}x - \sqrt{5}y)(Ax^2 + Bxy + Cy^2)$$

$$\Rightarrow (5\sqrt{2}x - \sqrt{5}y)(50x^2 + 5\sqrt{10}xy + 5y^2) = (5\sqrt{2}x - \sqrt{5}y)(Ax^2 + Bxy + Cy^2)$$

$$\Rightarrow 50x^2 + 5\sqrt{10}xy + 5y^2 = Ax^2 + Bxy + Cy^2$$

On comparing both sides-

$$A = 50, \quad B = 5\sqrt{10}, \quad C = 5$$

$$\begin{aligned} \text{Hence } A + C - \sqrt{10}B &= 50 + 5 - \sqrt{10}(5\sqrt{10}) \\ &= 55 - 50 \\ &= 5 \end{aligned}$$

275. If $9a^2 + 16b^2 + c^2 + 25 = 24(a+b)$, then the value of $(3a+4b+5c)$ is?

- (a) 10 (b) 6
(c) 7 (d) 9

SSC CHSL 03/07/2019 (Shift-III)

Ans. (c) : $9a^2 + 16b^2 + c^2 + 25 = 24(a+b)$

$$9a^2 + 16b^2 + c^2 + 25 - 24a - 24b = 0$$

$$9a^2 - 24a + 16 + 16b^2 - 24b + 9 + c^2 = 0$$

$$(3a-4)^2 + (4b-3)^2 + c^2 = 0$$

it is possible only when

$$3a - 4 = 0 \Rightarrow 3a = 4$$

$$4b - 3 = 0 \Rightarrow 4b = 3$$

And $c = 0$

$$\begin{aligned} \text{Hence } 3a + 4b + c &= 4 + 3 + 0 \\ &= 7 \end{aligned}$$

276. If $x \neq -1, 2$ and 5 , then the value of

$$\left\{ \frac{2(x^3 - 8)}{x^2 - x - 2} \times \frac{x^2 + 2x + 1}{x^2 - 4x - 5} \div \frac{x^2 + 2x + 4}{3x - 15} \right\} \text{ is equal to:}$$

- (a) $\frac{2}{3}$ (b) 6
(c) $\frac{3}{2}$ (d) $\frac{1}{6}$

SSC CHSL 03/07/2019 (Shift-II)

Ans. (b) : Given expression:-

$$\left\{ \frac{2(x^3 - 8)}{x^2 - x - 2} \times \frac{x^2 + 2x + 1}{x^2 - 4x - 5} \div \frac{x^2 + 2x + 4}{3x - 15} \right\}$$

$$= \left\{ \frac{2(x^3 - 2^3)}{x^2 - x - 2} \times \frac{x^2 + 2x + 1}{x^2 - 4x - 5} \times \frac{3x - 15}{x^2 + 2x + 4} \right\}$$

$$\begin{aligned} &= \frac{2(x-2)(x^2+2x+4)}{(x-2)(x+1)} \times \frac{(x+1)(x+1)}{(x+1)(x-5)} \times \frac{3(x-5)}{(x^2+2x+4)} \\ &= 2 \times 3 = 6 \end{aligned}$$

277. If x is real number and $x^4 - 5x^2 - 1 = 0$ then

the value of $\left(x^6 - 3x^2 + \frac{3}{x^2} - \frac{1}{x^6} + 1\right)$ is?

- (a) 116 (b) 96
(c) 110 (d) 126

SSC CHSL 03/07/2019 (Shift-I)

Ans. (d) : $x^4 - 5x^2 - 1 = 0$

$$\boxed{x^2 - \frac{1}{x^2} = 5}$$

$$x^6 - \frac{1}{x^6} = (5)^3 + 3 \times 5$$

$$\boxed{x^6 - \frac{1}{x^6} = 125 + 15 = 140}$$

Hence $x^6 - 3x^2 + \frac{3}{x^2} - \frac{1}{x^6} + 1$

$$x^6 - \frac{1}{x^6} - 3\left(x^2 - \frac{1}{x^2}\right) + 1$$

$$140 - 3(5) + 1$$

$$140 - 15 + 1 = 126$$

278. If $x^4 + x^{-4} = 1442$, then the value of $x - x^{-1}$ is where $(x > 0)$:

- (a) 6 (b) 7
(c) 15 (d) 8

SSC CHSL 04/07/2019 (Shift-III)

Ans. (a) : $x^4 + x^{-4} = 1442$ ($x > 0$)

$$\left(x^2\right)^2 + \left(\frac{1}{x^2}\right)^2 + 2 = 1442 + 2$$

By adding 2 in both sides,

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 1444$$

$$x^2 + \frac{1}{x^2} = 38$$

(By subtracting 2 in both sides)

$$x^2 + \frac{1}{x^2} - 2 = 38 - 2$$

$$\left(x - \frac{1}{x}\right)^2 = 36, \quad x - \frac{1}{x} = 6$$

279. If $a^2 + b^2 = 99$ and $ab = 11$, ($a > 0, b > 0$) then the value of $(a^3 + b^3)$ is :

- (a) 1250 (b) 1080
(c) 1100 (d) 968

SSC CHSL 04/07/2019 (Shift-III)

Ans. (d) : $\because (a+b)^2 = a^2 + b^2 + 2ab$

$$(a+b)^2 = 99 + 2 \times 11 = 121$$

$$a+b = 11$$

$$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$$

$$11^3 = a^3 + b^3 + 3 \times 11 \times 11$$

$$a^3 + b^3 = 1331 - 363$$

$$a^3 + b^3 = 968$$

280. If $(3x - 7)^3 + (3x - 8)^3 + (3x + 6)^3 = 3(3x - 7)(3x - 8)(3x + 6)$, the value of x is :

- (a) 3 (b) 1
(c) 4 (d) 2

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Ans. (b) : $(3x - 7)^3 + (3x - 8)^3 + (3x + 6)^3 = 3(3x - 7)(3x - 8)(3x + 6)$

$\therefore a^3 + b^3 + c^3 = 3abc$

$\therefore a + b + c = 0$

if $a = 3x - 7, b = 3x - 8, c = 3x + 6$

$3x - 7 + 3x - 8 + 3x + 6 = 0$

$9x = 7 + 8 - 6$

$9x = 9$

$x = 1$

281. If $x^2 - 6x + 1 = 0$, then the value of

$\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$ is :

- (a) 36 (b) 33
(c) 35 (d) 39

SSC CHSL 04/07/2019 (Shift-I)

Ans. (b) : $x^2 - 6x + 1 = 0$

$x + \frac{1}{x} = 6$

$x^3 + \frac{1}{x^3} = (6)^3 - 3 \times 6$

$x^3 + \frac{1}{x^3} = 198$

Then $\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$

$\frac{x \left(x^3 + \frac{1}{x^3}\right)}{x \left(x + \frac{1}{x}\right)}$

$= \frac{x^3 + \frac{1}{x^3}}{x + \frac{1}{x}}$

$= \frac{198}{6} = 33$

282. If $a^3 - b^3 = 899$ and $a - b = 29$, then the value of $(a - b)^2 - 3ab$ is equal to :

- (a) 35 (b) 16
(c) 29 (d) 31

SSC CHSL 09/07/2019 (Shift-II)

Ans. (d) $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

$(a - b)(a - b)^2 = a^3 - b^3 - 3ab(a - b)$

$29(a - b)^2 = 899 - 3ab \times 29$

$29[(a - b)^2 + 3ab] = 899$

$(a - b)^2 + 3ab = \frac{899}{29} = 31$

283. If $x^4 + x^{-4} = 1154$ ($x > 0$), then the value of $2(x - 3)^2$ is :

- (a) 16 (b) 12
(c) 15 (d) 20

SSC CHSL (Tier-I) 09/07/2019 (Shift-II)

Ans. (a) : $x^4 + \frac{1}{x^4} = 1154$

By adding 2 in both sides,

$\left(x^2 + \frac{1}{x^2}\right)^2 = 1156$

$x^2 + \frac{1}{x^2} = 34$

Again, By adding 2 in both sides,

$\left(x + \frac{1}{x}\right)^2 = 36$

$x + \frac{1}{x} = 6$

$x^2 + 1 = 6x$

$x^2 - 6x + 1 = 0$

$x^2 - 6x = -1$ (i)

$2(x - 3)^2 = 2(x^2 - 6x + 9)$
 $= 2(-1 + 9)$ (From equation)

$= 2 \times 8$

$= 16$

284. If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, then the value of $(a + b + c)^6$

is equal to :

- (a) $81 a^2 b^2 c^2$ (b) $729 a^2 b^2 c^2$
(c) $81 abc$ (d) $729 abc$

SSC CHSL (Tier-I) 10/07/2019 (Shift-II)

Ans. (b) : $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$

If $x + y + z = 0 \Rightarrow x^3 + y^3 + z^3 = 3xyz$

Hence $a + b + c = 3a^{1/3} \cdot b^{1/3} \cdot c^{1/3}$

$(a + b + c) = 3(abc)^{1/3}$

$\therefore (a + b + c)^6 = 729 a^2 b^2 c^2$

285. If $a^2 + b^2 = 169$, $ab = 60$, ($a > b$), then the value of $(a^2 - b^2)$ is equal to ?

- (a) 149 (b) 129
(c) 139 (d) 119

SSC CHSL 10/07/2019 (Shift-III)

Ans. (d) : $(a + b)^2 = a^2 + b^2 + 2ab$

$= 169 + 120 = 289$

$(a + b) = 17$

Again $(a - b)^2 = a^2 + b^2 - 2ab = 169 - 120$

$(a - b)^2 = 49 \Rightarrow (a - b) = 7$

$\therefore (a + b)(a - b) = 7 \times 17$

$a^2 - b^2 = 119$

IInd Method

Let $a = 12, b = 5$
 $ab = 60 = 12 \times 5$
 $\therefore a^2 + b^2 = (12)^2 + (5)^2 = 25 + 144 = 169$
 $\therefore (a^2 - b^2) = (12)^2 - (5)^2$
 $= 144 - 25$
 $= 119$

286. If $a + b - c = 12$ and $a^2 + b^2 + c^2 = 110$, then which of the following is true ?

- (p) $ab + bc + ca = 34$ (q) $ab + bc - ca = 17$
 (r) $ab - bc + ca = 17$ (s) $ab - bc - ca = 17$
 (a) p (b) s
 (c) q (d) r

SSC CHSL 10/07/2019 (Shift-II)

Ans. (b) : $a + b - c = 12$

$$(a + b - c)^2 = (12)^2$$

$$a^2 + b^2 + c^2 + 2(ab - bc - ca) = 144$$

$$\therefore 110 + 2(ab - bc - ca) = 144$$

$$2(ab - bc - ca) = 34$$

$$ab - bc - ca = 17$$

287. If $a + \frac{1}{a} = 3$, then the value of $\left(a^6 + \frac{1}{a^6}\right)$ is equal to ?

- (a) 730 (b) 319
 (c) 322 (d) 780

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Ans. (c) : $a + \frac{1}{a} = 3$

By squaring,

$$a^2 + \frac{1}{a^2} = 9 - 2 = 7$$

By cubing,

$$a^6 + \frac{1}{a^6} = (7)^3 - 3 \times 7 = 343 - 21 = 322$$

288. If $a + \frac{1}{a} = 2$, then what is the value of $a^4 - \frac{1}{a^4}$?

- (a) $\frac{1}{4}$ (b) 4
 (c) 1 (d) 0

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d) : $a + \frac{1}{a} = 2$

By squaring

$$a^2 + \frac{1}{a^2} = 4 - 2 = 2$$

If $a + \frac{1}{a} = k$ तब $a - \frac{1}{a} = \sqrt{k^2 - 4}$

$$\therefore a^2 - \frac{1}{a^2} = \sqrt{2^2 - 4} = 0$$

$$\therefore a^4 - \frac{1}{a^4} = \left(a^2 + \frac{1}{a^2}\right)\left(a^2 - \frac{1}{a^2}\right) = 0$$

OR

$$\text{If } a + \frac{1}{a} = 2 \Rightarrow a = 1$$

$$\therefore a^4 - \frac{1}{a^4} = 1^4 - \frac{1}{1^4} = 0$$

289. If $(x+y)^{\frac{1}{3}} + (y+z)^{\frac{1}{3}} = -(z+x)^{\frac{1}{3}}$ then the value of $(x^3 + y^3 + z^3)$ can be expressed as :

- (a) $\frac{1}{8}xyz$ (b) $\frac{3}{8}(x+y)(y+z)(z+x)$
 (c) $3xyz$ (d) $(x+y)(y+z)(z+x)$

SSC CHSL 10/07/2019 (Shift-I)

Ans. (b) $(x+y)^{\frac{1}{3}} + (y+z)^{\frac{1}{3}} = -(z+x)^{\frac{1}{3}}$

$$(x+y)^{\frac{1}{3}} + (y+z)^{\frac{1}{3}} + (z+x)^{\frac{1}{3}} = 0$$

$$\text{If } a + b + c = 0 \Rightarrow a^3 + b^3 + c^3 = 3abc$$

$$\Rightarrow (x+y) + (y+z) + (z+x) = 3(x+y)^{\frac{1}{3}}(y+z)^{\frac{1}{3}}(z+x)^{\frac{1}{3}}$$

$$\Rightarrow 2(x+y+z) = 3(x+y)^{\frac{1}{3}}(y+z)^{\frac{1}{3}}(z+x)^{\frac{1}{3}}$$

$$\Rightarrow (x+y+z) = \frac{3}{2}(x+y)^{\frac{1}{3}}(y+z)^{\frac{1}{3}}(z+x)^{\frac{1}{3}}$$

Again, on cubing both sides,

$$x^3 + y^3 + z^3 + 3(x+y)(y+z)(z+x) = \frac{27}{8}(x+y)(y+z)(z+x)$$

$$\Rightarrow x^3 + y^3 + z^3 = (x+y)(y+z)(z+x) \left[\frac{27}{8} - 3 \right]$$

$$\therefore x^3 + y^3 + z^3 = \frac{3}{8}(x+y)(y+z)(z+x)$$

290. a, b, c are three positive numbers such that $(a+b+c) = 20$, $a^2 + b^2 + c^2 = 152$, the value of $(ab+bc+ca)$ is equal to?

- (a) 110 (b) 102
 (c) 112 (d) 124

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d) : $a^2 + b^2 + c^2 + 2(ab + bc + ca) = (a + b + c)^2$

$$152 + 2(ab + bc + ca) = (20)^2$$

$$2(ab + bc + ca) = 400 - 152$$

$$ab + bc + ca = 124$$

291. If $a + 2b = 10$ and $2ab = 9$, then $|a - 2b|$ is equal to:

- (a) 2 (b) 8
 (c) 4 (d) 6

SSC CHSL -20/10/2020 (Shift-III)

Ans : (b) $(a-2b)^2 = (a+2b)^2 - 8ab$

$$= (10)^2 - 4 \times 9 = 64$$

$$a - 2b = \pm 8$$

$$|a - 2b| = 8$$

292. If $(a+b+4)\{ab+4(a+b)\} - 4ab = 0$ and $a \neq -4$, $b \neq -4$ then the value of $\left(\frac{1}{(a+b+4)^{117}} - 2^{-234}\right)$ is equal to :

- (a) 0 (b) $-\frac{1}{2^{234}}$
 (c) $\frac{1}{2^{117}}$ (d) $\frac{1}{4^{117}}$

SSC CHSL 11/07/2019 (Shift-II)

Ans. (a) : $(a+b+4)\{ab+4(a+b)\} - 4ab = 0$

Let, $a = 1$ and $b = -1$

On putting the value $a = 1$ and $b = -1$,

$$(1+(-1)+4)\{1 \times (-1) + 4(1+(-1))\} - 4 \times 1 \times (-1) = 0$$

$$4 \times (-1) + 0 + 4 = 0$$

$$0 = 0$$

$$\therefore \frac{1}{(a+b+4)^{117}} - 2^{-234} = \frac{1}{(1+(-1)+4)^{117}} - 2^{-234}$$

$$= \frac{1}{(4)^{117}} - 2^{-234}$$

$$= \frac{1}{2^{234}} - 2^{-234}$$

$$= 2^{-234} - 2^{-234}$$

$$= 0$$

293. If $a = \sqrt{8} - \sqrt{7}$ and $a = \frac{1}{b}$, then which of the value $\frac{a^2 + b^2 - 3ab}{a^2 + ab + b^2}$ is equal to?

- (a) $\frac{29}{33}$ (b) $\frac{29}{31}$
 (c) $\frac{27}{31}$ (d) $\frac{27}{32}$

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) : $a = \sqrt{8} - \sqrt{7}$

$$b = \frac{1}{a}$$

$$b = \frac{1}{\sqrt{8} - \sqrt{7}} \times \frac{\sqrt{8} + \sqrt{7}}{\sqrt{8} + \sqrt{7}}$$

$$b = \frac{\sqrt{8} + \sqrt{7}}{\sqrt{8} + \sqrt{7}}$$

$$\frac{a^2 + b^2 - 3ab}{a^2 + ab + b^2} = \frac{(a-b)^2 - ab}{(a+b)^2 - ab}$$

$$= \frac{(-\sqrt{7} - \sqrt{7})^2 - (\sqrt{8} - \sqrt{7})(\sqrt{8} + \sqrt{7})}{(\sqrt{8} + \sqrt{8})^2 - (\sqrt{8} - \sqrt{7})(\sqrt{8} + \sqrt{7})}$$

$$= \frac{(-2\sqrt{7})^2 - 1}{(2\sqrt{8})^2 - 1} = \frac{28 - 1}{32 - 1} = \frac{27}{31}$$

294. Given that x, y, z are positive real numbers are if $(x+y)^2 - z^2 = 8$, $(y+z)^2 - x^2 = 10$ and $(x+z)^2 - y^2 = 7$, then which of the value of $(x+y+z)$ is equal to ?

- (a) 6 (b) 7
 (c) 5 (d) 8

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) : $(x+y)^2 - z^2 = 8$

$$(x+y+z)(x+y-z) = 8 \quad \dots\dots\dots(i)$$

$$\therefore (y+z)^2 - x^2 = 10$$

$$(y+z+x)(y+z-x) = 10 \quad \dots\dots\dots(ii)$$

$$\therefore (x+z)^2 - y^2 = 7$$

$$(x+z+y)(x+z-y) = 7 \quad \dots\dots\dots(iii)$$

By adding the equation (i), (ii) and (iii)

$$(x+y+z)(x+y-z+y+z-x+x+z-y) = 8 + 10 + 7$$

$$(x+y+z)(x+y+z) = 25$$

$$(x+y+z)^2 = 25$$

$$x+y+z = 5$$

295. The value of :

$$\frac{18.43 \times 18.43 - 6.57 \times 6.57}{11.86}$$

$$11.86$$

- (a) 25 (b) 26
 (c) 24.12 (d) 23.62

SSC CHSL 11/07/2019 (Shift-I)

Ans. (a) : $\frac{18.43 \times 18.43 - 6.57 \times 6.57}{11.86}$

$$= \frac{(18.43)^2 - (6.57)^2}{11.86}$$

$$= \frac{(18.43 + 6.57)(18.43 - 6.57)}{11.86}$$

$$[\because a^2 - b^2 = (a+b)(a-b)]$$

$$= \frac{25 \times 11.86}{11.86} = 25$$

296. If $\frac{10}{7}(1 - 2.43 \times 10^{-3}) = 1.417 + x$ then the value of x is equal to :

- (a) 0.0417 (b) 0.81
 (c) 0.417 (d) 0.0081

SSC CHSL 11/07/2019 (Shift-I)

Ans. (d) : $\frac{10}{7}(1 - 2.43 \times 10^{-3}) = 1.417 + x$

$$\frac{10}{7}(1 - 0.00243) = 1.417 + x$$

$$\frac{10}{7} \times 0.99757 = 1.417 + x$$

$$1.4251 = 1.4170 + x$$

$$x = 0.0081$$

297. If $a + b + c = 0$, then $\left(\frac{2a^2}{3bc} + \frac{2b^2}{3ca} + \frac{2c^2}{3ab}\right)$ is

equal to:

- (a) 3 (b) 4
(c) 1 (d) 2

SSC CHSL -26/10/2020 (Shift-III)

$$\begin{aligned} \text{Ans. (d) : } & \left(\frac{2a^2}{3bc} + \frac{2b^2}{3ca} + \frac{2c^2}{3ab}\right) \\ &= \frac{2}{3} \left(\frac{a^3 + b^3 + c^3}{abc}\right) \\ &= \frac{2}{3} \left(\frac{3abc}{abc}\right) \quad \left[\begin{array}{l} \because (a+b+c) = 0 \\ \therefore a^3 + b^3 + c^3 = 3abc \end{array} \right] \\ &= 2 \end{aligned}$$

298. If $x = 3 + 2\sqrt{2}$, then the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ is:

- (a) 2 (b) 1
(c) 0 (d) 3

SSC CHSL -26/10/2020 (Shift-III)

$$\begin{aligned} \text{Ans. (a) : } x &= 3 + 2\sqrt{2} \\ x &= (\sqrt{2} + 1)^2 \\ \sqrt{x} &= \sqrt{2} + 1 \\ \frac{1}{\sqrt{x}} &= \sqrt{2} - 1 \\ \sqrt{x} - \frac{1}{\sqrt{x}} &= \sqrt{2} + 1 - \sqrt{2} + 1 \\ \sqrt{x} - \frac{1}{\sqrt{x}} &= 2 \end{aligned}$$

299. If $a^2 + b^2 + 2b + 4a + 5 = 0$, then the value of $\frac{2a-3b}{2a+3b}$ is equal to:

- (a) $\frac{1}{7}$ (b) $\frac{2}{7}$
(c) $\frac{3}{7}$ (d) $\frac{2}{5}$

SSC CHSL -26/10/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : } & a^2 + b^2 + 2b + 4a + 5 = 0 \\ & (a^2 + 4a + 4) + (b^2 + 2b + 1) = 0 \\ & (a+2)^2 + (b+1)^2 = 0 \\ & a+2 = 0 \text{ and } b+1 = 0 \\ & a = -2, b = -1 \\ & \frac{2a-3b}{2a+3b} = \frac{2 \times (-2) - 3 \times (-1)}{2 \times (-2) + 3 \times (-1)} \\ & \frac{-4+3}{-4-3} = \frac{-1}{-7} = \frac{1}{7} \end{aligned}$$

300. If $2a + \frac{1}{a} = 4$, then the value of $a^2 + \frac{1}{4a^2}$ is:

- (a) 3 (b) 4
(c) 5 (d) 12

SSC CHSL -26/10/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : } & 2a + \frac{1}{a} = 4 \\ a + \frac{1}{2a} &= 2 \quad (\text{On dividing by 2}) \\ \text{On squaring both sides,} \\ a^2 + \frac{1}{4a^2} + 2 \times a \times \frac{1}{2a} &= 4 \\ a^2 + \frac{1}{4a^2} &= 3 \end{aligned}$$

301. What is the value of $a^3 + b^3 + c^3 - 3abc$, when $a = 225$, $b = 226$ and $c = 227$?

- (a) 2034 (b) 2340
(c) 2304 (d) 2430

SSC CHSL -26/10/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : Given : } & a = 225, b = 226, c = 227 \\ a^3 + b^3 + c^3 - 3abc &= \\ & \left[\frac{1}{2} [a+b+c] [(a-b)^2 + (b-c)^2 + (c-a)^2] \right] \\ &= \frac{1}{2} [225+226+227] [(225-226)^2 + (226-227)^2 + (227-225)^2] \\ &= \frac{1}{2} [678] [1+1+4] \\ &= \frac{1}{2} \times 678 \times 6 = 2034 \end{aligned}$$

302. The value of

$$\left(a^{\frac{2}{3}} + 2a^{\frac{1}{2}} + 3a^{\frac{1}{3}} + 2a^{\frac{1}{6}} + 1 \right) \left(a^{\frac{1}{3}} - 2a^{\frac{1}{6}} + 1 \right) - a^{\frac{1}{2}} \left(a^{\frac{1}{2}} - 2 \right)$$

when $a = 7$, is:

- (a) 0 (b) $\sqrt{7}$
(c) 7 (d) 1

SSC CHSL -13/10/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (d) : } & (a^{\frac{2}{3}} + 2a^{\frac{1}{2}} + 3a^{\frac{1}{3}} + 2a^{\frac{1}{6}} + 1) (a^{\frac{1}{3}} - 2a^{\frac{1}{6}} + 1) \\ & - a^{\frac{1}{2}} \cdot (a^{\frac{1}{2}} - 2) \\ (\text{Let } a^{\frac{1}{6}} = x, \text{ then } a^{\frac{1}{3}} = x^2, a^{\frac{1}{2}} = x^3, a^{\frac{2}{3}} = x^4) \\ \text{According to question, } & (x^4 + 2x^3 + 3x^2 + 2x + 1) (x^2 - 2x + 1) - x^3 (x^3 - 2) \\ \Rightarrow & x^6 - 2x^5 + x^4 + 2x^5 - 4x^4 + 2x^3 + 3x^4 - 6x^3 + 3x^2 + 2x^3 - 4x^2 + 2x + x^2 - 2x + 1 - x^6 + 2x^3 \\ \Rightarrow & 4x^4 - 4x^4 - 6x^3 + 6x^3 - 4x^2 + 4x^2 + 1 \\ \Rightarrow & 1 \end{aligned}$$

303. If $4a + \frac{1}{5a} = 4$, then the value of $25a^2 + \frac{1}{16a^2}$ is:

- (a) $\frac{43}{2}$ (b) $\frac{55}{2}$
(c) $\frac{45}{4}$ (d) $\frac{45}{2}$

SSC CHSL -21/10/2020 (Shift-III)

Ans. (d) $4a + \frac{1}{5a} = 4$

On multiplying by $\frac{5}{4}$ in both sides,

$$5a + \frac{5}{4a} = 5$$

By squaring both sides,

$$25a^2 + \frac{1}{16a^2} + 2 \times 5a \times \frac{1}{4a} = 25$$

$$25a^2 + \frac{1}{16a^2} = 25 - \frac{5}{2}$$

$$25a^2 + \frac{1}{16a^2} = \frac{45}{2}$$

304. If $a + b = 10$ and $\frac{3}{7}$ of $ab = 9$, then the value of

$a^3 + b^3$ is:

- (a) 370 (b) 270
(c) 350 (d) 360

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) :

ab of $\frac{3}{7} = 9 \Rightarrow ab = 21$

By cubing both sides,

$$(a+b)^3 = (10)^3$$

$$a^3 + b^3 + 3ab(a+b) = 1000$$

$$a^3 + b^3 + 3 \times 21 \times 10 = 1000$$

$$a^3 + b^3 = 1000 - 630$$

$$\therefore a^3 + b^3 = 370$$

305. If

$$A = \frac{(0.1)^3 + (0.2)^3 + (0.3)^3 + 3(0.005 + 0.016 + 0.027) + 0.036}{(0.1)^2 + (0.2)^2 + (0.3)^2 + 0.04 + 0.06 + 0.12},$$

then the value of $60A$ is:

- (a) 30 (b) 36
(c) 60 (d) 20

SSC CHSL -13/10/2020 (Shift-II)

Ans. (b) :

$$A = \frac{(0.1)^3 + (0.2)^3 + (0.3)^3 + 3(0.005 + 0.016 + 0.027) + 0.036}{(0.1)^2 + (0.2)^2 + (0.3)^2 + 0.04 + 0.06 + 0.12}$$

$$A = \frac{(1 + 8 + 27 + 3 \times 48 + 36) \times 10^{-3}}{(1 + 4 + 9 + 22) \times 10^{-2}} = \frac{216}{36} \times \frac{1}{10} = \frac{6}{10}$$

$$\therefore 60A = 60 \times \frac{6}{10} = 36$$

306. If $a + b = 8$ and $a + a^2b + b + ab^2 = 128$ then the positive value of $a^3 + b^3$ is:

- (a) 152 (b) 344
(c) 96 (d) 224

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : $\therefore a + a^2b + b + ab^2 = 128$

$$(a+b) + ab(a+b) = 128$$

$$(a+b)(1+ab) = 128$$

$$(1+ab) = \frac{128}{8} = 16$$

$$\therefore ab = 15$$

$$a^3 + b^3 = (a+b)[(a+b)^2 - 3ab]$$

$$= 8[64 - 45]$$

$$= 8 \times 19 = 152$$

307. If $x^4 + \frac{1}{x^4} = \frac{257}{16}$ then find $\frac{8}{13} \left(x^3 + \frac{1}{x^3} \right)$,

where $x > 0$.

- (a) 4 (b) 5
(c) 6 (d) 8

SSC CHSL -13/10/2020 (Shift-II)

Ans. (b) : $x^4 + \frac{1}{x^4} = \frac{257}{16}$

$$\left(x^2 + \frac{1}{x^2} \right)^2 = \frac{257}{16} + 2 = \frac{257 + 32}{16} = \frac{289}{16}$$

$$x^2 + \frac{1}{x^2} = \frac{17}{4}$$

$$\left(x + \frac{1}{x} \right)^2 = \frac{17}{4} + 2 = \frac{25}{4}$$

$$x + \frac{1}{x} = \frac{5}{2}$$

$$\therefore x^3 + \frac{1}{x^3} = \left(\frac{5}{2} \right)^3 - 3 \times \left(\frac{5}{2} \right) = \frac{125}{8} - \frac{15}{2} = \frac{65}{8}$$

$$\therefore \frac{8}{13} \left(x^3 + \frac{1}{x^3} \right) = \frac{8}{13} \times \frac{65}{8} = 5$$

308. The value of $[(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3] \div [(a - b)^3 + (b - c)^3 + (c - a)^3]$ is equal to:

(Given $a \neq b \neq c$)

- (a) $(a + b)(b + c)(c + a)$
(b) $(a^2 + b^2)(b^2 + c^2)(c^2 + a^2)$
(c) $(a - b)(b - c)(c - a)$
(d) $(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$

SSC CHSL -19/03/2020 (Shift-I)

Ans. (a) : Let, $a^2 - b^2 = x, b^2 - c^2 = y, c^2 - a^2 = z$

And $a - b = K, b - c = L, c - a = M$

$$\therefore \left[(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 \right]$$

$$\div \left[(a - b)^2 + (b - c)^3 + (c - a)^3 \right]$$

$$= \frac{x^3 + y^3 + z^3}{K^3 + L^3 + M^3}$$

$$= \frac{3xyz}{3KLM} \quad \left[\because x + y + z = 0 \right]$$

$$= \frac{xyz}{KLM}$$

$$= \frac{(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)}{(a - b)(b - c)(c - a)}$$

$$= \frac{(a-b)(a+b)(b-c)(b+c)(c-a)(c+a)}{(a-b)(b-c)(c-a)}$$

$$= (a+b)(b+c)(c+a)$$

309. If $p + \left(\frac{1}{p}\right) = 2$ find the value of $p \times p \times p$.

- (a) 4 (b) 1
(c) 8 (d) 2

SSC CHSL -18/03/2020 (Shift-II)

Ans. (b) : $\because p + \frac{1}{p} = 2$
 $\therefore p = 1$
then $p \times p \times p = 1 \times 1 \times 1 = 1$

310. If $a + \frac{1}{a} + 2 = 0$, then the value of $a^{15} - \frac{1}{a^{100}}$ is

- (a) 1 (b) 0
(c) 2 (d) -2

SSC CHSL -21/10/2020 (Shift-III)

Ans. (d) $a + \frac{1}{a} + 2 = 0$
 $a + \frac{1}{a} = -2$
 $\therefore a = -1$
 $a^{15} - \frac{1}{a^{100}} = (-1)^{15} - \frac{1}{(-1)^{100}}$
 $= -1 - 1 = -2$

311. If $x = 3 + 2\sqrt{2}$, then the value of $x^2 + \frac{1}{x^2}$ is:

- (a) 34 (b) 36
(c) 32 (d) 30

SSC CHSL -20/10/2020 (Shift-II)

Ans : (a) Given,
 $x = 3 + 2\sqrt{2}$
 $\frac{1}{x} = 3 - 2\sqrt{2}$ -----[Conjugate of x]
 $x + \frac{1}{x} = 6 \Rightarrow x^2 + \frac{1}{x^2} = 36 - 2 = 34$

312. If $p + \frac{1}{p} = 112$, find $(p - 112)^{15} + \frac{1}{p^{15}}$.

- (a) 0 (b) 1
(c) 10 (d) 15

SSC CHSL -20/10/2020 (Shift-I)

Ans : (a) $p + \frac{1}{p} = 112$
 $(p-112) = -\frac{1}{p}$
 $(p-112)^{15} + \frac{1}{p^{15}} = \left(-\frac{1}{p}\right)^{15} + \frac{1}{p^{15}}$
 $= -\frac{1}{p^{15}} + \frac{1}{p^{15}} = 0$

313. If $x + y = 4$, $xy = 2$, $y + z = 5$, $yz = 3$, $z + x = 6$ and $zx = 4$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

- (a) 150.75 (b) 152.75
(c) 151.75 (d) 153.75

SSC CHSL -17/03/2020 (Shift-I)

Ans. (d) : $2(x+y+z) = 15$
 $x + y + z = \frac{15}{2}$
 $x + y = 4 \Rightarrow x^2 + y^2 + 2xy = 16$
 $y + z = 5 \Rightarrow y^2 + z^2 + 2yz = 25$
 $z + x = 6 \Rightarrow z^2 + x^2 + 2zx = 36$
 $2(x^2 + y^2 + z^2) + 2(xy + yz + zx) = 77$
 $\left. \begin{aligned} \because xy + yz + zx &= 9 \\ x + y + z &= \frac{15}{2} \end{aligned} \right\}$
 $2(x^2 + y^2 + z^2) + 2 \times 9 = 77$
 $2(x^2 + y^2 + z^2) = 77 - 18 = 59$
 $(x^2 + y^2 + z^2) = \frac{59}{2}$
 $\therefore x^3 + y^3 + z^3 - 3xyz = (x+y+z)(x^2 + y^2 + z^2 - xy - yz - zx)$
 $= \frac{15}{2} \times \left(\frac{59}{2} - 9\right) = \frac{15}{2} \times \frac{41}{2} = \frac{615}{4} = 153.75$

314. If $a^3 + b^3 = 20$ and $a + b = 5$, then find the value of $a^4 + b^4$.

- (a) 24 (b) 23
(c) 26 (d) 25

SSC CHSL -17/03/2020 (Shift-I)

Ans. (b): $(a + b)^3 = 5^3$
 $a^3 + b^3 + 3ab(a + b) = 125$
 $3ab \times 5 = 125 - 20 = 105$
 $ab = 7$
 $\therefore a^2 + b^2 = 25 - 14 = 11$
Again squaring on both sides,
 $a^4 + b^4 = 121 - 2(ab)^2$
 $= 121 - 2 \times 49 = 121 - 98 = 23$

315. If $x^4 + \frac{1}{x^4} = 14159$, then the value of $x + \frac{1}{x}$ is:

- (a) 9 (b) 10
(c) 11 (d) 12

SSC CHSL -19/03/2020 (Shift-II)

Ans. (c) $\because x^4 + \frac{1}{x^4} = 14159$
or $x^4 + \frac{1}{x^4} + 2 = 14159 + 2$ (On adding 2 in both sides)
or $\left(x^2 + \frac{1}{x^2}\right)^2 = 14161$ or $x^2 + \frac{1}{x^2} = 119$
 $x^2 + \frac{1}{x^2} + 2 = 119 + 2$
or $\left(x + \frac{1}{x}\right)^2 = 121$ or $x + \frac{1}{x} = 11$

316. If $x = 255, y = 256, z = 257$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

- (a) 1876 (b) 1378
(c) 2304 (d) 1984

SSC CHSL -14/10/2020 (Shift-III)

Ans. (c) : $x^3 + y^3 + z^3 - 3xyz =$
 $\frac{1}{2}(x+y+z)[(x-y)^2 + (y-z)^2 + (z-x)^2]$
 $= \frac{1}{2}(255+256+257)[(-1)^2 + (-1)^2 + (2)^2]$
 $= \frac{1}{2} \times 768 \times 6 = 2304$

317. If $x - 2y = 3$ and $xy = 5$, find the value of $x^2 - 4y^2$.

- (a) 23 (b) 20
(c) 21 (d) 22

SSC CHSL -12/10/2020 (Shift-I)

Ans. (c) : $(x+2y)^2 = (x-2y)^2 + 8xy$
 $= 9 + 40$
 $x + 2y = 7$
 $\therefore x^2 - 4y^2 = (x+2y)(x-2y)$
 $= 7 \times 3 = 21$

318. If $a - b = 4$ and $a^3 - b^3 = 88$, then what is the value of $a^2 - b^2$?

- (a) $8\sqrt{6}$ (b) $6\sqrt{6}$
(c) $7\sqrt{6}$ (d) $9\sqrt{6}$

SSC CHSL -12/10/2020 (Shift-II)

Ans. (a) : $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$
 $64 = 88 - 3ab \times 4$
 $12ab = 24$
 $ab = 2$
 $(a+b)^2 = (a-b)^2 + 4ab$
 $= 16 + 8 = 24$
 $(a+b) = \sqrt{24} = 2\sqrt{6}$
 $\therefore (a^2 - b^2) = (a+b)(a-b)$
 $= 2\sqrt{6} \times 4$
 $= 8\sqrt{6}$

319. $(a+2b)^2 - (a-2b)^2$ is equal to:

- (a) 10ab (b) 6ab
(c) 4ab (d) 8ab

SSC CHSL -14/10/2020 (Shift-I)

Ans. (d) : $(a+2b)^2 - (a-2b)^2$
 $= a^2 + 4b^2 + 4ab - a^2 - 4b^2 + 4ab$
 $= 8ab$

320. If $x + y = 4$ and $x^3 + y^3 = 12$, then the value of $x^4 + y^4 = ?$

- (a) $\frac{146}{7}$ (b) $\frac{146}{3}$
(c) $\frac{146}{9}$ (d) $\frac{146}{5}$

SSC CHSL -16/10/2020 (Shift-III)

Ans. (c) : $(x+y)^3 = x^3 + y^3 + 3xy(x+y)$

$$4^3 = 12 + 3xy \times 4$$

$$64 = 12 + 12xy$$

$$12xy = 52$$

$$xy = \frac{13}{3}$$

$$\therefore x + y = 4$$

$$x^2 + y^2 = 4^2 - 2 \times \frac{13}{3}$$

$$= \frac{48 - 26}{3} = \frac{22}{3}$$

$$x^4 + y^4 = \left(\frac{22}{3}\right)^2 - 2 \times \left(\frac{13}{3}\right)^2$$

$$= \frac{484}{9} - 2 \times \frac{169}{9}$$

$$= \frac{146}{9}$$

321. If $x + \frac{1}{x} = 4$, then find the value of $x^4 + \left(\frac{1}{x}\right)^4$ is:

- (a) 194 (b) 196
(c) 16 (d) 14

SSC CHSL -16/10/2020 (Shift-I)

Ans. (a) : if $x + \frac{1}{x} = k$
then $x^2 + \frac{1}{x^2} = k^2 - 2$
Now $x + \frac{1}{x} = 4$ ----- [Given]
 $\therefore x^2 + \frac{1}{x^2} = 4^2 - 2 = 14$
 $x^4 + \frac{1}{x^4} = (14)^2 - 2 = 194$

322. If $a + 3b = 12$ and $ab = 9$, then the value of $(a - 3b)$ is?

- (a) 9 (b) 6
(c) 8 (d) 4

SSC CHSL -19/10/2020 (Shift-II)

Ans. (b) : $a + 3b = 12$
 $a^2 + 9b^2 + 6ab = 144$
 $a^2 + 9b^2 = 144 - 54 = 90$
 $\therefore (a-3b)^2 = a^2 + 9b^2 - 6ab = 90 - 6 \times 9 = 90 - 54 = 36$
 $(a - 3b) = 6$

323. If $a^2 + \frac{2}{a^2} = 16$, then find the value of

$$\frac{72a^2}{a^4 + 2 + 8a^2}$$

- (a) 2 (b) 1
(c) 4 (d) 3

SSC CHSL -19/10/2020 (Shift-II)

Ans. (d) : $a^2 + \frac{2}{a^2} = 16$

$$\therefore \frac{72a^2}{a^4 + 2 + 8a^2} = \frac{72a^2}{a^2 \left(a^2 + \frac{2}{a^2} + 8 \right)}$$

$$\Rightarrow \frac{72}{\left(a^2 + \frac{2}{a^2} \right) + 8} = \frac{72}{16 + 8} = \frac{72}{24} = 3$$

324. If $1 + 9r^2 + 81r^4 = 256$ and $1 + 3r + 9r^2 = 32$, then find the value of $1 - 3r + 9r^2$.

- (a) 16 (b) 8
(c) 4 (d) 12

SSC CHSL -19/10/2020 (Shift-II)

Ans. (b) : $\because x^4 + y^4 + x^2y^2$
 $= (x^2 + y^2 - xy)(x^2 + y^2 + xy)$ According to formula
 $\therefore 1 + 9r^2 + 81r^4 = 256$
 $(1 + 3r + 9r^2)(1 - 3r + 9r^2) = 256$
 $(1 - 3r + 9r^2) = \frac{256}{32} = 8$

325. What is the value of

$$\frac{(0.4)^3 + (0.6)^3}{\left[(0.4)^2 + (0.6)^2 - (0.4) \times (0.6) \right]} = ?$$

(a) 1.2 (b) 1.1
(c) 1.0 (d) 0.9

SSC MTS 10-10-2017 (Shift-II)

Ans. (c) : Let $0.4 = a$
 $0.6 = b$

$$\therefore \frac{a^3 + b^3}{a^2 + b^2 - ab} = \frac{(a^2 + b^2 - ab)(a + b)}{(a^2 + b^2 - ab)}$$

$$= a + b = 0.4 + 0.6 = 1.0$$

326. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 4$, find the value of $x^2 + \frac{1}{x^2}$.

- (a) 254 (b) 194
(c) 258 (d) 196

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (b) : $\because \sqrt{x} + \frac{1}{\sqrt{x}} = 4$ -----[Given]

On squaring both sides,

$$\therefore x + \frac{1}{x} = 16 - 2 = 14$$

$$x^2 + \frac{1}{x^2} = (14)^2 - 2$$

$$= 196 - 2 = 194$$

327. If $x^3 + y^3 = 175$ and $x + y = 7$, find the value of $x^4 + y^4$.

- (a) 916 (b) 912
(c) 961 (d) 964

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (c) : $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

$$7^3 = 175 + 3xy \times 7$$

$$343 = 175 + 21xy$$

$$21xy = 168 \Rightarrow xy = 8$$

$$(x + y)^2 = 7^2$$

And $x^2 + y^2 = 7^2 - 2 \times 8 = 49 - 16 = 33$

then, $x^4 + y^4 = (x^2 + y^2)^2 - 2x^2y^2$

$$= 33^2 - 2 \times 64$$

$$= 1089 - 128 = 961$$

328. If $x = 3 + \sqrt{8}$, find the value of $x^3 + \frac{1}{x^3}$.

- (a) 216 (b) 200
(c) 196 (d) 198

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : $\because x = 3 + \sqrt{8}$

$$\therefore \frac{1}{x} = 3 - \sqrt{8}$$

$$x + \frac{1}{x} = 6$$

then, $x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x} \right)^3 - 3 \left(x + \frac{1}{x} \right)$

$$= 216 - 3 \times 6$$

$$= 216 - 18 = 198$$

329. If $x + y = 7$ and $xy = 12$, then the value of

$\left(\frac{1}{x^3} + \frac{1}{y^3} \right)$ is :

(a) $\frac{191}{1728}$ (b) 1

(c) $\frac{91}{1728}$ (d) $\frac{97}{1728}$

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (c) : Given $x + y = 7$, $xy = 12$

Let, $xy = 12 = 3 \times 4$

$$x + y = 3 + 4 \Rightarrow 7$$

L.H.S. = R.H.S.

$$\therefore \left(\frac{1}{x^3} + \frac{1}{y^3} \right) = \frac{1}{27} + \frac{1}{64}$$

$$= \frac{64 + 27}{27 \times 64} = \frac{91}{1728}$$

330. If $x + y + z = 0$, then $(x + y - z)^3 + (y + z - x)^3 + (z + x - y)^3 = k(xyz)$, where k is equal to :

- (a) -3 (b) 9
(c) 3 (d) -24

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (d) : Given, $\therefore x + y + z = 0$

$$\therefore x^3 + y^3 + z^3 = 3xyz$$

According to the question,

$$(x+y-z)^3 + (y+z-x)^3 + (z+x-y)^3 = kxyz$$

$$\therefore x+y+z=0$$

$\therefore x+y=-z, z+x=-y, y+z=-x$ on putting,

$$(-z-z)^3 + (-x-x)^3 + (-y-y)^3 = kxyz$$

$$-8z^3 - 8x^3 - 8y^3 = kxyz$$

$$-8(x^3 + y^3 + z^3) = kxyz$$

$$-8 \times 3xyz = kxyz$$

$$-24xyz = kxyz$$

$$k = -24$$

331. If $4x^2 + 9y^2 + z^2 + 49 = 12(x+y+z)$, then what is the value of $(4x+9y-z)$?

- (a) 6 (b) 12
(c) 0 (d) 9

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a) : $4x^2 + 9y^2 + z^2 + 49 = 12(x+y+z)$
 $(4x^2 - 12x + 9) + (9y^2 - 12y + 4) + (z^2 - 12z + 36) = 0$
 $(2x-3)^2 + (3y-2)^2 + (z-6)^2 = 0$
 $2x-3=0 \rightarrow x = \frac{3}{2}$
 $3y-2=0 \rightarrow y = \frac{2}{3}$
 $z-6=0 \rightarrow z = 6$
 $\therefore (4x+9y-z) = 4 \times \left(\frac{3}{2}\right) + 9 \times \left(\frac{2}{3}\right) - (6)$
 $= 6 + 6 - 6 = 6$

332. If $27(x+y)^3 + (x-y)^3 = 2(2x+y)(Ax^2+Bxy+Cy^2)$ then what is the value of $(A-B+C)$?

- (a) 11 (b) 7
(c) 4 (d) 21

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (c) :
 $27(x+y)^3 + (x-y)^3 = 2(2x+y)(Ax^2+Bxy+Cy^2)$
 $[3(x+y)]^3 + (x-y)^3 = 2(2x+y)(Ax^2+Bxy+Cy^2)$
 $[3(x+y)+(x-y)][\{3(x+y)\}^2 + (x-y)^2 - 3(x+y)(x-y)]$
 $(4x+2y)[3x^2+3y^2+6xy+x^2+y^2-2xy-3x^2+3y^2]$
 $2(2x+y)[x^2+4xy+7y^2] = 2(2x+y)(Ax^2+Bxy+Cy^2)$
 On comparing both sides
 $A=1, B=4, C=7$
 $\therefore A-B+C = 1-4+7 = 4$

333. If $a+b+c=8$ and $ab+bc+ca=11$, then what is the value of $a^3+b^3+c^3-3abc$?

- (a) 248 (b) 254
(c) 256 (d) 236

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) $\therefore a+b+c=8, ab+bc+ca=11$
 $\therefore a^3+b^3+c^3-3abc = (a+b+c)[(a+b+c)^2 - 3(ab+bc+ca)]$
 $= 8[8^2 - 3 \times 11] = 8(64 - 33) = 8 \times 31 = 248$

334. What is the value of 296×304 ?

- (a) 89974 (b) 89874
(c) 79984 (d) 89984

SSC MTS 10-10-2017 (Shift-III)

Ans. (d) : $296 \times 304 = ?$
 $= (300-4) \times (300+4)$
 $= (300)^2 - (4)^2$
 $= 90000 - 16 = 89984$

(III) Problems based on Factors of Polynomials and Remainder Theorem

335. The coefficient of x^3y in $(x-2y) \times (5x+y)^3$ is:

- (a) 75 (b) -150
(c) 250 (d) -175

SSC CHSL 05/08/2021 (Shift-I)

Ans. (d) :
 $x^3y = (x-2y)(5x+y)^3$
 $= (x-2y)[125x^3 + y^3 + 3 \times 5xy(5x+y)]$
 $= (x-2y)(125x^3 + y^3 + 75x^2y + 15xy^2)$
 $= 125x^4 + xy^3 + 75x^3y + 15x^2y^2 - 250x^3y - 2y^4 - 150x^2y^2 - 30xy^3$
 Required coefficient = $75 - 250 = -175$

336. Simplify the following expression

$$(2a-b-3c)(4a^2+b^2+9c^2+2ab+6ac-3bc)$$

- (a) $-8a^3 + b^3 + 27c^3$
 (b) $8a^3 + b^3 + 27c^3$
 (c) $8a^3 - b^3 - 27c^3 - 18abc$
 (d) $8a^3 - b^3 - 27c^3 + 18abc$

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : $(2a-b-3c)(4a^2+b^2+9c^2+2ab+6ac-3bc)$
 $\therefore a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

From option (c)
 $8a^3 - b^3 - 27c^3 - 18abc$
 $= (2a-b-3c)(4a^2+b^2+9c^2+2ab+6ac-3bc)$

337. What is the coefficient of x in the expansion of $(3x-4)^3$?

- (a) 108 (b) -108
(c) 144 (d) -144

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (c) : $(3x-4)^3 = 27x^3 - 64 - 3 \times 3x \times 4(3x-4)$
 $= 27x^3 - 64 - 108x^2 + 144x$
 Hence, coefficient of x is 144.

338. The coefficient of x in $(x-3y)^3$ is:

- (a) $3y^2$ (b) $-3y^2$
(c) $-27y^2$ (d) $27y^2$

SSC CGL (Tier-I)-2019 - 06/03/2020 (Shift-II)

Ans. (d) : $(x-3y)^3 = x^3 - 27y^3 - 3 \times x \times 3y(x-3y)$
 $= x^3 - 27y^3 - 9x^2y + 27xy^2$
 \therefore Coefficient of $x = 27y^2$

339. The coefficient of y in the expansion of $(2y-5)^3$, is:

- (a) 150 (b) 50
(c) -30 (d) -150

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-I)

Ans. (a) : $\because (a-b)^3 = a^3 - b^3 - 3ab(a-b)$
 $\therefore (2y-5)^3 = (2y)^3 - 5^3 - 3 \times 2y \times 5(2y-5)$
 $= 8y^3 - 125 - 30y(2y-5)$
 $= 8y^3 - 125 - 60y^2 + 150y$
Hence coefficient of $y = 150$

340. The coefficient of x^2 in $(2x+y)^3$ is:

- (a) $12y^2$ (b) $12y$
(c) 8 (d) 12

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (b) : $(2x+y)^3 = 8x^3 + y^3 + 12x^2y + 6xy^2$
Coefficient of $x^2 = 12y$

341. $25a^2 - 9$ is factored as :

- (a) $(25a+1)(a-9)$ (b) $(5a+1)(5a-9)$
(c) $(5a-3)^2$ (d) $(5a+3)(5a-3)$

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Ans. (d) : $25a^2 - 9 = (5a)^2 - (3)^2$
 $= (5a+3)(5a-3)$ [$\because a^2 - b^2 = (a+b)(a-b)$]

342. If $x^3 + 2x^2 - ax - b$ is exactly divisible by $(x^2 - 1)$, then the values of a and b are?

- (a) $a = -1$ and $b = 2$ (b) $a = 1$ and $b = -2$
(c) $a = 1$ and $b = 2$ (d) $a = 2$ and $b = 2$

SSC CHSL –26/10/2020 (Shift-II)

Ans. (c) : $x^3 + 2x^2 - ax - b$ is divided by $(x^2 - 1)$

$$(x^2-1) = (x+1)(x-1) = 0$$

$$x = -1, 1$$

$$-1+2+a-b = 0$$

$$a-b = -1 \quad \text{(i)}$$

$$x^3 + 2x^2 - ax - b = 0$$

on putting the value $x = 1$

$$1 + 2 - a - b = 0$$

$$-a - b = -3$$

$$a + b = 3 \quad \text{(ii)}$$

By solving the equation (i) and (ii)

$$a = 1$$

By putting the value of a in equation (ii)

$$b = 2$$

343. $2x - 3y$ is a factor of:

- (a) $4x^2 + 2x - 3y + 9y^2 - 12xy$
(b) $8x^3 + 27y^3$
(c) $4x^2 + 2x - 3y + 36y^2 + 12xy$
(d) $4x^2 + 9y^2 + 12xy$

SSC CHSL –16/10/2020 (Shift-II)

Ans. (a) :

$$(a) \quad (4x^2 + 2x - 3y + 9y^2 - 12xy)$$

$$= 4x^2 + 9y^2 - 12xy + 2x - 3y$$

$$= (2x - 3y)^2 + (2x - 3y)$$

$$= (2x - 3y)(2x - 3y + 1)$$

$$(b) \quad 8x^3 + 27y^3 = (2x + 3y)[4x^2 + 9y^2 - 6xy]$$

$$(c) \quad 4x^2 + 2x - 3y + 36y^2 + 12xy$$

$$= 4x^2 + 9y^2 + 12xy + 2x - 3y + 27y^2$$

$$= (2x + 3y)^2 + (2x - 3y) + 27y^2$$

$$(d) \quad 4x^2 + 9y^2 + 12xy = (2x + 3y)^2$$

Hence, $(2x - 3y)$ is the factor of given expression in option (a)

344. $(ax + by)$ is a factor of:

- (a) $a^2x^2 + 2abxy + b^2y^2$
(b) $a^2x^2 + 2ab + b^2y^2$
(c) $a^2x^2 + 2ab - b^2y^2$
(d) $a^2x^3 + 2abx + b^2y^2x$

SSC CHSL –16/10/2020 (Shift-II)

Ans. (a) : $\therefore ax + by = 0$

$$ax = -by$$

$$x = -\frac{by}{a}$$

By putting the value of x in given equation, it should be equal to zero.

From option (a),

$$\therefore a^2x^2 + 2abxy + b^2y^2 =$$

$$a^2 \left(-\frac{by}{a} \right)^2 + 2ab \left(-\frac{by}{a} \right) y + b^2y^2$$

$$= a^2 \frac{b^2y^2}{a^2} - 2b^2y^2 + b^2y^2$$

$$= b^2y^2 - 2b^2y^2 + b^2y^2$$

$$= 2b^2y^2 - 2b^2y^2 = 0$$

Hence $(ax+by)$ is the factor of equation $a^2x^2 + 2abxy + b^2y^2$

OR

From option (a),

$$a^2x^2 + 2abxy + b^2y^2$$

$$= (ax)^2 + 2ax \times by + (by)^2$$

$$= (ax + by)^2$$

Hence $(ax + by)$, is the factor of $a^2x^2 + 2abxy + b^2y^2$.

345. The factors of the expression $2x^2 - 5x - 12$ are:

- (a) $(x-4)$ and $(2x-3)$ (b) $(x-4)$ and $(2x+3)$
(c) $(x+4)$ and $(2x+3)$ (d) $(x+4)$ and $(2x-3)$

SSC CHSL –15/10/2020 (Shift-I)

Ans. (b) : $2x^2 - 5x - 12$

$$= 2x^2 - 8x + 3x - 12$$

$$= 2x(x-4) + 3(x-4)$$

$$= (x-4)(2x+3)$$

Hence, $(x - 4)$ and $(2x + 3)$ are the factor of given expression $2x^2 - 5x - 12$.

346. Simplify the following expression.

$$(2x - 3y)^3 - 18xy(2x - 3y)$$

$$(a) \quad 8x^3 - 72x^2y + 108xy^2 - 27y^3$$

$$(b) \quad 8x^3 - 27y^3 - 36x^2y - 54xy^2$$

$$(c) \quad 8x^3 - 27y^3$$

$$(d) \quad 8x^3 + 108xy^2 - 72x^2y$$

SSC CHSL 12/04/2021 (Shift-I)

Ans : (a) $(2x - 3y)^3 - 18xy(2x - 3y)$

$$= 8x^3 - 27y^3 - 18xy(2x - 3y) - 18xy(2x - 3y)$$

$$= 8x^3 - 27y^3 - 72x^2y + 108xy^2$$

347. $(4x^3y - 6x^2y^2 + 4xy^3 - y^4)$ can be expressed as?

$$(a) \quad (x+y)^4 - y^4$$

$$(b) \quad (x-y)^4 - x^4$$

$$(c) \quad x^4 - (x-y)^4$$

$$(d) \quad (x+y)^4 - x^4$$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) From option (c)

$$\begin{aligned} x^4 - (x-y)^4 &= (x^2)^2 - ((x-y)^2)^2 \\ &= [x^2 - (x-y)^2] [x^2 + (x-y)^2] \\ &= [x^2 - x^2 - y^2 + 2xy] [x^2 + x^2 + y^2 - 2xy] \\ &= [-y^2 + 2xy] [2x^2 + y^2 - 2xy] \\ &= -2x^2y^2 - y^4 + 2xy^3 + 4x^3y + 2xy^3 - 4x^2y^2 \\ &= 4x^3y - 6x^2y^2 + 4xy^3 - y^4 \end{aligned}$$

348. Using algebraic identities, simplify the following expression.

$$\frac{(x^4 + x^2 + 1)}{(x^2 + x + 1)}$$

- (a) $(x^2 - 2x + 1)$ (b) $(x^2 + x + 1)$
 (c) $(x^2 + 2x + 1)$ (d) $(x^2 - x + 1)$

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Ans. (d) :

$$\begin{array}{r} x^2 + x + 1 \Big) x^4 + x^2 + 1 (x^2 - x + 1 \\ \underline{-x^4 \pm x^2 \pm x^3} \\ 1 - x^3 \\ \underline{\mp x^3 \mp x^2 \mp x} \\ x^2 + x + 1 \\ \underline{-x^2 \pm x \pm 1} \\ 0 \end{array}$$

Hence, $\frac{x^4 + x^2 + 1}{x^2 + x + 1} = x^2 - x + 1$

349. Find the factors of the expression $3x^2 - 5x - 8$.

- (a) $(x + 1)$ and $(3x - 8)$
 (b) $(x - 1)$ and $(3x + 8)$
 (c) $(x - 1)$ and $(3x - 8)$
 (d) $(x + 1)$ and $(3x + 8)$

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Ans. (a) : Given expression $3x^2 - 5x - 8$
 $= 3x^2 + 3x - 8x - 8$
 $= 3x(x+1) - 8(x+1)$
 $= (x+1)(3x-8)$

350. If $kx^3 + 4x^2 + 3x - 4$ and $x^3 - 4x + k$ leave the same remainder when divided by $(x - 3)$, then the value of k is:

- (a) 1 (b) 0
 (c) -1 (d) 2

SSC CHSL -19/03/2020 (Shift-I)

Ans. (c) : \because Dividing the given polynomials $kx^3 + 4x^2 + 3x - 4$ and $x^3 - 4x + k$ by $(x-3)$ leaves the same remainder.

$$\therefore x - 3 = 0 \text{ or } x = 3$$

\therefore By putting the value $x = 3$ in both equation

$$K \times 3^3 + 4 \times 3^2 + 3 \times 3 - 4 = 3^3 - 4 \times 3 + K$$

$$\text{or } 27K + 36 + 9 - 4 = 27 - 12 + K$$

$$\text{or } 27K + 41 = 15 + K$$

$$\text{or } 26K = -26$$

$$K = -1$$

351. If $x^3 - 6x^2 + ax + b$ is divisible by $(x^2 - 3x + 2)$, then the values of a and b are:

- (a) $a = -6$ and $b = -11$ (b) $a = -11$ and $b = 6$
 (c) $a = 6$ and $b = 11$ (d) $a = 11$ and $b = -6$

SSC CHSL -19/03/2020 (Shift-III)

Ans. (d) : $\because x^3 - 6x^2 + ax + b$, is divisible by $(x^2 - 3x + 2)$ then $(x^2 - 3x + 2)$ will be the factor of polynomial $x^3 - 6x^2 + ax + b$

$$\therefore x^2 - 3x + 2 = 0$$

$$x^2 - 2x - x + 2 = 0$$

$$\text{or } x(x-2) - 1(x-2) = 0$$

$$(x-2)(x-1) = 0$$

$$\therefore x = 2, x = 1$$

\therefore Taking the value of equation $x^3 - 6x^2 + ax + b$ is zero by keeping to value of $x = 1$ and $x = 2$ we get the following equation.

By putting the value of $x = 2$,

$$2^3 - 6(2)^2 + a \times 2 + b = 0$$

$$\text{or } 8 - 24 + 2a + b = 0$$

$$\text{or } 2a + b = 16 \quad \text{---(i)}$$

By putting the value of $x = 1$

$$1^3 - 6(1)^2 + a \times 1 + b = 0$$

$$\text{or } 1 - 6 + a + b = 0$$

$$\text{or } a + b = 5 \quad \text{---(ii)}$$

By solving the equation (i) and (ii)

$$2a + b = 16$$

$$a + b = 5$$

$$\underline{- \quad - \quad -}$$

$$a = 11$$

Putting the value $a = 11$ in equation (ii) $b = 5 - 11 = -6$

Hence $a = 11, b = -6$

352. If $2x^3 + ax^2 + bx - 2$ leaves the remainders 7 and 0 when divided by $(2x - 3)$ and $(x + 2)$, respectively, then the values of a and b are respectively:

- (a) 2; -2 (b) -3; 3
 (c) 3; -3 (d) -2; 2

SSC CHSL -14/10/2020 (Shift-I)

Ans. (c) : $2x^3 + ax^2 + bx - 2$ _____ (1)

$$2x - 3 = 0 \Rightarrow \text{By putting the value } x = \frac{3}{2}$$

$$\text{Remainder} = 7$$

$$2 \times \frac{27}{8} + a \times \frac{9}{4} + \frac{3b}{2} - 2 = 7$$

$$\frac{27}{4} + \frac{9a}{4} + \frac{3b}{2} = 9$$

$$27 + 9a + 6b = 36$$

$$9a + 6b = 9$$

$$3a + 2b = 3$$

$$\text{_____ (2)}$$

Again $x + 2 = 0 \Rightarrow$ Put the value $x = -2$ in equation (1) $-16 + 4a - 2b - 2 = 0$
 $4a - 2b = 18$
 $2a - b = 9$ _____ (3)
 By solving the equation (2) and (3)
 $a = 3$ or $b = -3$

353. Simplify the following expression:

$$\frac{(a^2 - 4b^2)^3 + 64(b^2 - 4c^2)^3 + (16c^2 - a^2)^3}{(a - 2b)^3 + (2b - 4c)^3 + (4c - a)^3}$$

(a) $-(a - 2b)(b + 2c)(4c + a)$
 (b) $2(a + 2b)(b + 2c)(4c + a)$
 (c) $(a + 2b)(b + 2c)(4c + a)$
 (d) $4(a + 2b)(b + 2c)(4c + a)$

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Ans. (b)
$$\frac{(a^2 - 4b^2)^3 + 64(b^2 - 4c^2)^3 + (16c^2 - a^2)^3}{(a - 2b)^3 + (2b - 4c)^3 + (4c - a)^3}$$

If $a + b + c = 0$
 then $a^3 + b^3 + c^3 = 3abc$

$$= \frac{3(a^2 - 4b^2)4(b^2 - 4c^2)(16c^2 - a^2)}{3(a - 2b) + (2b - 4c)^3 + (4c - a)^3}$$

$$= \frac{(a - 2b)(a + 2b)(2b + 4c)(2b - 4c)(4c - a)(4c + a)}{(a - 2b)(2b - 4c)(4c - a)}$$

$$= (a + 2b)(2b + 4c)(4c + a)$$

$$= 2(a + 2b)(b + 2c)(4c + a)$$

354. If $(2x + 3y + 4)(2x + 3y - 5)$ is equal to $(ax^2 + by^2 + 2hxy + 2gx + 2fy + c)$, then what is the value of $\{3(g - f - c)/ab\}$?

- (a) $\frac{31}{24}$ (b) $\frac{25}{24}$
 (c) $\frac{41}{24}$ (d) 1

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (c) : $(2x + 3y + 4)(2x + 3y - 5)$
 $= (4x^2 + 9y^2 + 12xy - 2x - 3y - 20)$
 $(ax^2 + by^2 + 2hxy + 2gx + 2fy + c)$ ----- (Given)

On comparing both sides

$a = 4, b = 9, h = 6, g = -1, f = -\frac{3}{2}, c = -20$

$$\therefore \{3(g - f - c)\} / ab = \frac{3 \times \left(-1 + \frac{3}{2} + 20\right)}{4 \times 9}$$

$$= \frac{41/2}{12} = \frac{41}{24}$$

(IV) Problems based on Quadratic Equation and Nature of its Roots

355. If the difference between the roots of the equation $Ax^2 - Bx + C = 0$ is 4, then which of the following is true ?

- (a) $B^2 - 16A^2 = 4AC + 4B^2$
 (b) $B^2 - 10A^2 = 4AC + 6A^2$

- (c) $B^2 - 8A^2 = 4AC + 10A^2$
 (d) $B^2 - 16A^2 = 4AC + 8B^2$

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Ans. (b) Let roots are α and β

$(\alpha + \beta)^2 = (\alpha - \beta)^2 + 4\alpha\beta$

$$\left(\frac{B}{A}\right)^2 = 16 + \frac{4C}{A}$$

$B^2 = 16A^2 + 4AC$

$B^2 - 10A^2 = 4AC + 6A^2$

356. α and β are the roots of quadratic equation. If $\alpha + \beta = 8$ and $\alpha - \beta = 2\sqrt{5}$, then which of the following equation will have roots α^4 and β^4 ?

- (a) $x^2 - 1522x + 14641 = 0$
 (b) $x^2 - 1921x + 14641 = 0$
 (c) $x^2 - 1764x + 14641 = 0$
 (d) $x^2 - 2520x + 14641 = 0$

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Ans. (a) : Given-

$\alpha + \beta = 8$ (i) and $\alpha - \beta = 2\sqrt{5}$ (ii)

By adding the square of equation (i) and (ii)

$\alpha^2 + \beta^2 + 2\alpha\beta = 64$ (iii)

$\alpha^2 + \beta^2 - 2\alpha\beta = 20$

$2(\alpha^2 + \beta^2) = 84 \Rightarrow \alpha^2 + \beta^2 = 42$ (iv)

From equation (iii) and (iv)

$42 + 2\alpha\beta = 64$

$\Rightarrow \alpha\beta = 11$ (v)

$\therefore \alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2$

$= (42)^2 - 2 \times (11)^2$

$= 1764 - 242 = 1522$

And

$\alpha^4 \cdot \beta^4 = (\alpha\beta)^4$

$= (11)^4 = 14641$

Hence, quadratic equation

$x^2 - (\alpha^4 + \beta^4)x + \alpha^4 \cdot \beta^4 = 0$

$\Rightarrow x^2 - 1522x + 14641 = 0$

357. If a and b are the roots of the equation $Px^2 - Qx + R = 0$, then what is the value of $(1/a^2) + (1/b^2) + (a/b) + (b/a)$?

(a) $\frac{(Q^2 - 2P)(2R + P)}{PR^2}$

(b) $\frac{(Q^2 - 2PR)(R + P)}{PR^2}$

(c) $\frac{(Q^2 - 2R)(2P + R)}{P^2R^2}$

(d) $\frac{(Q^2 - 2PR)(2R + 2P)}{P^2R^2}$

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Ans. (b) : Sum of roots-

$\Rightarrow a + b = Q/P$ (i)

Multiple of roots $(a \cdot b) = R/P$ (ii)

$$\therefore \frac{1}{a^2} + \frac{1}{b^2} + \frac{a}{b} + \frac{b}{a} = \frac{a^2 + b^2}{a^2b^2} + \frac{a^2 + b^2}{ab}$$

$$= \frac{a^2 + b^2}{ab} \left[\frac{1}{ab} + 1 \right]$$

$$= \left\{ \frac{(a+b)^2 - 2ab}{ab} \right\} \left(\frac{1}{ab} + 1 \right)$$

$$= \left\{ \frac{\left(\frac{Q}{P}\right)^2 - 2\frac{R}{P}}{\frac{R}{P}} \right\} \left(\frac{P}{R} + 1 \right)$$

$$= \frac{(Q^2 - 2PR)}{RP} \left(\frac{P+R}{R} \right)$$

$$= \frac{(Q^2 - 2PR)(R+P)}{PR^2}$$

358. If A and B are the roots of the equation $Ax^2 - A^2x + AB = 0$, then what is the value of A and B respectively?

- (a) 1, 0 (b) 1, 1
(c) 0, 2 (d) 0, 1

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Ans. (a) : Given—
Quadratic equation $Ax^2 - A^2x + AB = 0$
 \therefore A and B are roots of quadratic equation.

Sum of roots $(A+B) = \frac{-(-A^2)}{A}$
 $\Rightarrow A+B = A \Rightarrow \boxed{B=0}$

Product of roots $(A \cdot B) = \frac{AB}{A}$
 $\Rightarrow A \times B = B$
 $\Rightarrow \boxed{A=1}$

Hence the value of A and B are 1 and 0 respectively.

359. α and β are the roots of the quadratic equation $x^2 - x - 1 = 0$. What is the value of $\alpha^8 + \beta^8$?

- (a) 47 (b) 54
(c) 59 (d) 68

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Ans. (a) : Given—
Quadratic equation
 $x^2 - x - 1 = 0$

\therefore α and β are the roots of quadratic equation

$\Rightarrow \alpha + \beta = 1$ (i)
 $\Rightarrow \alpha \cdot \beta = -1$ (ii)

$\therefore (\alpha^2 + \beta^2) = (\alpha + \beta)^2 - 2\alpha\beta$
 $= (1)^2 - 2 \times -1 = 3$

$\alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2$
 $= 9 - 2 = 7$

$\therefore \alpha^8 + \beta^8 = (\alpha^4 + \beta^4)^2 - 2\alpha^4\beta^4$
 $\Rightarrow \alpha^8 + \beta^8 = (7)^2 - 2 \times 1$
 $\Rightarrow \boxed{\alpha^8 + \beta^8 = 47}$

360. If α and β are the roots of equation $x^2 - 2x + 4 = 0$, then what is the equation whose roots are α^3/β^2 and β^3/α^2 ?

- (a) $x^2 - 4x + 8 = 0$ (b) $x^2 - 32x + 4 = 0$
(c) $x^2 - 2x + 4 = 0$ (d) $x^2 - 16x + 4 = 0$

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : α and β are the roots of $x^2 - 2x + 4 = 0$

$$\therefore \alpha + \beta = -\frac{b}{a} = 2$$

$$\alpha\beta = \frac{c}{a} = 4$$

$$\alpha^3 + \beta^3 = (2)^3 - 3 \times 4 \times 2 = -16$$

$$\alpha^2 + \beta^2 = (2)^2 - 2 \times 4 = -4$$

Sum -

$$\frac{\alpha^3}{\beta^2} + \frac{\beta^3}{\alpha^2} = \frac{\alpha^5 + \beta^5}{(\alpha\beta)^2}$$

$$\text{Product} = \alpha\beta = 4$$

$$(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$$

$$-16 \times (-4) = \alpha^5 + \beta^5 + 16 \times 2$$

$$\alpha^5 + \beta^5 = 32$$

Hence, equation,

$$x^2 - \left(\frac{\alpha^5 + \beta^5}{(\alpha\beta)^2} \right) x + \alpha\beta = 0$$

$$x^2 - 2x + 4 = 0$$

361. If one root of the equation $Ax^2 + Bx + C = 0$ is two and a half times the others, then which of the following is TRUE?

- (a) $7B^2 = 3CA$ (b) $7B^2 = 4CA$
(c) $7B^2 = 36CA$ (d) $10B^2 = 49CA$

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : The roots of $Ax^2 + Bx + C = 0$ are $\alpha, \frac{5}{2}\alpha$.

$$\alpha + \beta = -\frac{b}{a}$$

$$\therefore \alpha + \frac{5}{2}\alpha = -\frac{B}{A}$$

$$\frac{7}{2}\alpha = -\frac{B}{A}$$

$$\alpha = \frac{-2B}{7A}$$

$$\therefore \alpha\beta = \frac{C}{A}$$

$$\alpha \cdot \frac{5}{2}\alpha = \frac{C}{A}$$

$$\frac{5}{2}\alpha^2 = \frac{C}{A}$$

$$\left(\frac{-2B}{7A} \right) \times \left(\frac{-2B}{7A} \right) \times \frac{5}{2} = \frac{C}{A}$$

$$10B^2 = 49CA$$

- 362. If α and β are the roots of equation $x^2 - x + 1 = 0$, then which equation will have roots α^3 and β^3 ?**
 (a) $x^2 + 2x + 1 = 0$ (b) $x^2 - 2x - 1 = 0$
 (c) $x^2 + 3x - 1 = 0$ (d) $x^2 - 3x + 1 = 0$

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : α and β are the roots of equation $x^2 - x + 1 = 0$

$$\alpha + \beta = -\frac{-b}{a} = -\left(-\frac{1}{1}\right) = +1, \quad \alpha\beta = \frac{c}{a} = \frac{1}{1} = 1$$

if α^3 and β^3 are the roots of a equation then

$$\begin{aligned} \alpha^3 + \beta^3 &= (\alpha + \beta)^3 - 3\alpha\beta(\alpha + \beta) \\ &= 1^3 - 3 \times 1(1) \\ &= -2 \end{aligned}$$

$$\begin{aligned} \alpha^3 \cdot \beta^3 &= (\alpha\beta)^3 = 1^3 \\ &= 1 \end{aligned}$$

Required equation $\Rightarrow x^2 - (\text{sum of roots})x + \text{product of roots} = 0$
 $x^2 + 2x + 1 = 0$

- 363. If a and b are roots of the equation $ax^2 + bx + c = 0$, then which equation will have roots $(ab + a + b)$ and $(ab - a - b)$?**

- (a) $a^2x^2 + 2acx + c^2 + b^2 = 0$
 (b) $a^2x^2 - 2acx + c^2 - b^2 = 0$
 (c) $a^2x^2 - 2acx + c^2 + b^2 = 0$
 (d) $a^2x^2 + 2acx + c^2 - b^2 = 0$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :

$$ax^2 + bx + c = 0$$

$$a + b = \frac{-b}{a} \text{ and } a \cdot b = \frac{c}{a}$$

if the roots are $(ab + a + b)$ and $(ab - a - b)$

$$\text{then } (ab + a + b) + (ab - a - b) = 2ab = \frac{2c}{a}$$

$$(ab + a + b) \times (ab - a - b) = (ab)^2 - (a + b)^2$$

$$= \frac{c^2}{a^2} - \frac{b^2}{a^2} = \frac{c^2 - b^2}{a^2}$$

\therefore Quadratic equation \Rightarrow

$$x^2 - (\text{sum of roots})x + \text{product of roots} = 0$$

$$x^2 - \frac{2c}{a}x + \left(\frac{c^2 - b^2}{a^2}\right) = 0$$

$$a^2x^2 - 2acx + c^2 - b^2 = 0$$

- 364. If the roots of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ are equal, then which of the following is true?**

- (a) $b = (a+c)/ac$ (b) $2/b = (1/a) + (1/c)$
 (c) $2b = (1/a) + (1/c)$ (d) $abc = ab + bc + ca$

SSC CGL (Tier-II) 19-02-2018

Ans. (b) : The roots of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ are equal.

$$\therefore D = B^2 - 4AC = 0$$

$$[b(c-a)]^2 - 4a(b-c) \times c(a-b) = 0$$

$$\begin{aligned} b^2(c-a)^2 - 4ac(b-c)(a-b) &= 0 \\ b^2(c^2 + a^2 - 2ca) - 4ac[ab - b^2 - ac + bc] &= 0 \\ b^2c^2 + a^2b^2 - 2b^2ac - 4a^2bc + 4b^2ac + 4a^2c^2 - 4abc^2 &= 0 \\ (bc)^2 + (ab)^2 + (-2ac)^2 + 2b^2ac - 4a^2bc - 4abc^2 &= 0 \\ (bc + ab - 2ac)^2 &= 0 \\ bc + ab &= 2ac \\ \frac{2}{b} &= \frac{1}{a} + \frac{1}{c} \end{aligned}$$

- 365. If α and β are two roots of the quadratic equation $ax^2 - bx + c = 0$ where a, b, c are constants and $a \neq 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is**

- (a) $\frac{b}{c}$ (b) $\frac{c}{a}$
 (c) $\frac{c}{b}$ (d) $\frac{-b}{c}$

SSC CHSL -19/10/2020 (Shift-I)

Ans. (a) : $ax^2 - bx + c = 0$

Where α and β are the roots of equation.

$$\alpha + \beta = \frac{b}{a}, \quad \alpha\beta = \frac{c}{a}$$

$$\therefore \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = \left(\frac{\frac{b}{a}}{\frac{c}{a}}\right) = \frac{b}{c}$$

- 366. Find the values of x for the given equation $3x^2 + 5x - 2 = 0$.**

- (a) -3 and -2 (b) -2 and $\frac{1}{3}$
 (c) 3 and $-\frac{1}{2}$ (d) 2 and -3

SSC CHSL -14/10/2020 (Shift-I)

Ans. (b) : $3x^2 + 5x - 2 = 0$

$$3x^2 + 6x - x - 2 = 0$$

$$3x(x+2) - 1(x+2) = 0$$

$$(x+2)(3x-1) = 0$$

$$\therefore x = -2 \text{ and } \frac{1}{3}$$

(V) Miscellaneous

- 367. The area of a rectangle is $a^2 - b^2$ and its length is $a + b$, what will be its breadth?**

- (a) ab (b) $a - b$
 (c) $a + b$ (d) $2ab$

SSC CHSL -15/10/2020 (Shift-I)

Ans. (b) : Length of rectangle = $(a + b)$ (given)

$$\therefore \text{Area of rectangle} = l \times b$$

As per question,

$$(a^2 - b^2) = (a + b) \times \text{breadth}$$

$$\text{breadth} = \frac{(a+b)(a-b)}{(a+b)} = (a-b)$$

368. If $x^4 + y^4 + x^2y^2 = 21$ and $x^2 + y^2 - xy = 7$, then what is the value of $\frac{1}{x^2} + \frac{1}{y^2}$?

- (a) 5/2 (b) 3/2
(c) 5/4 (d) 5/4

SSC Selection Post Graduate Level 08/02/2022 (Shift-III)

Ans. (d) $x^2 + y^2 - xy = 7$ (i)
 $\therefore (x^2 + xy + y^2)(x^2 - xy + y^2) = (x^4 + x^2y^2 + y^4)$
 $(x^2 + xy + y^2)(7) = 21$
 $x^2 + xy + y^2 = 3$ (ii)

On adding equations (i) and (ii)

$$\begin{array}{r} x^2 + xy + y^2 = 3 \\ x^2 - xy + y^2 = 7 \\ \hline 2(x^2 + y^2) = 10 \\ x^2 + y^2 = 5 \end{array}$$

On subtracting equation (i) from (ii)

$$\begin{array}{r} x^2 + xy + y^2 = 3 \\ x^2 - xy + y^2 = 7 \\ \hline - \quad + \quad - \quad - \end{array}$$

$$\begin{array}{r} 2xy = -4 \\ xy = -2 \end{array}$$

$$\frac{1}{x^2} + \frac{1}{y^2} = \frac{y^2 + x^2}{x^2y^2} = \frac{5}{(-2)^2} = \frac{5}{4}$$

369. If $a + \frac{1}{a+1} = 3$, then what is the value of $(a+1)^3 + \frac{1}{(a+1)^3}$?

- (a) 8 (b) 52
(c) 62 (d) 2

SSC Selection Post Graduate Level 09/02/2022 (Shift-III)

Ans. (b) : $a + \frac{1}{a+1} = 3$

On adding 1 both sides

$$a + 1 + \frac{1}{a+1} = 4$$

On cubing both sides,

$$\left(a + 1 + \frac{1}{a+1}\right)^3 = 4^3$$

$$(a+1)^3 + \frac{1}{(a+1)^3} + 3 \times (a+1) \times \frac{1}{(a+1)} \left(a + 1 + \frac{1}{a+1}\right) = 64$$

$$(a+1)^3 + \frac{1}{(a+1)^3} + 3 \times 4 = 64$$

$$(a+1)^3 + \frac{1}{(a+1)^3} = 52$$

370. If $2x^2 + 5x + 1 = 0$, then one of the values of $x - \frac{1}{2x}$ is:

- (a) $\frac{\sqrt{17}}{2}$ (b) $\frac{13}{2}$

- (c) $\frac{5}{2}$ (d) $\frac{\sqrt{13}}{2}$

SSC CGL (Tier-II) 29/01/2022

Ans : (a) $2x^2 + 5x + 1 = 0$

On dividing by $2x$, we have

$$x + \frac{1}{2x} = -\frac{5}{2}$$

On squaring both sides,

$$x^2 + \frac{1}{4x^2} + 1 = \frac{25}{4} \Rightarrow x^2 + \frac{1}{4x^2} = \frac{21}{4}$$

Subtracting 1 from both sides, we get-

$$x^2 + \frac{1}{4x^2} - 1 = \frac{21}{4} - 1$$

$$\left(x - \frac{1}{2x}\right)^2 = \frac{17}{4}$$

$$\Rightarrow x - \frac{1}{2x} = \frac{\sqrt{17}}{2}$$

371. If $a + b - c = 0$, then what is the value of $\frac{(b-c)^2}{4bc} + \frac{(c-a)^2}{4ca} + \frac{(a+b)^2}{4ab}$?

- (a) $\frac{1}{2}$ (b) $-\frac{3}{4}$
(c) $-\frac{1}{2}$ (d) $\frac{3}{4}$

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) : $a + b - c = 0$

$$a + b = c \quad \dots(i)$$

Let, $a = b = 1, c = 2$

Which satisfy equation (i)

$$\begin{aligned} \therefore \frac{(b-c)^2}{4bc} + \frac{(c-a)^2}{4ca} + \frac{(a+b)^2}{4ab} \\ = \frac{1}{4 \times 2} + \frac{1}{4 \times 2} - \frac{4}{4 \times 1} \\ = \frac{2}{8} - 1 = -\frac{3}{4} \end{aligned}$$

372. If $\left(\frac{x}{y} + 1\right) = 4$, then what is the value of $\left(\frac{x^2 + y^2}{y^2}\right)$?

- (a) 22 (b) 14
(c) 10 (d) 12

SSC CHSL 16/04/2021 (Shift-I)

Ans. (c) : $\frac{x}{y} + 1 = 4$ -----(Given)

On squaring both sides,

$$\frac{x^2}{y^2} + 1 + \frac{2x}{y} = 16$$

$$\frac{x^2}{y^2} + 1 + 2 \times 3 = 16 \quad \left(\begin{array}{l} \because \frac{x}{y} + 1 = 4 \\ \therefore \frac{x}{y} = 4 - 1 = 3 \end{array} \right)$$

$$\left(\frac{x^2 + y^2}{y^2} \right) = 10$$

373. If $a^2 + b^2 + c^2 + 170 = 2(8a + 5b - 9c)$, then the value of $\sqrt{4a + 8b - c}$ will be:

- (a) 9 (b) 12
(c) 15 (d) 8

SSC CHSL 13/04/2021 (Shift-III)

Ans. (a) : Given,

$$a^2 + b^2 + c^2 + 170 = 2(8a + 5b - 9c)$$

$$a^2 + b^2 + c^2 + 170 = 16a + 10b - 18c$$

$$a^2 - 16a + 64 + b^2 - 10b + 25 + c^2 + 18c + 81 = 0$$

$$(a-8)^2 + (b-5)^2 + (c+9)^2 = 0$$

$$a = 8, b = 5, c = -9$$

Now, $\sqrt{4a + 8b - c}$

$$\sqrt{4 \times 8 + 8 \times 5 - (-9)}$$

$$\sqrt{32 + 40 + 9}$$

$$\sqrt{81}$$

$$= 9$$

374. When $(2^{24} - 1)$ is divided by 7, the remainder is:

- (a) 2 (b) 0
(c) 4 (d) 1

SSC CHSL 04/08/2021 (Shift-III)

Ans. (b) : $\frac{2^{24} - 1}{7} = \frac{(2^3)^8 - 1}{7} = \frac{1 - 1}{7} = 0$

375. If $a = \frac{\sqrt{5} + 2}{\sqrt{5} - 2}$ and $b = \frac{\sqrt{5} - 2}{\sqrt{5} + 2}$, then the value of

$2a^2 + 2b^2 - 5ab$ is equal to:

- (a) 635 (b) 639
(c) 649 (d) 693

SSC CHSL 12/08/2021 (Shift-II)

Ans. (b) : Given that-

$$a = \frac{\sqrt{5} + 2}{\sqrt{5} - 2} \quad b = \frac{\sqrt{5} - 2}{\sqrt{5} + 2}$$

$$\Rightarrow b = \frac{\sqrt{5} - 2}{\sqrt{5} + 2} \times \frac{\sqrt{5} - 2}{\sqrt{5} - 2}$$

$$\Rightarrow a = \frac{\sqrt{5} + 2}{\sqrt{5} - 2} \times \frac{\sqrt{5} + 2}{\sqrt{5} + 2} \quad \Rightarrow b = \frac{5 + 4 - 4\sqrt{5}}{1} = 9 - 4\sqrt{5}$$

$$\Rightarrow a = \frac{5 + 4 + 4\sqrt{5}}{1} = 9 + 4\sqrt{5}$$

$$\therefore a^2 = 81 + 80 + 72\sqrt{5} = 161 + 72\sqrt{5}$$

$$\therefore b^2 = 81 + 80 - 72\sqrt{5}$$

$$\therefore a^2 = 81 + 80 + 72\sqrt{5} = 161 + 72\sqrt{5} = 161 - 72\sqrt{5}$$

According to the question,

$$2a^2 + 2b^2 - 5ab = 2(161 + 72\sqrt{5}) + 2(161 - 72\sqrt{5}) - 5 \times 1$$

$$= 322 + 2 \times 72\sqrt{5} + 322 - 2 \times 72\sqrt{5} - 5$$

$$= 644 - 5$$

$$= 639$$

376. If $\left[\sqrt{a^2 + b^2 + ab} \right] + \left[\sqrt{a^2 + b^2 - ab} \right] = 1$, then

what is the value of $(1 - a^2)(1 - b^2)$?

- (a) 1/4 (b) 4/7
(c) 5/4 (d) 3/4

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : $\sqrt{a^2 + b^2 + ab} + \sqrt{a^2 + b^2 - ab} = 1$

Squaring both sides,

$$a^2 + b^2 + ab + a^2 + b^2 - ab + 2\sqrt{(a^2 + b^2)^2 - a^2b^2} = 1$$

$$2(a^2 + b^2) + 2\sqrt{a^4 + b^4 + a^2b^2} = 1$$

$$\sqrt{a^4 + b^4 + a^2b^2} = \frac{1}{2} - (a^2 + b^2)$$

$$a^4 + b^4 + a^2b^2 = \frac{1}{4} + (a^2 + b^2)^2 - (a^2 + b^2)$$

$$a^4 + b^4 + a^2b^2 = \frac{1}{4} + (a^4 + b^4 + 2a^2b^2) - a^2 - b^2$$

$$a^2 + b^2 - a^2b^2 = \frac{1}{4}$$

$$\therefore (1 - a^2)(1 - b^2) = 1 - a^2 - b^2 + a^2b^2$$

$$= 1 - \frac{1}{4} = \frac{3}{4}$$

377. $ab(a-b) + bc(b-c) + ca(c-a)$ is equal to :

- (a) $(a-b)(b+c)(c-a)$ (b) $(b-a)(b-c)(c-a)$
(c) $(a+b)(b-c)(c-a)$ (d) $(a-b)(b-c)(c-a)$

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Ans. (b) : $ab(a-b) + bc(b-c) + ca(c-a)$

By putting the value.

$$a = 1, b = 2, c = 3$$

$$= 2 \times (-1) + 6 \times (-1) + 3 \times 2 = -2$$

From option (b)

$$(b-a)(b-c)(c-a)$$

$$= (2-1)(2-3)(3-1)$$

$$= 1 \times (-1) \times 2 = -2$$

378. If $y^2 = y + 7$, then what is the value of y^3 ?

- (a) $8y + 7$ (b) $y + 14$
(c) $y + 2$ (d) $4y + 7$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $y^2 = y + 7$ (1)

Multiplying by y,

$$y^3 = y^2 + 7y$$
 (2)

By adding of equation (i) and (ii)

$$y^2 + y^3 = y + 7 + y^2 + 7y$$

$$y^3 = 8y + 7$$

379. If $x = (a/b) + (b/a)$, $y = (b/c) + (c/b)$ and $z = (c/a) + (a/c)$, then what is the value of $xyz - x^2 - y^2 - z^2$?

- (a) -4 (b) 2
(c) -1 (d) -6

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : $x = \frac{a}{b} + \frac{b}{a}$, $y = \frac{b}{c} + \frac{c}{a}$, $z = \frac{c}{a} + \frac{a}{c}$
By putting the value $a = b = c = 1$
 $x = y = z = 2$
By putting the value in equation-
 $= xyz - (x^2 + y^2 + z^2)$
 $= 2 \times 2 \times 2 - (4 + 4 + 4) = -4$

380. If $a + a^2 + a^3 - 1 = 0$, then what is the value of $a^3 + (1/a)$?

- (a) 1 (b) 4
(c) 2 (d) 3

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Ans. (c) : $a + a^2 + a^3 = 1$ (1)
On multiplying by a
 $a^2 + a^3 + a^4 = a$ (2)
From equation (2) & equation (1),
 $a^4 - a = a - 1$
 $a^4 - 2a + 1 = 0$
 $a^3 + \frac{1}{a} = 2$

381. If $x^{2a} = y^{2b} = z^{2c} \neq 0$ and $x^2 = yz$, then the value of $\frac{ab + bc + ca}{bc}$ is:

- (a) 3 (b) 3bc
(c) 3ab (d) 3ac

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-I)

Ans. (a) : Let, $x^{2a} = y^{2b} = z^{2c} = k$
 $x = k^{\frac{1}{2a}}$, $y = k^{\frac{1}{2b}}$, $z = k^{\frac{1}{2c}}$
From, $x^2 = yz$
 $k^{\frac{1}{a}} = k^{\frac{1}{2b}} \cdot k^{\frac{1}{2c}}$
 $k^{\frac{1}{a}} = k^{\left(\frac{1}{2b} + \frac{1}{2c}\right)}$
 $\frac{1}{a} = \frac{1}{2b} + \frac{1}{2c}$, $\frac{1}{a} = \frac{c+b}{2bc}$
 $ab + ac = 2bc$
Hence, $\frac{ab + bc + ca}{bc} = \frac{3bc}{bc} = 3$

Trick:

$$\begin{aligned} x^2 &= yz \\ x &= y = z = 2 \\ \therefore a &= b = c = 2 \\ &= \frac{ab + bc + ca}{bc} \\ &= \frac{4 + 4 + 4}{4} = \frac{12}{4} = 3 \end{aligned}$$

382. If $b + c = ax$, $c + a = by$, $a + b = cz$, then the value of $\frac{1}{9} \left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} \right]$ is:

- (a) 1 (b) 0
(c) $\frac{1}{9}$ (d) $\frac{1}{3}$

SSC CGL (Tier-I)-2019 - 06/03/2020 (Shift-III)

Ans. (c) : $b + c = ax$
 $x = \frac{b+c}{a}$
Thus, $y = \frac{c+a}{b}$, $z = \frac{a+b}{c}$
 $\therefore \frac{1}{9} \left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} \right]$
 $= \frac{1}{9} \left[\frac{1}{\frac{b+c}{a} + 1} + \frac{1}{\frac{c+a}{b} + 1} + \frac{1}{\frac{a+b}{c} + 1} \right]$
 $= \frac{1}{9} \left[\frac{a}{a+b+c} + \frac{b}{c+a+b} + \frac{c}{a+b+c} \right]$
 $= \frac{1}{9} \left[\frac{a+b+c}{a+b+c} \right]$, $\frac{1}{9} \times 1 = \frac{1}{9}$

383. If $3^a = 27^b = 81^c$ and $abc = 144$, then the value of $12 \left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c} \right)$ is:

- (a) $\frac{18}{120}$ (b) $\frac{33}{10}$
(c) $\frac{17}{120}$ (d) $\frac{18}{10}$

SSC CGL (Tier-I)-2019 - 06/03/2020 (Shift-I)

Ans. (b) : $3^a = 27^b = 81^c$
 $3^a = 3^{3b} = 3^{4c}$
 $a = 3b = 4c$
 $a : b : c = 1 : \frac{1}{3} : \frac{1}{4} = 12 : 4 : 3$
Let, $a = 12k$, $b = 4k$, $c = 3k$
 $\therefore abc = 144$
 $\therefore 12k \times 4k \times 3k = 144$
 $144k^3 = 144$
 $k^3 = 1 \Rightarrow k = 1$
then, $a = 12k \Rightarrow 12 \times 1 = 12$
 $b = 4k \Rightarrow 4 \times 1 = 4$
 $c = 3k \Rightarrow 3 \times 1 = 3$
Hence $12 \left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c} \right)$
 $= 12 \left(\frac{1}{12} + \frac{1}{8} + \frac{1}{15} \right) = 12 \left[\frac{10+15+8}{120} \right]$
 $= 12 \times \frac{33}{120} = \frac{33}{10}$

384. If the value of $(a+b-2)^2 + (b+c-5)^2 + (c+a-5)^2 = 0$, then the value of $\sqrt{(b+c)^a + (c+a)^b} - 1$ is:
- (a) 3 (b) 2
(c) 0 (d) 1

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (a) : $(a+b-2)^2 + (b+c-5)^2 + (c+a-5)^2 = 0$
It is possible only when
 $a+b-2=0, b+c-5=0, c+a-5=0$
then, $a+b=2$
 $b+c=5$
 $c+a=5$
 $2(a+b+c)=12$
 $a+b+c=6$
 $\therefore a=1, b=1, c=4$
then, $\sqrt{(b+c)^a + (c+a)^b} - 1 = \sqrt{5^1 + 5^1} - 1 = \sqrt{9} = 3$

385. If x, y, z are three numbers such that $x+y=13, y+z=15$ and $z+x=16$, then the value of $\frac{xy+xz}{xyz}$ is:

- (a) $\frac{5}{36}$ (b) $\frac{18}{5}$
(c) $\frac{5}{18}$ (d) $\frac{36}{5}$

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (c) : $x+y=13$ (1)
 $y+z=15$ (2)
 $z+x=16$ (3)
From equation (1) + (2) + (3)
 $x+y+z=22$
 $\therefore x=7, y=6, z=9$
 $\therefore \frac{xy+xz}{xyz} = \frac{y+z}{yz} = \frac{6+9}{54} = \frac{5}{18}$

386. If $a=2b=8c$ and $a+b+c=13$ then the value of $\frac{\sqrt{a^2+b^2+c^2}}{2c}$ is:

- (a) $\frac{9}{2}$ (b) $\frac{5}{6}$
(c) $-\frac{9}{2}$ (d) $-\frac{5}{6}$

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (a) : $a=2b=8c$
 $a:b:c=1:\frac{1}{2}:\frac{1}{8}=8:4:1$
On taking the value of a, b and $C, 8, 4, 1$ respectively
 $a+b+c=8+4+1=13$
 $\therefore \frac{\sqrt{a^2+b^2+c^2}}{2c} = \frac{\sqrt{64+16+1}}{2} = \frac{9}{2}$

387. If $3\sqrt{\frac{1-a}{a}} + 9 = 19 - 3\sqrt{\frac{a}{1-a}}$ then what is the value of a ?
- (a) $\frac{3}{10}, \frac{7}{10}$ (b) $\frac{1}{10}, \frac{9}{10}$
(c) $\frac{2}{5}, \frac{3}{5}$ (d) $\frac{1}{5}, \frac{4}{5}$

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Ans. (b) :

$$3\sqrt{\frac{1-a}{a}} + 9 = 19 - 3\sqrt{\frac{a}{1-a}}$$

$$3\left(\sqrt{\frac{1-a}{a}} + \sqrt{\frac{a}{1-a}}\right) = 10$$

$$\sqrt{\frac{1-a}{a}} + \sqrt{\frac{a}{1-a}} = \frac{10}{3}$$

By squaring both sides

$$\frac{1-a}{a} + \frac{a}{1-a} + 2 = \frac{100}{9}$$

$$\frac{1+a^2-2a+a^2+2a-2a^2}{a(1-a)} = \frac{100}{9}$$

$$100a - 100a^2 = 9$$

$$100a^2 - 100a + 9 = 0$$

$$a = \frac{90}{100}, \frac{10}{100}$$

$$a = \frac{9}{10}, \frac{1}{10}$$

388. If $a+b=10$ and $\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$, then what is the value of $3ab + 4a^2 + 5b^2$?

- (a) 450 (b) 300
(c) 600 (d) 750

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Ans. (b) : $a+b=10$ (i)

$$\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$$

$$\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = 2$$

By squaring both sides,

$$\frac{a}{b} + \frac{b}{a} + 2 = 4$$

$$a^2 + b^2 = 2ab$$

$$(a-b)^2 = 0$$

$$a=b$$

$$\therefore a=b=5$$

$$3ab + 4a^2 + 5b^2$$

$$= 3 \times 5 \times 5 + 4 \times 25 + 5 \times 25$$

$$= 75 + 100 + 125 = 300$$

389. If $(x+y)/z=2$, then what is the value of $[y/(y-z)] + [x/(x-z)]$?

- (a) 0 (b) 1
(c) 2 (d) -1

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Ans. (c) :

$$\frac{(x+y)}{z} = 2$$

$$x + y = 2z$$

$$y = 2z - x$$

$$\left[\frac{y}{(y-z)} + \frac{x}{x-z} \right]$$

By putting the value of y.

$$= \left[\frac{2z-x}{(2z-x-z)} + \frac{x}{x-z} \right]$$

$$= \left[\frac{2z-x}{z-x} + \frac{x}{x-z} \right]$$

$$= \left[\frac{2z-x}{z-x} - \frac{x}{z-x} \right]$$

$$= 2 \left[\frac{z-x}{z-x} \right] = 2$$

390. $p^3+q^3+r^3-3pqr = 4$. If $a = q+r$, $b=r+p$ and $c=p+q$, then what is the value of $a^3+b^3+c^3-3abc$?

- (a) 4 (b) 8
(c) 2 (d) 12

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Ans. (b) : $a + b + c = q + r + r + p + p + q = 2(p+q+r)$

$$a^3 + b^3 + c^3 - 3abc$$

$$= \frac{1}{2}(a+b+c) \left[(a-b)^2 + (b-c)^2 + (c-a)^2 \right]$$

$$= (p+q+r) \left[(q-p)^2 + (r-q)^2 + (p-r)^2 \right]$$

$$= (p+q+r) \left[(p-q)^2 + (q-r)^2 + (r-p)^2 \right]$$

$$= 2[p^3 + q^3 + r^3 - 3pqr]$$

$$= 2 \times 4 = 8$$

Method II -

By value putting, Equations = 4, Variables = 2

if $q = r = 0$

$$p^3 = 4, a = 0, b = p, c = p$$

Hence $a^3 + b^3 + c^3 - 3abc$

$$= 0 + p^3 + p^3 - 0$$

$$= 2p^3 = 2 \times 4 = 8$$

391. If $a - (1/a) = b$, $b - (1/b) = c$ and $c - (1/c) = a$, then what is the value of $(1/ab) + (1/bc) + (1/ca)$?

- (a) -3 (b) -6
(c) -1 (d) -9

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : $a - \frac{1}{a} = b$

$$a - b = \frac{1}{a} \text{-----(i)}$$

Thus, $b - c = \frac{1}{b} \text{-----(ii)}$

$$c - a = \frac{1}{c} \text{-----(iii)}$$

From equation (i) \times (ii) + equation (ii) \times (iii) + equation (iii) \times (i),

$$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = (a-b)(b-c) + (b-c)(c-a) + (c-a)(a-b)$$

$$= ab - ac - b^2 + bc + bc - ab - c^2 + ca + ca - cb - a^2 + ab$$

$$= (ab + bc + ca) - (a^2 + b^2 + c^2) \text{-----(iv)}$$

Again, from the given equation

$$a - \frac{1}{a} = b \Rightarrow a^2 - 1 = ab$$

Thus $b^2 - 1 = bc$ and $c^2 - 1 = ac$

From equation (iv)

$$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = (a^2 - 1 + b^2 - 1 + c^2 - 1) - (a^2 + b^2 + c^2) = -3$$

392. If $(x/a) + (y/b) = 3$ and $(x/b) - (y/a) = 9$, then what is the value of x/y ?

- (a) $(b+3a)/(a-3b)$ (b) $(a+3b)/(b-3a)$
(c) $(1+3a)/(a+3b)$ (d) $(a+3b^2)/(b-3a^2)$

SSC CGL (Tier-II) 18-02-2018

Ans. (a): Given-

$$\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 3, \left(\frac{x}{b}\right) - \left(\frac{y}{a}\right) = 9$$

$$xb + ya = 3ab \text{..... (i)}$$

$$xa - yb = 9ab \text{..... (ii)}$$

Putting 3ab in equation (ii)

$$xa - yb = 3(xb+ya)$$

$$3xb + 3ya = xa - yb$$

$$3xb - xa = -yb - 3ya$$

$$x(3b-a) = -y(b+3a)$$

$$\frac{x}{y} = \left(\frac{b+3a}{a-3b}\right)$$

393. If $[a+(1/a)]^2 - 2[a-(1/a)] = 12$, then which of the following is a value of 'a'?

- (a) $-8 + \sqrt{3}$ (b) $-8 - \sqrt{3}$
(c) $-8 + \sqrt{5}$ (d) None of these

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : Given equation

$$\left[a + \frac{1}{a}\right]^2 - 2\left[a - \frac{1}{a}\right] = 12$$

$$\left(a - \frac{1}{a}\right)^2 + 4 - 2\left(a - \frac{1}{a}\right) = 12$$

$$\left(a - \frac{1}{a}\right)^2 - 2\left(a - \frac{1}{a}\right) = 8 \text{.....(1)}$$

Let $\left(a - \frac{1}{a}\right) = y$ From equation (1)

$$y^2 - 2y - 8 = 0$$

$$y = \frac{2 \pm \sqrt{4+32}}{2}$$

$$y = 4, -2$$

$$a - \frac{1}{a} = 4, \quad a - \frac{1}{a} = -2$$

$$(a^2 - 1 - 4a) = 0, \quad a^2 + 2a - 1 = 0$$

$$a = \frac{4 \pm \sqrt{36+4}}{2}, \quad (a+1)^2 - 2 = 0, \quad a+1 = \pm\sqrt{2}$$

$$a = 2 \pm \sqrt{5} \text{ (None of these)}$$

394. If $x^2 - 4x + 1 = 0$, then what is the value of $x^9 + x^7 - 194x^5 - 194x^3$?

- (a) 4 (b) -4
(c) 1 (d) -1

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : Equation $x^2 - 4x + 1 = 0$

$$x + \frac{1}{x} = 4$$

By squaring both sides

$$\Rightarrow x^2 + \frac{1}{x^2} = 14$$

again squaring both sides

$$x^4 + \frac{1}{x^4} = 196 - 2$$

$$x^4 + \frac{1}{x^4} = 194$$

$$x^4 - 194 = \frac{-1}{x^4} \quad \dots(i)$$

$$\Rightarrow x^9 + x^7 - 194x^5 - 194x^3$$

$$= x^5(x^4 - 194) + x^3(x^4 - 194)$$

$$= x^5 \times \left(\frac{-1}{x^4}\right) + x^3 \times \left(\frac{-1}{x^4}\right) = -\left(x + \frac{1}{x}\right)$$

$$= -4$$

395. x, y and z all are positive number. If $3^x > 9^y$ and $2^y > 4^z$, then which of the following is TRUE?

- (a) $x > y > z$ (b) $x > z > y$
(c) $z > y > x$ (d) $y > x > z$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

$$\because 3^x > 9^y$$

$$3^x > 3^{2y}$$

$$\therefore x > 2y$$

$$x > y$$

Again

$$\because 2^y > 4^z$$

$$2^y > 2^{2z}$$

$$\therefore y > 2z$$

$$y > z$$

Hence, from the above we can say that,

$$\therefore x > y > z$$

396. If $x = (1/8)$, which of the following has the largest values?

- (a) $x/2$ (b) x^2
(c) \sqrt{x} (d) $1/x$

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$x = \frac{1}{8}$$

On squaring both side in equation (i)

$$x^2 = \frac{1}{64}$$

Taking both side square root in eqⁿ (i)

$$\sqrt{x} = \frac{1}{2\sqrt{2}}$$

$$\frac{1}{x} = 8$$

Hence $\frac{1}{x}$ is the greatest

397. If $A = 1 + 2^P$ and $B = 1 + 2^{-P}$, then what is the value of B?

- (a) $(A+1)/(A-1)$ (b) $(A+2)/(A+1)$
(c) $A/(A-1)$ (d) $(A-2)/(A+1)$

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

$$B = 1 + 2^{-P}$$

$$= 1 + \frac{1}{2^P} = \frac{2^P + 1}{2^P} = \frac{A}{A-1}$$

398. If $x + y + z = 0$, then what is the value of $(3y^2 + x^2 + z^2)/(2y^2 - xz)$?

- (a) 2 (b) 1
(c) $3/2$ (d) $5/3$

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : $x + y + z = 0$

By putting the value $x = 1, y = -2, z = 1$

$$1 - 2 + 1 = 0$$

$$0 = 0$$

$$\therefore \frac{3y^2 + x^2 + z^2}{2y^2 - xz} = \frac{3 \times (-2)^2 + 1^2 + 1^2}{2 \times (-2)^2 - 1 \times 1} = \frac{14}{7} = 2$$

399. If $(a + b)/c = 6/5$ and $(b + c)/a = 9/2$, then what is the value of $(a + c)/b$?

- (a) $9/5$ (b) $11/7$
(c) $7/11$ (d) $7/4$

SSC CGL (Tier-II) 17-02-2018

Ans. (d) : $\frac{a+b}{c} = \frac{6}{5}$ (i),

$$\frac{b+c}{a} = \frac{9}{2}$$
 (ii),

$$\frac{a+c}{b} = ?$$

on comparing ,
 $a + b = 6$
 $c = 5$
 $b + c = 9$
 $c = 5$ on putting
 $b = 4$
 $a = 2$
 $\therefore \frac{a+c}{b} = \frac{2+5}{4} = \frac{7}{4}$

400. If $x_1x_2x_3 = 4(4+x_1+x_2+x_3)$, then what is the value of $[1/(2+x_1)] + [1/(2+x_2)] + [1/(2+x_3)]$?
 (a) 1 (b) 1/2
 (c) 2 (d) 1/3

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : $x_1x_2x_3 = 4(4+x_1+x_2+x_3)$
 putting $x_1 = x_2 = x_3 = 4$
 $4 \times 4 \times 4 = 4(4+4+4+4)$
 $64 = 64$
 $\therefore \frac{1}{2+x_1} + \frac{1}{2+x_2} + \frac{1}{2+x_3} = \frac{1}{2+4} + \frac{1}{2+4} + \frac{1}{2+4}$
 $= \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{3}{6}$
 $= \frac{1}{2}$

401. If $x^4 + x^2y^2 + y^4 = \frac{21}{256}$ and $x^2 + xy + y^2 = \frac{3}{16}$, then $2(x^2 + y^2) =$
 (a) $\frac{5}{16}$ (b) $\frac{3}{8}$
 (c) $\frac{3}{4}$ (d) $\frac{5}{8}$

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d) $x^2 - xy + y^2 = \frac{x^4 + x^2y^2 + y^4}{x^2 + xy + y^2}$
 $= \frac{21}{256} \times \frac{16}{3} = \frac{7}{16}$... (i)
 $x^2 + xy + y^2 = \frac{3}{16}$... (ii)
 By adding $2(x^2 + y^2) = \frac{10}{16} = \frac{5}{8}$

402. If $x = 2 + \sqrt{3}$, then find the value of $x^4 - 8x^3 + 16x^2$.
 (a) 2 (b) 1
 (c) 0 (d) -1

SSC CHSL –15/10/2020 (Shift-II)

Ans. (b) : $x = 2 + \sqrt{3}$
 $x - 2 = \sqrt{3}$
 $(x - 2)^2 = (\sqrt{3})^2$ [By squaring both sides]

$x^2 - 4x + 4 = 3$
 $x^2 - 4x = -1$
 On squaring both sides [
 $(x^2 - 4x)^2 = (-1)^2$
 $x^4 - 8x^3 + 16x^2 = 1$

403. If $a + b + c + d = 2$, then the maximum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is _____?
 (a) $\frac{54}{13}$ (b) $\frac{63}{22}$
 (c) $\frac{81}{16}$ (d) $\frac{91}{9}$

SSC CHSL –18/03/2020 (Shift-II)

Ans. (c) : $a + b + c + d = 2$ ----- (Given)
 For the maximum value we will take $a = b = c = d$
 $\therefore a = b = c = d = \frac{1}{2}$
 then, $(1 + a)(1 + b)(1 + c)(1 + d)$
 $= \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{81}{16}$

404. If $A = \frac{x-1}{x+1}$, then the value of $A - \frac{1}{A}$ is:
 (a) $\frac{-4(2x-1)}{x^2-1}$ (b) $\frac{-4x}{x^2-1}$
 (c) $\frac{x^2-1}{-4(2x-1)}$ (d) $\frac{x^2-1}{-4(2x+1)}$

SSC CHSL –19/03/2020 (Shift-III)

Ans. (b) : $\because A = \frac{x-1}{x+1}$
 $\therefore \frac{1}{A} = \frac{x+1}{x-1}$
 $A - \frac{1}{A} = \frac{x-1}{x+1} - \frac{x+1}{x-1} = \frac{(x-1)^2 - (x+1)^2}{x^2-1}$
 $= \frac{x^2 - 2x + 1 - x^2 - 2x - 1}{x^2-1}$
 Hence $A - \frac{1}{A} = \frac{-4x}{x^2-1}$

405. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^{18} + x^{12} + x^6 + 1$ is:
 (a) 1 (b) 3
 (c) 0 (d) 2

SSC CHSL –21/10/2020 (Shift-III)

Ans. (c)
 $x + \frac{1}{x} = \sqrt{3}$
 $x^3 + \frac{1}{x^3} = (\sqrt{3})^3 - 3\sqrt{3}$

$$x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3}$$

$$x^3 + \frac{1}{x^3} = 0 \Rightarrow x^6 + 1 = 0$$

From question $x^{18} + x^{12} + x^6 + 1$
 $= x^{12}(x^6+1) + (x^6+1) = 0 + 0 = 0$

406. If $x = \frac{\sqrt{3}}{2}$, then the value of $\frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} - \sqrt{1-x}}$ is equal to?
 (a) $\sqrt{2}$ (b) 2
 (c) 3 (d) $\sqrt{3}$

SSC CHSL-21/10/2020 (Shift-II)

Ans. (d)

Givne $x = \frac{\sqrt{3}}{2}$

$$\frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} - \sqrt{1-x}} \times \frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}$$

$$= \frac{(1+x) + (1-x) + 2\sqrt{(1+x)(1-x)}}{(1+x) - (1-x)}$$

$$= \frac{2 + 2\sqrt{1-x^2}}{2x} = \frac{1 + \sqrt{1-x^2}}{x}$$

$$= \frac{1 + \sqrt{1 - \frac{3}{4}}}{\frac{\sqrt{3}}{2}} = \frac{1 + \frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

407. If $x = \sqrt[3]{5} + 2$, then the value of $x^3 - 6x^2 + 12x - 12$ is equal to?
 (a) 0 (b) 2
 (c) 1 (d) -1

SSC CHSL -21/10/2020 (Shift-I)

Ans. (c) Given

$$x = \sqrt[3]{5} + 2$$

$$x - 2 = \sqrt[3]{5}$$

On cubing both sides

$$(x - 2)^3 = (\sqrt[3]{5})^3$$

$$x^3 - 8 - 6x(x - 2) = 5$$

$$x^3 - 8 - 6x^2 + 12x - 4 = 1$$

$$\therefore x^3 - 6x^2 + 12x - 12 = 1$$

408. If $x/y = 3/5$, then what is the ratio of $(3x + 2y)$ and $(3x - y)$?
 (a) 19: 4 (b) 19: 7
 (c) 17: 4 (d) 17: 7

SSC MTS 9-10-2017 (Shift-III)

Ans : (a) $\because \frac{x}{y} = \frac{3}{5}$ -----[Given]

On putting the value of $x = 3$, and $y = 5$ in given expression

$$\frac{3x + 2y}{3x - y} = \frac{3 \times 3 + 2 \times 5}{3 \times 3 - 5} = \frac{19}{4}$$

409. For what value of k will the expression $p + \frac{1}{9}\sqrt{p} + k^2$ be a perfect square?
 (a) $k = \pm \frac{1}{8}$
 (b) $k = \pm \frac{1}{9}$
 (c) $k = \pm \frac{1}{21}$
 (d) $k = \pm \frac{1}{18}$

SSC CHSL 10/06/2022 (Shift- II)

Ans. (d) : From question,

$$p + \frac{1}{9}\sqrt{p} + k^2$$

Formula -
 $(x + y)^2 = x^2 + 2xy + y^2$
 Where, $x^2 = p$, $y^2 = k^2$
 $\Rightarrow x = \sqrt{p}$ $\Rightarrow y = k$
 $\therefore (\sqrt{p})^2 \pm 2 \times \sqrt{p} \times k + k^2$
 On taking, $\pm 2\sqrt{p}k = \frac{1}{9}\sqrt{p}$

$$k = \pm \frac{1}{18}$$

410. What is the value of $[(a^{-2}b^3) \div (a^1b^{-1})] \times [(a^2b^{-4}) \div (a^{-1}b^2)]$?
 (a) b^2 (b) $1/b^2$
 (c) a^2 (d) a^2b^2

SSC MTS 9-10-2017 (Shift-I)

Ans : (b) $[(a^{-2}b^3) \div (a^1b^{-1})] \times [(a^2b^{-4}) \div (a^{-1}b^2)]$

$$= \left[\left(\frac{b^3}{a^2} \right) \div \left(\frac{a}{b} \right) \right] \times \left[\left(\frac{a^2}{b^4} \right) \div \left(\frac{b^2}{a} \right) \right]$$

$$= \left[\frac{b^3 \times b}{a^2 \times a} \right] \times \left[\frac{a^2 \times a}{b^4 \times b^2} \right]$$

$$= \frac{b^4}{a^3} \times \frac{a^3}{b^6}$$

$$= \frac{1}{b^2}$$

(I) Problems based on Trigonometric Ratios

1. If $5 \sin \theta - 4 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\frac{5 \sin \theta - \cos \theta}{5 \sin \theta + 3 \cos \theta}$ is
- (a) $\frac{2}{7}$ (b) $\frac{3}{7}$
(c) $\frac{6}{7}$ (d) $\frac{4}{7}$

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans. (b) Given,
 $5 \sin \theta - 4 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$
 $5 \sin \theta = 4 \cos \theta$
 According to the question,

$$\frac{5 \sin \theta - \cos \theta}{5 \sin \theta + 3 \cos \theta}$$

$$= \frac{4 \cos \theta - \cos \theta}{4 \cos \theta + 3 \cos \theta}$$

$$= \frac{3 \cos \theta}{7 \cos \theta} = \frac{3}{7}$$

2. If $\cos B = \frac{5}{7}$, What is the value of $\operatorname{cosec} B + \cot B$?

Given that $0 < B < \frac{\pi}{2}$

- (a) $\frac{5}{\sqrt{6}}$ (b) $\frac{6}{\sqrt{12}}$
(c) $\frac{7}{\sqrt{6}}$ (d) $\sqrt{6}$

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (d) Given $\cos B = \frac{5}{7}$
 $\sin B = \sqrt{1 - \cos^2 B}$

$$= \sqrt{1 - \left(\frac{5}{7}\right)^2}$$

$$= \sqrt{\frac{24}{49}}$$

$$= \frac{2\sqrt{6}}{7}$$

$$\therefore \operatorname{cosec} B + \cot B = \frac{1}{\sin B} + \frac{\cos B}{\sin B}$$

$$= \frac{7}{2\sqrt{6}} + \frac{5/7}{2\sqrt{6}}$$

$$= \frac{7}{2\sqrt{6}} + \frac{5/7}{2\sqrt{6}}$$

$$= \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}}$$

$$= \frac{12}{2\sqrt{6}}$$

$$= \sqrt{6}$$

3. If $5 \sin \theta - 4 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\frac{5 \sin \theta + 2 \cos \theta}{5 \sin \theta + 3 \cos \theta}$ is:

- (a) $\frac{4}{7}$ (b) $\frac{6}{7}$
(c) $\frac{2}{7}$ (d) $\frac{3}{7}$

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (b) Given,
 $5 \sin \theta = 4 \cos \theta$
 According to the question,

$$\frac{5 \sin \theta + 2 \cos \theta}{5 \sin \theta + 3 \cos \theta} = ?$$

$$= \frac{4 \cos \theta + 2 \cos \theta}{4 \cos \theta + 3 \cos \theta} = \frac{6 \cos \theta}{7 \cos \theta}$$

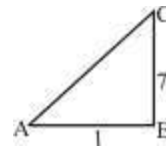
$$= \frac{6}{7}$$

4. If $\tan^2 A + 2 \tan A - 63 = 0$ Given that $0 < A < \frac{\pi}{2}$ what is the value of $(2 \sin A + 5 \cos A)$?

- (a) $19\sqrt{50}$ (b) $15\sqrt{50}$
(c) $\frac{19}{\sqrt{50}}$ (d) $\frac{15}{\sqrt{50}}$

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (c) $\tan^2 A + 2 \tan A - 63 = 0$
 $\tan^2 A + 9 \tan A - 7 \tan A - 63 = 0$
 $\tan A (\tan A + 9) - 7 (\tan A + 9) = 0$
 $(\tan A + 9) (\tan A - 7) = 0$
 $\tan A = 7$



Value of $AC = \sqrt{7^2 + 1^2} = \sqrt{50}$
 $2 \sin A + 5 \cos A$

$$= 2 \times \frac{7}{\sqrt{50}} + 5 \times \frac{1}{\sqrt{50}}$$

$$= \frac{19}{\sqrt{50}}$$

5. If $\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta} = \frac{k+1}{1-k}$, $k \neq 1$, then k is equal to:

- (a) $\sin \theta$ (b) $\operatorname{cosec} \theta$
 (c) $\cos \theta$ (d) $\sec \theta$

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) : $\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta} = \frac{k+1}{1-k}$
 $\frac{1 + \sin \theta}{1 - \sin \theta} = \frac{1+k}{1-k}$
 $1-k + \sin \theta - k \sin \theta = 1 + k - \sin \theta - k \sin \theta$
 $2k = 2 \sin \theta$
 $k = \sin \theta$

Trick:-

$$\frac{\cot \theta + \cos \theta}{\cot \theta - \cos \theta} = \frac{k+1}{1-k}$$

By componendo and dividendo rule

$$\frac{\cos \theta}{\cot \theta} = \frac{k}{1}$$

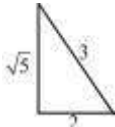
$$\sin \theta = k$$

6. If $\cos\theta = \frac{2}{3}$, then $2\sec^2\theta + 2\tan^2\theta - 6$ equals:

- (a) 1 (b) 4
 (c) 2 (d) 0

SSC CHSL 15/04/2021 (Shift-I)

Ans. (a) : Given, $\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{2}{3}$



By Pythagoras theorem,
 $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

$$(\text{Perpendicular})^2 = (3)^2 - (2)^2$$

$$\text{Perpendicular} = \sqrt{9-4}$$

$$= \sqrt{5}$$

According to the question,

$$2\sec^2\theta + 2\tan^2\theta - 6 \quad \left(\because \sec\theta = \frac{H}{B}, \tan\theta = \frac{P}{B} \right)$$

$$= 2\left(\frac{3}{2}\right)^2 + 2\left(\frac{\sqrt{5}}{2}\right)^2 - 6$$

$$= 2 \times \frac{9}{4} + 2 \times \frac{5}{4} - 6$$

$$= \frac{9}{2} + \frac{5}{2} - 6$$

$$= 7 - 6 = 1$$

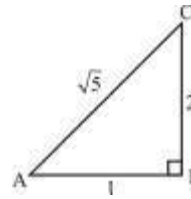
7. In ΔABC , right angled at B, if $\cot A = \frac{1}{2}$, then

the value of $\frac{\sin A (\cos C + \cos A)}{\cos C (\sin C - \sin A)}$ is :

- (a) 3 (b) -3
 (c) -2 (d) 2

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) : $\cot A = \frac{1}{2} = \frac{B}{P}$ -----[Given]



By Pythagoras theorem,

$$H = \sqrt{(1)^2 + (2)^2} = \sqrt{5}$$

$$\frac{\sin A (\cos C + \cos A)}{\cos C (\sin C - \sin A)} = \frac{2}{\sqrt{5}} \left(\frac{2}{\sqrt{5}} + \frac{1}{\sqrt{5}} \right)$$

$$= \frac{2}{\sqrt{5}} \left(\frac{1}{\sqrt{5}} - \frac{2}{\sqrt{5}} \right)$$

$$= \frac{3}{\sqrt{5}} = -3$$

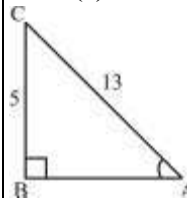
8. If $\sin A = \frac{5}{13}$ and $7 \cot B = 24$, then the value of

$(\sec A \cos B) (\operatorname{cosec} B \tan A)$ is:

- (a) $\frac{65}{42}$ (b) $\frac{13}{14}$
 (c) $\frac{15}{13}$ (d) $\frac{13}{7}$

SSC CGL (Tier-II) 29/01/2022

Ans : (a) According to the question,



$$AB = \sqrt{13^2 - 5^2}$$

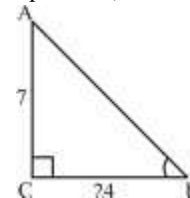
$$AB = \sqrt{144}$$

$$AB = 12$$

$(\sec A \cdot \cos B) (\operatorname{cosec} B \tan A)$

$$= \left(\frac{13}{12} \cdot \frac{24}{25} \right) \left(\frac{25}{7} \cdot \frac{5}{12} \right)$$

$$= \frac{65}{42}$$



$$AB = \sqrt{24^2 + 7^2}$$

$$AB = \sqrt{625}$$

$$AB = 25$$

9. In ΔPQR , $\angle Q = 90^\circ$. If $\tan R = \frac{1}{3}$, then what

is the value of $\frac{\sec P (\cos R + \sin P)}{\operatorname{cosec} R (\sin R - \operatorname{cosec} P)}$?

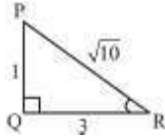
- (a) $\frac{18}{7}$ (b) $-\frac{18}{7}$
 (c) $-\frac{2}{7}$ (d) $\frac{2}{7}$

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (b) : Given,

$\angle Q = 90^\circ$]

$$\tan R = \frac{1}{3} = \frac{P}{B}$$



From Pythagoras theorem.

$$H = \sqrt{P^2 + B^2}$$

$$H = \sqrt{1^2 + 3^2}$$

$$H = \sqrt{10}$$

Then, $\frac{\sec P(\cos R + \sin P)}{\operatorname{cosec} R(\sin R - \operatorname{cosec} P)}$

$$= \frac{\frac{\sqrt{10}}{1} \left(\frac{3}{\sqrt{10}} + \frac{3}{\sqrt{10}} \right)}{\frac{\sqrt{10}}{1} \left(\frac{1}{\sqrt{10}} - \frac{\sqrt{10}}{3} \right)}$$

$$= \frac{\frac{6}{\sqrt{10}} \times \sqrt{10}}{\sqrt{10} \left(\frac{3-10}{3\sqrt{10}} \right)}$$

$$\frac{6}{-\frac{7}{3}} = -\frac{18}{7}$$

10. If $\sin A = \frac{1}{2}$, A is an acute angle, then find the

value of $\frac{\tan A - \cot A}{\sqrt{3}(1 + \operatorname{cosec} A)}$:

- (a) $\frac{4\sqrt{3}}{9}$ (b) $\frac{2}{9}$
 (c) $-\frac{2}{9}$ (d) $-\frac{4\sqrt{3}}{9}$

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) : Given that, $\sin A = \frac{1}{2}$

$$\sin A = \sin 30^\circ$$

$$\therefore A = 30^\circ$$

On putting the value of A

$$\frac{\tan A - \cot A}{\sqrt{3}(1 + \operatorname{cosec} A)} = \frac{\tan 30^\circ - \cot 30^\circ}{\sqrt{3}(1 + \operatorname{cosec} 30^\circ)} = \frac{\frac{1}{\sqrt{3}} - \sqrt{3}}{\sqrt{3}(1+2)}$$

$$= \frac{\frac{1-3}{\sqrt{3}}}{3\sqrt{3}} = \frac{-2}{9}$$

11. If $\sin \theta = \frac{11}{15}$, then the value of $(\sec \theta - \tan \theta)$ is:

- (a) $\frac{2\sqrt{26}}{13}$ (b) $\frac{\sqrt{26}}{13}$
 (c) $\frac{4}{\sqrt{26}}$ (d) $\frac{1}{\sqrt{26}}$

SSC CHSL 19/04/2021 (Shift-I)

Ans. (b) : $\sin \theta = \frac{11}{15}$ (Given)

$$\cos \theta = \sqrt{1 - \sin^2 \theta} =$$

$$\sqrt{1 - \frac{121}{225}} = \sqrt{\frac{104}{225}} = \sqrt{\frac{4 \times 26}{225}} = \frac{2}{15} \times \sqrt{26}$$

So,

$$(\sec \theta - \tan \theta) = \frac{15}{2\sqrt{26}} - \frac{\left(\frac{11}{15}\right)}{\left(\frac{2\sqrt{26}}{15}\right)}$$

$$= \frac{15}{2\sqrt{26}} - \frac{11}{2\sqrt{26}} = \frac{4}{2\sqrt{26}}$$

$$= \frac{2}{\sqrt{26}} = \frac{\sqrt{26}}{13}$$

12. If $\tan \theta = \frac{4}{3}$, then the value of $\frac{9\sin \theta + 12\cos \theta}{27\cos \theta - 20\sin \theta}$ will be equal to:

- (a) 72 (b) 36
 (c) 18 (d) 100

SSC CHSL 10/08/2021 (Shift-I)

Ans. (a) : $\tan \theta = \frac{4}{3}$

$$\frac{\sin \theta}{\cos \theta} = \frac{4}{3}$$

On taking, $\sin \theta = 4$ and $\cos \theta = 3$

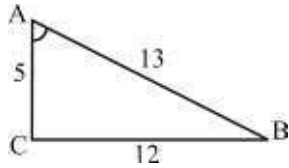
$$\therefore \frac{9\sin \theta + 12\cos \theta}{27\cos \theta - 20\sin \theta} = \frac{36 + 36}{81 - 80} = 72$$

13. In a triangle ABC, right-angled at C, if $\sec A = \frac{13}{5}$, then find the value of $\frac{1 + \sin A}{\cos B}$?

- (a) $\frac{25}{12}$ (b) $\frac{3}{2}$
 (c) $\frac{18}{5}$ (d) 5

SSC CHSL 06/08/2021 (Shift-I)

Ans. (a) :



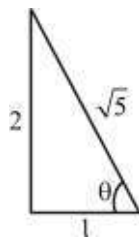
$$\begin{aligned} \therefore \sec A &= \frac{13}{5} \\ \therefore BC^2 &= 13^2 - 5^2 \\ BC &= 12 \\ \therefore \frac{1 + \sin A}{\cos B} &= \frac{1 + \frac{12}{13}}{\frac{12}{13}} = \frac{25}{12} \end{aligned}$$

14. If $\operatorname{cosec} \theta = \frac{\sqrt{5}}{2}$, then what will be the value of $(\sec \theta + \tan \theta - \cot \theta \sin \theta)$?

- (a) $2 + \sqrt{5}$ (b) $2 + \frac{2\sqrt{5}}{5}$
 (c) $2 + \frac{4\sqrt{5}}{5}$ (d) $2 + \frac{\sqrt{5}}{5}$

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c)



$$\begin{aligned} \operatorname{cosec} \theta &= \frac{\sqrt{5}}{2} \\ \sec \theta + \tan \theta - \cot \theta \sin \theta &= \frac{\sqrt{5}}{1} + \frac{2}{1} - \frac{1}{2} \times \frac{2}{\sqrt{5}} \\ &= \frac{5 + 2\sqrt{5} - 1}{\sqrt{5}} = 2 + \frac{4}{\sqrt{5}} = 2 + \frac{4\sqrt{5}}{5} \end{aligned}$$

15. If $(\sin A - \cos A) = 0$, then what is the value of $\cot A$?

- (a) $\frac{\pi}{6}$ (b) 0
 (c) 1 (d) $\frac{\pi}{4}$

SSC CHSL 04/08/2021 (Shift-I)

Ans. (c) : $\sin A - \cos A = 0$

$$\sin A = \cos A$$

$$\frac{\sin A}{\cos A} = 1$$

$$\tan A = 1$$

$$\cot A = \frac{1}{\tan A} \quad (\tan A = 1)$$

$$\cot A = \frac{1}{1}$$

$$\cot A = 1$$

Trick:-

$$\sin A - \cos A = 0$$

$$\sin A = \cos A$$

taking $\angle A = 45^\circ$

$$\sin 45^\circ = \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\text{So, } \cot 45^\circ = 1$$

16. If $\cos \theta = \frac{4x}{1+4x^2}$, then what is the value of $\sin \theta$?

- (a) $\frac{1+4x^2}{1-4x^2}$ (b) $\frac{1+4x^2}{4x^2}$
 (c) $\frac{1-4x^2}{1+4x^2}$ (d) $\frac{1-4x^2}{4x^2}$

SSC CHSL 04/08/2021 (Shift-I)

Ans. (c) : $\cos \theta = \frac{4x}{1+4x^2}$

$$\cos \theta = \frac{B}{H}$$

$$H^2 = P^2 + B^2$$

$$(1+4x^2)^2 = P^2 + 16x^2$$

$$1+16x^4 + 2 \times 1 \times 4x^2 = P^2 + 16x^2$$

$$P^2 = (1+16x^4 - 8x^2)$$

$$P = (1-4x^2)$$

$$\sin \theta = \frac{P}{H}$$

$$\sin \theta = \frac{1-4x^2}{1+4x^2}$$

17. If $5 \sin^2 \theta = 3(1 + \cos \theta)$, $0^\circ < \theta < 90^\circ$, then the value of $\operatorname{cosec} \theta + \cot \theta$ is:

- (a) $\frac{4}{\sqrt{21}}$ (b) $\sqrt{\frac{3}{7}}$
 (c) $\frac{5}{\sqrt{21}}$ (d) $\sqrt{\frac{7}{3}}$

SSC CHSL 13/04/2021 (Shift-I)

Ans. (d) : $5 \sin^2 \theta = 3(1 + \cos \theta)$

$$5(1 - \cos^2 \theta) = 3(1 + \cos \theta)$$

$$5(1 + \cos \theta)(1 - \cos \theta) = 3(1 + \cos \theta)$$

$$5 - 5 \cos \theta = 3$$

$$\cos \theta = \frac{2}{5} = \frac{B}{H}$$

$$P = \sqrt{25 - 4} = \sqrt{21}$$

$$\operatorname{cosec} \theta + \cot \theta = \frac{5}{\sqrt{21}} + \frac{2}{\sqrt{21}} = \frac{7}{\sqrt{21}} = \sqrt{\frac{7}{3}}$$

18. If $\cot\theta = \sqrt{2} + 1$, then $\operatorname{cosec}\theta \sec\theta = ?$

- (a) $\frac{\sqrt{2}}{2}$ (b) $\frac{\sqrt{2}}{4}$
 (c) $2\sqrt{2}$ (d) $4\sqrt{2}$

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : $\cot\theta = \frac{\sqrt{2}+1}{1} = \frac{B}{P}$

$$H = \sqrt{(\sqrt{2}+1)^2 + (1)^2}$$

$$= \sqrt{3+2\sqrt{2}+1} = \sqrt{(4+2\sqrt{2})}$$

$$\operatorname{cosec}\theta \cdot \sec\theta = \frac{\sqrt{4+2\sqrt{2}}}{1} \times \frac{\sqrt{4+2\sqrt{2}}}{\sqrt{2}+1}$$

$$= \frac{4+2\sqrt{2}}{\sqrt{2}+1} = \frac{2\sqrt{2}(\sqrt{2}+1)}{(\sqrt{2}+1)} = 2\sqrt{2}$$

19. If $3\sin^2 A + 4\cos^2 A - 3 = 0$, then the value of $\cot A$ (where $0 \leq A \leq 90^\circ$) is:

- (a) ∞ (b) 0
 (c) 1 (d) not defined

SSC CHSL 11/08/2021 (Shift-I)

Ans. (b) : $3\sin^2 A + 4\cos^2 A - 3 = 0$
 \therefore given $0 \leq A \leq 90^\circ$
 Let $\angle A = 90^\circ$
 Then,
 $3\sin^2 A + 4\cos^2 A - 3 = 3\sin^2 90^\circ + 4\cos^2 90^\circ - 3$
 \therefore L.H.S. = $3 \times 1 + 0 - 3 = 0 =$ R.H.S.
 So, $\cot A = \cot 90^\circ = 0$

20. If $\operatorname{cosec}\theta = \frac{41}{9}$ and θ is an acute angle, then the value of $5 \tan \theta$ will be:

- (a) $\frac{7}{8}$ (b) $\frac{9}{8}$
 (c) $\frac{13}{4}$ (d) $\frac{11}{8}$

SSC CHSL 04/08/2021 (Shift-II)

Ans. (b) : $\therefore \operatorname{cosec}\theta = \frac{41}{9} = \frac{\text{hypotenuse}}{\text{perpendicular}}$
 \therefore from triplet, base = 40
 (Triplet, 41, 40, 9)
 Then $5 \tan \theta = 5 \times \frac{9}{40} = \frac{9}{8}$ ($\therefore \tan \theta = \frac{\text{Perpendicular}}{\text{Base}}$)

21. If $\cos\theta = \frac{7}{3\sqrt{6}}$ and θ is an acute angle, then the value of $27\sin^2\theta - \frac{3}{2}$ is:

- (a) 12 (b) 15
 (c) 1 (d) 9

SSC CHSL 05/08/2021 (Shift-III)

Ans. (c) : $\cos\theta = \frac{7}{3\sqrt{6}}$

$$\therefore \sin^2\theta = 1 - \cos^2\theta = 1 - \left(\frac{7}{3\sqrt{6}}\right)^2 = 1 - \frac{49}{54} = \frac{5}{54}$$

$$\therefore 27\sin^2\theta - \frac{3}{2} = 27 \times \frac{5}{54} - \frac{3}{2} = \frac{5}{2} - \frac{3}{2} = \frac{2}{2} = 1$$

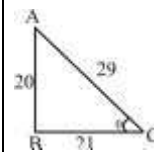
22. If $21 \tan\theta = 20$, then $(1 + \sin\theta - \cos\theta) : (1 - \sin\theta + \cos\theta)$ is equal to:

- (a) 11 : 13 (b) 14 : 15
 (c) 12 : 11 (d) 13 : 15

SSC CHSL 16/04/2021 (Shift-III)

Ans. (b) : $21 \tan\theta = 20$ (Given)

$$\tan\theta = \frac{20}{21}$$



$$\therefore (1 + \sin\theta - \cos\theta) : (1 - \sin\theta + \cos\theta)$$

$$= \left(1 + \frac{20}{29} - \frac{21}{29}\right) : \left(1 - \frac{20}{29} + \frac{21}{29}\right)$$

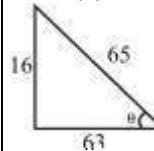
$$= \frac{28}{29} : \frac{30}{29} = 28 : 30 = 14 : 15$$

23. If $\sec\theta = \frac{65}{63}$ and θ is an acute angle, then the value of $8(\operatorname{cosec}\theta - \cot\theta)$ is:

- (a) 2 (b) 1
 (c) 8 (d) 4

SSC CHSL 12/04/2021 (Shift-III)

Ans : (b)



Given,

$$\sec\theta = \frac{65}{63}$$

$$\sin\theta = \frac{16}{65}$$

$$\therefore 8(\operatorname{cosec}\theta - \cot\theta) = 8 \frac{(1 - \cos\theta)}{\sin\theta} = \frac{8 \times \left(1 - \frac{63}{65}\right)}{16/65}$$

$$= \frac{16}{16} = 1$$

24. If $\cos\theta = \frac{P^2 - 1}{P^2 + 1}$, $0^\circ < \theta < 90^\circ$, then $\operatorname{cosec}\theta$ is equal to:

- (a) $\frac{1+P^2}{2P}$ (b) $\frac{1-P^2}{2P}$
 (c) $\frac{2P}{1-P^2}$ (d) $\frac{2P}{1+P^2}$

SSC CHSL 05/08/2021 (Shift-II)

Ans. (a) : $\cos \theta = \frac{P^2 - 1}{P^2 + 1}$

$\therefore \sin^2 \theta = 1 - \cos^2 \theta$

$\therefore \sin^2 \theta = 1 - \left(\frac{P^2 - 1}{P^2 + 1} \right)^2 = \frac{(P^2 + 1)^2 - (P^2 - 1)^2}{(P^2 + 1)^2}$

$= \frac{4P^2}{(P^2 + 1)^2}$

$\sin \theta = \frac{2P}{P^2 + 1}$

$\therefore \operatorname{cosec} \theta = \frac{1 + P^2}{2P}$

25. If $3\cos^2 \theta - 4\sin \theta + 1 = 0$, $0^\circ < \theta < 90^\circ$, then the value of $3\cos^2 \theta + 5\tan^2 \theta$ will be:

- (a) $6\frac{2}{3}$ (b) $5\frac{1}{5}$
 (c) $5\frac{2}{3}$ (d) $5\frac{4}{5}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : $3\cos^2 \theta - 4\sin \theta + 1 = 0$

$3(1 - \sin^2 \theta) - 4\sin \theta + 1 = 0$

$3 - 3\sin^2 \theta - 4\sin \theta + 1 = 0$

$3\sin^2 \theta + 4\sin \theta - 4 = 0$

$(\sin \theta + 2)(3\sin \theta - 2) = 0$

$\sin \theta = \frac{2}{3}$, $\sin \theta = -2$ (invalid)

$\therefore \cos \theta = \sqrt{1 - \sin^2 \theta} = \sqrt{1 - \frac{4}{9}} = \frac{\sqrt{5}}{3}$

$3\cos^2 \theta + 5\tan^2 \theta = 3 \times \frac{5}{9} + 5 \times \frac{(2/3)^2}{(\sqrt{5}/3)^2}$

$= \frac{5}{3} + 5 \times \frac{4}{5}$

$= \frac{17}{3} = 5\frac{2}{3}$

26. If $5 \cos \theta = 4 \sin \theta$, $0^\circ \leq \theta \leq 90^\circ$, then what will be the value of $\sec \theta$?

- (a) $\frac{\sqrt{41}}{5}$ (b) $\frac{3}{5}$
 (c) $\frac{\sqrt{41}}{16}$ (d) $\frac{\sqrt{41}}{4}$

SSC CHSL 09/08/2021 (Shift-II)

Ans. (d) : $5\cos \theta = 4\sin \theta$

$\therefore \tan \theta = \frac{5}{4}$

$\therefore \sec^2 \theta = 1 + \tan^2 \theta$

$\therefore \sec^2 \theta = 1 + \frac{25}{16} = \frac{41}{16}$

$\sec \theta = \frac{\sqrt{41}}{4}$

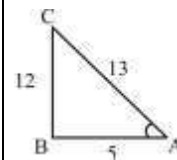
27. If $5\tan A = 12$, then what is the value of $\frac{13\sin A + 20\tan A}{15\tan A - 13\cos A}$, where A is an acute angle?

- (a) $1\frac{19}{41}$ (b) $\frac{31}{41}$
 (c) $\frac{41}{50}$ (d) $1\frac{29}{31}$

SSC CHSL 12/08/2021 (Shift-II)

Ans. (d) : $5\tan A = 12$

$\tan A = \frac{12}{5}$



$\therefore \frac{13\sin A + 20\tan A}{15\tan A - 13\cos A} = \frac{13 \times \frac{12}{13} + 20 \times \frac{12}{5}}{15 \times \frac{12}{5} - 13 \times \frac{5}{13}}$
 $= \frac{12 + 48}{36 - 5} = \frac{60}{31} = 1\frac{29}{31}$

28. If $\operatorname{cosec} A = 10$, then what is the value of $20\sin A + 9\sqrt{11} \sec A$?

Given that is an acute angle.

- (a) 32 (b) 34
 (c) 30 (d) 23

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : $\operatorname{cosec} A = 10$

or, $\sin A = \frac{1}{10}$ $\therefore \cos^2 A = 1 - \sin^2 A$

$\therefore \cos A = \sqrt{1 - \frac{1}{100}} = \frac{\sqrt{99}}{10}$

$\therefore 20\sin A + 9\sqrt{11} \sec A = 20 \times \frac{1}{10} + 9\sqrt{11} \times \frac{10}{\sqrt{99}}$

$= 2 + 30 = 32$

29. If $\tan \theta = 15$, then what is the value of $\sec \theta$?

- (a) $\sqrt{224}$ (b) $\sqrt{226}$
 (c) $\frac{1}{\sqrt{226}}$ (d) $\frac{1}{\sqrt{224}}$

SSC CHSL 15/04/2021 (Shift-II)

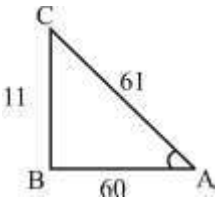
Ans : (b) $\tan\theta = 15$
 $\therefore \sec^2\theta = 1 + \tan^2\theta$
 $\therefore \sec^2\theta = 1 + (15)^2 = 1 + 225 = 226$
 $\sec\theta = \sqrt{226}$

30. If $\tan A = \frac{1.1}{6}$, then what is the value of $(4 \cos A - 7 \sin A)$? Given that A is an acute angle.

- (a) $2\frac{14}{61}$ (b) $2\frac{41}{71}$
(c) $2\frac{41}{61}$ (d) $2\frac{14}{71}$

SSC CHSL 13/04/2021 (Shift-II)

Ans. (c) : $\tan A = \frac{1.1}{6} = \frac{11}{60}$



$$(4 \cos A - 7 \sin A) = 4 \times \frac{60}{61} - 7 \times \frac{11}{61}$$

$$= \left(\frac{240 - 77}{61} \right) = 2\frac{41}{61}$$

31. If $\sin B = \frac{9}{41}$, then what is the value of $\cot B$, where $0^\circ < B < 90^\circ$?

- (a) $\frac{41}{9}$ (b) $\frac{40}{9}$
(c) $\frac{9}{41}$ (d) $\frac{9}{40}$

SSC CHSL 09/08/2021 (Shift-III)

Ans. (b) : $\sin B = \frac{9}{41}$

$$\therefore \cos B = \sqrt{1 - \sin^2 B}$$

$$\therefore \cos B = \sqrt{1 - \frac{81}{1681}} = \sqrt{\frac{1600}{1681}} = \frac{40}{41}$$

$$\therefore \cot B = \frac{\cos B}{\sin B} = \frac{40/41}{9/41} = \frac{40}{9}$$

32. If $\sin\theta = \frac{2\sqrt{ab}}{a+b}$, $a > b > 0$, then the value of $\frac{\cos\theta + 1}{\cos\theta - 1}$ will be:

- (a) $-\frac{a}{b}$ (b) $\frac{a}{b}$
(c) $-\frac{b}{a}$ (d) $\frac{b}{a}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (a) : $\sin\theta = \frac{2\sqrt{ab}}{a+b}$

$$\therefore \cos\theta = \sqrt{1 - \sin^2\theta}$$

$$\therefore \cos\theta = \sqrt{1 - \frac{4ab}{(a+b)^2}} = \sqrt{\frac{(a+b)^2 - 4ab}{(a+b)^2}} = \frac{a-b}{a+b}$$

$$\therefore \frac{\cos\theta + 1}{\cos\theta - 1} = \frac{a-b+a+b}{a-b-a-b} = \frac{2a}{-2b} = -\frac{a}{b}$$

33. If $3 \sin^2\theta - \cos\theta - 1 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $\cot\theta + \operatorname{cosec}\theta$?

- (a) $\frac{3\sqrt{2}}{2}$ (b) $2\sqrt{3}$
(c) $\sqrt{5}$ (d) $2\sqrt{5}$

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (c) : $3 \sin^2\theta - \cos\theta - 1 = 0$ $0^\circ < \theta < 90^\circ$

$$3(1 - \cos^2\theta) - \cos\theta - 1 = 0$$

$$3 - 3 \cos^2\theta - \cos\theta - 1 = 0$$

$$3 \cos^2\theta + \cos\theta - 2 = 0$$

$$3 \cos^2\theta + 3 \cos\theta - 2 \cos\theta - 2 = 0$$

$$3 \cos\theta (\cos\theta + 1) - 2 (\cos\theta + 1) = 0$$

$$(\cos\theta + 1) (3 \cos\theta - 2) = 0$$

$$\cos\theta = -1 \text{ (invalid)}$$

$$\text{and } \cos\theta = \frac{2}{3} = \frac{B}{H}$$

$$H^2 = P^2 + B^2$$

$$P^2 = 3^2 - 2^2$$

$$P = \sqrt{5}$$

$$\cot\theta + \operatorname{cosec}\theta = ?$$

$$\frac{2}{\sqrt{5}} + \frac{3}{\sqrt{5}} = \frac{5}{\sqrt{5}} = \sqrt{5}$$

34. Find the value of $\sin(60+\theta) - \cos(30-\theta)$.

- (a) 1 (b) $\frac{1}{2}$
(c) 0 (d) -1

SSC CHSL -18/03/2020 (Shift-II)

Ans. (c) : $\sin(60+\theta) - \cos(30-\theta)$
 $\sin(60+\theta) - \sin(60+\theta) = 0$

35. If $x \sin 30^\circ \cos 60^\circ = \sin 45^\circ \cos 45^\circ$, then the value of x is:

- (a) 2 (b) 0
(c) 3 (d) 1

SSC CHSL -19/03/2020 (Shift-III)

Ans. (a) : $x \sin 30^\circ \cos 60^\circ = \sin 45^\circ \cos 45^\circ$

$$x \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$$

$$\frac{x}{4} = \frac{1}{2}$$

$$x = \frac{4}{2} \Rightarrow \text{Hence } x = 2$$

36. If A lies in the first quadrant and $6 \tan A = 5$, then the value of $\frac{8 \sin A - 4 \cos A}{\cos A + 2 \sin A}$ is:
- (a) 4 (b) 16
(c) -2 (d) 1

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (d) : $6 \tan A = 5$

$$\tan A = \frac{5}{6}$$

$$\therefore \frac{8 \sin A - 4 \cos A}{\cos A + 2 \sin A}$$

On dividing by $\cos A$ in each term,

$$= \frac{8 \tan A - 4}{1 + 2 \tan A} = \frac{8 \times \frac{5}{6} - 4}{1 + 2 \times \frac{5}{6}}$$

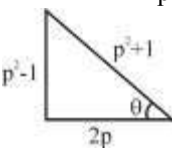
$$= \frac{16}{16} = 1$$

37. If $\sec \theta + \tan \theta = p$, $0^\circ < \theta < 90^\circ$, then $\frac{p^2 - 1}{p^2 + 1}$ is equal to:

- (a) $2 \operatorname{cosec} \theta$ (b) $\sin \theta$
(c) $\operatorname{cosec} \theta$ (d) $\cos \theta$

SSC CGL (Tier-I) – 04/03/2020 (Shift-III)

Ans. (b) : $\sec \theta + \tan \theta = P \dots \dots (1)$

$$\sec \theta - \tan \theta = \frac{1}{p} \quad (\because \sec^2 \theta - \tan^2 \theta = 1) \dots \dots (2)$$


On adding,

$$2 \sec \theta = p + \frac{1}{p}, \quad \sec \theta = \frac{p^2 + 1}{2p}$$

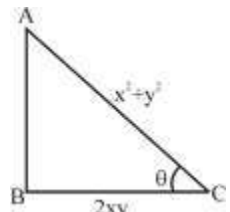
$$\therefore \frac{p^2 - 1}{p^2 + 1} = \sin \theta$$

38. If $\sec \theta - \tan \theta = \frac{x}{y}$, ($0 < x < y$) and $0^\circ < \theta < 90^\circ$, then $\sin \theta$ is equal to:

- (a) $\frac{x^2 + y^2}{y^2 - x^2}$ (b) $\frac{2xy}{x^2 + y^2}$
(c) $\frac{y^2 - x^2}{x^2 + y^2}$ (d) $\frac{x^2 + y^2}{2xy}$

SSC CGL (Tier-I) – 04/03/2020 (Shift-I)

Ans. (c) :



$$\sec \theta - \tan \theta = \frac{x}{y}$$

$$\sec \theta + \tan \theta = \frac{y}{x} \quad [\because \sec^2 \theta - \tan^2 \theta = 1]$$

$$\therefore 2 \sec \theta = \frac{x}{y} + \frac{y}{x} = \frac{x^2 + y^2}{xy}$$

$$\sec \theta = \frac{x^2 + y^2}{2xy}$$

$$AB = \sqrt{(x^2 + y^2)^2 - 4x^2y^2} = y^2 - x^2 \quad [\because y > x]$$

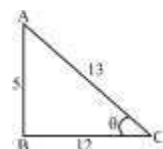
$$\therefore \sin \theta = \frac{y^2 - x^2}{x^2 + y^2}$$

39. If $5 \cos \theta - 12 \sin \theta = 0$, then what is the value of $\frac{1 + \sin \theta + \cos \theta}{1 - \sin \theta + \cos \theta}$?

- (a) $\frac{5}{4}$ (b) $\frac{3}{2}$
(c) $\frac{5}{2}$ (d) $\frac{3}{4}$

SSC CGL (Tier-I)– 05/03/2020 (Shift-II)

Ans. (b) :



$$5 \cos \theta - 12 \sin \theta = 0$$

$$\cot \theta = \frac{12}{5}$$

$$\frac{1 + \sin \theta + \cos \theta}{1 - \sin \theta + \cos \theta}$$

$$= \frac{1 + \frac{5}{13} + \frac{12}{13}}{1 - \frac{5}{13} + \frac{12}{13}}$$

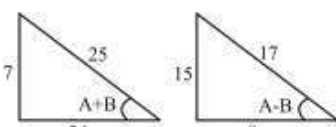
$$= \frac{30}{20} = \frac{3}{2}$$

40. If $0^\circ < A, B < 45^\circ$, $\cos(A+B) = \frac{24}{25}$ and $\sin(A-B) = \frac{15}{17}$, then $\tan 2A$ is:

- (a) $\frac{416}{87}$ (b) 0
(c) 1 (d) $\frac{213}{4}$

SSC CGL (Tier-I) – 06/03/2020 (Shift-III)

Ans. (a) :

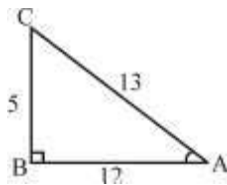


$$\begin{aligned} \tan 2A &= \tan[(A+B) + (A-B)] \\ &= \frac{\tan(A+B) + \tan(A-B)}{1 - \tan(A+B) \cdot \tan(A-B)} \\ &= \frac{\frac{7}{24} + \frac{15}{8}}{1 - \frac{7}{24} \times \frac{15}{8}} \\ &= \frac{\frac{52}{24}}{\frac{29}{64}} = \frac{52 \times 64}{24 \times 29} = \frac{416}{87} \end{aligned}$$

41. If $\frac{\sin A + \cos A}{\cos A} = \frac{17}{12}$, then the value of $\frac{1 - \cos A}{\sin A}$ is:
- (a) $\frac{5}{12}$ (b) -5
(c) 1 (d) $\frac{1}{5}$

SSC CGL (Tier-I) – 07/03/2020 (Shift-II)

Ans. (d) :



$$\begin{aligned} \frac{\sin A + \cos A}{\cos A} &= \frac{17}{12} \\ \tan A + 1 &= \frac{17}{12} \\ \tan A &= \frac{5}{12} \\ \therefore \frac{1 - \cos A}{\sin A} &= \frac{1 - \frac{12}{13}}{\frac{5}{13}} \\ &= \frac{1}{5} \end{aligned}$$

42. The value of $\frac{1 - 2\sin^2\theta \cos^2\theta}{\sin^4\theta + \cos^4\theta} - 1$ is:

- (a) -1 (b) 1
(c) $-2\sin^2\theta \cos^2\theta$ (d) 0

SSC CGL (Tier-I) – 07/03/2020 (Shift-I)

Ans. (d) : $\frac{1 - 2\sin^2\theta \cos^2\theta}{\sin^4\theta + \cos^4\theta} - 1$

$$\begin{aligned} \therefore (\sin^2\theta + \cos^2\theta)^2 &= \sin^4\theta + \cos^4\theta + 2\sin^2\theta \cdot \cos^2\theta \\ \therefore \sin^4\theta + \cos^4\theta &= 1 - 2\sin^2\theta \cdot \cos^2\theta \end{aligned}$$

then, $\frac{\sin^4\theta + \cos^4\theta}{\sin^4\theta + \cos^4\theta} - 1$
 $\frac{1 - 1}{1 - 1} = 0$

43. If $\sec \theta (\cos \theta + \sin \theta) = \sqrt{2}$, then what is the value of $(2 \sin \theta) / (\cos \theta - \sin \theta)$?

- (a) $3\sqrt{2}$ (b) $3/\sqrt{2}$
(c) $1/\sqrt{2}$ (d) $\sqrt{2}$

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : $\sec \theta (\cos \theta + \sin \theta) = \sqrt{2}$

$$1 + \tan \theta = \sqrt{2}$$

$$\tan \theta = \sqrt{2} - 1$$

According to the question,

$$\frac{2 \sin \theta}{\cos \theta - \sin \theta} = \frac{2 \tan \theta}{1 - \tan \theta}$$

$$= \frac{2(\sqrt{2} - 1)}{1 - (\sqrt{2} - 1)}$$

$$= \frac{2(\sqrt{2} - 1)}{\sqrt{2}(\sqrt{2} - 1)}$$

$$= \sqrt{2}$$

44. If $\frac{1 + \sin \phi}{1 - \sin \phi} = \frac{p^2}{q^2}$, then $\sec \phi$ is equal to :

- (a) $\frac{1}{p^2} + \frac{1}{q^2}$ (b) $\frac{p^2 q^2}{p^2 + q^2}$
(c) $\frac{1}{2} \left(\frac{q}{p} + \frac{p}{q} \right)$ (d) $\frac{2p^2 q^2}{p^2 + q^2}$

SSC CGL (Tier-II) 12-09-2019

Ans. (c) $\frac{1 + \sin \phi}{1 - \sin \phi} = \frac{p^2}{q^2}$

$$\frac{(1 + \sin \phi)^2}{1 - \sin^2 \phi} = \frac{p^2}{q^2} \Rightarrow \frac{1 + \sin^2 \phi + 2 \sin \phi}{\cos^2 \phi} = \frac{p^2}{q^2}$$

$$\sec^2 \phi + \tan^2 \phi + 2 \sec \phi \tan \phi = \frac{p^2}{q^2}$$

$$\therefore (\sec \phi + \tan \phi)^2 = \frac{p^2}{q^2}$$

$$\sec \phi + \tan \phi = \frac{p}{q} \dots \dots (i)$$

$$\therefore \sec \phi - \tan \phi = \frac{q}{p} \dots \dots (ii) \left\{ \because \sec^2 \phi - \tan^2 \phi = 1 \right.$$

By adding the equation (i) and (ii)

$$2 \sec \phi = \left(\frac{p}{q} + \frac{q}{p} \right)$$

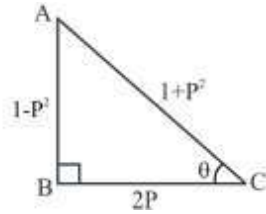
$$\sec \phi = \frac{1}{2} \left(\frac{p}{q} + \frac{q}{p} \right)$$

45. If $\cos \theta = 2p / (1 + p^2)$, then $\tan \theta$ is equal to:

- (a) $\frac{p^2}{1 + p^2}$ (b) $\frac{1 - p^2}{1 + p^2}$
(c) $\frac{2p}{1 - p^2}$ (d) $\frac{1 - p^2}{2p}$

SSC CGL (TIER-I) – 04.06.2019 (Shift-II)

Ans. (d)



$$\therefore \cos \theta = \frac{2P}{1+P^2}$$

$$\therefore \tan \theta = \frac{1-P^2}{2P}$$

46. If $3\sin \theta = 2\cos \theta$, then $\frac{4\sin \theta - \cos \theta}{4\cos \theta + \sin \theta}$ is equal to:

- (a) $\frac{5}{11}$ (b) $\frac{5}{14}$
 (c) $\frac{5}{7}$ (d) $\frac{5}{8}$

SSC CGL (TIER-I) – 13.06.2019 (Shift-I)

Ans. (b) : According to the question,

$$3\sin \theta = 2\cos \theta$$

$$\Rightarrow \frac{\sin \theta}{\cos \theta} = \frac{2}{3}$$

$$\tan \theta = \frac{2}{3}$$

$$\therefore \frac{4\sin \theta - \cos \theta}{4\cos \theta + \sin \theta}$$

$$\Rightarrow \frac{4\tan \theta - 1}{4 + \tan \theta} \text{ [On dividing by } \cos \theta \text{ in numerator and denominator]}$$

$$\Rightarrow \frac{4 \times \frac{2}{3} - 1}{4 + \frac{2}{3}}$$

$$\Rightarrow \frac{\left(\frac{8-3}{3}\right)}{\left(\frac{12+2}{3}\right)} = \frac{5}{14}$$

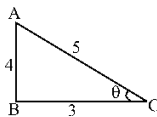
47. If $\operatorname{cosec} \theta = 1.25$, then $\frac{4\tan \theta - 5\cos \theta + 1}{\sec \theta + 4\cot \theta - 1} = ?$

- (a) 2 (b) $\frac{9}{10}$
 (c) $\frac{1}{2}$ (d) $\frac{10}{11}$

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d) $\operatorname{cosec} \theta = 1.25$

$$= \frac{5}{4}$$



$$\therefore \frac{4\tan \theta - 5\cos \theta + 1}{\sec \theta + 4\cot \theta - 1} = \frac{4 \times \frac{4}{3} - 5 \times \frac{3}{5} + 1}{\frac{5}{3} + 4 \times \frac{3}{4} - 1}$$

$$= \frac{16}{3} - 3 + 1 = \frac{10}{3}$$

$$= \frac{\frac{10}{3}}{\frac{5}{3} + 3 - 1} = \frac{10}{3}$$

$$= \frac{10}{11}$$

48. If $2\sin \theta + 15\cos^2 \theta = 7$, $0^\circ < \theta < 90^\circ$, then what is the value of $\frac{3 - \tan \theta}{2 + \tan \theta}$?

- (a) $\frac{1}{2}$ (b) $\frac{5}{8}$
 (c) $\frac{1}{4}$ (d) $\frac{3}{4}$

SSC CPO-SI – 12/12/2019 (Shift-I)

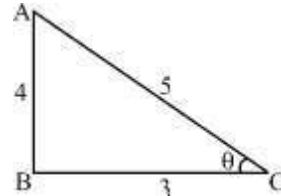
Ans. (a) $2\sin \theta + 15\cos^2 \theta = 7$

$$2\sin \theta + 15(1 - \sin^2 \theta) = 7$$

$$15\sin^2 \theta - 2\sin \theta - 8 = 0$$

$$15\sin^2 \theta - 12\sin \theta + 10\sin \theta - 8 = 0$$

$$(5\sin \theta - 4)(3\sin \theta + 2) = 0$$



$$\sin \theta = \frac{4}{5} \text{ or } \frac{2}{3}$$

$$\therefore \tan \theta = \frac{4}{3}$$

$$\text{Now, } \frac{3 - \tan \theta}{2 + \tan \theta} = \frac{3 - \frac{4}{3}}{2 + \frac{4}{3}}$$

$$\Rightarrow \frac{\left(\frac{5}{3}\right)}{\left(\frac{10}{3}\right)} = \frac{1}{2}$$

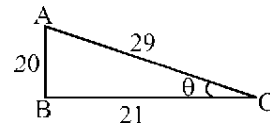
49. If $21 \tan \theta = 20$, then $(1 + \sin \theta + \cos \theta) : (1 - \sin \theta + \cos \theta) = ?$

- (a) 7 : 3 (b) 5 : 2
 (c) 3 : 1 (d) 2 : 1

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (a) $21 \tan \theta = 20$

$$\tan \theta = \frac{20}{21}$$



$$\text{then, } = (1 + \sin \theta + \cos \theta) : (1 - \sin \theta + \cos \theta)$$

$$= \left(1 + \frac{20}{29} + \frac{21}{29}\right) : \left(1 - \frac{20}{29} + \frac{21}{29}\right)$$

$$= \frac{70}{29} : \frac{30}{29} = 7 : 3$$

50. If $(\cos\theta + \sin\theta) : (\cos\theta - \sin\theta) = (\sqrt{3} + 1) : (\sqrt{3} - 1)$, $0^\circ < \theta < 90^\circ$ then what is the value of $\sec\theta$?

- (a) $\sqrt{2}$ (b) $\frac{2\sqrt{3}}{3}$
 (c) 2 (d) 1

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (b)

$$(\cos\theta + \sin\theta) : (\cos\theta - \sin\theta) = (\sqrt{3} + 1) : (\sqrt{3} - 1)$$

$$\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$$

$$\frac{\cos\theta}{\sin\theta} = \sqrt{3}$$

$$\text{or } \tan\theta = \frac{1}{\sqrt{3}}$$

$$\tan^2\theta = \frac{1}{3}$$

$$\sec^2\theta - 1 = \frac{1}{3}$$

$$\sec^2\theta = \frac{1}{3} + 1 = \frac{4}{3}$$

$$\sec\theta = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

51. The value of

$$\left[\frac{\sqrt{3} + 2\sin P}{1 - 2\cos P} \right]^3 + \left[\frac{1 + 2\cos P}{\sqrt{3} - 2\sin P} \right]^3 \text{ is:}$$

- (a) $\sin P \cos P$ (b) $2\sin P \cos P$
 (c) 1 (d) 0

SSC CHSL -13/10/2020 (Shift-I)

Ans. (d) : $\left[\frac{\sqrt{3} + 2\sin P}{1 - 2\cos P} \right]^3 + \left[\frac{1 + 2\cos P}{\sqrt{3} - 2\sin P} \right]^3$

Let $P = 90^\circ$

$$\left[\frac{\sqrt{3} + 2\sin 90^\circ}{1 - 2\cos 90^\circ} \right]^3 + \left[\frac{1 + 2\cos 90^\circ}{\sqrt{3} - 2\sin 90^\circ} \right]^3$$

$$\left[\frac{\sqrt{3} + 2 \times 1}{1 - 0} \right]^3 + \left[\frac{1 + 0}{\sqrt{3} - 2 \times 1} \right]^3$$

$$(\sqrt{3} + 2)^3 + \left(\frac{1}{\sqrt{3} - 2} \right)^3$$

$$(\sqrt{3} + 2)^3 + \left(\frac{\sqrt{3} + 2}{(\sqrt{3} - 2)(\sqrt{3} + 2)} \right)^3$$

$$(\sqrt{3} + 2)^3 + \left(\frac{\sqrt{3} + 2}{3 - 4} \right)^3$$

$$(\sqrt{3} + 2)^3 - \frac{(\sqrt{3} + 2)^3}{1}$$

$$= 0$$

52. If $\cos\theta = \frac{2P}{P^2 + 1}$, ($P \neq \pm 1$) then $\operatorname{cosec}\theta$ is equal to?

- (a) $\frac{P^2 + 1}{P^2 - 1}$ (b) $\frac{2P}{P^2 + 1}$
 (c) $\frac{P^2 - 1}{2P}$ (d) $\frac{2P}{P^2 - 1}$

SSC CHSL (Tier-I) 05/07/2019 (Shift-I)

Ans. (a) : $\cos\theta = \frac{2P}{P^2 + 1}$

$$\sqrt{1 - \sin^2\theta} = \frac{2P}{P^2 + 1} \quad (\cos^2\theta = 1 - \sin^2\theta)$$

$$1 - \sin^2\theta = \left(\frac{2P}{P^2 + 1} \right)^2$$

$$\sin^2\theta = 1 - \frac{4P^2}{(P^2 + 1)^2}$$

$$\sin^2\theta = \frac{(P^2 + 1)^2 - 4P^2}{(P^2 + 1)^2}$$

$$\sin^2\theta = \frac{P^4 + 1 + 2P^2 - 4P^2}{(P^2 + 1)^2}$$

$$\sin^2\theta = \frac{P^4 + 1 - 2P^2}{(P^2 + 1)^2}$$

$$\sin^2\theta = \frac{(P^2 - 1)^2}{(P^2 + 1)^2}$$

$$\sin\theta = \frac{P^2 - 1}{P^2 + 1}$$

$$\operatorname{cosec}\theta = \frac{P^2 + 1}{P^2 - 1}$$

53. Find x if $2 \sin^2 x - 1 = 0$.

- (a) $\frac{\pi}{4}$ (b) π
 (c) 0 (d) $\frac{\pi}{2}$

SSC CHSL -17/03/2020 (Shift-III)

Ans. (a) : $2 \sin^2 x - 1 = 0$
 $2 \sin^2 x = 1$

$$\sin^2 x = \frac{1}{2}$$

$$\sin x = \frac{1}{\sqrt{2}} = \sin \frac{\pi}{4} \quad \left[\frac{\pi}{4} = 45^\circ \right]$$

$$\Rightarrow x = \frac{\pi}{4}$$

54. If $\sin\theta = \frac{4}{5}$, find the value of $\sin 3\theta$.

- (a) $\frac{64}{125}$ (b) $\frac{32}{45}$
 (c) $\frac{12}{25}$ (d) $\frac{44}{125}$

SSC CHSL -17/03/2020 (Shift-III)

Ans. (d) $\sin \theta = \frac{4}{5}$
 $\therefore \sin 3\theta = 3\sin\theta - 4\sin^3\theta$
 $= 3 \times \frac{4}{5} - 4 \times \left(\frac{4}{5}\right)^3$
 $= \frac{12}{5} - \frac{4 \times 64}{125}$
 $= \frac{12 \times 25 - 4 \times 64}{125}$
 $= \frac{300 - 256}{125}$
 $= \frac{44}{125}$

55. If $\sec A = \frac{5}{3}$, then what is the value of $\cot A$?

- (a) $\frac{3}{4}$ (b) $\frac{3}{5}$
 (c) $\frac{4}{5}$ (d) $\frac{4}{3}$

SSC CHSL -19/10/2020 (Shift-III)

Ans. (a) : $\sec A = \frac{5}{3}$
 $\therefore \sec^2 A - 1 = \tan^2 A$
 $\frac{25}{9} - 1 = \tan^2 A, \tan^2 A = \frac{16}{9}$
 $\cot^2 A = \frac{9}{16} \Rightarrow \cot A = \frac{3}{4}$

56. If $0 < \theta < 90^\circ$, $3b \operatorname{cosec}\theta = a \sec\theta$ and $3a \sec\theta - b \operatorname{cosec}\theta = 8$ then the value of $9b^2 + a^2$ is:

- (a) 6 (b) 8
 (c) 7 (d) 9

SSC CHSL -19/10/2020 (Shift-II)

Ans. (d): $3b \operatorname{cosec}\theta = a \sec\theta$ (i)
 or $9b \operatorname{cosec}\theta = 3a \sec\theta$
 $\therefore 3a \sec\theta - b \operatorname{cosec}\theta = 8$
 $\Rightarrow 9b \operatorname{cosec}\theta - b \operatorname{cosec}\theta = 8$
 $b \operatorname{cosec}\theta = 1$
 $b = \sin\theta$
 Form equation (i)
 $3 \times \sin\theta \operatorname{cosec}\theta = a \sec\theta$
 $a = 3 \cos\theta$
 $\therefore 9b^2 + a^2 = 9 \sin^2\theta + 9 \cos^2\theta = 9$

57. If $\tan\theta + \cot\theta = 6$, then find the value of $\tan^2\theta + \cot^2\theta$.

- (a) 26 (b) 24
 (c) 36 (d) 34

SSC CHSL -15/10/2020 (Shift-II)

Ans. (d) : $\tan\theta + \cot\theta = 6$
 By squaring both side
 $(\tan\theta + \cot\theta)^2 = 6^2$
 $\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 36$
 $\tan^2\theta + \cot^2\theta = 34$

58. If $\sin x = \frac{2}{3}$, then find the value of $\cos 3x$.

- (a) 0.5678 (b) -0.8765
 (c) 0.6735 (d) -0.5797

SSC CHSL -15/10/2020 (Shift-II)

Ans. (d) : $\sin x = \frac{2}{3} \Rightarrow \cos x = \sqrt{1 - \sin^2 x}$
 $= \sqrt{1 - \frac{4}{9}} = \frac{\sqrt{5}}{3}$
 $\therefore \cos 3x = 4\cos^3 x - 3\cos x,$
 $= \frac{4 \times 5\sqrt{5}}{27} - \frac{3 \times \sqrt{5}}{3}$
 $= \frac{20\sqrt{5} - 27\sqrt{5}}{27}$
 $= -\frac{7\sqrt{5}}{27} = -0.5797$

59. If $\tan x = \frac{3}{2}$, then the value of $\frac{3\sin x + 2\cos x}{3\sin x - 2\cos x}$ is:

- (a) $\frac{13}{5}$ (b) 5
 (c) $\frac{5}{13}$ (d) $\frac{1}{5}$

SSC CHSL -14/10/2020 (Shift-I)

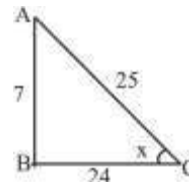
Ans. (a) : $\tan x = \frac{3}{2}$
 $\frac{\sin x}{\cos x} = \frac{3}{2}$
 $\frac{3\sin x + 2\cos x}{3\sin x - 2\cos x} = \frac{3 \times 3 + 2 \times 2}{3 \times 3 - 2 \times 2} = \frac{13}{5}$

60. If $\cos x = \frac{24}{25}$, $0^\circ \leq x \leq 90^\circ$, then the value of $\cot x + \operatorname{cosec} x$ is:

- (a) 7 (b) 0
 (c) $\frac{7}{2}$ (d) 1

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) :



$\cos x = \frac{24}{25}$
 $AB = \sqrt{625 - 576} = \sqrt{49} = 7$
 $\cot x + \operatorname{cosec} x$
 $= \frac{24}{7} + \frac{25}{7} = 7$

61. If A is an acute angle and $\cot A + \operatorname{cosec} A = 3$, then the value of $\cos A$ is equal to:

- (a) $\frac{4}{5}$ (b) $\frac{2}{5}$
(c) $\frac{1}{5}$ (d) $\frac{3}{5}$

SSC CHSL -26/10/2020 (Shift-I)

Ans. (a) : $\cot A + \operatorname{cosec} A = 3$ _____(i)

$$\therefore \operatorname{cosec}^2 A - \cot^2 A = 1$$

$$(\operatorname{cosec} A - \cot A)(\operatorname{cosec} A + \cot A) = 1$$

$$\operatorname{cosec} A - \cot A = \frac{1}{3} \quad \text{_____ (ii)}$$

On adding the equation (i) and (ii).

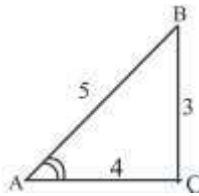
$$\cot A + \operatorname{cosec} A = 3$$

$$\operatorname{cosec} A - \cot A = \frac{1}{3}$$

$$\frac{\operatorname{cosec} A - \cot A}{\cot A + \operatorname{cosec} A} = \frac{\frac{1}{3}}{3}$$

$$\operatorname{cosec} A = \frac{5}{3}$$

From Triplet Base = 4



$$\therefore \cos A = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{4}{5}$$

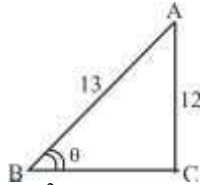
62. If $\operatorname{cosec} \theta = \frac{13}{12}$, then the value of $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$

is:

- (a) 2 (b) 4
(c) 2 (d) 3

SSC CHSL -26/10/2020 (Shift-I)

Ans. (d) : Given $\operatorname{cosec} \theta = \frac{13}{12}$



$$(AB)^2 = (AC)^2 + (BC)^2$$

$$(13)^2 = (12)^2 + (BC)^2$$

$$169 = 144 + (BC)^2$$

$$(BC)^2 = 169 - 144 = 25$$

$$BC = 5$$

$$\therefore \frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta} = \frac{2 \times \frac{12}{13} - 3 \times \frac{5}{13}}{4 \times \frac{12}{13} - 9 \times \frac{5}{13}}$$

$$\frac{24}{48} - \frac{15}{45} = \frac{9}{3} = 3$$

$$\frac{13}{13} - \frac{13}{13} = 0$$

63. If $\tan \theta = \frac{20}{21}$, then the value of $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$

is:

- (a) $\frac{-29}{31}$ (b) $\frac{27}{21}$
(c) $\frac{29}{35}$ (d) $\frac{-1}{41}$

SSC CHSL -12/10/2020 (Shift-III)

Ans. (d) : $\tan \theta = \frac{20}{21}$

$$\Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{20}{21}$$

$$\therefore \sin\theta = 20, \cos\theta = 21$$

$$\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} = \frac{20 - 21}{20 + 21} = \frac{-1}{41}$$

64. If $2 \cot \theta = 3$, then $\frac{\sqrt{13} \cos \theta - 3 \tan \theta}{3 \tan \theta + \sqrt{13} \sin \theta}$ is:

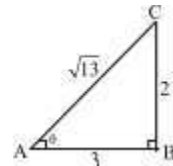
- (a) $\frac{2}{3}$ (b) $\frac{1}{5}$
(c) $\frac{3}{4}$ (d) $\frac{1}{4}$

SSC CHSL -19/03/2020 (Shift-II)

Ans. (d) : $\because 2 \cot \theta = 3$

$$\text{or } \cot \theta = \frac{3}{2}$$

$$\text{or } \tan \theta = \frac{2}{3}$$



$$\therefore \text{Hypotenuse}^2 = \text{Base}^2 + \text{Height}^2$$

$$(AC)^2 = 3^2 + 2^2$$

$$(AC)^2 = 9 + 4$$

$$(AC)^2 = 13$$

$$AC = \sqrt{13}$$

$$\therefore \frac{\sqrt{13} \cos \theta - 3 \tan \theta}{3 \tan \theta + \sqrt{13} \sin \theta}$$

$$= \frac{\sqrt{13} \cdot \frac{3}{\sqrt{13}} - 3 \cdot \frac{2}{3}}{3 \cdot \frac{2}{3} + \sqrt{13} \cdot \frac{2}{\sqrt{13}}} \quad \text{(From rightangle } \triangle ABC)$$

$$= \frac{3 - 2}{2 + 2} = \frac{1}{4}$$

65. If $\frac{\sin x + \cos x}{\sin x - \cos x} = \frac{6}{5}$, then the value of $\frac{\tan^2 x + 1}{\tan^2 x - 1}$

is:

- (a) $\frac{61}{60}$ (b) $\frac{60}{61}$
(c) $\frac{35}{61}$ (d) $\frac{61}{35}$

SSC CHSL -19/03/2020 (Shift-I)

Ans. (a) : $\frac{\sin x + \cos x}{\sin x - \cos x} = \frac{6}{5}$

or $5 \sin x + 5 \cos x = 6 \sin x - 6 \cos x$

or $11 \cos x = \sin x$

or $\frac{\sin x}{\cos x} = 11$

or $\tan x = 11$

$\therefore \frac{\tan^2 x + 1}{\tan^2 x - 1} = \frac{(11)^2 + 1}{(11)^2 - 1}$

$= \frac{121 + 1}{121 - 1}$

$= \frac{122}{120} \Rightarrow \frac{61}{60}$

66. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 5$ and θ is an acute angle, then

the value of $\frac{3\cos^2\theta + 1}{3\cos^2\theta - 1}$ is:

- (a) 1 (b) 4
(c) 3 (d) 2

SSC CHSL -21/10/2020 (Shift-II)

Ans. (b)

$\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 5$

$\frac{\sec\theta + \tan\theta + \sec\theta - \tan\theta}{\sec\theta + \tan\theta - \sec\theta + \tan\theta} = \frac{5 + 1}{5 - 1}$

$\frac{2\sec\theta}{2\tan\theta} = \frac{6}{4}$

$\frac{\sec\theta}{\tan\theta} = \frac{3}{2}$

$\sin\theta = \frac{3}{2}$

$AC^2 = AB^2 + BC^2$

$(3)^2 = (2)^2 + (BC)^2$

$9 = 4 + (BC)^2$

$\sqrt{9 - 4} = BC$

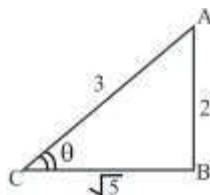
$BC = \sqrt{5}$

then, $\frac{3\cos^2\theta + 1}{3\cos^2\theta - 1}$

$3 \times \left(\frac{\sqrt{5}}{3}\right)^2 + 1 = \frac{3 \times \frac{5}{9} + 1}{3 \times \left(\frac{\sqrt{5}}{3}\right)^2 - 1} = \frac{3 \times \frac{5}{9} + 1}{3 \times \frac{5}{9} - 1}$

$\frac{5}{3} + 1 = \frac{8}{3} = 4$

$\frac{5}{3} + 1 = \frac{8}{3} = 4$



67. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$ and θ is an acute angle, then the value of $\sin\theta$ is:

(a) $\frac{3}{5}$ (b) $\frac{2\sqrt{5}}{5}$

(c) $\frac{1}{5}$ (d) $\frac{\sqrt{5}}{5}$

SSC CHSL -21/10/2020 (Shift-III)

Ans. (b)

Given, $\sec\theta + \tan\theta = 2 + \sqrt{5}$... (i) Then $\sin\theta = ?$

$\therefore \sec^2\theta - \tan^2\theta = 1$

$(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$(\sec\theta - \tan\theta) = \frac{1}{2 + \sqrt{5}} \times \frac{2 - \sqrt{5}}{2 - \sqrt{5}}$

$= \frac{2 - \sqrt{5}}{-1} = \sqrt{5} - 2$... (ii)

On adding the equation (i) and (ii),

$\sec\theta + \tan\theta = 2 + \sqrt{5}$

$\sec\theta - \tan\theta = \sqrt{5} - 2$

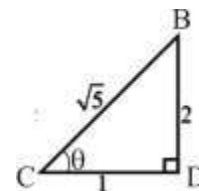
$2\sec\theta = 2 + 2\sqrt{5} - 2$

$\sec\theta = \sqrt{5}$

$\cos\theta = \frac{1}{\sqrt{5}}$

$\sin\theta = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$\sin\theta = \frac{2\sqrt{5}}{5}$



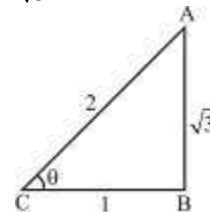
68. If $\cot\theta = \frac{1}{\sqrt{3}}$ then what is the value of

$\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\operatorname{cosec}^2\theta + \sec\theta)$

- (a) 7 (b) 4
(c) 6 (d) 5

SSC CHSL 02/07/2019 (Shift-I)

Ans. (d) : $\cot\theta = \frac{1}{\sqrt{3}}$



then $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\operatorname{cosec}^2\theta + \sec\theta)$

$= \frac{2 - \frac{3}{4}}{1 - \frac{1}{4}} + \left(\frac{4}{3} + 2\right)$

$= \frac{5}{4} \times \frac{4}{3} + \frac{10}{3} = \frac{15}{3} = 5$

(II) Problems based on Trigonometric Identities

69. Simplify the following expression:

$$\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} - \sin A$$

- (a) $1 + \cos A$ (b) $(1 + \sin A) \cos A$
 (c) $1 + \sin A$ (d) $\cos A$

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (d) Value of $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} - \sin A$

$$\begin{aligned} &= \frac{\cos A}{1 - \frac{\sin A}{\cos A}} + \frac{\sin A}{1 - \frac{\cos A}{\sin A}} - \sin A \\ &= \frac{\cos A}{\frac{\cos A - \sin A}{\cos A}} + \frac{\sin A}{\frac{\sin A - \cos A}{\sin A}} - \sin A \\ &= \frac{\cos^2 A}{\cos A - \sin A} + \frac{\sin^2 A}{\sin A - \cos A} - \sin A \\ &= \frac{\cos^2 A - \sin^2 A}{(\cos A - \sin A)} - \sin A \\ &= \cos A + \sin A - \sin A = \cos A \end{aligned}$$

70. The value of $2 - \sqrt{\frac{\cot \theta + \cos \theta}{\cot \theta - \cos \theta}}$, when $0^\circ < \theta < 90^\circ$ is equal to:

- (a) $2 + \sec \theta + \tan \theta$ (b) $2 - \sec \theta + \tan \theta$
 (c) $2 - \sec \theta - \tan \theta$ (d) $2 + \sec \theta - \tan \theta$

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b)

$$\begin{aligned} 2 - \sqrt{\frac{\cot \theta + \cos \theta}{\cot \theta - \cos \theta}} &= 2 - \sqrt{\frac{(\cot \theta + \cos \theta)^2}{\cot^2 \theta - \cos^2 \theta}} \\ &= 2 - \frac{(\cot \theta + \cos \theta)}{\sqrt{\frac{\cos^2 \theta}{\sin^2 \theta} - \cos^2 \theta}} = 2 - \frac{\frac{\cos \theta}{\sin \theta} (1 + \sin \theta)}{\frac{\cos \theta}{\sin \theta} \times \cos \theta} = 2 - \sec \theta + \tan \theta \end{aligned}$$

71. If $\sec^2 \theta + \tan^2 \theta = 3 \frac{1}{2}$, $0^\circ < \theta < 90^\circ$, then $(\cos \theta + \sin \theta)$ is equal to.

- (a) $\frac{1 + \sqrt{5}}{3}$ (b) $\frac{2 + \sqrt{5}}{3}$
 (c) $\frac{1 + \sqrt{5}}{6}$ (d) $\frac{9 + 2\sqrt{5}}{6}$

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (b) $\sec^2 \theta + \tan^2 \theta = 3 \frac{1}{2} = \frac{7}{2}$ ($\because \sec^2 \theta - \tan^2 \theta = 1$)

$$\frac{\sec^2 \theta - \tan^2 \theta = 1}{2 \sec^2 \theta = \frac{9}{2}} \Rightarrow \sec \theta = 3/2 \text{ or } \cos \theta = \frac{2}{3}$$

$$\therefore \sin \theta \sqrt{1 - \cos^2 \theta} = \sqrt{1 - \frac{4}{9}} = \sqrt{\frac{5}{9}}$$

$$\therefore \cos \theta + \sin \theta = \frac{2}{3} = \frac{\sqrt{5}}{2} = \frac{2 + \sqrt{5}}{3}$$

72. Simplify $\sec^2 \alpha \left(1 + \frac{1}{\operatorname{cosec} \alpha}\right) \left(1 - \frac{1}{\operatorname{cosec} \alpha}\right)$.

- (a) $\tan^4 \alpha$ (b) $\sin^2 \alpha$
 (c) 1 (d) -1

SSC CGL (Tier-I) 24/08/2021 (Shift I)

Ans. (c) : $\sec^2 \alpha \left(1 + \frac{1}{\operatorname{cosec} \alpha}\right) \left(1 - \frac{1}{\operatorname{cosec} \alpha}\right)$
 $= \sec^2 \alpha \cdot (1 + \sin \alpha) (1 - \sin \alpha)$
 $= \sec^2 \alpha \cdot (1 - \sin^2 \alpha)$ ($\because 1 - \sin^2 \alpha = \cos^2 \alpha$)
 $= \sec^2 \alpha \cdot \cos^2 \alpha = \frac{1}{\cos^2 \alpha} \cdot \cos^2 \alpha = 1$

73. For $\theta < 90^\circ$,

$\frac{1}{\cos \theta} + \frac{1}{\tan \theta - \sec \theta}$ is equal to :

- (a) $\sec \theta$ (b) $-\sec \theta$
 (c) $-\tan \theta$ (d) $\tan \theta$

SSC CGL (Tier-I) 17/08/2021 (Shift II)

Ans. (c) : $\frac{1}{\cos \theta} + \frac{1}{\tan \theta - \sec \theta}$

$$\begin{aligned} &= \sec \theta + \frac{\sec \theta + \tan \theta}{-(\sec \theta - \tan \theta)(\sec \theta + \tan \theta)} \\ &= \sec \theta - \frac{\sec \theta + \tan \theta}{\sec^2 \theta - \tan^2 \theta} \quad [\because \sec^2 \theta - \tan^2 \theta = 1] \\ &= \sec \theta - \sec \theta - \tan \theta = -\tan \theta \end{aligned}$$

74. $\frac{(1 + \cos \theta)(\operatorname{cosec} \theta - \cot \theta) \sec \theta}{\sin \theta (1 - \sin \theta)(\sec \theta + \tan \theta)} = ?$

- (a) $\sec^2 \theta$ (b) $\sin^2 \theta$
 (c) $\cos^2 \theta$ (d) $\operatorname{cosec}^2 \theta$

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : $\frac{(1 + \cos \theta)(\operatorname{cosec} \theta - \cot \theta) \sec \theta}{\sin \theta (1 - \sin \theta)(\sec \theta + \tan \theta)} = ?$

$$\begin{aligned} &= \frac{(1 + \cos \theta) \frac{(1 - \cos \theta)}{\sin \theta} \times \sec \theta}{\sin \theta (1 - \sin \theta) \frac{(1 + \sin \theta)}{\cos \theta}} \\ &= \frac{\sin^2 \theta \frac{1}{\cos \theta \sin \theta}}{\cos^2 \theta \times \sin \theta \frac{1}{\cos \theta}} \end{aligned}$$

$$\begin{aligned} &= \frac{\sin^2 \theta}{\cos^2 \theta} \times \frac{1}{\sin^2 \theta} \\ &= \sec^2 \theta \end{aligned}$$

75. If $\operatorname{cosec}^2 \theta (\cos \theta - 1)(1 + \cos \theta) = k$, then what is the value of k?

- (a) 1 (b) -1
 (c) $\frac{1}{2}$ (d) 0

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) : $\operatorname{cosec}^2 \theta (\cos \theta - 1)(1 + \cos \theta) = k$

$$\frac{-1}{\sin^2 \theta} \times (1 - \cos \theta)(1 + \cos \theta) = k$$

$$\frac{-\sin^2 \theta}{\sin^2 \theta} = k$$

$$k = -1$$

76. If $\frac{\operatorname{cosec} \theta + \cot \theta}{\operatorname{cosec} \theta - \cot \theta} = 7$, then the value of

$$\frac{4 \sin^2 \theta + 5}{4 \sin^2 \theta - 1}$$
 is:

- (a) 3 (b) 15
(c) 9 (d) 12

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : $\frac{\operatorname{cosec} \theta + \cot \theta}{\operatorname{cosec} \theta - \cot \theta} = \frac{7}{1}$

By componendo and Dividendo method

$$\frac{2 \operatorname{cosec} \theta}{2 \cot \theta} = \frac{7+1}{7-1}$$

$$\frac{1}{\sin \theta} = \frac{8}{\cos \theta}$$

$$\frac{1}{\cos \theta} = \frac{4}{3}$$

$$\cos \theta = \frac{3}{4}$$

$$\therefore \sin^2 \theta = 1 - \cos^2 \theta = 1 - \frac{9}{16} = \frac{7}{16}$$

$$\frac{4 \sin^2 \theta + 5}{4 \sin^2 \theta - 1} = \frac{\frac{7}{4} + 5}{\frac{7}{4} - 1} = \frac{27}{3} = 9$$

77. If, $\sec \theta + \tan \theta = 3$ then the value of $\sec \theta$ is:

- (a) $\frac{4}{3}$ (b) $\frac{3}{4}$
(c) $\frac{5}{3}$ (d) $\frac{3}{5}$

SSC CGL (Tier-II)– 18/11/2020

Ans. (c) : $\sec \theta + \tan \theta = 3$ _____ (1)

$$\therefore \sec^2 \theta - \tan^2 \theta = 1$$

$$(\sec \theta + \tan \theta)(\sec \theta - \tan \theta) = 1$$

$$3(\sec \theta - \tan \theta) = 1$$

$$\sec \theta - \tan \theta = \frac{1}{3}$$
 _____ (2)

From equation (i) and (ii)

$$\boxed{\sec \theta = \frac{5}{3}}$$

78. If $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = 2 \frac{51}{79}$ then the value of $\sin \theta$ is equal to :

- (a) $\frac{91}{144}$ (b) $\frac{39}{72}$
(c) $\frac{65}{144}$ (d) $\frac{35}{72}$

SSC CGL (Tier-II) – 18/11/2020

Ans. (c) : $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = 2 \frac{51}{79}$

By componendo and Dividendo method

$$\frac{\sec \theta + \tan \theta + \sec \theta - \tan \theta}{\sec \theta + \tan \theta - \sec \theta + \tan \theta} = \frac{209 + 79}{209 - 79}$$

$$\frac{\sec \theta}{\tan \theta} = \frac{288}{130}$$

$$\frac{1}{\sin \theta} = \frac{144}{65}$$

$$\sin \theta = \frac{65}{144}$$

79. If $\sec \theta - \tan \theta = P$, then $\operatorname{cosec} \theta = ?$

- (a) $\frac{2P}{1-P^2}$ (b) $\frac{P^2+1}{1-P^2}$
(c) $\frac{1-P^2}{1+P^2}$ (d) $\frac{2P}{1+P^2}$

SSC CGL (TIER-I)– 04.06.2019 (Shift-III)

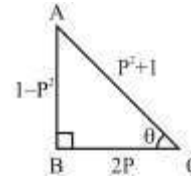
Ans. (b) : $\sec \theta - \tan \theta = P$

then, $\sec \theta + \tan \theta = \frac{1}{P}$ [$\because \sec^2 \theta - \tan^2 \theta = 1$]

$$2 \sec \theta = P + \frac{1}{P}$$

$$2 \sec \theta = \frac{P^2 + 1}{P}$$

$$\sec \theta = \frac{P^2 + 1}{2P}$$



$$\operatorname{cosec} \theta = \frac{P^2 + 1}{1 - P^2}$$

80. $\left(\frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta} \right)^2 + 1, \theta \neq 45^\circ$, is equal to:

- (a) $\sec^2 \theta$ (b) $2 \tan^2 \theta$
(c) $\operatorname{cosec}^2 \theta$ (d) $\cot^2 \theta$

SSC CGL (TIER-I)– 04.06.2019 (Shift-II)

Ans. (a) :

$$\left(\frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta} \right)^2 + 1, \theta \neq 45^\circ$$

$$= \left[\frac{\sin \theta \left(\frac{1 - 2 \sin^2 \theta}{2 \cos^2 \theta - 1} \right)}{\cos \theta} \right]^2 + 1$$

$$\begin{aligned}
 &= \left[\tan \theta \left(\frac{\cos 2\theta}{\cos 2\theta} \right) \right]^2 + 1 \\
 &= [\tan \theta]^2 + 1 \\
 &= \tan^2 \theta + 1 \\
 &= \sec^2 \theta
 \end{aligned}$$

81. $\frac{2 + \tan^2 \theta + \cot^2 \theta}{\sec \theta \cdot \operatorname{cosec} \theta}$ is equal to:

- (a) $\cos \theta \sin \theta$ (b) $\sec \theta \operatorname{cosec} \theta$
 (c) $\tan \theta$ (d) $\cot \theta$

SSC CGL (TIER-I) – 04.06.2019 (Shift-I)

Ans. (b) :

$$\begin{aligned}
 &\frac{2 + \tan^2 \theta + \cot^2 \theta}{\sec \theta \cdot \operatorname{cosec} \theta} = ? \\
 &= \frac{1 + \tan^2 \theta + 1 + \cot^2 \theta}{\sec \theta \cdot \operatorname{cosec} \theta} \\
 &= \frac{\sec^2 \theta + \operatorname{cosec}^2 \theta}{\sec \theta \cdot \operatorname{cosec} \theta} \\
 &= \frac{\sec \theta}{\operatorname{cosec} \theta} + \frac{\operatorname{cosec} \theta}{\sec \theta} \\
 &= \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \\
 &= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cdot \cos \theta} \\
 &= \frac{1}{\sin \theta \cdot \cos \theta} \\
 &= \sec \theta \cdot \operatorname{cosec} \theta
 \end{aligned}$$

82. The value of $\frac{1}{\sin \theta} - \frac{\cot^2 \theta}{1 + \operatorname{cosec} \theta}$ is:

- (a) 1 (b) -1
 (c) 0 (d) 2

SSC CGL (TIER-I) – 06.06.2019 (Shift-III)

Ans. (a) :

$$\begin{aligned}
 &\frac{1}{\sin \theta} - \frac{\cot^2 \theta}{1 + \operatorname{cosec} \theta} \\
 &= \frac{1}{\sin \theta} - \frac{\operatorname{cosec}^2 \theta - 1}{\operatorname{cosec} \theta + 1} \\
 &= \operatorname{cosec} \theta - (\operatorname{cosec} \theta - 1) \\
 &= 1
 \end{aligned}$$

83. If $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + k$, then $k =$ ____.

- (a) $\tan \theta + \sec \theta$ (b) $\tan \theta \operatorname{cosec} \theta$
 (c) $\cot \theta + \sec \theta$ (d) $\operatorname{cosec} \theta \sec \theta$

SSC CGL (TIER-I) – 07.06.2019 (Shift-III)

Ans. (d) :

$$\begin{aligned}
 &\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + k \\
 &\frac{\sin \theta / \cos \theta}{1 - \cos \theta / \sin \theta} + \frac{\cos \theta / \sin \theta}{1 - \sin \theta / \cos \theta} = 1 + k \\
 \Rightarrow &\frac{\sin^2 \theta}{\cos \theta (\sin \theta - \cos \theta)} + \frac{\cos^2 \theta}{\sin \theta (\cos \theta - \sin \theta)} = 1 + k
 \end{aligned}$$

$$\begin{aligned}
 \Rightarrow &\frac{\sin^3 \theta - \cos^3 \theta}{\sin \theta \cdot \cos \theta \cdot (\sin \theta - \cos \theta)} = 1 + k \\
 \Rightarrow &\frac{(\sin \theta - \cos \theta)(\sin^2 \theta + \cos^2 \theta + \sin \theta \cdot \cos \theta)}{\sin \theta \cdot \cos \theta \cdot (\sin \theta - \cos \theta)} = 1 + k
 \end{aligned}$$

$$\Rightarrow \frac{(1 + \sin \theta \cdot \cos \theta)}{\sin \theta \cdot \cos \theta} = 1 + k$$

$$\Rightarrow \frac{1}{\sin \theta \cdot \cos \theta} + \frac{\sin \theta \cdot \cos \theta}{\sin \theta \cdot \cos \theta} = 1 + k$$

$$\Rightarrow \operatorname{cosec} \theta \cdot \sec \theta + 1 = 1 + k$$

By compare the both side

$$\boxed{k = \operatorname{cosec} \theta \cdot \sec \theta}$$

84. If $\left(\frac{\tan \theta - \sec \theta + 1}{\tan \theta + \sec \theta - 1} \right) \sec \theta = \frac{1}{k}$, then $k =$ ____.

- (a) $1 - \cos \theta$ (b) $1 - \sin \theta$
 (c) $1 + \cos \theta$ (d) $1 + \sin \theta$

SSC CGL (TIER-I) – 07.06.2019 (Shift-II)

Ans. (d) : $\left(\frac{\tan \theta - \sec \theta + 1}{\tan \theta + \sec \theta - 1} \right) \cdot \sec \theta = \frac{1}{k}$

$$\therefore [\sec^2 \theta - \tan^2 \theta = 1]$$

$$\left(\frac{\tan \theta - \sec \theta + \sec^2 \theta - \tan^2 \theta}{\tan \theta + \sec \theta - 1} \right) \cdot \sec \theta = \frac{1}{k}$$

$$\frac{(\sec \theta - \tan \theta)[-1 + \sec \theta + \tan \theta]}{(\tan \theta + \sec \theta - 1)} \cdot \sec \theta = \frac{1}{k}$$

$$\left(\frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta} \right) \cdot \frac{1}{\cos \theta} = \frac{1}{k}$$

$$\frac{1 - \sin \theta}{\cos^2 \theta} = \frac{1}{k}$$

$$\frac{1 - \sin \theta}{1 - \sin^2 \theta} = \frac{1}{k}$$

$$\frac{1}{1 + \sin \theta} = \frac{1}{k}$$

$$k = 1 + \sin \theta$$

85. The value of $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x}$, $0^\circ < x < 90^\circ$, is equal to:

- (a) $\tan x$ (b) $2 \sec x$
 (c) $\cot x$ (d) $2 \cos x$

SSC CGL (TIER-I) – 07.06.2019 (Shift-I)

Ans. (a) : $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x}$

$$\Rightarrow \frac{\sec x + \tan x}{(\sec x - \tan x)(\sec x + \tan x)} - \frac{1}{\cos x}$$

$$\Rightarrow \frac{\sec x + \tan x}{\sec^2 x - \tan^2 x} - \frac{1}{\cos x}$$

We know that,

$$\boxed{\sec^2 x - \tan^2 x = 1}$$

$$\Rightarrow \frac{\sec x + \tan x}{1} - \sec x$$

$$\Rightarrow \sec x + \tan x - \sec x$$

$$\Rightarrow \boxed{\tan x}$$

86. If $\frac{\tan \theta + \sin \theta}{\tan \theta - \sin \theta} = \frac{k+1}{k-1}$, then $k = ?$
- (a) $\sin \theta$ (b) $\cos \theta$
 (c) $\sec \theta$ (d) $\operatorname{cosec} \theta$
- SSC CGL (TIER-I) – 10.06.2019 (Shift-I)

Ans. (c) : $\frac{\tan \theta + \sin \theta}{\tan \theta - \sin \theta} = \frac{k+1}{k-1}$

By componendo and Dividendo method

$$\frac{(\tan \theta + \sin \theta) + (\tan \theta - \sin \theta)}{(\tan \theta + \sin \theta) - (\tan \theta - \sin \theta)} = \frac{(k+1) + (k-1)}{(k+1) - (k-1)}$$

$$\frac{\tan \theta}{\sin \theta} = \frac{k}{1} \Rightarrow k = \frac{1}{\cos \theta} = \sec \theta$$

87. What is the value of $[(\cos 7A + \cos 5A) \div \sin 7A - \sin 5A]$?
- (a) $\tan A$ (b) $\tan 4A$
 (c) $\cot 4A$ (d) $\cot A$
- SSC CGL (Tier-II) 19-02-2018

Ans. (d) : $\frac{\cos 7A + \cos 5A}{\sin 7A - \sin 5A}$

$$\therefore \cos C + \cos D = 2 \cos \frac{C+D}{2} \cdot \cos \frac{C-D}{2}$$

$$\sin C - \sin D = 2 \cos \frac{C+D}{2} \cdot \sin \frac{C-D}{2}$$

$$\therefore \frac{2 \cos \frac{12A}{2} \cdot \cos \frac{2A}{2}}{2 \cos \frac{12A}{2} \cdot \sin \frac{2A}{2}} = \cot A$$

88. What is the value of $\left[(\sec 2\theta + 1) \sqrt{\sec^2 \theta - 1} \right] \times \frac{1}{2} (\cot \theta - \tan \theta) ?$
- (a) 0 (b) 1
 (c) $\operatorname{cosec} \theta$ (d) $\sec \theta$
- SSC CGL (Tier-II) 18-02-2018

Ans. (b) :

$$\left[\left((\sec 2\theta + 1) \sqrt{\sec^2 \theta - 1} \right) \times \frac{1}{2} (\cot \theta - \tan \theta) \right]$$

$$\left[(\sec 2\theta + 1) \tan \theta \times \frac{1}{2} \left[\frac{\cos \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} \right] \right]$$

$$\left[\left(\frac{1}{\cos 2\theta} + 1 \right) \tan \theta \times \frac{1}{2} \left[\frac{\cos^2 \theta - \sin^2 \theta}{\sin \theta \cos \theta} \right] \right]$$

$$\left[\frac{1}{2 \cos^2 \theta - 1} + 1 \right] \tan \theta \times \frac{\cos 2\theta}{\sin 2\theta}$$

$$\frac{\sin 2\theta}{\cos 2\theta} \times \frac{\cos 2\theta}{\sin 2\theta} = 1$$

89. The value of $\frac{\sin \theta + \cos \theta - 1}{\sin \theta - \cos \theta + 1} \times \frac{\tan^2 \theta (\operatorname{cosec}^2 \theta - 1)}{\sec \theta - \tan \theta}$ is :
- (a) 1 (b) 0
 (c) -1 (d) $\frac{1}{2}$
- SSC CGL (Tier-II) 13-09-2019

Ans. (a) :

$$= \frac{(\sin \theta + \cos \theta - 1)}{(\sin \theta - \cos \theta + 1)} \times \frac{\tan^2 \theta (\operatorname{cosec}^2 \theta - 1)}{\sec \theta - \tan \theta}$$

$$= \frac{(\sin \theta + \cos \theta - 1)}{(1 + \sin \theta - \cos \theta)} \times \frac{\tan^2 \theta \cdot \cot^2 \theta \cdot \cos \theta}{(1 - \sin \theta)}$$

$$= \frac{\sin \theta \cdot \cos \theta + \cos^2 \theta - \cos \theta}{(1 - \sin^2 \theta) - \cos \theta + \cos \theta \cdot \sin \theta}$$

$$= \frac{\sin \theta \cdot \cos \theta + \cos^2 \theta - \cos \theta}{\cos^2 \theta - \cos \theta + \cos \theta \cdot \sin \theta} = 1$$

90. The value of $\frac{(\sin \theta - \cos \theta)(1 + \tan \theta + \cot \theta)}{1 + \sin \theta \cos \theta} = ?$
- (a) $\sec \theta - \operatorname{cosec} \theta$ (b) $\operatorname{cosec} \theta - \sec \theta$
 (c) $\tan \theta - \cot \theta$ (d) $\sin \theta + \cos \theta$
- SSC CGL (Tier-II) 13-09-2019

Ans. (a) :

$$\frac{(\sin \theta - \cos \theta)(1 + \tan \theta + \cot \theta)}{1 + \sin \theta \cos \theta}$$

$$= \frac{(\sin \theta - \cos \theta) \left(1 + \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \right)}{1 + \sin \theta \cos \theta}$$

$$= \frac{(\sin \theta - \cos \theta) \times \frac{(\sin \theta \cos \theta + \sin^2 \theta + \cos^2 \theta)}{\cos \theta \sin \theta}}{1 + \sin \theta \cos \theta}$$

$$= \frac{(\sin \theta - \cos \theta)(1 + \sin \theta \cos \theta)}{(1 + \sin \theta \cos \theta) \cos \theta \sin \theta}$$

$$= \frac{\sin \theta}{\cos \theta \sin \theta} - \frac{\cos \theta}{\cos \theta \sin \theta}$$

$$= \sec \theta - \operatorname{cosec} \theta$$

91. If $\sec \theta + \tan \theta = p$, ($p > 1$) then $\frac{\operatorname{cosec} \theta + 1}{\operatorname{cosec} \theta - 1} = ?$
- (a) $2p^2$ (b) $\frac{p+1}{p-1}$
 (c) p^2 (d) $\frac{p-1}{p+1}$
- SSC CGL (Tier-II) 13-09-2019

Ans. (c) : $\sec \theta + \tan \theta = p$

$$\frac{1}{\cos \theta} + \frac{\sin \theta}{\cos \theta} = p, \quad \frac{1 + \sin \theta}{\cos \theta} = p$$

$$\frac{(1 + \sin \theta)^2}{\cos^2 \theta} = p^2$$

$$\frac{(1+\sin\theta)^2}{(1-\sin\theta)(1+\sin\theta)} = p^2$$

$$\frac{1+\sin\theta}{1-\sin\theta} = p^2$$

$$\frac{\operatorname{cosec}\theta+1}{\operatorname{cosec}\theta-1} = p^2$$

92. The value of $(1+\cot\theta - \operatorname{cosec}\theta)(1+\cos\theta+\sin\theta)\sec\theta = ?$

- (a) $\sin\theta\cos\theta$ (b) 2
(c) -2 (d) $\sec\theta\operatorname{cosec}\theta$

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : $(1+\cot\theta - \operatorname{cosec}\theta)(1+\cos\theta+\sin\theta)\sec\theta$

$$= \left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right) \times (1+\cos\theta+\sin\theta) \times \frac{1}{\cos\theta}$$

$$= \frac{(\sin\theta + \cos\theta - 1)(\sin\theta + \cos\theta + 1)}{\sin\theta \cdot \cos\theta}$$

$$= \frac{(\sin\theta + \cos\theta)^2 - 1}{\sin\theta \cdot \cos\theta}$$

$$= \frac{(\sin^2\theta + \cos^2\theta) + 2\sin\theta \cdot \cos\theta - 1}{\sin\theta \cdot \cos\theta}$$

$$= \frac{2\sin\theta \cdot \cos\theta}{\sin\theta \cdot \cos\theta} \quad [\because \sin^2\theta + \cos^2\theta = 1]$$

$$= 2$$

93. The value of $\frac{\sec\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$ is

- equal to :
(a) $2\cos\phi$ (b) $2\sin\phi$
(c) $\operatorname{cosec}\phi\sec\phi$ (d) $\sin\phi\cos\phi$

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : $\frac{\sec\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$

$$\frac{(\sec\phi - \tan\phi)(\sin\phi + \cos\phi)(\sec\phi + \tan\phi)}{\sin\phi\left(\frac{\cos\phi + \sin\phi}{\cos\phi}\right) + \cos\phi\left(\frac{\sin\phi + \cos\phi}{\sin\phi}\right)}$$

$$= \frac{(\sec^2\phi - \tan^2\phi)(\sin\phi + \cos\phi)}{(\sin\phi + \cos\phi)(\tan\phi + \cot\phi)}$$

$$= \frac{1}{\left(\frac{\sin\phi}{\cos\phi} + \frac{\cos\phi}{\sin\phi}\right)} = \frac{\sin\phi\cos\phi}{(\sin^2\phi + \cos^2\phi)} = \sin\phi\cos\phi$$

94. The value of $\sqrt{\frac{\operatorname{cosec}\phi - \cot\phi}{\operatorname{cosec}\phi + \cot\phi}} \div \frac{\sin\phi}{1+\cos\phi}$ is equal to :

- (a) $\operatorname{cosec}\phi$ (b) $\frac{1}{2}$
(c) 1 (d) $\sec\phi$

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : $\sqrt{\frac{\operatorname{cosec}\phi - \cot\phi}{\operatorname{cosec}\phi + \cot\phi}} \div \frac{\sin\phi}{1+\cos\phi}$

$$= \sqrt{\frac{1-\cos\phi}{1+\cos\phi}} \div \left(\frac{\sin\phi}{1+\cos\phi}\right)$$

$$= \sqrt{\frac{(1-\cos\phi)^2}{\sin^2\phi}} \div \left(\frac{\sin\phi}{1+\cos\phi}\right)$$

$$= \frac{(1-\cos\phi)}{\sin\phi} \times \frac{(1+\cos\phi)}{\sin\phi}$$

$$= \frac{(1-\cos^2\phi)}{\sin^2\phi} = \frac{\sin^2\phi}{\sin^2\phi} = 1$$

95. $\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$ is equal to :

- (a) $1 + \sin A \cos A$ (b) $1 + \sin A - \cos A$
(c) $1 + \cos A - \sin A$ (d) $1 - \sin A \cos A$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

$$\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$$

$$= \frac{2\sin A(1+\sin A)}{(1+\sin A)+\cos A} \times \frac{(1+\sin A)-\cos A}{(1+\sin A)-\cos A}$$

$$= \frac{2\sin A(1+\sin A)[(1+\sin A)-\cos A]}{1+\sin^2 A+2\sin A-\cos^2 A}$$

$$= \frac{2\sin A(1+\sin A)[1+\sin A-\cos A]}{2\sin^2 A+2\sin A}$$

$$= \frac{(2\sin A+2\sin^2 A)(1+\sin A-\cos A)}{(2\sin^2 A+2\sin A)}$$

$$= 1+\sin A-\cos A$$

96. $\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$ is equal to :

- (a) $1-\sec\theta\tan\theta$ (b) $\sec\theta+\tan\theta$
(c) $\sec\theta-\tan\theta$ (d) $1+\sec\theta\tan\theta$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

$$\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}} = \sqrt{\frac{\frac{1}{\tan\theta} + \frac{1}{\sec\theta}}{\frac{1}{\tan\theta} - \frac{1}{\sec\theta}}}$$

$$= \sqrt{\frac{(\sec\theta + \tan\theta)}{(\sec\theta - \tan\theta)} \times \frac{(\sec\theta + \tan\theta)}{(\sec\theta + \tan\theta)}}$$

$$= \sqrt{\frac{(\sec\theta + \tan\theta)^2}{\sec^2\theta - \tan^2\theta}} \quad (\because \sec^2\theta - \tan^2\theta = 1)$$

$$= \sec\theta + \tan\theta$$

97. If $\cos x = \frac{p}{q}$ and $0^\circ < x < 90^\circ$, then the value of $\tan x$ is:

- (a) $\frac{\sqrt{q^2 - p^2}}{q}$ (b) $\frac{q}{\sqrt{q^2 - p^2}}$
 (c) $\frac{p}{\sqrt{p^2 - q^2}}$ (d) $\frac{\sqrt{q^2 - p^2}}{p}$

SSC CHSL -15/10/2020 (Shift-I)

Ans. (d) : $\cos x = \frac{p}{q} \rightarrow \sec x = \frac{q}{p}$ ($\because \cos \theta = \frac{1}{\sec \theta}$)
 $\sec^2 x = \frac{q^2}{p^2}$
 $\therefore \tan x = \sqrt{\sec^2 x - 1} = \sqrt{\frac{q^2}{p^2} - 1} = \frac{\sqrt{q^2 - p^2}}{p}$

98. If $\sin \theta - \cos \theta = \frac{1}{29}$ find the value of $\sin \theta + \cos \theta$.

- (a) $\frac{2}{29}$ (b) $\frac{22}{29}$
 (c) $\frac{42}{29}$ (d) $\frac{41}{29}$

SSC CHSL -18/03/2020 (Shift-II)

Ans. (d) : $\sin \theta - \cos \theta = \frac{1}{29}$
 $\Rightarrow \frac{\text{Height}}{\text{Hypotenuse}} - \frac{\text{Base}}{\text{Hypotenuse}} = \frac{1}{29} = \frac{21}{29} - \frac{20}{29}$
 From triplet, 20, 21, 29
 $\therefore \sin \theta + \cos \theta = \frac{\text{Height}}{\text{Hypotenuse}} + \frac{\text{Base}}{\text{Hypotenuse}}$
 $= \frac{21}{29} + \frac{20}{29} = \frac{41}{29}$

99. If $0^\circ < \theta < 90^\circ$ then the value of $\frac{\sec \theta (1 - \sin \theta)(\sec \theta + \tan \theta)}{(\sec \theta - \tan \theta)^2} = \frac{1+k}{1-k}$, k is equal :

- (a) $\cos \theta$ (b) $\sin \theta$
 (c) $\operatorname{cosec} \theta$ (d) $\sec \theta$

SSC CHSL 04/07/2019 (Shift-I)

Ans. (b) : $0^\circ < \theta < 90^\circ$
 $\Rightarrow \frac{\sec \theta (1 - \sin \theta)(\sec \theta + \tan \theta)}{(\sec \theta - \tan \theta)^2} = \frac{1+k}{1-k}$
 $\Rightarrow \frac{1}{\cos \theta} (1 - \sin \theta) \left(\frac{1 + \sin \theta}{\cos \theta} \right) = \frac{1+k}{1-k}$
 $\Rightarrow \frac{(1 - \sin \theta)^2}{\cos^2 \theta} = \frac{1+k}{1-k}$
 $\Rightarrow \frac{(1 - \sin \theta)(1 + \sin \theta)}{(1 - \sin \theta)^2} = \frac{1+k}{1-k}$
 $\Rightarrow \frac{1 + \sin \theta}{1 - \sin \theta} = \frac{1+k}{1-k}$
 then, $\boxed{k = \sin \theta}$

100. If $\frac{1}{\sec \theta - \tan \theta} - \frac{1}{\cos \theta} = \sec \theta \times k$, $0^\circ < \theta < 90^\circ$ then K is equal :

- (a) $\operatorname{cosec} \theta$ (b) $\cot \theta$
 (c) $\tan \theta$ (d) $\sin \theta$

SSC CHSL 02/07/2019 (Shift-II)

Ans. (d) : $\frac{1}{\sec \theta - \tan \theta} - \frac{1}{\cos \theta} = \sec \theta \times k$, $0^\circ < \theta < 90^\circ$

$$\frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta} = \sec \theta \times k$$

$$\frac{\cos \theta}{1 - \sin \theta} - \frac{1}{\cos \theta} = \sec \theta \times k$$

$$\frac{\cos^2 \theta - (1 - \sin \theta)}{\cos \theta (1 - \sin \theta)} = \sec \theta \times k$$

$$\frac{\cos^2 \theta - 1 + \sin \theta}{\cos \theta (1 - \sin \theta)} = \sec \theta \times k \quad (\because \cos^2 \theta - 1 = -\sin^2 \theta)$$

$$\frac{-\sin^2 \theta + \sin \theta}{\cos \theta (1 - \sin \theta)} = \sec \theta \times k$$

$$\frac{\sin \theta (-\sin \theta + 1)}{\cos \theta (1 - \sin \theta)} = \sec \theta \times k$$

$$\frac{\sin \theta}{\cos \theta} = \frac{k}{\cos \theta}$$

$$k = \sin \theta$$

101. Simplify $\left(\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} \right) \left(\frac{1}{\tan \theta + \cot \theta} \right)$

- (a) $2 \sin \theta$ (b) $2 \cos \theta$
 (c) $\cos \theta$ (d) $\sin \theta$

SSC CHSL 02/07/2019 (Shift-III)

Ans. (b) : $\left(\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} \right) \left(\frac{1}{\tan \theta + \cot \theta} \right)$

$$= \left(\frac{\sin^2 \theta + 1 + \cos^2 \theta + 2 \cos \theta}{(1 + \cos \theta) \sin \theta} \right) \left(\frac{1}{\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}} \right)$$

$$= \left(\frac{\sin^2 \theta + \cos^2 \theta + 1 + 2 \cos \theta}{(1 + \cos \theta) \sin \theta} \right) \left(\frac{\cos \theta \sin \theta}{\sin^2 \theta + \cos^2 \theta} \right)$$

$$= \left(\frac{1 + 1 + 2 \cos \theta}{(1 + \cos \theta) \sin \theta} \right) \left(\frac{\cos \theta \sin \theta}{\sin^2 \theta + \cos^2 \theta} \right)$$

$$= \frac{2(1 + \cos \theta)}{(1 + \cos \theta) \sin \theta} \cdot \frac{\cos \theta \sin \theta}{1} = 2 \cos \theta$$

102. $\frac{\cot \theta}{(1 - \sin \theta)(\sec \theta + \tan \theta)}$ is equal :

- (a) $\operatorname{cosec} \theta$ (b) $\sin \theta$
 (c) $\sec \theta$ (d) 1

SSC CHSL 01/07/2019 (Shift-III)

Ans. (a)

$$\begin{aligned} \frac{\cot \theta}{(1-\sin \theta)(\sec \theta+\tan \theta)} &= \frac{\frac{\cos \theta}{\sin \theta}}{(1-\sin \theta)\left(\frac{1}{\cos \theta}+\frac{\sin \theta}{\cos \theta}\right)} \\ &= \frac{\frac{\cos \theta}{\sin \theta}}{(1-\sin \theta)\left(\frac{1+\sin \theta}{\cos \theta}\right)} \\ &= \frac{\frac{\cos \theta}{\sin \theta}}{\frac{1-\sin^2 \theta}{\cos \theta}} \\ &= \frac{\frac{\cos \theta}{\sin \theta}}{\frac{\cos \theta}{\cos^2 \theta}} = \frac{1}{\sin \theta} \\ &= \operatorname{cosec} \theta \end{aligned}$$

103. $\frac{(\sec \theta+\tan \theta)(1-\sin \theta)}{\operatorname{cosec} \theta(1+\cos \theta)(\operatorname{cosec} \theta-\cot \theta)}$ equal is :
- (a) $\sec \theta$ (b) $\sin \theta$
 (c) $\cos \theta$ (d) $\operatorname{cosec} \theta$

SSC CHSL 02/07/2019 (Shift-I)

Ans. (c) :

$$\begin{aligned} &\frac{(\sec \theta+\tan \theta)(1-\sin \theta)}{\operatorname{cosec} \theta(1+\cos \theta)(\operatorname{cosec} \theta-\cot \theta)} \\ &= \frac{\left(\frac{1}{\cos \theta}+\frac{\sin \theta}{\cos \theta}\right)(1-\sin \theta)}{\frac{1}{\sin \theta}(1+\cos \theta)(\operatorname{cosec} \theta-\cot \theta)} \\ &= \frac{\left(\frac{1+\sin \theta}{\cos \theta}\right)(1-\sin \theta)}{(\operatorname{cosec} \theta+\cot \theta)(\operatorname{cosec} \theta-\cot \theta)} \\ &= \frac{1-\sin^2 \theta}{\cos \theta} \\ &= \frac{\cos^2 \theta}{\operatorname{cosec}^2 \theta-\cot^2 \theta} \\ &= \frac{\cos^2 \theta}{\cos \theta} \quad [\because \operatorname{cosec}^2 \theta-\cot^2 \theta=1] \end{aligned}$$

104. If $\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\operatorname{cosec} \theta-\cot \theta}{\operatorname{cosec} \theta+\cot \theta}} = \frac{1-r}{1+r}$ then the value of r is :
- (a) $\sin \theta$ (b) $\operatorname{cosec} \theta$
 (c) $\cos \theta$ (d) $\sec \theta$

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c) :

$$\begin{aligned} &\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\operatorname{cosec} \theta-\cot \theta}{\operatorname{cosec} \theta+\cot \theta}} = \frac{1-r}{1+r} \\ \Rightarrow &\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\frac{1}{\sin \theta}-\frac{\cos \theta}{\sin \theta}}{\frac{1}{\sin \theta}+\frac{\cos \theta}{\sin \theta}}} = \frac{1-r}{1+r} \end{aligned}$$

$$\begin{aligned} \Rightarrow &\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\frac{1-\cos \theta}{\sin \theta}}{\frac{1+\cos \theta}{\sin \theta}}} = \frac{1-r}{1+r} \\ \Rightarrow &\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{1-\cos \theta}{1+\cos \theta}} = \frac{1-r}{1+r} \\ \Rightarrow &\frac{1-\cos \theta}{1+\cos \theta} = \frac{1-r}{1+r} \end{aligned}$$

Hence, it is clear that $r = \cos \theta$

105. If $\frac{(\sin \theta-\operatorname{cosec} \theta)(\cos \theta-\sec \theta)}{\tan^2 \theta-\sin^2 \theta} = r^3$ then the value of r is :

- (a) $\tan \theta$ (b) $\operatorname{cosec} \theta \sec \theta$
 (c) $\cot \theta$ (d) $\sin \theta \cos \theta$

SSC CHSL 03/07/2019 (Shift-I)

Ans. (c) :

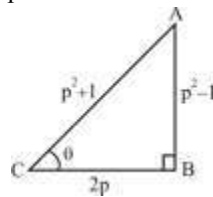
$$\begin{aligned} r^3 &= \frac{(\sin \theta-\operatorname{cosec} \theta)(\cos \theta-\sec \theta)}{\tan^2 \theta-\sin^2 \theta} \\ &= \frac{\left(\sin \theta-\frac{1}{\sin \theta}\right)\left(\cos \theta-\frac{1}{\cos \theta}\right)}{\frac{\sin^2 \theta}{\cos^2 \theta}-\sin^2 \theta} \\ &= \frac{\left(\frac{\sin^2 \theta-1}{\sin \theta}\right)\left(\frac{\cos^2 \theta-1}{\cos \theta}\right)}{\frac{(-\cos^2 \theta) \times (-\sin^2 \theta)}{\sin^2 \theta \cos^2 \theta}} \\ &= \frac{\left(\frac{\sin^2 \theta-1}{\sin \theta}\right)\left(\frac{\cos^2 \theta-1}{\cos \theta}\right)}{\frac{1}{\sin^2 \theta \cos^2 \theta}} \\ &= \frac{\cos^2 \theta \cdot \sin^2 \theta \cdot \cos^2 \theta}{\sin \theta \cdot \cos \theta \cdot \sin^2 \theta \cdot \sin^2 \theta} \\ &= \frac{\cos^3 \theta}{\sin^3 \theta} = \left(\frac{\cos \theta}{\sin \theta}\right)^3, r = \cot \theta \end{aligned}$$

106. If $\cos \theta = \frac{2p}{p^2+1}$ then $\sin \theta$ is :

- (a) $\frac{2p}{p^2+1}$ (b) $\frac{p^2+1}{p^2-1}$
 (c) $\frac{p^2-1}{p^2+1}$ (d) $\frac{2p}{p^2-1}$

SSC CHSL 04/07/2019 (Shift-II)

Ans. (c) : $\cos \theta = \frac{2p}{p^2+1}$



$$\begin{aligned} (AB)^2 &= (AC)^2 - (BC)^2 \\ &= (p^2+1)^2 - (2p)^2 \\ &= p^4+1+2p^2-4p^2 \end{aligned}$$

$$= p^4 + 1 - 2p^2$$

$$(AB)^2 = (p^2 - 1)^2$$

$$AB = p^2 - 1$$

$$\sin \theta = \frac{AB}{AC} = \frac{p^2 - 1}{p^2 + 1}$$

107. If $12\cot^2 \theta - 31 \operatorname{cosec} \theta + 32 = 0$, $0^\circ < \theta < 90^\circ$ then the value of $\sin \theta$ is :

- (a) $\frac{4}{5}, \frac{3}{4}$ (b) $\frac{5}{4}, \frac{4}{3}$
(c) $\frac{1}{3}, \frac{3}{2}$ (d) $\frac{2}{3}, \frac{1}{4}$

SSC CHSL 05/07/2019 (Shift-I)

Ans. (a) : $12\cot^2 \theta - 31 \operatorname{cosec} \theta + 32 = 0$
 $12(\operatorname{cosec}^2 \theta - 1) - 31 \operatorname{cosec} \theta + 32 = 0$
 $12 \operatorname{cosec}^2 \theta - 12 - 31 \operatorname{cosec} \theta + 32 = 0$
 $12 \operatorname{cosec}^2 \theta - 31 \operatorname{cosec} \theta + 20 = 0$
 $12 \operatorname{cosec}^2 \theta - 16 \operatorname{cosec} \theta - 15 \operatorname{cosec} \theta + 20 = 0$
 $4 \operatorname{cosec} \theta (3 \operatorname{cosec} \theta - 4) - 5(3 \operatorname{cosec} \theta - 4) = 0$
 $(3 \operatorname{cosec} \theta - 4)(4 \operatorname{cosec} \theta - 5) = 0$
 $\Rightarrow \operatorname{cosec} \theta = \frac{4}{3}$ and $\operatorname{cosec} \theta = \frac{5}{4}$
 $\sin \theta = \frac{3}{4}$ and $\sin \theta = \frac{4}{5}$
 $\sin \theta \Rightarrow \frac{4}{5}, \frac{3}{4}$

108. Find the smallest positive angle which satisfies the given trigonometric equation.

$$2\sin^2 x + \sqrt{3}\cos x + 1 = 0$$

- (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$
(c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{6}$

SSC CHSL -19/10/2020 (Shift-I)

Ans. (d) : $2\sin^2 x + \sqrt{3}\cos x + 1 = 0$
 $2(1 - \cos^2 x) + \sqrt{3}\cos x + 1 = 0$
 $2\cos^2 x - \sqrt{3}\cos x - 3 = 0$
 $2\cos^2 x - 2\sqrt{3}\cos x + \sqrt{3}\cos x - 3 = 0$
 $2\cos x(\cos x - \sqrt{3}) + \sqrt{3}(\cos x - \sqrt{3}) = 0$
 $(\cos x - \sqrt{3})(2\cos x + \sqrt{3}) = 0$
 $\cos x = \frac{-\sqrt{3}}{2} = \cos 150^\circ$
 $\therefore x = \frac{5\pi}{6}$

109. If $\sin \theta + \operatorname{cosec} \theta = 2$, then the value of $\sin^2 \theta + \operatorname{cosec}^2 \theta$ is:

- (a) 1 (b) 2
(c) 8 (d) 4

SSC CHSL -16/10/2020 (Shift-II)

Ans. (b) : $\therefore \sin \theta + \operatorname{cosec} \theta = 2$
or $\sin \theta + \frac{1}{\sin \theta} = 2$ [$\because \operatorname{cosec} \theta = \frac{1}{\sin \theta}$]
or $\left(\sin \theta + \frac{1}{\sin \theta}\right)^2 = 2^2$ [By squaring the both side]
or $\sin^2 \theta + \frac{1}{\sin^2 \theta} + 2 = 4$
or $\sin^2 \theta + \frac{1}{\sin^2 \theta} = 2$
or $\sin^2 \theta + \operatorname{cosec}^2 \theta = 2$

110. $\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$ is equal to:

- (a) $2\cos x$ (b) $2\operatorname{cosec} x$
(c) $2\sin x$ (d) $2\sec x$

SSC CHSL -15/10/2020 (Shift-I)

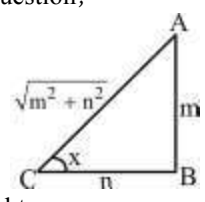
Ans. (d) : $\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$
 $= \frac{\cos^2 x + 1 + \sin^2 x + 2\sin x}{\cos x(1 + \sin x)} = \frac{(\cos^2 x + \sin^2 x) + 1 + 2\sin x}{\cos x(1 + \sin x)}$
 $= \frac{2 + 2\sin x}{\cos x(1 + \sin x)} = \frac{2(1 + \sin x)}{\cos x(1 + \sin x)} = \frac{2}{\cos x} = 2\sec x$

111. If $\tan x = \frac{m}{n}$ and $0^\circ \leq x \leq 90^\circ$, then the value of $(\sin x + \cos x)$ is :

- (a) $\frac{1}{\sqrt{m^2 - n^2}}$ (b) $\frac{m + n}{\sqrt{m^2 + n^2}}$
(c) $\sqrt{m^2 + n^2}$ (d) $\frac{1}{\sqrt{m^2 + n^2}}$

SSC CHSL -13/10/2020 (Shift-III)

Ans. (b) : From question,



$\tan x = \frac{m}{n} = \frac{\text{Height}}{\text{Base}}$
Hypotenuse = $\sqrt{(AB)^2 + (BC)^2} = \sqrt{m^2 + n^2}$
Hence $\sin x + \cos x = \frac{\text{Height}}{\text{Hypotenuse}} + \frac{\text{Base}}{\text{Hypotenuse}}$
 $= \frac{m}{\sqrt{m^2 + n^2}} + \frac{n}{\sqrt{m^2 + n^2}}$
 $= \frac{m + n}{\sqrt{m^2 + n^2}}$

112. $\frac{\cot x}{1 + \operatorname{cosec} x} + \frac{1 + \operatorname{cosec} x}{\cot x}$ is equal to:

- (a) $2\sin x$ (b) $2\operatorname{cosec} x$
 (c) $2\sec x$ (d) $2\cos x$

SSC CHSL -13/10/2020 (Shift-III)

Ans. (c) : Given-

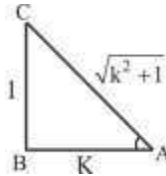
$$\begin{aligned} & \frac{\cot x}{1 + \operatorname{cosec} x} + \frac{1 + \operatorname{cosec} x}{\cot x} \\ &= \frac{\cot^2 x + 1 + \operatorname{cosec}^2 x + 2\operatorname{cosec} x}{\cot x (1 + \operatorname{cosec} x)} \\ &= \frac{\operatorname{cosec}^2 x + \operatorname{cosec}^2 x + 2\operatorname{cosec} x}{\cot x (1 + \operatorname{cosec} x)} \\ &= \frac{2\operatorname{cosec}^2 x + 2\operatorname{cosec} x}{\cot x (1 + \operatorname{cosec} x)} \\ &= \frac{2\operatorname{cosec} x (1 + \operatorname{cosec} x)}{\cot x (1 + \operatorname{cosec} x)} \\ &= \frac{2}{\sin x} \times \frac{\sin x}{\cos x} = 2 \sec x \end{aligned}$$

113. If $\cot A = k$, then $\sin A$ is equal to: (assume that A is an acute angle)

- (a) $\frac{1}{k}$ (b) $-\frac{1}{k}$
 (c) $\frac{1}{\sqrt{1+k^2}}$ (d) $\frac{k^2}{\sqrt{1+k^2}}$

SSC CHSL -12/10/2020 (Shift-I)

Ans. (c) : Given-



$$\therefore \cot A = \frac{\text{Base}}{\text{Height}}$$

$$\therefore \cot A = \frac{K}{1} \quad \text{Base} = K, \text{ Height} = 1$$

$$\text{Base} = \sqrt{K^2 + 1}$$

$$\therefore \sin A = \frac{\text{Base}}{\text{Height}}$$

$$\sin A = \frac{1}{\sqrt{k^2 + 1}}$$

114. If the value of $\sec B + \tan B = r$, then the value of $\sec B - \tan B$ is equal to:

- (a) $1/r$ (b) 0
 (c) r^2 (d) $-r$

SSC CHSL -20/10/2020 (Shift-III)

Ans : (a) $\sec B + \tan B = r$ (Given)

$$\{\therefore \sec^2 \theta - \tan^2 \theta = 1\}$$

$$(\sec B + \tan B)(\sec B - \tan B) = 1$$

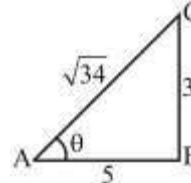
$$(\sec B - \tan B) = \frac{1}{r}$$

115. If $\tan \theta = \frac{3}{5}$, ($0^\circ < \theta < 90^\circ$) then $\sin \theta \cdot \cos \theta$ is equal to :

- (a) $\frac{15}{34}$ (b) $\frac{14}{\sqrt{34}}$
 (c) $\sqrt{17}$ (d) $\frac{16}{\sqrt{34}}$

SSC CHSL 11/07/2019 (Shift-III)

Ans. (a) :



From Pythagoras theorem

$$AC^2 = BC^2 + AB^2$$

$$AC^2 = 3^2 + 5^2$$

$$AC^2 = 34$$

$$AC = \sqrt{34}$$

$$\sin \theta = \frac{3}{\sqrt{34}}, \quad \cos \theta = \frac{5}{\sqrt{34}}$$

$$\begin{aligned} \therefore \sin \theta \cdot \cos \theta &= \frac{3}{\sqrt{34}} \times \frac{5}{\sqrt{34}} \\ &= \frac{15}{34} \end{aligned}$$

116. If $\frac{\cos \alpha}{\sin \alpha + \cos \beta} + \frac{\cos \beta}{\sin \beta - \cos \alpha} = \frac{x}{\sin \alpha - \cos \beta} + \frac{\cos \beta}{\sin \beta + \cos \alpha}$ then x is equal to :

- (a) $\sin \beta$ (b) $\sin \alpha$
 (c) $\cos \beta$ (d) $\cos \alpha$

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d) $\frac{\cos \alpha}{\sin \alpha + \cos \beta} + \frac{\cos \beta}{\sin \beta - \cos \alpha} = \frac{x}{\sin \alpha - \cos \beta} + \frac{\cos \beta}{\sin \beta + \cos \alpha}$

$$\text{Let } \alpha + \beta = 180^\circ \Rightarrow \beta = (180^\circ - \alpha)$$

$$\therefore \cos \alpha = -\cos \beta \Rightarrow \cos \beta = -\cos \alpha$$

$$\therefore \frac{\cos \alpha}{\sin \alpha + \cos(180^\circ - \alpha)} + \frac{\cos \beta}{\sin(180^\circ - \alpha) - \cos \alpha}$$

$$= \frac{x}{\sin \alpha - \cos(180^\circ - \alpha)} + \frac{\cos \beta}{\sin(180^\circ - \alpha) + \cos \alpha}$$

$$\Rightarrow \left(\frac{\cos \alpha}{\sin \alpha - \cos \alpha} - \frac{\cos \alpha}{\sin \alpha - \cos \alpha} \right)$$

$$= \frac{x}{(\sin \alpha + \cos \alpha)} - \frac{\cos \alpha}{(\sin \alpha + \cos \alpha)}$$

$$0 = \frac{x - \cos \alpha}{(\sin \alpha + \cos \alpha)}$$

$$x - \cos \alpha = 0$$

$$x = \cos \alpha$$

117. If $\sqrt{\frac{1-\sin x}{1+\sin x}} = a - \tan x$ then a is equal :

- (a) $\cos x$ (b) $\sin x$
 (c) $\sec x$ (d) $\operatorname{cosec} x$

SSC CHSL 10/07/2019 (Shift-III)

Ans. (c): $\sqrt{\frac{1-\sin x}{1+\sin x}} = a - \tan x \quad \{\because 1 - \sin^2 x = \cos^2 x\}$

$$\frac{(1-\sin x)}{\cos x} = a - \tan x$$

$$\sec x - \tan x = a - \tan x$$

$$a = \sec x$$

118. If $\cos \theta = 4x$ and $\sin \theta = \frac{4}{x} (x \neq 0)$ then find the value of $\left(x^2 + \frac{1}{x^2}\right)$:

- (a) $\frac{1}{2}$ (b) $\frac{1}{16}$
 (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

SSC CHSL 09/07/2019 (Shift-I)

Ans. (b) : Given,

$$\cos \theta = 4x, \quad \sin \theta = \frac{4}{x}$$

$$x = \frac{\cos \theta}{4}, \quad \frac{1}{x} = \frac{\sin \theta}{4}$$

$$x^2 + \frac{1}{x^2} = \frac{\cos^2 \theta}{16} + \frac{\sin^2 \theta}{16}$$

$$= \frac{1}{16}(\cos^2 \theta + \sin^2 \theta) = \frac{1}{16}$$

119. If θ is an acute angle and given $5\sin \theta + 12\cos \theta = 13$, then find the value of $\tan \theta$:

- (a) $\frac{12}{13}$ (b) $\frac{5}{13}$
 (c) $\frac{5}{12}$ (d) $\frac{13}{12}$

SSC CHSL 09/07/2019 (Shift-III)

Ans. (c) : $5\sin \theta + 12\cos \theta = 13$

$$\frac{5}{13}\sin \theta + \frac{12}{13}\cos \theta = 1 \quad \dots\dots\dots(i)$$

$$\therefore \sin^2 \theta + \cos^2 \theta = 1$$

$$\therefore \sin \theta \cdot \sin \theta + \cos \theta \cdot \cos \theta = 1 \quad \dots\dots\dots(ii)$$

By comparing the equation (i) and (ii)

$$\sin \theta = \frac{5}{13}, \quad \cos \theta = \frac{12}{13}$$

$$\frac{\sin \theta}{\cos \theta} = \frac{\frac{5}{13}}{\frac{12}{13}} = \frac{5}{13} \times \frac{13}{12}$$

$$\tan \theta = \frac{5}{12}$$

120. If $\sin \theta = 3x$ and $\cos \theta = \frac{3}{x} (x \neq 0)$ then value of

$$6\left(x^2 + \frac{1}{x^2}\right):$$

- (a) $\frac{1}{4}$ (b) $\frac{1}{2}$
 (c) $\frac{1}{3}$ (d) $\frac{2}{3}$

SSC CHSL 08/07/2019 (Shift-II)

Ans. (d) : $\sin \theta = 3x, \quad \sin^2 \theta = 9x^2 \quad \dots\dots\dots(i)$

$$\cos \theta = \frac{3}{x}, \quad \cos^2 \theta = \frac{9}{x^2} \quad \dots\dots\dots(ii)$$

By adding the equation (i) and (ii)

$$\sin^2 \theta + \cos^2 \theta = 9x^2 + \frac{9}{x^2}$$

$$1 = 9\left(x^2 + \frac{1}{x^2}\right)$$

$$\frac{1}{9} = x^2 + \frac{1}{x^2}$$

Multiplying by 6 in both side.

$$6\left(x^2 + \frac{1}{x^2}\right) = \frac{6}{9}$$

$$= \frac{2}{3}$$

(III) Problems based on Exponents of Trigonometric Functions

121. If $\cos^2 \theta - \sin^2 \theta = \tan^2 \phi$, then which of the following is true?

- (a) $\cos^2 \phi - \sin^2 \phi = \cot^2 \theta$
 (b) $\cos^2 \phi - \sin^2 \phi = \tan^2 \theta$
 (c) $\cos \theta \cos \phi = \sqrt{2}$
 (d) $\cos \theta \cos \phi = 1$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) $\cos^2 \theta - \sin^2 \theta = \tan^2 \phi$

$$\cos 2\theta = \tan^2 \phi$$

$$\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = \tan^2 \phi$$

From the componendo and dividendo to method

$$\frac{1 - \tan^2 \theta + 1 + \tan^2 \theta}{1 - \tan^2 \theta - 1 - \tan^2 \theta} = \frac{\tan^2 \phi + 1}{\tan^2 \phi - 1}$$

$$\frac{2}{-2\tan^2 \theta} = \frac{1 + \tan^2 \phi}{-(1 - \tan^2 \phi)} = \frac{1}{-\cos 2\phi}$$

$$\tan^2 \theta = \cos 2\phi$$

$$\tan^2 \theta = \cos^2 \phi - \sin^2 \phi$$

122. If $\tan \alpha = \frac{2}{\sqrt{13}}$, then the value of

$\frac{\operatorname{cosec}^2 \alpha + 2 \sec^2 \alpha}{\operatorname{cosec}^2 \alpha - 3 \sec^2 \alpha}$ is:

- (a) 21 (b) 14
(c) 32 (d) 16

SSC CHSL -18/03/2020 (Shift-I)

Ans. (a) $\because \tan \alpha = \frac{2}{\sqrt{13}} \therefore \cot \alpha = \frac{\sqrt{13}}{2}$
 then, $\frac{\operatorname{cosec}^2 \alpha + 2 \sec^2 \alpha}{\operatorname{cosec}^2 \alpha - 3 \sec^2 \alpha} = \frac{1 + \cot^2 \alpha + 2 + 2 \tan^2 \alpha}{1 + \cot^2 \alpha - 3 - 3 \tan^2 \alpha}$
 $= \frac{3 + \cot^2 \alpha + 2 \tan^2 \alpha}{-2 + \cot^2 \alpha - 3 \tan^2 \alpha} = \frac{3 + \frac{13}{4} + 2 \times \frac{4}{13}}{-2 + \frac{13}{4} - 3 \times \frac{4}{13}}$
 $= \frac{3 \times 52 + 169 + 32}{-2 \times 52 + 169 - 48} = \frac{156 + 201}{-104 + 121} = \frac{357}{17} = 21$

123. If $\sin \theta + \operatorname{cosec} \theta = 7$, then what is the value of $\sin^3 \theta + \operatorname{cosec}^3 \theta$?

- (a) 350 (b) 382
(c) 322 (d) 367

SSC CHSL 06/08/2021 (Shift-II)

Ans. (c) $\sin \theta + \operatorname{cosec} \theta = 7 \rightarrow \sin^2 \theta + \operatorname{cosec}^2 \theta + 2 = 49$
 $\sin^3 \theta + \operatorname{cosec}^3 \theta = (\sin \theta + \operatorname{cosec} \theta) [\sin^2 \theta + \operatorname{cosec}^2 \theta - 1]$
 $= 7 \times [47 - 1]$
 $= 7 \times 46$
 $= 322$

124. If $(1 + \cot^2 \theta) + \{1 + (\cot^2 \theta)^{-1}\}$ is equal to k, then $\sqrt{k} = ?$

- (a) $\sin \theta \cos \theta$ (b) $\operatorname{cosec} \theta \sec \theta$
(c) $\sin \theta \sec \theta$ (d) $\operatorname{cosec} \theta \cos \theta$

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) $(1 + \cot^2 \theta) + \{1 + (\cot^2 \theta)^{-1}\} = k$
 $(1 + \cot^2 \theta) + (1 + \tan^2 \theta) = k \left(\because \tan \theta = \frac{1}{\cot \theta} \right)$
 $\operatorname{cosec}^2 \theta + \sec^2 \theta = k$
 $k = \frac{\sin^2 \theta + \cos^2 \theta}{\sin^2 \theta \cos^2 \theta} \Rightarrow \sqrt{k} = \sqrt{\frac{1}{\operatorname{cosec}^2 \theta \sec^2 \theta}}$
 $\therefore \sqrt{k} = \operatorname{cosec} \theta \sec \theta$

125. If $\tan \theta + \cot \theta = 3$, then what will be the value of $\tan^2 \theta + \cot^2 \theta$?

- (a) 11 (b) 1
(c) -1 (d) 7

SSC CHSL 12/08/2021 (Shift-I)

Ans. (d) $\tan \theta + \cot \theta = 3$
 square both sides,
 $\tan^2 \theta + \cot^2 \theta + 2 \tan \theta \cot \theta = 9$
 $\tan^2 \theta + \cot^2 \theta = 9 - 2 = 7$
 $\therefore \tan^2 \theta + \cot^2 \theta = 7$

126. If $\sin x - \cos x = 0$, then the value of $(\sin^3 x - \cos^3 x)$ is:

- (a) 2 (b) 4
(c) 0 (d) 1

SSC CHSL -13/10/2020 (Shift-III)

Ans. (c) $\because \sin x - \cos x = 0$
 $\therefore (\sin x - \cos x)^3 = \sin^3 x - \cos^3 x - 3 \sin x \cos x (\sin x - \cos x)$
 $0 = \sin^3 x - \cos^3 x - 3 \sin x \cos x \times 0$
 or $\sin^3 x - \cos^3 x = 0$

127. If $\tan^4 x - \tan^2 x = 1$, then the value of $\sin^4 x + \sin^2 x$ is:

- (a) $\frac{3}{4}$ (b) $\frac{3}{2}$ (c) $\frac{1}{2}$ (d) 1

SSC CHSL -14/10/2020 (Shift-II)

Ans. (d) $\tan^4 x - \tan^2 x = 1$
 $\tan^4 x = 1 + \tan^2 x$
 $\tan^4 x = \sec^2 x$
 $\frac{\sin^4 x}{\cos^4 x} = \frac{1}{\cos^2 x}$
 $\sin^4 x = \cos^2 x$
 $\sin^4 x + \sin^2 x = \cos^2 x + \sin^2 x = 1$

128. If $\cos^2 \theta + \cos^4 \theta = 1$, then the value of $\sin \theta + \sin^2 \theta$ is:

- (a) $\frac{1}{2}$ (b) 0 (c) 1 (d) 2

SSC CHSL -16/10/2020 (Shift-I)

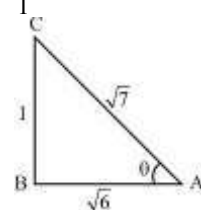
Ans. (c) $\cos^2 \theta + \cos^4 \theta = 1$
 or $\cos^4 \theta = 1 - \cos^2 \theta$
 or $\cos^4 \theta = \sin^2 \theta$
 or $\cos^2 \theta = \sin \theta$
 $\therefore \sin \theta + \sin^2 \theta$
 $= \cos^2 \theta + \sin^2 \theta = 1$

129. If $\cot \theta = \sqrt{6}$ then the value of $\frac{\operatorname{cosec}^2 \theta + \sec^2 \theta}{\operatorname{cosec}^2 \theta - \sec^2 \theta}$ is:

- (a) $\frac{49}{36}$ (b) $\frac{48}{35}$ (c) $\frac{7}{5}$ (d) $\frac{43}{36}$

SSC CHSL 03/07/2019 (Shift-I)

Ans. (c) $\cot \theta = \frac{\sqrt{6}}{1}$



From the Pythagoras theorem,

$$AC^2 = (\sqrt{6})^2 + (1)^2$$

$$AC^2 = 6 + 1$$

$$AC = \sqrt{7}$$

As per question,

$$\frac{\operatorname{cosec}^2 \theta + \sec^2 \theta}{\operatorname{cosec}^2 \theta - \sec^2 \theta} = \frac{(\sqrt{7})^2 + \left(\frac{\sqrt{7}}{\sqrt{6}}\right)^2}{(\sqrt{7})^2 - \left(\frac{\sqrt{7}}{\sqrt{6}}\right)^2}$$

$$= \frac{7 + \frac{7}{6}}{7 - \frac{7}{6}} = \frac{49}{6} \times \frac{6}{35}$$

$$= \frac{49}{35} = \frac{7}{5}$$

130. The value of $\sin^4 \theta + \cos^4 \theta + 2\sin^2 \theta \cos^2 \theta$ is:

- (a) 2 (b) 0
(c) 1 (d) 4

SSC CHSL -19/10/2020 (Shift-III)

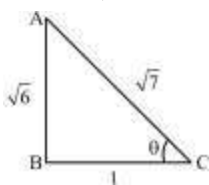
Ans. (c) : $\sin^4 \theta + \cos^4 \theta + 2\sin^2 \theta \cos^2 \theta$
 $= (\sin^2 \theta + \cos^2 \theta)^2$
 $= (1)^2 \Rightarrow 1$

131. If $4\cos^2 \theta - 3\sin^2 \theta + 2 = 0$ then the value of $\tan \theta$ is (where $0^\circ \leq \theta < 90^\circ$)

- (a) $\sqrt{6}$ (b) 1
(c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{2}$

SSC CHSL -12/10/2020 (Shift-II)

Ans. (a) : $4\cos^2 \theta - 3\sin^2 \theta + 2 = 0$
 $4\cos^2 \theta - 3(1 - \cos^2 \theta) = -2$
 $4\cos^2 \theta - 3 + 3\cos^2 \theta = -2$
 $7\cos^2 \theta = 1$
 $\cos \theta = \frac{1}{\sqrt{7}}$



$\therefore \tan \theta = \frac{\sqrt{6}}{1} = \sqrt{6}$

132. The value of $\tan^2 \phi + \cot^2 \phi - \sec^2 \phi \operatorname{cosec}^2 \phi$ is equal to :

- (a) -2 (b) 1
(c) 0 (d) -1

SSC CGL (Tier-II) 12-09-2019

Ans. (a) $\tan^2 \phi + \cot^2 \phi - \sec^2 \phi \operatorname{cosec}^2 \phi$
 $= \frac{\sin^2 \phi}{\cos^2 \phi} + \frac{\cos^2 \phi}{\sin^2 \phi} - \frac{1}{\sin^2 \phi \cos^2 \phi}$

$$= \frac{\sin^4 \phi + \cos^4 \phi - 1}{\cos^2 \phi \sin^2 \phi} = \frac{(\sin^2 \phi + \cos^2 \phi)^2 - 2\sin^2 \phi \cos^2 \phi - 1}{\cos^2 \phi \sin^2 \phi}$$

$$= \frac{1 - 2\sin^2 \phi \cos^2 \phi - 1}{\sin^2 \phi \cos^2 \phi} = \frac{-2\sin^2 \phi \cos^2 \phi}{\sin^2 \phi \cos^2 \phi} = -2$$

133. $\left(\frac{1 - \tan \theta}{1 - \cot \theta}\right)^2 + 1 = ?$

- (a) $\operatorname{cosec}^2 \theta$ (b) $\sec^2 \theta$
(c) $\cos^2 \theta$ (d) $\sin^2 \theta$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

$$\left(\frac{1 - \tan \theta}{1 - \cot \theta}\right)^2 + 1 = \left(\frac{1 - \tan \theta}{1 - \frac{1}{\tan \theta}}\right)^2 + 1$$

$$= \left(\frac{1 - \tan \theta}{\frac{\tan \theta - 1}{\tan \theta}}\right)^2 + 1 = (-\tan \theta)^2 + 1$$

$$= \tan^2 \theta + 1$$

$$= \sec^2 \theta$$

134. $(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi = ?$

- (a) $\sec \phi$ (b) $\cot^2 \phi$
(c) $\cos \phi$ (d) $\cos \phi$

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Ans. (b) : $(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$

$$= \left(\frac{1}{\cos \phi} - \frac{\sin \phi}{\cos \phi}\right)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

$$= \frac{(1 - \sin \phi)^2 \times (1 + \sin \phi)^2}{\cos^2 \phi} \div \sin^2 \phi$$

$$= \frac{(1 - \sin^2 \phi)^2}{\cos^2 \phi} \div \sin^2 \phi = \frac{(\cos^2 \phi)^2}{\cos^2 \phi \times \sin^2 \phi} = \frac{\cos^2 \phi}{\sin^2 \phi}$$

$$= \cot^2 \phi$$

135. The value of $\left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A}\right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1\right)$

is :

- (a) 2 (b) $\frac{3}{2}$
(c) 1 (d) $\frac{1}{2}$

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Ans. (a) :

$$\left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A}\right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1\right)$$

$$= \frac{\sin^2 A + 1 + \cos^2 A - 2\cos A}{\sin A(1 - \cos A)} \div \left(\frac{\cos^2 A}{\sin^2 A + \sin A} + 1\right)$$

$$= \frac{2(1 - \cos A)}{\sin A(1 - \cos A)} \div \frac{(1 + \sin A)}{(\sin^2 A + \sin A)}$$

$$= \frac{2}{\sin A} \times \frac{\sin A(1 + \sin A)}{1 + \sin A} = 2$$

136. The value of $\frac{\sec^2 \theta}{\operatorname{cosec}^2 \theta} + \frac{\operatorname{cosec}^2 \theta}{\sec^2 \theta} - (\sec^2 \theta + \operatorname{cosec}^2 \theta)$

is :

- (a) 1 (b) 0
(c) -2 (d) 2

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Ans. (c) :

$$\frac{\sec^2 \theta}{\operatorname{cosec}^2 \theta} + \frac{\operatorname{cosec}^2 \theta}{\sec^2 \theta} - (\sec^2 \theta + \operatorname{cosec}^2 \theta)$$

$$= \frac{\sin^2 \theta}{\cos^2 \theta} + \frac{\cos^2 \theta}{\sin^2 \theta} - \left(\frac{1}{\cos^2 \theta} + \frac{1}{\sin^2 \theta} \right)$$

$$= \frac{\sin^4 \theta + \cos^4 \theta - (\sin^2 \theta + \cos^2 \theta)}{\cos^2 \theta \cdot \sin^2 \theta}$$

$$= \frac{(\sin^2 \theta + \cos^2 \theta)^2 - 2\sin^2 \theta \cdot \cos^2 \theta - 1}{\cos^2 \theta \cdot \sin^2 \theta}$$

$$= \frac{1 - 2\sin^2 \theta \cdot \cos^2 \theta - 1}{\cos^2 \theta \cdot \sin^2 \theta}$$

$$= -2$$

137. The value of $\frac{2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta)}{\cos^4 \theta - \sin^4 \theta - 2\cos^2 \theta}$

is:

- (a) 1 (b) 2
(c) -2 (d) -1

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Ans. (a) :

$$\frac{2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta)}{\cos^4 \theta - \sin^4 \theta - 2\cos^2 \theta}$$

$$= \frac{2[\sin^2 \theta + \cos^2 \theta][\sin^4 \theta + \cos^4 \theta - \sin^2 \theta \cdot \cos^2 \theta] - 3(\sin^4 \theta + \cos^4 \theta)}{(\cos^2 \theta + \sin^2 \theta)(\cos^2 \theta - \sin^2 \theta) - 2\cos^2 \theta}$$

$$= \frac{2(\sin^4 \theta + \cos^4 \theta - \sin^2 \theta \cdot \cos^2 \theta) - 3(\sin^4 \theta + \cos^4 \theta)}{\cos^2 \theta - \sin^2 \theta - 2\cos^2 \theta}$$

$$= \frac{-\sin^4 \theta - \cos^4 \theta - 2\sin^2 \theta \cdot \cos^2 \theta}{-(\cos^2 \theta + \sin^2 \theta)}$$

$$= \frac{-(\sin^2 \theta + \cos^2 \theta)^2}{-(\cos^2 \theta + \sin^2 \theta)}$$

$$= \frac{1}{1} = 1$$

138. The value of $\frac{3(1 - 2\sin^2 x)}{\cos^2 x - \sin^2 x}$ is:

- (a) 1 (b) 4
(c) 3 (d) 2

SSC CGL (Tier-I) - 09/03/2020 (Shift-III)

Ans. (c) :

$$\frac{3(1 - 2\sin^2 x)}{\cos^2 x - \sin^2 x}$$

$$= \frac{3(1 - 2\sin^2 x)}{1 - 2\sin^2 x} \quad (\because \cos^2 x = 1 - \sin^2 x)$$

$$= 3$$

139. The expression $3\sec^2 \theta \tan^2 \theta + \tan^6 \theta - \sec^6 \theta$ is equal to:

- (a) -1 (b) 1
(c) 2 (d) -2

SSC CGL (Tier-I) - 04/03/2020 (Shift-II)

Ans. (a) : $3\sec^2 \theta \cdot \tan^2 \theta + \tan^6 \theta - \sec^6 \theta$

$$= 3\sec^2 \theta \cdot \tan^2 \theta - (\sec^6 \theta - \tan^6 \theta)$$

$$= 3\sec^2 \theta \cdot \tan^2 \theta - (\sec^2 \theta - \tan^2 \theta)(\sec^4 \theta + \tan^4 \theta + \sec^2 \theta \cdot \tan^2 \theta)$$

$$= 3\sec^2 \theta \cdot \tan^2 \theta - 1 \times [(\sec^2 \theta - \tan^2 \theta)^2 + 3\sec^2 \theta \cdot \tan^2 \theta]$$

$$= 3\sec^2 \theta \cdot \tan^2 \theta - 1 - 3\sec^2 \theta \cdot \tan^2 \theta = -1$$

140. The value of $\frac{\sec^6 \theta - \tan^6 \theta - 3\sec^2 \theta \tan^2 \theta + 1}{\cos^4 \theta - \sin^4 \theta + 2\sin^2 \theta + 2}$ is:

- (a) 1 (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

SSC CGL (Tier-I) - 05/03/2020 (Shift-I)

Ans. (c) : $\frac{\sec^6 \theta - \tan^6 \theta - 3\sec^2 \theta \tan^2 \theta + 1}{\cos^4 \theta - \sin^4 \theta + 2\sin^2 \theta + 2}$

$$= \frac{(\sec^2 \theta - \tan^2 \theta)(\sec^4 \theta + \tan^4 \theta + \sec^2 \theta \tan^2 \theta) - 3\sec^2 \theta \cdot \tan^2 \theta + 1}{(\cos^2 \theta + \sin^2 \theta)(\cos^2 \theta - \sin^2 \theta) + 2\sin^2 \theta + 2}$$

$$= 1 \times \frac{\{(\sec^2 \theta - \tan^2 \theta)^2 + 3\sec^2 \theta \cdot \tan^2 \theta\} - 3\sec^2 \theta \cdot \tan^2 \theta + 1}{1 - \sin^2 \theta - \sin^2 \theta + 2\sin^2 \theta + 2}$$

$$\left(\because \sec^2 \theta - \tan^2 \theta = 1 \right)$$

$$\left(\cos^2 \theta = 1 - \sin^2 \theta \right)$$

$$= \frac{1+1}{3} = \frac{2}{3}$$

141. The value of $4 \left[\frac{(1 - \sec A)^2 + (1 + \sec A)^2}{1 + \sec^2 A} \right]$ is:

- (a) 2 (b) 8
(c) 1 (d) 4

SSC CGL (Tier-I) - 06/03/2020 (Shift-III)

Ans. (b) :

$$4 \left[\frac{(1 - \sec A)^2 + (1 + \sec A)^2}{1 + \sec^2 A} \right]$$

$$= 4 \left[\frac{2(1 + \sec^2 A)}{1 + \sec^2 A} \right] \quad [\because (a+b)^2 + (a-b)^2 = 2(a^2 + b^2)]$$

$$= 8$$

142. If $\cos \theta + \sec \theta = 2$, then $(\cos^{117} \theta + \sec^{117} \theta)$ equal to :

- (a) 234 (b) 2^{117}
(c) 2 (d) 117

SSC CGL (Tier-I) - 19.06.2019 (Shift-III)

Ans. (c) $\cos\theta + \sec\theta = 2$

Let $\theta = 0^\circ$
 $\cos 0^\circ + \sec 0^\circ = 2$
 $1 + 1 = 2$
 $2 = 2$

$\therefore \cos^{117}\theta + \sec^{117}\theta = \cos^{117}0^\circ + \sec^{117}0^\circ = (1)^{117} + (1)^{117} = 2$

143. The value of $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$ is equal to :

- (a) $\sin\theta \cos^2\theta$ (b) $\sin\theta \sec^2\theta$
 (c) $\operatorname{cosec}\theta \cos^2\theta$ (d) $\operatorname{cosec}\theta \sec^2\theta$

SSC CGL (TIER-I) - 06.06.2019 (Shift-I)

Ans. (b) : $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$

$$= \sqrt{\frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta}} \times \sqrt{\frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta}$$

$$= \sqrt{\frac{\sin^2\theta + \cos^2\theta}{\cos^2\theta \cdot \sin^2\theta}} \times \sqrt{\sin^2\theta \left[\frac{1}{\cos^2\theta} - 1 \right]}$$

$$= \frac{1}{\cos\theta \cdot \sin\theta} \times \sqrt{\frac{\sin^2\theta \cdot \sin^2\theta}{\cos^2\theta}}$$

$$= \frac{1}{\cos\theta \cdot \sin\theta} \times \frac{\sin^2\theta}{\cos\theta} = \sin\theta \cdot \sec^2\theta$$

144. If $(1 + \tan^2\theta) + (1 + (\tan^2\theta)^{-1}) = k$, then $\sqrt{k} = ?$

- (a) $\operatorname{cosec}\theta \sec\theta$ (b) $\sin\theta \cos\theta$
 (c) $\operatorname{cosec}\theta \cos\theta$ (d) $\sin\theta \sec\theta$

SSC CGL (TIER-I) - 06.06.2019 (Shift-III)

Ans. (a) : $(1 + \tan^2\theta) + [1 + (\tan^2\theta)^{-1}] = k$

$$\sec^2\theta + [1 + \cot^2\theta] = k$$

$$\sec^2\theta + \operatorname{cosec}^2\theta = k$$

$$\frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta} = k$$

$$k = \frac{\sin^2\theta + \cos^2\theta}{\sin^2\theta \cdot \cos^2\theta} = \frac{1}{\sin^2\theta \cdot \cos^2\theta}$$

$$= \operatorname{cosec}^2\theta \cdot \sec^2\theta$$

$$\sqrt{k} = \operatorname{cosec}\theta \cdot \sec\theta$$

145. The expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$ is equal to:

- (a) 0 (b) 1
 (c) 2 (d) -1

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (a) $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3 = ?$

$$= [(\cos^2\theta + \sin^2\theta)(\cos^4\theta + \sin^4\theta - \cos^2\theta \sin^2\theta - \sin^2\theta \cos^2\theta) - 1](\tan\theta + \cot\theta)^2 + 3$$

$$= [1(\cos^2\theta + \sin^2\theta)^2 - 2\cos^2\theta \cdot \sin^2\theta - \cos^2\theta \cdot \sin^2\theta - 1] \left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta \cos\theta} \right)^2 + 3$$

$$= (1 - 3\cos^2\theta \cdot \sin^2\theta - 1) \times \frac{1}{\sin^2\theta \cdot \cos^2\theta} + 3$$

$$= -3\cos^2\theta \cdot \sin^2\theta \times \frac{1}{\sin^2\theta \cdot \cos^2\theta} + 3$$

$$= -3 + 3 = 0$$

146. The expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 1$ is equal to:

- (a) 1 (b) -2
 (c) 0 (d) -1

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b) $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 1$

$$= \{(\cos^2\theta + \sin^2\theta)[\cos^4\theta + \sin^4\theta - \cos^2\theta \sin^2\theta] - 1\}(\tan\theta + \cot\theta)^2 + 1$$

$$= 1 \times [(\cos^2\theta + \sin^2\theta)^2 - 2\sin^2\theta \cos^2\theta - \cos^2\theta \sin^2\theta - 1] \left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta \cos\theta} \right)^2 + 1$$

$$= -3\sin^2\theta \cos^2\theta \times \frac{1}{\sin^2\theta \cos^2\theta} + 1$$

$$= -3 + 1 = -2$$

147. If $\cot\theta = \frac{3}{\sqrt{5}}$, $0^\circ < \theta < 90^\circ$ then the value of

$\frac{6\sec^2\theta - \frac{5}{3}\operatorname{cosec}^2\theta}{\frac{3}{5}\sec^2\theta + \frac{4}{3}\operatorname{cosec}^2\theta}$, is equal to:

- (a) 1/3 (b) 1
 (c) 1/2 (d) 2/3

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b) $\cot\theta = \frac{3}{\sqrt{5}} \Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{3}{\sqrt{5}}$

By taking the value of $\cos\theta = 3$, $\sin\theta = \sqrt{5}$

$$\frac{6\sec^2\theta - \frac{5}{3}\operatorname{cosec}^2\theta}{\frac{3}{5}\sec^2\theta + \frac{4}{3}\operatorname{cosec}^2\theta} = \frac{6 \times \left(\frac{1}{3}\right)^2 - \frac{5}{3} \times \left(\frac{1}{\sqrt{5}}\right)^2}{\frac{3}{5} \times \left(\frac{1}{3}\right)^2 + \frac{4}{3} \times \left(\frac{1}{\sqrt{5}}\right)^2}$$

$$= \frac{\left(\frac{2}{3} - \frac{1}{3}\right)}{\left(\frac{1}{15} + \frac{4}{15}\right)} = \frac{\frac{1}{3}}{\frac{1}{3}} = 1$$

148. If $\tan\theta = \frac{2}{\sqrt{11}}$, $0 < \theta < 90^\circ$, then the value of

$\frac{2\operatorname{cosec}^2\theta - 3\sec^2\theta}{3\operatorname{cosec}^2\theta + 4\sec^2\theta}$ is equal to:

- (a) $\frac{11}{45}$ (b) $\frac{11}{49}$
 (c) $\frac{13}{49}$ (d) $\frac{10}{49}$

SSC CHSL -26/10/2020 (Shift-III)

Ans. (d) : $\frac{2\operatorname{cosec}^2\theta - 3\sec^2\theta}{3\operatorname{cosec}^2\theta + 4\sec^2\theta}$

$$= \frac{2(1 + \cot^2\theta) - 3(1 + \tan^2\theta)}{3(1 + \cot^2\theta) + 4(1 + \tan^2\theta)}$$

$$= \frac{2\cot^2\theta - 3\tan^2\theta - 1}{3\cot^2\theta + 4\tan^2\theta + 7}$$

$$\begin{aligned}
 &= \frac{2 \times \frac{11}{4} - 3 \times \frac{4}{11} - 1}{3 \times \frac{11}{4} + 4 \times \frac{4}{11} + 7} \\
 &= \frac{121 - 24 - 22}{363 + 64 + 308} \\
 &= \frac{22}{735} = \frac{10}{735} \\
 &= \frac{2}{73.5} = \frac{10}{735}
 \end{aligned}$$

149. If A and B are acute angles and SecA = 3; Cot B = 4, then the value of $\frac{\operatorname{cosec}^2 A + \sin^2 B}{\cot^2 A + \sec^2 B}$ is:

- (a) $\frac{25}{261}$ (b) $\frac{322}{323}$
 (c) $\frac{1}{261}$ (d) 2

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : sec A = 3, cot B = 4

$$\begin{aligned}
 &\frac{\operatorname{cosec}^2 A + \sin^2 B}{\cot^2 A + \sec^2 B} \\
 &= \frac{\left(\frac{3}{\sqrt{8}}\right)^2 + \left(\frac{1}{\sqrt{17}}\right)^2}{\left(\frac{1}{\sqrt{8}}\right)^2 + \left(\frac{\sqrt{17}}{4}\right)^2} \\
 &= \frac{\frac{9}{8} + \frac{1}{17}}{\frac{1}{8} + \frac{17}{16}} = \frac{\frac{161}{136}}{\frac{19}{16}} = \frac{322}{323}
 \end{aligned}$$

150. If cosA, sinA, cotA are in geometric progression, then the value of $\tan^6 A - \tan^2 A$ is:

- (a) 1 (b) $\frac{1}{3}$
 (c) $\frac{1}{2}$ (d) 3

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : $\because \cos A, \sin A, \cot A$ is in G.P.
 $\therefore \frac{T_2}{T_1} = \frac{T_3}{T_2} \Rightarrow \frac{\sin A}{\cos A} = \frac{\cot A}{\sin A} \Rightarrow \sin^3 A = \cos^2 A$
 (where T = term)
 $\frac{\sin^3 A}{\cos^3 A} = \frac{\cos^2 A}{\cos^3 A} \Rightarrow \tan^3 A = \sec A$
 $\therefore \tan^6 A - \tan^2 A = \sec^2 A - \tan^2 A = 1$

151. If $\sec A = \frac{\sqrt{11}}{3}$, then the value of $\frac{\operatorname{cosec}^2 A + \tan^2 A}{\sin^2 A + \cot^2 A}$ is:

- (a) $\frac{4}{9}$ (b) $\frac{11}{9}$
 (c) $\frac{9}{4}$ (d) $\frac{2}{11}$

SSC CHSL-13/10/2020 (Shift-II)

Ans. (b) : Given, $\sec A = \frac{\sqrt{11}}{3}$
 $\tan A = \sqrt{\sec^2 A - 1} = \sqrt{\frac{11}{9} - 1} = \frac{\sqrt{2}}{3}$
 $\sin A = \sqrt{1 - \cos^2 A} = \sqrt{1 - \frac{9}{11}} = \sqrt{\frac{2}{11}}$
 $\therefore \frac{\operatorname{cosec}^2 A + \tan^2 A}{\sin^2 A + \cot^2 A} = \frac{\frac{11}{2} + \frac{2}{9}}{\frac{2}{11} + \frac{9}{2}} = \frac{(99 + 4)/18}{(99 + 4)/22}$
 $= \frac{22}{18} = \frac{11}{9}$

152. If $7\cos^2 \theta + 3\sin^2 \theta = 6$, $0^\circ < \theta < 90^\circ$, then the value of $\frac{\cot^2 2\theta + \sec^2 2\theta}{\tan^2 2\theta - \sin^2 2\theta}$ is:

- (a) $\frac{49}{45}$ (b) $\frac{28}{27}$
 (c) $\frac{52}{27}$ (d) $\frac{26}{15}$

SSC CGL (Tier-I)- 04/03/2020 (Shift-III)

Ans. (c) : $7\cos^2 \theta + 3\sin^2 \theta = 6$
 $4\cos^2 \theta + 3(\cos^2 \theta + \sin^2 \theta) = 6$
 $4\cos^2 \theta + 3 = 6$
 $4\cos^2 \theta = 3$
 $\cos^2 \theta = \frac{3}{4}$
 $\theta = 30^\circ$
 Hence $\frac{\cot^2 60^\circ + \sec^2 60^\circ}{\tan^2 60^\circ - \sin^2 60^\circ}$
 $= \frac{\frac{1}{3} + 4}{3 - \frac{3}{4}}$
 $= \frac{13 \times 4}{3 \times 9} = \frac{52}{27}$

153. If $8\sin^2 \theta + 2\cos \theta = 5$, $0^\circ < \theta < 90^\circ$, then the value of $\tan^2 \theta + \sec^2 \theta - \sin^2 \theta$ will be:

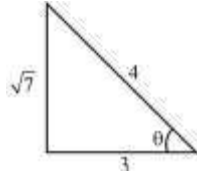
- (a) $\frac{431}{144}$ (b) $\frac{23}{9}$
 (c) $\frac{153}{72}$ (d) $\frac{305}{144}$

SSC CHSL 12/04/2021 (Shift-I)

Ans : (d) $8\sin^2\theta + 2\cos\theta = 5$
 $8 - 8\cos^2\theta + 2\cos\theta = 5$
 $8\cos^2\theta - 6\cos\theta + 4\cos\theta - 3 = 0$
 $2\cos\theta(4\cos\theta - 3) + 1(4\cos\theta - 3) = 0$
 $(4\cos\theta - 3)(2\cos\theta + 1) = 0$

$$\cos\theta = \frac{3}{4}$$

$$\cos\theta = \frac{-1}{2} \quad (\text{invalid})$$



$$\tan^2\theta + \sec^2\theta - \sin^2\theta$$

$$\frac{7}{9} + \frac{16}{9} - \frac{7}{16}$$

$$\frac{112 + 256 - 63}{144} = \frac{305}{144}$$

154. If $3\cos^2\theta - 4\sin\theta + 1 = 0$, $0^\circ < \theta < 90^\circ$, then $\tan\theta + \sec\theta = ?$

- (a) $2\sqrt{5}$ (b) $2\sqrt{3}$
(c) $3\sqrt{3}$ (d) $\sqrt{5}$

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (d) : $3\cos^2\theta - 4\sin\theta + 1 = 0$
 $3(1 - \sin^2\theta) - 4\sin\theta + 1 = 0$
 $3 - 3\sin^2\theta - 4\sin\theta + 1 = 0$
 $3\sin^2\theta + 4\sin\theta - 4 = 0$
 $3\sin^2\theta + 6\sin\theta - 2\sin\theta - 4 = 0$
 $(\sin\theta + 2)(3\sin\theta - 2) = 0$
 $\therefore 3\sin\theta = 2$

$$\sin\theta = \frac{2}{3} \quad (\text{on taking})$$

$$\begin{aligned} \tan\theta + \sec\theta &= \left(\frac{\sin\theta + 1}{\cos\theta} \right) \\ &= \frac{5/3}{\sqrt{1 - \frac{4}{9}}} \\ &= \frac{5/3}{\frac{\sqrt{5}}{3}} \\ &= \sqrt{5} \end{aligned}$$

155. If $\tan\theta = \sqrt{5}$, then the value of $\frac{\operatorname{cosec}^2\theta + \sec^2\theta}{\operatorname{cosec}^2\theta - \sec^2\theta}$ is :

- (a) $-\frac{7}{5}$ (b) $\frac{7}{5}$
(c) $-\frac{3}{2}$ (d) $\frac{3}{2}$

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,

$\tan\theta = \sqrt{5}$ then the value of $\frac{\operatorname{cosec}^2\theta + \sec^2\theta}{\operatorname{cosec}^2\theta - \sec^2\theta}$ is:

$$\therefore \operatorname{cosec}^2\theta = 1 + \cot^2\theta$$

$$\sec^2\theta = 1 + \tan^2\theta$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{\sqrt{5}}$$

$$= \frac{1 + \cot^2\theta + 1 + \tan^2\theta}{1 + \cot^2\theta - 1 - \tan^2\theta}$$

$$= \frac{2 + \frac{1}{5} + 5}{\frac{1}{5} - 5}$$

$$= \frac{7 + \frac{1}{5}}{\frac{1}{5} - 5}$$

$$= \frac{36}{5}$$

$$= -\frac{36}{24}$$

$$= -\frac{3}{2}$$

$$= -\frac{36}{24}$$

$$= -\frac{3}{2}$$

156. If $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then what will be the value of $\sec\theta - \cos\theta$?

- (a) $\frac{4}{3}$ (b) $\frac{1}{2}$
(c) $\frac{3}{2}$ (d) $\frac{2}{3}$

SSC CHSL 09/08/2021 (Shift-I)

Ans. (c) : $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$
 $\cos^2\theta - 1 + \cos^2\theta - 3\cos\theta + 2 = 0$
 $2\cos^2\theta - 3\cos\theta + 1 = 0$
 $2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$
 $2\cos\theta(\cos\theta - 1) - 1(\cos\theta - 1) = 0$
 $(\cos\theta - 1)(2\cos\theta - 1) = 0$

$$\cos\theta = 1, \frac{1}{2}$$

$$(\because \cos\theta = 1, \cos\theta = \frac{1}{2}, \sec\theta = 1, \sec\theta = 2)$$

by taking value, $\cos\theta = \frac{1}{2}$

$$\therefore \sec\theta - \cos\theta = 2 - \frac{1}{2} = \frac{3}{2}$$

by taking value $\cos\theta = 1$

$$\sec\theta - \cos\theta = 1 - 1 = 0$$

Hence it is clear that $\cos\theta = \frac{1}{2}$ satisfied answer.

Trick:-

$$\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$$

taking $\theta = 60^\circ$

$$\therefore \text{L.H.S} = \cos^2 60^\circ - \sin^2 60^\circ - 3\cos 60^\circ + 2$$

$$= \frac{1}{4} - \frac{3}{4} - \frac{3}{2} + 2$$

$$= -\frac{1}{2} + \frac{1}{2} = 0 = \text{R.H.S}$$

So, $\sec\theta - \cos\theta = \sec 60^\circ - \cos 60^\circ$

$$= 2 - \frac{1}{2} = \frac{3}{2}$$

157. $1 + 2\tan^2\theta + 2\sin\theta \cdot \sec^2\theta$, $0^\circ < \theta < 90^\circ$, is equal to:

- (a) $\frac{1 - \cos\theta}{1 + \cos\theta}$ (b) $\frac{1 + \cos\theta}{1 - \cos\theta}$
 (c) $\frac{1 - \sin\theta}{1 + \sin\theta}$ (d) $\frac{1 + \sin\theta}{1 - \sin\theta}$

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (d) : $1 + 2\tan^2\theta + 2\sin\theta \cdot \sec^2\theta$

$$1 + 2 \cdot \frac{\sin^2\theta}{\cos^2\theta} + \frac{2\sin\theta}{\cos^2\theta}$$

$$\frac{\cos^2\theta + 2\sin^2\theta + 2\sin\theta}{\cos^2\theta}$$

$$\frac{\cos^2\theta + \sin^2\theta + \sin^2\theta + 2\sin\theta}{1 - \sin^2\theta} \quad [\because \cos^2\theta = 1 - \sin^2\theta]$$

$$\frac{1 + \sin^2\theta + 2\sin\theta}{(1 - \sin\theta)(1 + \sin\theta)} \quad \left[\begin{array}{l} \because (a+b)^2 = a^2 + b^2 + 2ab \\ (a-b)^2 = (a-b)(a+b) \end{array} \right]$$

$$\frac{(1 + \sin\theta)^2}{(1 - \sin\theta)(1 + \sin\theta)}$$

$$\Rightarrow \frac{1 + \sin\theta}{1 - \sin\theta}$$

158. If $4\sin^2\theta = 3(1 + \cos\theta)$, $0^\circ < \theta < 90^\circ$, then what is the value of $(2\tan\theta + 4\sin\theta - \sec\theta)$?

- (a) $3\sqrt{15} - 4$ (b) $15\sqrt{3} - 4$
 (c) $15\sqrt{3} + 3$ (d) $4\sqrt{5} - 3$

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

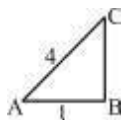
Ans. (a) $4\sin^2\theta = 3(1 + \cos\theta)$

$$4(1 - \cos^2\theta) = 3(1 + \cos\theta)$$

$$4(1 - \cos\theta)(1 + \cos\theta) = 3(1 + \cos\theta)$$

$$4 - 4\cos\theta = 3$$

$$\cos\theta = \frac{1}{4}$$



$$AC^2 = AB^2 + BC^2$$

$$4^2 = 1^2 + BC^2$$

$$BC = \sqrt{15}$$

$$2\tan\theta + 4\sin\theta - \sec\theta$$

$$= 2 \times \frac{\sqrt{15}}{1} + 4 \times \frac{\sqrt{15}}{4} - \frac{4}{1}$$

$$= 3\sqrt{15} - 4$$

159. If $117 \cos^2 A + 129 \sin^2 A = 120$ and $170 \cos^2 B + 158 \sin^2 B = 161$, then the value of $\operatorname{cosec}^2 A \sec^2 B$ is:

- (a) 16 (b) 9
 (c) 1 (d) 4

SSC CHSL -13/10/2020 (Shift-I)

Ans. (a) : $117 \cos^2 A + 129 \sin^2 A = 120$

$$117 \cos^2 A + 117 \sin^2 A + 12 \sin^2 A = 120$$

$$117 (\cos^2 A + \sin^2 A) + 12 \sin^2 A = 120$$

$$12 \sin^2 A = 120 - 117$$

$$\sin^2 A = \frac{3}{12}$$

$$\sin^2 A = \frac{1}{4}$$

$$\operatorname{cosec}^2 A = 4 \text{-----(i)}$$

$$\text{And } 170 \cos^2 B + 158 \sin^2 B = 161$$

$$158 \cos^2 B + 12 \cos^2 B + 158 \sin^2 B = 161$$

$$12 \cos^2 B + 158 (\sin^2 B + \cos^2 B) = 161$$

$$12 \cos^2 B = 161 - 158$$

$$\cos^2 B = \frac{3}{12}$$

$$\cos^2 B = \frac{1}{4} \Rightarrow \sec^2 B = 4 \text{-----(ii)}$$

Multiplying equation (i) and (ii)

$$\operatorname{cosec}^2 A \sec^2 B = 4 \times 4 = 16$$

160. If $\cos\theta = \frac{5}{13}$, then the value of $\tan^2\theta + \sec^2\theta$ is equal to :

- (a) $\frac{233}{25}$ (b) $\frac{303}{25}$
 (c) $\frac{313}{25}$ (d) $\frac{323}{25}$

SSC CGL (Tier-II) - 18/11/2020

Ans. (c) $\cos\theta = \frac{5}{13} \Rightarrow \sec\theta = \frac{13}{5} \tan^2\theta + \sec^2\theta$

$$= (\sec^2\theta - 1) + \sec^2\theta$$

$$= 2\sec^2\theta - 1$$

$$= 2 \times \frac{13^2}{5^2} - 1 = \frac{313}{25}$$

161. If $\sin^6\theta + \cos^6\theta = \frac{1}{3}$, $0^\circ < \theta < 90^\circ$ then what is the value of $\sin\theta\cos\theta$?

- (a) $\frac{\sqrt{2}}{3}$ (b) $\frac{\sqrt{6}}{6}$
 (c) $\frac{\sqrt{2}}{\sqrt{3}}$ (d) $\frac{2}{9}$

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (c) : $\sin^6 \theta + \cos^6 \theta = \frac{1}{3}$
 $\therefore a^3 + b^3 = (1+b)(a^2 - ab + b^2)$
 So, $(\sin^2 \theta)^3 + (\cos^2 \theta) = (\sin^2 \theta + \cos^2 \theta)(\sin^2 \theta - \sin^2 \theta \cos^2 \theta + \cos^2 \theta)$
 $\frac{1}{3} = 1 \times (1 - \frac{1}{3}) = 1 \times (1 - \sin^2 \theta \cdot \cos^2 \theta)$
 $\therefore \sin^2 \theta \cos^2 \theta = \frac{2}{3}$
 $\sin \theta \cos \theta = \frac{\sqrt{2}}{\sqrt{3}}$

162. If $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$, then the value of

$\frac{24 \cos^2 \theta - 15 \sec^2 \theta}{6 \operatorname{cosec}^2 \theta - 7 \cot^2 \theta}$ is:

- (a) 6 (b) 2
 (c) 4 (d) 1

SSC CHSL 06/08/2021 (Shift-III)

Ans. (b) : $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$
 $\sin^2 \theta = 5 \tan^2 \theta - 5 \sin^2 \theta$
 $6 \sin^2 \theta = 5 \tan^2 \theta$
 $\cos^2 \theta = \frac{5}{6}, \sin^2 \theta = 1 - \frac{5}{6} = \frac{1}{6} (\because \sin^2 \theta = 1 - \cos^2 \theta)$
 $\therefore \frac{24 \cos^2 \theta - 15 \sec^2 \theta}{6 \operatorname{cosec}^2 \theta - 7 \cot^2 \theta} = \frac{24 \times \frac{5}{6} - 15 \times \frac{6}{5}}{6 \times 6 - 7 \times 5}$
 $(\because \sin^2 \theta = 1 - \cos^2 \theta)$
 $= \frac{20 - 18}{1} = 2$

163. If $\sin \theta + \sin^2 \theta = 1$, then the value of $\cos^2 \theta + \cos^4 \theta$ is equal to :

- (a) 5 (b) 0
 (c) 1 (d) $\frac{1}{2}$

SSC CGL (Tier-II) - 18/11/2020

Ans. (c) : $\because \sin \theta + \sin^2 \theta = 1, \cos^2 \theta + \cos^4 \theta = ?$
 $\sin \theta = 1 - \sin^2 \theta$
 $\sin \theta = \cos^2 \theta$
 then, $\cos^2 \theta + \cos^4 \theta = ?$
 $\cos^2 \theta + (\cos^2 \theta)^2$
 $\sin \theta + \sin^2 \theta$
 1
 $\therefore \boxed{\cos^2 \theta + \cos^4 \theta = 1}$

164. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta = y \cos \theta$, then the value of $x^2 + y^2$ is:

- (a) 2 (b) 4
 (c) 0 (d) 1

SSC CHSL -20/10/2020 (Shift-I)

Ans : (d) Given,

$x \sin \theta = y \cos \theta$
 $\frac{\sin \theta}{\cos \theta} = \frac{y}{x} \dots (i)$

$\therefore x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$
 $xy^3 + yx^3 = xy$ From equation (i)
 $xy(y^2 + x^2) = xy$
 $x^2 + y^2 = 1$

165. The least value of $8 \operatorname{cosec}^2 \theta + 25 \sin^2 \theta$ is:

- (a) $20\sqrt{2}$ (b) $30\sqrt{2}$
 (c) $40\sqrt{2}$ (d) $10\sqrt{2}$

SSC CHSL -12/10/2020 (Shift-I)

Ans. (a) : The minimum value of $8 \operatorname{cosec}^2 \theta + 25 \sin^2 \theta$

$= 2\sqrt{a \times b}$
 $= 2\sqrt{25 \times 8} = 20\sqrt{2}$

Note : $a \sin^2 \theta + b \operatorname{cosec}^2 \theta$

$a \cos^2 \theta + b \sec^2 \theta$

$a \tan^2 \theta + b \cot^2 \theta$

Minimum value $= 2\sqrt{ab}$

(IV) Problems based on Angular Values of Trigonometric Functions

166. If $\sec \theta$ and $\sin \theta$ ($0^\circ < \theta < 90^\circ$) are the roots of the equation $\sqrt{6}x^2 - kx + \sqrt{6} = 0$ then the value of k is:

- (a) $3\sqrt{3}$ (b) $3\sqrt{2}$
 (c) $2\sqrt{3}$ (d) $\sqrt{3}$

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) : $\sqrt{6}x^2 - kx + \sqrt{6} = 0$

Multiple of roots $= \sec \theta \cdot \sin \theta = \frac{\sqrt{6}}{\sqrt{6}}$

$\tan \theta = 1, \theta = 45^\circ$

Sum of roots $= \sec \theta + \sin \theta = \frac{k}{\sqrt{6}}$

$\sec 45^\circ + \sin 45^\circ = \frac{k}{\sqrt{6}}$

$\sqrt{2} + \frac{1}{\sqrt{2}} = \frac{k}{\sqrt{6}}$

$\frac{3}{\sqrt{2}} = \frac{k}{\sqrt{6}}$

$k = 3\sqrt{3}$

167. If $\tan^2 x - 3 \sec^2 x + 3 = 0$, then the value of x ($0 \leq x \leq 90^\circ$), is:

- (a) 30° (b) 0°
 (c) 45° (d) 60°

Ans. (b) : $\tan^2 x - 3 \sec^2 x + 3 = 0$

$[\because \tan^2 x = \sec^2 x - 1]$

$$\begin{aligned} \sec^2 x - 1 - 3\sec^2 x + 3 &= 0 \\ -2\sec^2 x &= -2 \\ \sec^2 x &= 1 \\ \sec x &= \sec 0^\circ \\ x &= 0^\circ \end{aligned}$$

168. Which of the following is irrational number ?

- (1) $\tan 30^\circ \tan 60^\circ$ (2) $\sin 30^\circ$
 (3) $\tan 45^\circ$ (4) $\cos 30^\circ$
 (a) (3) (b) (1)
 (c) (2) (d) (4)

SSC CHSL (Tier-I) 10/07/2019 (Shift-II)

Ans. (d) (i) $\tan 30^\circ \tan 60^\circ = \frac{1}{\sqrt{3}} \times \sqrt{3} = 1$

(ii) $\sin 30^\circ = \frac{1}{2}$

(iii) $\tan 45^\circ = 1$

(iv) $\cos 30^\circ = \frac{\sqrt{3}}{2}$

Hence, it is clear that $\cos 30^\circ = \frac{\sqrt{3}}{2}$ which is represented a irrational number.

169. Find the value of $\frac{\tan 60^\circ - \tan 15^\circ}{1 + \tan 60^\circ \tan 15^\circ}$

- (a) 1 (b) $\frac{1}{2}$
 (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{2}}$

SSC CHSL -12/10/2020 (Shift-II)

Ans. (a) : $\frac{\tan 60^\circ - \tan 15^\circ}{1 + \tan 60^\circ \tan 15^\circ}$

Compare from formula. $\frac{\tan A - \tan B}{1 + \tan A \tan B} = \tan(A - B)$
 $= \tan(60^\circ - 15^\circ) = \tan 45^\circ = 1$

170. If $\frac{\cos A}{\operatorname{cosec} A + 1} + \frac{\cos A}{\operatorname{cosec} A - 1} = 2$, $0^\circ \leq A \leq 90^\circ$, then A is equal to:

- (a) 45° (b) 90°
 (c) 30° (d) 60°

SSC CHSL -21/10/2020 (Shift-I)

Ans. (a) From question,

$$\frac{\cos A}{\operatorname{cosec} A + 1} + \frac{\cos A}{\operatorname{cosec} A - 1} = 2$$

$$\frac{\cos A(\operatorname{cosec} A - 1) + \cos A(\operatorname{cosec} A + 1)}{\operatorname{cosec}^2 A - 1} = 2$$

$$\frac{\cot A - \cos A + \cot A + \cos A}{\cot^2 A} = 2$$

$$\frac{2\cot A}{\cot^2 A} = 2$$

$$\tan A = 1 \Rightarrow \tan A = \tan 45^\circ \quad \therefore A = 45^\circ$$

171. What is the value of $[2 \sin(45^\circ + \theta) \sin(45^\circ - \theta)] / \cos 2\theta$?

- (a) 0 (b) $\tan 2\theta$
 (c) $\cot 2\theta$ (d) 1

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Ans. (d) : $\frac{2 \sin(45^\circ + \theta) \cdot \sin(45^\circ - \theta)}{\cos 2\theta}$

$$\begin{aligned} \because [2 \sin A \cdot \sin B &= \cos(A - B) - \cos(A + B)] \\ &= \frac{[\cos(45^\circ + \theta - 45^\circ - \theta) - \cos(45^\circ + \theta + 45^\circ - \theta)]}{\cos 2\theta} \\ &= \frac{[\cos 2\theta - \cos 90^\circ]}{\cos 2\theta} = \frac{\cos 2\theta}{\cos 2\theta} = 1 \end{aligned}$$

172. What is the value of $[\sin(90^\circ - A) + \cos(180^\circ - 2A)] / [\cos(90^\circ - 2A) + \sin(180^\circ - A)]$?

- (a) $\sin(A/2) \cos A$ (b) $\cot(A/2)$
 (c) $\tan(A/2)$ (d) $\sin A \cos(A/2)$

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : $\frac{[\sin(90^\circ - A) + \cos(180^\circ - 2A)]}{[\cos(90^\circ - 2A) + \sin(180^\circ - A)]}$

$$= \frac{(\cos A - \cos 2A)}{(\sin 2A + \sin A)}$$

$$= \frac{2 \sin\left(\frac{A + 2A}{2}\right) \cdot \sin\left(\frac{2A - A}{2}\right)}{2 \sin\left(\frac{2A + A}{2}\right) \cdot \cos\left(\frac{2A - A}{2}\right)}$$

$$= \frac{2 \sin\left(\frac{3A}{2}\right) \cdot \sin\left(\frac{A}{2}\right)}{2 \sin\left(\frac{3A}{2}\right) \cdot \cos\left(\frac{A}{2}\right)}$$

$$= \frac{\sin \frac{A}{2}}{\cos \frac{A}{2}} = \tan \frac{A}{2}$$

173. What is the value of $[\sin(90^\circ - 10\theta) - \cos(\pi - 6\theta)] / [\cos(\pi/2 - 10\theta) - \sin(\pi - 6\theta)]$?

- (a) $\tan 2\theta$ (b) $\cot 2\theta$
 (c) $\cot \theta$ (d) $\cot 3\theta$

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : $\frac{[\sin(90^\circ - 10\theta)] - \cos(\pi - 6\theta)}{[\cos(90^\circ - 10\theta)] - \sin(\pi - 6\theta)}$

$$= \frac{\cos 10\theta + \cos 6\theta}{\sin 10\theta - \sin 6\theta}$$

$$= \frac{2 \cos \frac{10\theta + 6\theta}{2} \cdot \cos \frac{10\theta - 6\theta}{2}}{2 \cos \frac{10\theta + 6\theta}{2} \cdot \sin \frac{10\theta - 6\theta}{2}}$$

$$= \frac{\cos 2\theta}{\sin 2\theta} = \cot 2\theta$$

174. What is the value of $(\cos 40^\circ - \cos 140^\circ)/(\sin 80^\circ + \sin 20^\circ)$?

- (a) $2\sqrt{3}$ (b) $2/\sqrt{3}$
 (c) $1/\sqrt{3}$ (d) $\sqrt{3}$

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Ans. (b) :
$$\frac{(\cos 40^\circ - \cos 140^\circ)}{(\sin 80^\circ + \sin 20^\circ)}$$

$$= \frac{2 \sin \left(\frac{40^\circ + 140^\circ}{2} \right) \cdot \sin \left(\frac{140^\circ - 40^\circ}{2} \right)}{2 \sin \left(\frac{80^\circ + 20^\circ}{2} \right) \cdot \cos \left(\frac{80^\circ - 20^\circ}{2} \right)}$$

$$= \frac{2 \sin 90^\circ \cdot \sin 50^\circ}{2 \sin 50^\circ \cdot \cos 30^\circ}$$

$$= \frac{\sin 90^\circ}{\cos 30^\circ} = \frac{1}{\left(\frac{\sqrt{3}}{2} \right)} = \frac{2}{\sqrt{3}}$$

175. What is the value of $[1 - \tan(90^\circ - \theta) + \sec(90^\circ - \theta)]/[\tan(90^\circ - \theta) + \sec(90^\circ - \theta) + 1]$?

- (a) $\cot(\theta/2)$ (b) $\tan(\theta/2)$
 (c) $\sin \theta$ (d) $\cos \theta$

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Ans. (b) :
$$\frac{[1 - \tan(90^\circ - \theta) + \sec(90^\circ - \theta)]}{[\tan(90^\circ - \theta) + \sec(90^\circ - \theta) + 1]}$$

$$= \frac{[1 - \cot \theta + \operatorname{cosec} \theta]}{[\cot \theta + \operatorname{cosec} \theta + 1]}$$

$$= \frac{\left(\frac{1 - \cos \theta}{\sin \theta} + \frac{1}{\sin \theta} \right)}{\left(\frac{\cos \theta}{\sin \theta} + \frac{1}{\sin \theta} + 1 \right)} = \frac{(\sin \theta - \cos \theta + 1)}{(\cos \theta + \sin \theta + 1)}$$

$$= \frac{2 \sin \theta/2 \cdot \cos \theta/2 - 1 + 2 \sin^2 \theta/2 + 1}{2 \sin \theta/2 \cdot \cos \theta/2 + 2 \cos^2 \theta/2 - 1 + 1}$$

$$= \frac{2 \sin \theta/2 (\cos \theta/2 + \sin \theta/2)}{2 \cos \theta/2 (\sin \theta/2 + \cos \theta/2)}$$

$$= \frac{\sin \theta/2}{\cos \theta/2} = \tan \theta/2$$

176. What is the value of $\{\sin(90^\circ - x) \cos[\pi - (x - y)]\} + \{\cos(90^\circ - x) \sin[\pi - (y - x)]\}$?

- (a) $-\cos y$ (b) $-\sin y$
 (c) $\cos x$ (d) $\tan y$

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Ans. (a) :
$$\{\sin(90^\circ - x) \cos[\pi - (x - y)]\} + \{\cos(90^\circ - x) \sin[\pi - (y - x)]\}$$

$$= -\cos x \cos(x - y) + \sin x \sin(y - x)$$

$$= -\cos x \cos(x - y) - \sin x \sin(x - y)$$

$$= -[\cos x \cos(x - y) + \sin x \sin(x - y)]$$

$$= -\cos[x - (x - y)]$$

$$= -\cos[x - x + y]$$

$$= -\cos y$$

177. What is the value of

$$\frac{\tan^2 60^\circ - 2 \sin^2 45^\circ}{\cos 24^\circ \cos 37^\circ \operatorname{cosec} 53^\circ \cos 60^\circ \operatorname{cosec} 66^\circ + \sin^2 60^\circ}$$

- (a) $1 \frac{4}{5}$ (b) $1 \frac{3}{5}$
 (c) 2 (d) 1

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b)

$$\frac{\tan^2 60^\circ - 2 \sin^2 45^\circ}{\cos 24^\circ \cos 37^\circ \operatorname{cosec} 53^\circ \cos 60^\circ \operatorname{cosec} 66^\circ + \sin^2 60^\circ}$$

$$= \frac{(\sqrt{3})^2 - 2 \times \left(\frac{1}{\sqrt{2}} \right)^2}{\frac{\cos 24^\circ}{\sin 66^\circ} \times \frac{\cos 37^\circ}{\sin 53^\circ} \times \frac{1}{2} + \frac{3}{4}}$$

$$= \frac{3 - 1}{\left(\frac{\cos 24^\circ}{\cos 24^\circ} \right) \times \left(\frac{\cos 37^\circ}{\cos 37^\circ} \right) \times \frac{1}{2} + \frac{3}{4}} = \frac{2}{\frac{1}{2} + \frac{3}{4}} = \frac{8}{5} = 1 \frac{3}{5}$$

178. What is the value of $(32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1)/[4 \sin x \cos x \sin(60^\circ - x) \cos(60^\circ - x) \sin(60^\circ + x) \cos(60^\circ + x)]$?

- (a) $4 \tan 6x$ (b) $4 \cot 6x$
 (c) $8 \cot 6x$ (d) $8 \tan 6x$

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Ans. (c) :

$$= \frac{(32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1)}{4 \sin x \cos x \cdot \sin(60^\circ - x) \cdot \cos(60^\circ - x) \sin(60^\circ + x) \cos(60^\circ + x)}$$

$\therefore \sin x \cdot \sin(60^\circ - x) \sin(60^\circ + x) = \frac{1}{4} \sin 3x$

and $\cos x \cdot \cos(60^\circ - x) \cdot \cos(60^\circ + x) = \frac{1}{4} \cos 3x$

$$\therefore \frac{2(16 \cos^6 x - 24 \cos^4 x + 9 \cos^2 x - 1)}{4 \times \frac{1}{4} \sin 3x \times \frac{1}{4} \cos 3x}$$

$$= \frac{2[(4 \cos^3 x)^2 + (3 \cos x)^2 - 2 \times 4 \cos^3 x \times 3 \cos x] - 1}{\frac{1}{8} \times 2 \sin 3x \cdot \cos 3x}$$

$$= \frac{2(4 \cos^3 x - 3 \cos x)^2 - 1}{\frac{1}{8} \sin 6x}$$

$$= \frac{8 \times 2 \cos^2 3x - 1}{\sin 6x}$$

$$= \frac{8 \times \cos 6x}{\sin 6x} = 8 \cot 6x$$

179. What is the value of

$$\frac{\left[4 \cos(90^\circ - A) \sin^3(90^\circ + A) \right] - \left[4 \sin(90^\circ + A) \cos^3(90^\circ - A) \right]}{\cos \left(\frac{180^\circ + 8A}{2} \right)} ?$$

- (a) 1 (b) -1
(c) 0 (d) 2

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Ans. (b) :

$$\left\{ \left[4 \cos(90^\circ - A) \sin^3(90^\circ + A) - \left[4 \sin(90^\circ + A) \cos^3(90^\circ - A) \right] \right] \right\}$$

$$\frac{\cos\left(\frac{180^\circ + 8A}{2}\right)}{= \frac{4 \sin A \cdot \cos^3 A - 4 \cos A \cdot \sin^3 A}{\cos(90^\circ + 4A)}}$$

$$\begin{aligned} \therefore \cos(90^\circ - \theta) &= \sin \theta \\ \cos(90^\circ + \theta) &= -\sin \theta \\ \sin(90^\circ - \theta) &= \cos \theta \\ \sin(90^\circ + \theta) &= \cos \theta \end{aligned}$$

$$= \frac{4 \sin A \cos A (\cos^2 A - \sin^2 A)}{-\sin 4A}$$

$$= \frac{2 \cdot 2 \sin A \cos A \cdot \cos 2A}{-\sin 4A}$$

$$= \frac{2 \cdot \sin 2A \cdot \cos 2A}{-\sin 4A} \quad \{\therefore \sin 2A = 2 \sin A \cos A\}$$

$$= \frac{\sin 4A}{-\sin 4A} = -1$$

180. What is the value of $2 \sin 15^\circ \cos 15^\circ - 4 \sin^3 15^\circ \cos 15^\circ$?

- (a) $3/\sqrt{2}$ (b) $\sqrt{3}/2$
(c) $\sqrt{3}/4$ (d) $1/2$

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Ans. (c) : $2 \sin 15^\circ \cdot \cos 15^\circ - 4 \sin^3 15^\circ \cdot \cos 15^\circ$
 $= 2 \sin 15^\circ \cdot \cos 15^\circ [1 - 2 \sin^2 15^\circ]$
 $= \sin 30^\circ \times \cos 30^\circ$
 $[2 \sin \theta \cdot \cos \theta = \sin 2\theta, 1 - 2 \sin^2 \theta = \cos 2\theta]$
 $= \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$

181. What is the value of $\cos 15^\circ + \cos 105^\circ$?

- (a) $\sqrt{3}$ (b) $1/\sqrt{2}$
(c) $\sqrt{3}/2$ (d) $1/\sqrt{3}$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : $\cos 15^\circ + \cos 105^\circ$
 $= 2 \cos \frac{120^\circ}{2} \cdot \cos \frac{90^\circ}{2}$
 $[\cos C + \cos D = 2 \cos \frac{C+D}{2} \cdot \cos \frac{C-D}{2}]$
 $= 2 \times \frac{1}{2} \times \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

182. What is the value of $\cos 15^\circ - \cos 165^\circ$?

- (a) $\sqrt{3}/\sqrt{2}$ (b) $2/(\sqrt{3}-1)$
(c) $(\sqrt{3}+1)/\sqrt{2}$ (d) $(\sqrt{3}+1)/2$

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

$$\cos C - \cos D = 2 \sin \frac{C+D}{2} \cdot \sin \frac{D-C}{2}$$

$$\cos 15^\circ - \cos 165^\circ = 2 \sin \frac{180^\circ}{2} \cdot \sin \frac{150^\circ}{2}$$

$$= 2 \times 1 \times \sin 75^\circ$$

$$\sin 75^\circ = \sin(30^\circ + 45^\circ)$$

$$= \sin 30^\circ \cos 45^\circ + \cos 30^\circ \cdot \sin 45^\circ$$

$$= \frac{1}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\therefore \cos 15^\circ - \cos 165^\circ = 2 \times \left(\frac{\sqrt{3}+1}{2\sqrt{2}} \right) = \frac{\sqrt{3}+1}{\sqrt{2}}$$

183. If $P + Q + R = 60^\circ$, then what is the value of $\cos Q \cos R (\cos P - \sin P) + \sin Q \sin R (\sin P - \cos P)$?

- (a) $1/2$ (b) $\sqrt{3}/2$
(c) $1/\sqrt{2}$ (d) $\sqrt{2}$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Given : $P + Q + R = 60^\circ$ -----(i)

Because P, Q and R are variables.

\therefore From equation (i) we can take $P = Q = 0^\circ$ and $R = 60^\circ$

$$\cos Q \cdot \cos R (\cos P - \sin P) + \sin Q \cdot \sin R (\sin P - \cos P)$$

$$= 1 \times \frac{1}{2} (1 - 0) + 0$$

$$= \frac{1}{2}$$

184. What is the value of $[1 - \tan(90^\circ - \theta)]^2 / [\cos^2(90^\circ - \theta)] - 1$?

- (a) $-\sin 2\theta$ (b) $-\cos 2\theta$
(c) $\cos 2\theta$ (d) $\sin 2\theta$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

$$\frac{[1 - \tan(90^\circ - \theta)]^2}{\cos^2(90^\circ - \theta)} - 1$$

By value putting,

$$\theta = 45^\circ$$

$$= \frac{(1 - \tan 45^\circ)^2}{\cos^2 45^\circ} - 1$$

$$= 0 - 1 = -1$$

Form the option (a),

$$-\sin 2\theta = -\sin 90^\circ$$

$$= -1$$

Hence, option (a) is correct.

185. What is the value of $[(\sin 59^\circ \cos 31^\circ + \cos 59^\circ \sin 31^\circ) \div (\cos 20^\circ \cos 25^\circ - \sin 20^\circ \sin 25^\circ)]$?

- (a) $1/\sqrt{2}$ (b) $2\sqrt{2}$
(c) $\sqrt{3}$ (d) $\sqrt{2}$

SSC CGL (Tier-II) 18-02-2018

Ans. (d) :

$$\frac{\sin 59^\circ \cdot \cos 31^\circ + \cos 59^\circ \sin 31^\circ}{\cos 20^\circ \cdot \cos 25^\circ - \sin 20^\circ \sin 25^\circ}$$

$$\sin(A+B) = \sin A \cdot \cos B + \cos A \cdot \sin B$$

$$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$$

$$\Rightarrow \frac{\sin(59+31)}{\cos(20+25)} = \frac{\sin 90^\circ}{\cos 45^\circ} = \frac{1}{\frac{1}{\sqrt{2}}} = \sqrt{2}$$

186. What is the value of $\cos(90-B) \sin(C-A) + \sin(90+A) \cos(B+C) - \sin(90-C) \cos(A+B)$?

- (a) 1 (b) $\sin(A+B-C)$
 (c) $\cos(B+C-A)$ (d) 0

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Ans. (d): $\cos(90-B) \sin(C-A) + \sin(90+A) \cos(B+C) - \sin(90-C) \cos(A+B)$
 $= \sin B \sin(C-A) + \cos A \cos(B+C) - \cos C \cos(A+B)$
 $= \sin B [\sin C \cos A - \cos C \sin A] + \cos A [\cos B \cos C - \sin B \sin C] - \cos C [\cos A \cos B - \sin A \sin B]$
 $= 0$

187. $2\cos\theta + \sec\theta - 2\sqrt{2} = 0$, where θ is an acute angle. Find the value of θ .

- (a) 60° (b) 30°
 (c) 15° (d) 45°

SSC CHSL 12/04/2021 (Shift-III)

Ans : (d) $2\cos\theta + \sec\theta - 2\sqrt{2} = 0$

let, $\theta = 45^\circ$

L.H.S = $2 \times \cos 45^\circ + \sec 45^\circ - 2\sqrt{2}$

$= \sqrt{2} + \sqrt{2} - 2\sqrt{2}$

$= 2\sqrt{2} - 2\sqrt{2} = 0 = \text{R.H.S}$

$\theta = 45^\circ$

188. The value of $\frac{\cos 8^\circ \cos 24^\circ \cos 60^\circ \cos 66^\circ \cos 82^\circ}{\sin 82^\circ \sin 66^\circ \sin 60^\circ \sin 8^\circ \sin 24^\circ}$ is

- (a) 1 (b) $\frac{1}{\sqrt{2}}$
 (c) $\frac{1}{\sqrt{3}}$ (d) 0

SSC CHSL 09/08/2021 (Shift-III)

Ans. (c) : $\frac{\cos 8^\circ \cos 24^\circ \cos 60^\circ \cos 66^\circ \cos 82^\circ}{\sin 82^\circ \sin 66^\circ \sin 60^\circ \sin 8^\circ \sin 24^\circ}$

$= \frac{\cos 8^\circ}{\cos 8^\circ} \times \frac{\cos 24^\circ}{\cos 24^\circ} \times \frac{\cos 60^\circ}{\sin 60^\circ} \times \frac{\cos 66^\circ}{\cos 66^\circ} \times \frac{\cos 82^\circ}{\cos 82^\circ}$

($\because \sin(90-\theta) = \cos\theta$)

$\therefore = \frac{\cos 60^\circ}{\sin 60^\circ} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$

189. In a right-angled triangle ABC right angled at C, $\sin A = \sin B$. What is the value of $\cos A$?

- (a) $\frac{\sqrt{3}}{2}$ (b) 1
 (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

SSC CHSL 09/08/2021 (Shift-II)

Ans. (c) : $\sin A = \sin B$

Let $\angle A = \angle B = 45^\circ$

$\sin 45^\circ = \sin 45^\circ$

$\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

$\therefore \cos A = \cos 45^\circ = \frac{1}{\sqrt{2}}$

190. If $\sin^2 x = 3 \cos^2 x$ and $0^\circ \leq x \leq 90^\circ$, then what is the value of $\frac{x}{2}$?

- (a) 30° (b) 45°
 (c) 15° (d) 22.5°

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : $\sin^2 x = 3 \cos^2 x$

$\tan^2 x = 3$

$\tan x = \sqrt{3} = \tan 60^\circ$

$x = 60^\circ$

$\therefore \frac{x}{2} = \frac{60}{2} = 30^\circ$

191. What is the value of $\sin^2 60^\circ + \tan^2 45^\circ + \sec^2 45^\circ - \operatorname{cosec}^2 30^\circ$?

- (a) $-\frac{1}{4}$ (b) $\frac{1}{4}$
 (c) 4 (d) -4

SSC CHSL 12/04/2021 (Shift-II)

Ans : (a) $\sin^2 60^\circ + \tan^2 45^\circ + \sec^2 45^\circ - \operatorname{cosec}^2 30^\circ$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + (1)^2 + (\sqrt{2})^2 - (2)^2$

$= \frac{3}{4} + 1 + 2 - 4$

$= \frac{3}{4} - 1 = \frac{-1}{4}$

192. If $\frac{3\sqrt{3} \sec \theta + 4 \tan \theta}{3 \tan \theta + \sqrt{3} \sec \theta} = 2$, $0^\circ < \theta < 90^\circ$, then the value of $\cos \theta$ will be:

- (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{4}$
 (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

SSC CHSL 13/04/2021 (Shift-III)

$$\text{Ans.(d)} : \frac{3\sqrt{3} \sec \theta + 4 \tan \theta}{3 \tan \theta + \sqrt{3} \sec \theta} = 2$$

$$\sqrt{3} \sec \theta = 2 \tan \theta$$

$$\sin \theta = \frac{\sqrt{3}}{2} = \sin 60^\circ$$

$$\theta = 60^\circ$$

$$\therefore \cos \theta = \cos 60^\circ = \frac{1}{2}$$

193. What number should be subtracted from $4(\sin^4 60^\circ + \cos^4 30^\circ) - (\tan^2 45^\circ - \cot^2 30^\circ) + \cos^2 45^\circ - \operatorname{cosec}^2 45^\circ + \sec^2 60^\circ$ to get 2?

- (a) 5 (b) 4
(c) 7 (d) 3

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Ans.(c) :

$$4(\sin^4 60^\circ + \cos^4 30^\circ) - (\tan^2 45^\circ - \cot^2 30^\circ) + \cos^2 45^\circ - \operatorname{cosec}^2 45^\circ + \sec^2 60^\circ - ? = 2$$

$$? = 4(\sin^4 60^\circ + \cos^4 30^\circ) - (\tan^2 45^\circ - \cot^2 30^\circ) + \cos^2 45^\circ - \operatorname{cosec}^2 45^\circ + \sec^2 60^\circ - 2$$

$$? = 4 \left[\left(\frac{\sqrt{3}}{2} \right)^4 + \left(\frac{\sqrt{3}}{2} \right)^4 \right] - [(1)^2 - (\sqrt{3})^2] + \left(\frac{1}{\sqrt{2}} \right)^2 - (\sqrt{2}) + (2)^2 - 2$$

$$? = 4 \left[\frac{9}{16} + \frac{9}{16} \right] - [1 - 3] + \frac{1}{2} - 2 + 4 - 2$$

$$? = 4 \left[\frac{18}{16} \right] + 2 + \frac{1}{2}$$

$$? = \frac{9}{2} + \frac{5}{2}$$

$$? = \frac{14}{2}$$

$$? = 7$$

194. If $2\cos^2 \theta = 3(1 - \sin \theta)$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\tan 2\theta + \operatorname{cosec} 3\theta + \sec 2\theta)$?

- (a) $\sqrt{3} + 1$ (b) $\sqrt{3} - 1$
(c) $\frac{1 + \sqrt{3}}{\sqrt{3}}$ (d) $\frac{1 - \sqrt{3}}{\sqrt{3}}$

SSC CHSL 04/08/2021 (Shift-III)

Ans. (b) : $2\cos^2 \theta = 3(1 - \sin \theta)$ ($\because 0^\circ < \theta < 90^\circ$)

Putting, $\theta = 30^\circ$

$$2 \times \frac{3}{4} = 3 \left(1 - \frac{1}{2} \right)$$

$$\frac{3}{2} = \frac{3}{2}$$

$$\tan^2 \theta + \operatorname{cosec} 3\theta - \sec 2\theta$$

$$= \tan^2 60^\circ + \operatorname{cosec} 90^\circ - \sec 60^\circ$$

$$= \sqrt{3} + 1 - 2$$

$$= \sqrt{3} - 1$$

195. For $A = 30^\circ$, Find the value of:

$$\frac{-3\sin^2 2A + 2\sec^2 A - \tan \frac{3A}{2}}{\frac{1}{3} \sin 3A}$$

$$(a) -\frac{7}{4}$$

$$(b) -\frac{7}{36}$$

$$(c) \frac{57}{4}$$

$$(d) \frac{11}{4}$$

SSC CHSL 05/08/2021 (Shift-III)

Ans. (a) : Given, $\angle A = 30^\circ$

$$\frac{-3\sin^2 2A + 2\sec^2 A - \tan \frac{3A}{2}}{\frac{1}{3} \sin^3 A}$$

$$= \frac{-3\sin^2 60^\circ + 2\sec^2 30^\circ - \tan 45^\circ}{\frac{1}{3} \times \sin 90^\circ}$$

$$= \frac{-3 \times \frac{3}{4} + 2 \times \frac{4}{3} - 1}{\frac{1}{3}} = \frac{-\frac{9}{4} + \frac{8}{3} - 1}{\frac{1}{3}} = \frac{-\frac{7}{12}}{\frac{1}{3}}$$

$$= \frac{-7}{4}$$

196. Find the value of θ , if

$\sec^2 \theta + (1 - \sqrt{3})\tan \theta - (1 + \sqrt{3}) = 0$, where θ is an acute angle.

- (a) 60° (b) 30°
(c) 45° (d) 15°

SSC CHSL 05/08/2021 (Shift-III)

Ans. (a) : $\sec^2 \theta + (1 - \sqrt{3})\tan \theta - (1 + \sqrt{3}) = 0$

From option (a),

Let $\theta = 60^\circ$

$$\sec^2 60^\circ + (1 - \sqrt{3})\tan 60^\circ - (1 + \sqrt{3}) = 0$$

$$4 + (1 + \sqrt{3})\sqrt{3} - 1 - \sqrt{3} = 0$$

$$4 + \sqrt{3} - 4 - \sqrt{3} = 0$$

$$0 = 0$$

$$\Rightarrow \text{L.H.S} = \text{R.H.S.}$$

197. If $3\cos \theta = 2\sin^2 \theta$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\tan^2 \theta + \sec^2 \theta - \operatorname{cosec}^2 \theta)$?

$$(a) -\frac{7}{3}$$

$$(b) -\frac{17}{3}$$

$$(c) \frac{17}{3}$$

$$(d) \frac{7}{3}$$

SSC CHSL 10/08/2021 (Shift-III)

Ans. (c) : $3\cos \theta = 2\sin^2 \theta$

Let $\theta = 60^\circ$,

$$\text{L.H.S} = 3 \times \cos 60^\circ = \frac{3}{2}$$

$$\text{R.H.S} = 2 \times \sin^2 60^\circ = 2 \times \frac{3}{4} = \frac{3}{2}$$

$$\therefore \text{L.H.S} = \text{R.H.S}$$

$$\begin{aligned} \text{Now, } \tan^2\theta + \sec^2\theta - \operatorname{cosec}^2\theta & \\ = \tan^2 60^\circ + \sec^2 60^\circ - \operatorname{cosec}^2 60^\circ & \\ = \left(3 + 4 - \frac{4}{3}\right) & \\ = \frac{17}{3} & \end{aligned}$$

198. The value of $\operatorname{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \sin 15^\circ \sin 35^\circ \sec 55^\circ \sin 30^\circ \sec 75^\circ$ is:
- (a) 0 (b) 1
(c) 1/2 (d) 2

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : $\operatorname{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \sin 15^\circ \sin 35^\circ \sec 55^\circ \sin 30^\circ \sec 75^\circ$

$$\begin{aligned} & \left\{ \begin{array}{l} \because \cos(90^\circ - \theta) = \sin \theta \\ \sin(90^\circ - \theta) = \cos \theta \end{array} \right\} \\ = & \operatorname{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \frac{\sin 15^\circ}{\sin 15^\circ} \times \frac{\sin 35^\circ}{\sin 35^\circ} \times \sin 30^\circ \\ = & \operatorname{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \frac{1}{2} \\ = & \frac{1}{\sin(58^\circ + \theta)} - \frac{1}{\cos(32^\circ - \theta)} + \frac{1}{2} \\ = & \frac{1}{\sin(58^\circ + \theta)} - \frac{1}{\sin(58^\circ - \theta)} + \frac{1}{2} \\ = & \frac{1}{2} \end{aligned}$$

199. Solve the following equation and find the value of θ .

$$3 \cot \theta + \tan \theta - 2\sqrt{3} = 0, 0 < \theta < 90^\circ$$

- (a) 30° (b) 45°
(c) 15° (d) 60°

SSC CHSL 04/08/2021 (Shift-II)

Ans. (d) : $3 \cot \theta + \tan \theta - 2\sqrt{3} = 0$

$$3 \cot \theta + \tan \theta = 2\sqrt{3}$$

$$\tan \theta + \frac{3}{\tan \theta} = 2\sqrt{3}$$

put the value of $\theta = 60^\circ$ in L.H.S.

$$\tan 60^\circ + \frac{3}{\tan 60^\circ}$$

$$\sqrt{3} + \frac{3}{\sqrt{3}} = \sqrt{3} + \sqrt{3} = 2\sqrt{3} = \text{R.H.S}$$

\therefore L.H.S = R.H.S
Hence, the required value of θ is 60°

200. The value of $\sqrt{\cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ}$ is:

- (a) 1 (b) $\frac{1}{\sqrt{2}}$
(c) 0 (d) $\frac{\sqrt{3}}{2}$

SSC CHSL 10/08/2021 (Shift-II)

Ans. (c) : $\sqrt{\cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ}$

$$= \sqrt{\cos(60^\circ + 30^\circ)} \quad \because \cos(A+B) = (\cos A \cos B - \sin A \sin B)$$

$$= \sqrt{\cos 90^\circ} = 0$$

201. If $\sec^2 \alpha + 4 \cos^2 \alpha = 4$ and $0^\circ \leq \alpha \leq 90^\circ$, then find the value of α .

- (a) 30° (b) 0°
(c) 45° (d) 60°

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (c) $\sec^2 \alpha + 4 \cos^2 \alpha = 4 \quad 0^\circ \leq \alpha \leq 90^\circ$

$$\begin{aligned} \frac{1}{\cos^2 \alpha} + 4 \cos^2 \alpha &= 4 \\ 4 \cos^4 \alpha - 4 \cos^2 \alpha + 1 &= 0 \\ (2 \cos^2 \alpha - 1)^2 &= 0 \\ 2 \cos^2 \alpha &= 1 \\ \cos^2 \alpha &= \frac{1}{2} \\ \cos \alpha &= \frac{1}{\sqrt{2}} \\ \alpha &= 45^\circ \end{aligned}$$

202. If $(2 \cos A + 1)(2 \cos A - 1) = 0$, $0^\circ < A \leq 90^\circ$, then find the value of A.

- (a) 90° (b) 45°
(c) 30° (d) 60°

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (d) $(2 \cos A + 1)(2 \cos A - 1) = 0 \quad 0^\circ < A \leq 90^\circ$

$$\begin{aligned} 4 \cos^2 A - 1 &= 0 \\ \cos^2 A &= \frac{1}{4} \\ \cos A &= \frac{1}{2} \\ A &= 60^\circ \end{aligned}$$

203. If $A = 30^\circ$, What is the value of

$$\frac{[8 \sin A + 11 \operatorname{cosec} A - \cot^2 A]}{10 \cos 2A} ?$$

- (a) $5\frac{1}{5}$ (b) $4\frac{3}{5}$
(c) $4\frac{2}{5}$ (d) $3\frac{4}{5}$

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (b) Given, $A = 30^\circ$

$$\begin{aligned} & \frac{[8 \sin A + 11 \operatorname{cosec} A - \cot^2 A]}{10 \cos 2A} = ? \\ & \frac{8 \times \frac{1}{2} + 11 \times 2 - 3}{10 \times \frac{1}{2}} \\ & = \frac{4 + 22 - 3}{5} \\ & = \frac{23}{5} = 4\frac{3}{5} \end{aligned}$$

204. If $\cot^2 \alpha + \tan^2 \alpha = 2$, $0^\circ \leq \alpha \leq 90^\circ$, then find the value of a.

- (a) 0° (b) 45°
(c) 60° (d) 90°

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b) Given,
 $\cot^2 \alpha + \tan^2 \alpha = 2$
Put $\theta = 45^\circ$
 $1 + 1 = 2$
 $2 = 2$
L.H.S = R.H.S
Hence, $\theta = 45^\circ$

205. If $A = 60^\circ$, what is the value of:

$$\frac{10 \sin \frac{A}{2} + 8 \cos A}{7 \sin \frac{3A}{2} - 12 \cos A} ?$$

- (a) 10 (b) 12
(c) 9 (d) 7

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (c) Given, $A = 60^\circ$
The given expression is-

$$\begin{aligned} & \frac{10 \sin \frac{A}{2} + 8 \cos A}{7 \sin \frac{3A}{2} - 12 \cos A} \\ \Rightarrow & \frac{10 \sin \frac{60}{2} + 8 \cos 60^\circ}{7 \sin 3 \times \frac{60}{2} - 12 \cos 60^\circ} \\ \Rightarrow & \frac{10 \sin 30^\circ + 8 \cos 60^\circ}{7 \sin 90^\circ - 12 \cos 60^\circ} \\ \Rightarrow & \frac{10 \times \frac{1}{2} + 8 \times \frac{1}{2}}{7 \times 1 - 12 \times \frac{1}{2}} \\ \Rightarrow & 9 \end{aligned}$$

206. If $A = 10^\circ$, what is the value of:

$$\frac{12 \sin 3A + 5 \cos(5A - 5^\circ)}{9 \sin \frac{9A}{2} - 4 \cos(5A + 10^\circ)}$$

- (a) $\frac{6\sqrt{2} + 5}{(9 - 2\sqrt{2})}$ (b) $\frac{6\sqrt{2} - 5}{(9 - 2\sqrt{2})}$
(c) $\frac{(9 - 2\sqrt{2})}{(6\sqrt{2} + 5)}$ (d) $\frac{6\sqrt{2} + 5}{(9 + 2\sqrt{2})}$

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (a) Given, that-
 $A = 10^\circ$
 $\therefore \frac{12 \sin 3A + 5 \cos(5A - 5^\circ)}{9 \sin \frac{9A}{2} - 4 \cos(5A + 10^\circ)} = ?$

$$\begin{aligned} & \frac{12 \sin 30^\circ + 5 \cos(50^\circ - 5^\circ)}{9 \sin \frac{90^\circ}{2} - 4 \cos(50^\circ + 10^\circ)} \\ & \frac{12 \times \frac{1}{2} + 5 \cos 45^\circ}{9 \sin 45^\circ - 4 \cos 60^\circ} \\ & \frac{6 + 5 \times \frac{1}{\sqrt{2}}}{9 \times \frac{1}{\sqrt{2}} - 4 \times \frac{1}{2}} \\ & \frac{6\sqrt{2} + 5}{(9 - 2\sqrt{2})} \end{aligned}$$

207. Find the value of following expression :

$$\frac{\tan^3 45^\circ + 4 \cos^3 60^\circ}{2 \operatorname{cosec}^2 45^\circ - 3 \sec^2 30^\circ + \sin 30^\circ}$$

- (a) $\frac{3}{4}$ (b) $1 + \sqrt{2}$
(c) $\frac{4}{3}$ (d) 3

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (d)
$$\begin{aligned} & \frac{\tan^3 45^\circ + 4 \cos^3 60^\circ}{2 \operatorname{cosec}^2 45^\circ - 3 \sec^2 30^\circ + \sin 30^\circ} \\ & = \frac{1 + 4 \times \frac{1}{8}}{2 \times 2 - 3 \times \frac{4}{3} + \frac{1}{2}} \\ & = \frac{1 + \frac{1}{2}}{4 - 4 + \frac{1}{2}} \\ & = \frac{\frac{3}{2}}{\frac{1}{2}} = 3 \end{aligned}$$

208. If $2k \sin 30^\circ \cos 30^\circ \cot 60^\circ$

$$= \frac{\cot^2 30^\circ \sec 60^\circ \tan 45^\circ}{\operatorname{cosec}^2 45^\circ \operatorname{cosec} 30^\circ}, \text{ then find the value of } k.$$

- (a) $\frac{3}{2}$ (b) 3
(c) 1 (d) 6

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(b) From question,

$$\begin{aligned} 2k \sin 30^\circ \cos 30^\circ \cot 60^\circ &= \frac{\cot^2 30^\circ \sec 60^\circ \tan 45^\circ}{\operatorname{cosec}^2 45^\circ \operatorname{cosec} 30^\circ} \\ 2k \times \frac{1}{2} \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} &= \frac{(\sqrt{3})^2 \times 2 \times 1}{(\sqrt{2})^2 \times 2} \end{aligned}$$

$$\frac{k}{2} = \frac{3}{2}$$

$$\therefore k = 3$$

Hence, option (b) is correct.

209. $\tan^2 A + 5\sec A = 13$, where $0 < A < 90^\circ$. Solve for A (in degrees).

- (a) 0 (b) 60
(c) 45 (d) 30

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans. (b) From question,
 $\tan^2 A + 5\sec A = 13, 0^\circ < A < 90^\circ$
 $\Rightarrow \frac{\sin^2 A}{\cos^2 A} + \frac{5}{\cos A} = 13$
 $\left\{ \because \tan A = \frac{\sin A}{\cos A}, \sec A = \frac{1}{\cos A} \right\}$
 $\frac{\sin^2 A + 5\cos A}{\cos^2 A} = 13$
 $\sin^2 A + 5\cos A = 13\cos^2 A$
 $(1 - \cos^2 A) + 5\cos A - 13\cos^2 A = 0$
 $\left\{ \because \sin^2 A + \cos^2 A = 1 \right\}$
 $-14\cos^2 A + 5\cos A + 1 = 0$
 $14\cos^2 A - 5\cos A - 1 = 0$
 $14\cos^2 A - (7-2)\cos A - 1 = 0$
 $14\cos^2 A - 7\cos A + 2\cos A - 1 = 0$
 $7\cos A(2\cos A - 1) + 1(2\cos A - 1) = 0$
 $(2\cos A - 1)(7\cos A + 1) = 0$
 $\therefore 2\cos A - 1 = 0$
 $\Rightarrow 2\cos A = 1$
 $\Rightarrow \cos A = \frac{1}{2}$
 $\Rightarrow \cos A = \cos 60^\circ$
 $A = 60^\circ$

Short Method :

By option (b),
 $A = 60^\circ$
 $\tan^2 60^\circ + 5\sec 60^\circ = 13$

$\Rightarrow (\sqrt{3})^2 + 5 \times 2 = 13$

$\Rightarrow 3 + 10 = 13, \boxed{13 = 13}$

Hence, option (b) is correct.

210. If $\cos(A - B) = \frac{\sqrt{3}}{2}$ and $\sec A = 2, 0^\circ \leq A \leq 90^\circ,$

$\leq B \leq 90^\circ$, then what is the measure of B?

- (a) 60° (b) 0°
(c) 30° (d) 90°

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (c) Given $\sec A = 2$
 $A = 60^\circ$

$\cos(A - B) = \frac{\sqrt{3}}{2}$

$A - B = 30^\circ$

$60^\circ - B = 30^\circ$

$B = 30^\circ$

211. What is the value of :

$8\sqrt{3} \sin 30^\circ \tan 60^\circ - 3 \cos 0^\circ + \sin^2 45^\circ + 2 \cos^2 30^\circ$

- (a) 15 (b) 12
(c) 9 (d) 18

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (b)

$8\sqrt{3} \sin 30^\circ \tan 60^\circ - 3 \cos 0^\circ + 3 \sin^2 45^\circ + 2 \cos^2 30^\circ$

$8\sqrt{3} \times \frac{1}{2} \times \sqrt{3} - 3 \times 1 + 3 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 2 \times \left(\frac{\sqrt{3}}{2}\right)^2$

$= 12 - 3 + \frac{3}{2} + \frac{3}{2}$

$= 9 + 3$

$= 12$

212. If A lies between 45° and 540° , and $\sin A = 0.5$, what is the value of A/3 in degrees?

- (a) 170° (b) 175°
(c) 160° (d) 165°

SSC CHSL 15/04/2021 (Shift-I)

Ans. (a) : $\sin A = 0.5 = \frac{1}{2} = 30^\circ$

Where ($45^\circ < A < 540^\circ$)

$A = 30^\circ, 150^\circ, 390^\circ, 510^\circ$

$\frac{A}{3} = \frac{510^\circ}{3} = 170^\circ$

213. If $\tan \theta + 3 \cot \theta - 2\sqrt{3} = 0, 0^\circ < \theta < 90^\circ$ then what is the value of $(\operatorname{cosec}^2 \theta + \cos^2 \theta)$?

- (a) $\frac{2}{3}$ (b) $\frac{19}{12}$
(c) $\frac{14}{3}$ (d) $\frac{11}{12}$

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) : $\tan \theta + 3 \cot \theta - 2\sqrt{3} = 0$

By putting value, $\theta = 60^\circ$

$\tan 60^\circ + 3 \cot 60^\circ - 2\sqrt{3} = \sqrt{3} + \sqrt{3} - 2\sqrt{3} = 0$

$\therefore \operatorname{cosec}^2 \theta + \cos^2 \theta = \operatorname{cosec}^2 60^\circ + \cos^2 60^\circ$

$= \left(\frac{2}{\sqrt{3}}\right)^2 + \left(\frac{1}{2}\right)^2$

$= \frac{4}{3} + \frac{1}{4} = \frac{19}{12}$

214. Find the value of

$\frac{8\sin 30^\circ \sin 260^\circ - 4\sin 90^\circ - \sec^2 45^\circ}{\tan^2 45^\circ - \cot^2 30^\circ}$

- (a) $-\frac{1}{2}$ (b) $\frac{5}{2}$
(c) $\frac{3}{4}$ (d) $\frac{3}{2}$

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (d) : Find value of

$\frac{8\sin 30^\circ \sin^2 60^\circ - 4\sin 90^\circ - \sec^2 45^\circ}{\tan^2 45^\circ - \cot^2 30^\circ}$

$= \frac{8 \times \frac{1}{2} \times \frac{3}{4} - 4 - 2}{1 - 3} = \frac{3 - 6}{-2} = \frac{-3}{-2}$

$= \frac{3}{2}$

215. The value of

$$\frac{\tan^2 30^\circ + \sin^2 90^\circ + \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$
 is:

- (a) $\frac{47}{12}$ (b) $\frac{37}{12}$
 (c) $\frac{43}{12}$ (d) $\frac{25}{12}$

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (c) :

$$\frac{\tan^2 30^\circ + \sin^2 90^\circ + \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$

$$= \frac{\left(\frac{1}{3} + 1 + \frac{1}{4} + \frac{1}{2} \times \frac{1}{2}\right)}{\sin(60^\circ - 30^\circ)} = \frac{\frac{43}{24}}{\sin 30^\circ} = \frac{\frac{43}{24}}{\frac{1}{2}} = \frac{43}{12}$$

216. The value of $4(\sin^4 30^\circ + \cos^4 30^\circ) - 3(\sin^2 45^\circ - 2\cos^2 45^\circ)$ is :

- (a) 0 (b) 4
 (c) 2 (d) 1

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (b)

$$4(\sin^4 30^\circ + \cos^4 30^\circ) - 3(\sin^2 45^\circ - 2\cos^2 45^\circ)$$

$$= 4\left(\frac{1}{16} + \frac{9}{16}\right) - 3\left(\frac{1}{2} - 2 \times \frac{1}{2}\right)$$

$$= \frac{10}{4} + \frac{3}{2}$$

$$= \frac{10+6}{4} = \frac{16}{4} = 4$$

217. The value of $\frac{\tan 13^\circ \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2\sec^2 60^\circ (\sin^2 60^\circ - 3\cos 60^\circ + 2)}$

is :

- (a) $\frac{1}{10}$ (b) $-\frac{1}{4}$
 (c) $\frac{1}{4}$ (d) $-\frac{1}{10}$

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (a)

The value of $\frac{\tan 13^\circ \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2\sec^2 60^\circ (\sin^2 60^\circ - 3\cos 60^\circ + 2)}$ is:

$$= \frac{1}{2 \times 4 \left(\frac{3}{4} - 3 \times \frac{1}{2} + 2\right)}$$

$$= \frac{1}{8 \left(\frac{3-6+8}{4}\right)}$$

$$= \frac{1}{8 \times \frac{5}{4}}$$

$$= \frac{1}{10}$$

218. Find the value of $\cot 25^\circ \cot 35^\circ \cot 45^\circ \cot 55^\circ \cot 65^\circ$.

- (a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$
 (c) $\frac{\sqrt{3}}{2}$ (d) 1

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (d) : $\cot 25^\circ \cot 35^\circ \cot 45^\circ \cot 55^\circ \cot 65^\circ = ?$
 $= \cot 25^\circ \cdot \cot 65^\circ \cot 45^\circ \cot 35^\circ \cdot \cot 55^\circ$
 (cot $45^\circ = 1$)

$\therefore \cot A \cdot \cot B = 1$
 $= \cot 25^\circ \cdot \cot 65^\circ \cot 45^\circ \cot 35^\circ \cdot \cot 55^\circ$
 $= 1 \times 1 \times 1 = 1$

219. For $\theta : 0^\circ < \theta < 90^\circ$

$3 \sec \theta + 4 \cos \theta = 4\sqrt{3}$, find the value of $(1 - \sin \theta + \cos \theta)$.

- (a) $\frac{1+2\sqrt{3}}{2}$ (b) $\frac{1+\sqrt{3}}{2}$
 (c) $\frac{1-\sqrt{3}}{2}$ (d) $\frac{1-2\sqrt{3}}{2}$

SSC CHSL 10/08/2021 (Shift-I)

Ans. (b) : $3 \sec \theta + 4 \cos \theta = 4\sqrt{3}$

By value putting, $\theta = 30^\circ$

$$\text{L.H.S} = 3 \times \frac{2}{\sqrt{3}} + 4 \times \frac{\sqrt{3}}{2}$$

$$= 2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3} = \text{L.H.S} = \text{R.H.S}$$

Hence $1 - \sin \theta + \cos \theta$

$$= 1 - \sin 30^\circ + \cos 30^\circ$$

$$= 1 - \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1+\sqrt{3}}{2}$$

220. Evaluate the following expression.

$$\frac{3(\cot^2 46^\circ - \sec^2 44^\circ)}{2(\sin^2 28^\circ + \sin^2 62^\circ)} + \frac{2\cos^2 60^\circ \tan^2 33^\circ \tan^2 57^\circ}{\sec^2(90^\circ - \theta) - \cot^2 \theta}$$

- (a) -1 (b) 1
 (c) -2 (d) 2

SSC CHSL 10/08/2021 (Shift-I)

Ans. (a) :

$$\frac{3(\cot^2 46^\circ - \sec^2 44^\circ)}{2(\sin^2 28^\circ + \sin^2 62^\circ)} + \frac{2\cos^2 60^\circ \tan^2 33^\circ \tan^2 57^\circ}{\sec^2(90^\circ - \theta) - \cot^2 \theta}$$

$$= \frac{3(\cot^2 46^\circ - \text{cosec}^2 46^\circ)}{2(\sin^2 28^\circ + \cos^2 28^\circ)} + \frac{2 \times \left(\frac{1}{2}\right)^2 \times \tan^2 33^\circ \cot^2 33^\circ}{\text{cosec}^2 \theta - \cot^2 \theta}$$

[$\therefore \sec(90^\circ - \theta) = \text{cosec} \theta$, $\sin(90^\circ - \theta) = \cos \theta$

and $\tan(90^\circ - \theta) = \cot \theta$]

$$= \frac{3 \times (-1)}{2 \times 1} + \frac{\frac{1}{2} \times 1}{1} \quad [\therefore \cot^2 \theta - \text{cosec}^2 \theta = -1]$$

$$= \frac{-3}{2} + \frac{1}{2} = -1$$

221. If $2\cos^2\theta = 3\sin\theta$, $0^\circ < \theta < 90^\circ$, then the value of $\left(\frac{1}{2}\operatorname{cosec}^2\theta - \cot^2\theta\right)$ is:

- (a) -1 (b) $\frac{1}{4}$
 (c) $\frac{1}{2}$ (d) 0

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a): $2\cos^2\theta = 3\sin\theta$

Taking $\theta = 30^\circ$,

$$2 \times \left(\frac{\sqrt{3}}{2}\right)^2 = 3 \times \left(\frac{1}{2}\right) \Rightarrow 2 \times \frac{3}{4} = 3 \times \frac{1}{2}$$

$$\therefore \text{L.H.S} = \text{R.H.S} \Rightarrow \frac{3}{2} = \frac{3}{2}$$

\therefore Putting the value of $\theta = 30^\circ$ in $\left(\frac{1}{2}\operatorname{cosec}^2\theta - \cot^2\theta\right)$

$$= \frac{1}{2} \times \operatorname{cosec}^2 30^\circ - \cot^2 30^\circ$$

$$= \frac{1}{2} \times (2)^2 - (\sqrt{3})^2$$

$$= 2 - 3$$

$$= -1$$

222. If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$, then find the value of $4\cot^2 x - 3\operatorname{cosec}^2 x$:

- (a) 0 (b) 8
 (c) 1 (d) 2

SSC CHSL 09/07/2019 (Shift-II)

Ans. (a):

$$\cos x = \frac{-\sqrt{3}}{2}, \quad \pi < x < \frac{3\pi}{2}$$

$$\cos x = \cos 210^\circ$$

$$x = 210^\circ$$

$$4\cot^2 x - 3\operatorname{cosec}^2 x = 4 \times \cot^2 210^\circ - 3\operatorname{cosec}^2 210^\circ$$

$$= 4 \cdot \cot^2 (180^\circ + 30^\circ) - 3\operatorname{cosec}^2 (180^\circ + 30^\circ)$$

$$= 4 \times 3 - 3 \times 4$$

$$= 0$$

223. If $2(\operatorname{cosec}^2 39^\circ - \tan^2 51^\circ) - \frac{2}{3}\sin 90^\circ - \tan^2 56^\circ y$

$\tan^2 34^\circ = \frac{y}{3}$ the value of y is:

- (a) $\frac{-2}{3}$ (b) 1 (c) -1 (d) $\frac{2}{3}$

SSC CHSL 08/07/2019 (Shift-I)

Ans. (b):

$$2(\operatorname{cosec}^2 39^\circ - \tan^2 51^\circ) - \frac{2}{3}\sin 90^\circ - \tan^2 56^\circ y \tan^2 34^\circ = \frac{y}{3}$$

$$\Rightarrow 2[\operatorname{cosec}^2 39^\circ - \tan^2 (90^\circ - 39^\circ)] - \frac{2}{3}\sin 90^\circ - \tan^2 56^\circ$$

$$y \tan^2 (90^\circ - 56^\circ) = \frac{y}{3}$$

$$\Rightarrow 2[\operatorname{cosec}^2 39^\circ - \cot^2 39^\circ] - \frac{2}{3}\sin 90^\circ - \tan^2 56^\circ y$$

$$\cdot \cot^2 56^\circ = \frac{y}{3}$$

$$\Rightarrow 2\left[1 - \frac{2}{3} \times 1 - y = \frac{y}{3}\right] \quad \boxed{\operatorname{cosec}^2\theta - \cot^2\theta = 1}$$

$$\Rightarrow 2 - \frac{2}{3} = y + \frac{y}{3}$$

$$\Rightarrow \frac{4}{3} = \frac{4y}{3}$$

$$\Rightarrow y = 1$$

224. If $4(\operatorname{cosec}^2 66^\circ - \tan^2 24^\circ) + \frac{1}{2}\sin 90^\circ - 4\tan^2 66^\circ y$

$\tan^2 24^\circ = \frac{y}{2}$ then the value of y is:

- (a) $\frac{-1}{2}$ (b) $\frac{1}{2}$
 (c) -1 (d) 1

SSC CHSL 08/07/2019 (Shift-II)

Ans. (d): $4(\operatorname{cosec}^2 66^\circ - \tan^2 24^\circ) + \frac{1}{2}\sin 90^\circ - 4\tan^2 66^\circ y$

$$y \tan^2 24^\circ = \frac{y}{2}$$

$$4\left(\frac{1}{\sin^2 66^\circ} - \frac{\sin^2 24^\circ}{\cos^2 24^\circ}\right) + \frac{1}{2} \times 1 - 4 \times \cot^2 24^\circ \times y \tan^2 24^\circ = \frac{y}{2}$$

$$4\left(\frac{1}{\cos^2 24^\circ} - \frac{\sin^2 24^\circ}{\cos^2 24^\circ}\right) + \frac{1}{2} - 4 \times \frac{1}{\tan^2 24^\circ} \times y \tan^2 24^\circ = \frac{y}{2}$$

$$4\left(\frac{1 - \sin^2 24^\circ}{\cos^2 24^\circ}\right) + \frac{1}{2} - 4y = \frac{y}{2}$$

$$4\left(\frac{\cos^2 24^\circ}{\cos^2 24^\circ}\right) + \frac{1}{2} - 4y = \frac{y}{2}$$

$$4 + \frac{1}{2} - 4y = \frac{y}{2}$$

$$y = 1$$

225. If $4(\operatorname{cosec}^2 65^\circ - \tan^2 25^\circ) - \sin 90^\circ - \tan^2$

$63^\circ \cdot y \cdot \tan^2 27^\circ = \frac{y}{2}$, then value of Y is:

- (a) -1 (b) 2
 (c) $\frac{-1}{2}$ (d) 1

SSC CHSL (Tier-I)-08/07/2019 (Shift-III)

Ans. (b):

$$4(\operatorname{cosec}^2 65^\circ - \tan^2 25^\circ) - \sin 90^\circ - \tan^2 63^\circ y \cdot \tan^2 27^\circ = \frac{y}{2}$$

$$\Rightarrow 4[\operatorname{Cosec}^2 65^\circ - \tan^2 (90^\circ - 65^\circ)] - \sin 90^\circ - \tan^2 (90^\circ - 27^\circ) \cdot y \cdot \tan^2 27^\circ = \frac{y}{2}$$

$$\Rightarrow 4(\operatorname{cosec}^2 65^\circ - \cot^2 65^\circ) - \sin 90^\circ - \cot^2 27^\circ \cdot y \cdot \tan^2 27^\circ = \frac{y}{2}$$

$$\Rightarrow 4 \times 1 - 1 - y = \frac{y}{2}$$

$$\begin{aligned} \Rightarrow 3 - y &= \frac{y}{2} \\ \Rightarrow 6 - 2y &= y \\ \Rightarrow 6 &= 3y \\ \Rightarrow y &= 6/3 \\ y &= 2 \end{aligned}$$

226. If θ is Acute Angle, and given that $\sec^2\theta + 4\tan^2\theta = 6$ then find the value of θ ?

- (a) 60° (b) 45°
(c) 0° (d) 30°

SSC CHSL 10/07/2019 (Shift-II)

Ans. (b) : $\sec^2\theta + 4\tan^2\theta = 6$
 $\therefore 1 + \tan^2\theta + 4\tan^2\theta = 6$ ($\sec^2\theta = 1 + \tan^2\theta$)
 $5\tan^2\theta = 5$
 $\tan^2\theta = (1)^2 = (\tan 45^\circ)^2$
 $\theta = 45^\circ$

227. If $\theta = 9^\circ$ then find the value of $\cot\theta \cot 2\theta \cot 3\theta \cot 4\theta \cot 5\theta \cot 6\theta \cot 7\theta \cot 8\theta \cot 9\theta$ is :

- (a) $\sqrt{3}$ (b) 1
(c) $\sqrt{3}-1$ (d) $\frac{1}{\sqrt{3}}$

SSC CHSL 10/07/2019 (Shift-III)

Ans. (b) : $\theta = 9^\circ$ $\left\{ \begin{array}{l} \because \cot(90^\circ - \theta) = \tan\theta \\ \tan\theta = \frac{1}{\cot\theta} \end{array} \right\}$
 $= \cot\theta \cot 2\theta \cot 3\theta \cot 4\theta \cot 5\theta \cot 6\theta \cot 7\theta \cot 8\theta \cot 9\theta$
 $= \cot 9^\circ \cot 18^\circ \cot 27^\circ \cot 36^\circ \cot 45^\circ \cot 54^\circ \cot 63^\circ \cot 72^\circ \cot 81^\circ$
 $= (\cot 9^\circ \cdot \cot 81^\circ) \times (\cot 18^\circ \cdot \cot 72^\circ) \times (\cot 27^\circ \cdot \cot 63^\circ)$
 $\times (\cot 36^\circ \cdot \cot 54^\circ) \times \cot 45^\circ$
 $= \cot(90^\circ - 81^\circ) \cot 81^\circ \times \cot 72^\circ \cdot \cot(90^\circ - 72^\circ) \times \cot$
 $(90^\circ - 63^\circ) \cot 63^\circ \times \cot(90^\circ - 54^\circ) \times \cot 54^\circ \times \cot 45^\circ$
 $= \tan 81^\circ \cdot \cot 81^\circ \times \cot 72^\circ \cdot \tan 72^\circ \times \cot 63^\circ \cdot \tan 63^\circ \times$
 $\cot 54^\circ \cdot \tan 54^\circ \times 1$
 $= 1$

228. If θ is a positive acute angle and $\tan 2\theta \tan 3\theta = 1$, then the value of θ is:

- (a) 36° (b) 60°
(c) 45° (d) 18°

SSC CHSL -20/10/2020 (Shift-III)

Ans : (d) $\tan 2\theta \cdot \tan 3\theta = 1$
 $\tan 2\theta = \frac{1}{\tan 3\theta}$
 $\tan 2\theta = \cot 3\theta$ [$\because \tan(90^\circ - \theta) = \cot \theta$]
 $2\theta + 3\theta = 90^\circ$
 $5\theta = 90^\circ$
 $\theta = 18^\circ$

229. $0^\circ \leq \theta \leq 90^\circ$ के लिए θ क्या है, जबकि

$$\sqrt{3}\cos\theta + \sin\theta = 1$$

- (a) 45° (b) 30°
(c) 90° (d) 0°

SSC CHSL (Tier-I) 11/07/2019 (Shift-I)

Ans. (c) : $\sqrt{3}\cos\theta + \sin\theta = 1$

$$\sqrt{(\sqrt{3})^2 + (1)^2} = 2 \text{ By dividing by 2 in both side,}$$

$$\frac{\sqrt{3}}{2}\cos\theta + \frac{1}{2}\sin\theta = \frac{1}{2}$$

$$\cos\theta \cdot \cos 30^\circ + \sin\theta \cdot \sin 30^\circ = \frac{1}{2}$$

$$[\cos(A-B) = \cos A \cdot \cos B + \sin A \cdot \sin B]$$

$$\cos(\theta - 30^\circ) = \cos 60^\circ$$

$$\theta - 30^\circ = 60^\circ$$

$$\theta = 90^\circ$$

230. $\left(\frac{\sin^2 31^\circ + \sin^2 59^\circ}{\sec^2 35^\circ - \cot^2 55^\circ} + \tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ \right)$

of simplify value is :

- (a) -1 (b) $\frac{1}{2}$
(c) 0 (d) 1

SSC CHSL 11/07/2019 (Shift-II)

Ans. (c) : $\left(\frac{\sin^2 31^\circ + \sin^2 59^\circ}{\sec^2 35^\circ - \cot^2 55^\circ} + \tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ \right)$
 $= \frac{\sin^2(90^\circ - 59^\circ) + \sin^2 59^\circ}{1 + \tan^2 35^\circ - \cot^2(90^\circ - 35^\circ)} + \tan(90^\circ - 61^\circ) \cot 61^\circ$
 $\quad \quad \quad - \operatorname{cosec}^2 61^\circ$
 $= \frac{\cos^2 59^\circ + \sin^2 59^\circ}{1 + \tan^2 35^\circ - \tan^2 35^\circ} + \cot^2 61^\circ - (1 + \cot^2 61^\circ)$
 $= \frac{1}{1} + \cot^2 61^\circ - 1 - \cot^2 61^\circ = 1 - 1 = 0$

231. $(\sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \sin^2 54^\circ)$ is equal to :

- (a) $\frac{14}{3}$ (b) $\frac{17}{3}$
(c) 5 (d) $\frac{16}{3}$

SSC CHSL 11/07/2019 (Shift-III)

Ans. (d) : $\sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \sin^2 54^\circ$
 $= \sin^2(90^\circ - 54^\circ) + (\sqrt{3})^2 + \left(\frac{2}{\sqrt{3}}\right)^2 + \sin^2 54^\circ$
 $= \cos^2 54^\circ + \sin^2 54^\circ + 3 + \frac{4}{3}$
 $= 1 + 3 + \frac{4}{3} = \frac{16}{3}$

232. If $2\sin^2\theta + 3\sin\theta - 2 = 0$, ($0^\circ < \theta < 90^\circ$) then find the value of θ is ?

- (a) 90° (b) 45°
(c) 30° (d) 60°

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) : $2\sin^2\theta + 3\sin\theta - 2 = 0$ ($0^\circ < \theta < 90^\circ$)

$$\sin\theta = \frac{-3 \pm \sqrt{3^2 - 4 \times 2(-2)}}{2 \times 2}$$

$$\sin\theta = \frac{-3 \pm \sqrt{25}}{4}$$

$$\sin\theta = \frac{-3 \pm 5}{4}$$

$$\sin\theta = \frac{1}{2}$$

$$\sin\theta = \sin 30^\circ$$

$$\theta = 30^\circ$$

233. The value of x , if $2\sin^2x = 2 - 3\sin x$, is:

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$
(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

SSC CHSL -16/10/2020 (Shift-III)

Ans. (b) : $2\sin^2x = 2 - 3\sin x$

$$2\sin^2x + 3\sin x - 2 = 0$$

$$2\sin^2x + 4\sin x - \sin x - 2 = 0$$

$$2\sin x(\sin x + 2) - 1(\sin x + 2) = 0$$

$$(\sin x + 2)(2\sin x - 1) = 0$$

$$\sin x + 2 = 0, 2\sin x - 1 = 0$$

$$\sin x \neq -2, \quad \sin x = \frac{1}{2} = \sin 30^\circ$$

$$\Rightarrow x = \frac{\pi}{6}$$

234. If $2\sin^2\theta + 5\cos\theta - 4 = 0$, ($0^\circ < \theta < 90^\circ$) then find value of $\cot\theta + \operatorname{cosec}\theta$ is :

- (a) $\frac{2}{\sqrt{3}}$ (b) $\frac{3\sqrt{3}}{2}$
(c) $\frac{\sqrt{3}}{2}$ (d) $\sqrt{3}$

SSC CHSL 05/07/2019 (Shift-I)

Ans. (d) : $2\sin^2\theta + 5\cos\theta - 4 = 0$, ($0^\circ < \theta < 90^\circ$)

$$2(1 - \cos^2\theta) + 5\cos\theta - 4 = 0$$

$$2 - 2\cos^2\theta + 5\cos\theta - 4 = 0$$

$$2\cos^2\theta - 5\cos\theta + 2 = 0$$

By multiplying from -1

$$\cos\theta = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 2 \times 2}}{2 \times 2}$$

$$\cos\theta = \frac{5 \pm 3}{4}$$

$$\cos\theta = 2 \text{ By taking the positive sign.}$$

$$\therefore \cos\theta = \frac{1}{2} \text{ By taking the sign.}$$

$$\cos\theta = \cos 60^\circ$$

$$\theta = 60^\circ$$

$$\text{then, } \cot\theta + \operatorname{cosec}\theta = \cot 60^\circ + \operatorname{cosec} 60^\circ$$

$$= \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}$$

$$= \frac{3}{\sqrt{3}}$$

$$= \sqrt{3}$$

235. If $\tan x = \cot(65^\circ + 9x)$ then the value of x is :

- (a) 2.0° (b) 2.5°
(c) 1.5° (d) 1.0°

SSC CHSL 04/07/2019 (Shift-II)

Ans. (b) : $\tan x = \cot(65^\circ + 9x)$

$$\Rightarrow \tan x = \tan[90^\circ - (65^\circ + 9x)]$$

$$\Rightarrow x = 25 - 9x$$

$$\Rightarrow 10x = 25$$

$$x = \frac{25}{10} = 2.5^\circ$$

236. If $\cos x = \frac{-1}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $2\tan^2x + 3\operatorname{cosec}^2x$ is :

- (a) 8 (b) 16
(c) 4 (d) 10

SSC CHSL 05/07/2019 (Shift-III)

Ans. (d) : $\cos x = -\frac{1}{2}$

$$\cos x = \cos(180^\circ - 60^\circ)$$

$$\cos x = \cos 120^\circ$$

$$x = 120^\circ$$

$$2\tan^2x + 3\operatorname{cosec}^2x$$

$$= 2\tan^2 120^\circ + 3\operatorname{cosec}^2 120^\circ$$

$$= 2[\tan(180^\circ - 60^\circ)]^2 + 3[\operatorname{cosec}(180^\circ - 60^\circ)]^2$$

$$= 2(-\tan 60^\circ)^2 + 3\operatorname{cosec}^2 60^\circ$$

$$= 2 \times 3 + 3 \times \frac{4}{3} = 10$$

237. If $\cos x = \frac{-1}{2}$ and $\pi < x < \frac{3\pi}{2}$ then the value of $4\tan^2x + 3\operatorname{cosec}^2x$ is :

- (a) 10 (b) 4
(c) 8 (d) 16

SSC CHSL /07/2019 (Shift-II)

Ans. (d) : $\because \cos x = \frac{-1}{2}$ and $\pi < x < \frac{3\pi}{2}$

$$\cos x = \cos\left(\pi + \frac{\pi}{3}\right)$$

241. The value of

$$\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\operatorname{cosec}^2 70^\circ - \tan^2 20^\circ}{\sec^2 37^\circ - \cot^2 53^\circ}$$

is:

- (a) 0 (b) 2
(c) 3 (d) 1

SSC CHSL -19/10/2020 (Shift-I)

Ans. (d) :

$$\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\operatorname{cosec}^2 70^\circ - \tan^2 20^\circ}{\sec^2 37^\circ - \cot^2 53^\circ}$$

$$= \tan(63^\circ - \theta) - \tan(63^\circ - \theta) + \frac{\operatorname{cosec}^2 70^\circ - \cot^2 70^\circ}{\sec^2 37^\circ - \tan^2 37^\circ}$$

$$\text{where } \left\{ \begin{array}{l} \because \cot(90 - \theta) = \tan \theta \\ \tan(90 - \theta) = \cot \theta, \sec^2 \theta - \tan^2 \theta = 1 \\ \operatorname{cosec}^2 \theta - \cot^2 \theta = 1 \end{array} \right.$$

$$= 0 + \frac{1}{1} = 1$$

242. The value of

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ} :$$

- (a) 2 (b) 1
(c) $\frac{1}{2}$ (d) 4

SSC CHSL 02/07/2019 (Shift-III)

$$\text{Ans. (a) : } \frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ}$$

$$= \frac{(\cos(90^\circ - 81^\circ) + \sin 81^\circ)(\sec(90^\circ - 81^\circ) + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec(90^\circ - 56^\circ) + \cos(90^\circ - 65^\circ) \operatorname{cosec} 65^\circ}$$

$$= \frac{(\sin 81^\circ + \sin 81^\circ)(\operatorname{cosec} 81^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \operatorname{cosec} 56^\circ + \sin 65^\circ \operatorname{cosec} 65^\circ}$$

$$= \frac{(2 \sin 81^\circ)(2 \operatorname{cosec} 81^\circ)}{\sin 56^\circ \times \frac{1}{\sin 56^\circ} + \sin 65^\circ \times \frac{1}{\sin 65^\circ}}$$

$$= \frac{2 \sin 81^\circ \times \frac{2}{\sin 81^\circ}}{1 + 1}$$

$$= \frac{4}{2} = 2$$

243. The value of $\frac{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}{2 \operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3 \cos 60^\circ + 2)}$

is:

- (a) 2 (b) 1
(c) $\frac{3}{2}$ (d) $\frac{1}{2}$

SSC CHSL 01/07/2019 (Shift-III)

$$\text{Ans. (d) : } \frac{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}{2 \operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3 \cos 60^\circ + 2)}$$

$$= \frac{\tan(90^\circ - 77^\circ) \cdot \tan(90^\circ - 53^\circ) \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ}{2 \cdot \left(\frac{2}{\sqrt{3}}\right)^2 \left(\left(\frac{1}{2}\right)^2 - 3 \times \frac{1}{2} + 2\right)}$$

$$= \frac{\cot 77^\circ \cdot \cot 53^\circ \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ}{2 \times \frac{4}{3} \times \left(\frac{1}{4} - \frac{3}{2} + 2\right)}$$

$$= \frac{1}{\tan 77^\circ} \times \frac{1}{\tan 53^\circ} \times \tan 45^\circ \times \tan 53^\circ \times \tan 77^\circ = \frac{8 \left(\frac{1-6+8}{4}\right)}{3}$$

$$= \frac{1}{\frac{8}{3} \times \frac{3}{4}} = \frac{1}{2}$$

244. If $\sin(\theta + 30^\circ) = \frac{3}{\sqrt{12}}$, then the value of θ is

equal to:

- (a) 45° (b) 30°
(c) 15° (d) 60°

SSC CHSL -21/10/2020 (Shift-II)

Ans. (b) Given,

$$\sin(\theta + 30^\circ) = \frac{3}{\sqrt{12}}$$

$$\sin(\theta + 30^\circ) = \frac{3}{2\sqrt{3}} \times \frac{\sqrt{3}}{2}$$

$$\sin(\theta + 30^\circ) = \sin 60^\circ$$

$$\theta + 30^\circ = 60^\circ$$

$$\theta = 30^\circ$$

245. If $3(\cot^2 \theta - \cos^2 \theta) = 1 - \sin^2 \theta$, $0^\circ < \theta < 90^\circ$, then θ is equal to:

- (a) 60° (b) 45° (c) 30° (d) 15°

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a) $3(\cot^2 \theta - \cos^2 \theta) = 1 - \sin^2 \theta$

$$3 \left(\frac{\cos^2 \theta}{\sin^2 \theta} - \cos^2 \theta \right) = \cos^2 \theta$$

$$3 \cos^2 \theta \left(\frac{1 - \sin^2 \theta}{\sin^2 \theta} \right) = \cos^2 \theta$$

$$3 \cot^2 \theta = 1$$

$$\cot \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 60^\circ$$

246. If $\cot \theta = \frac{1}{\sqrt{3}}$, $0^\circ < \theta < 90^\circ$, then the value of

$$\frac{2 - \sin^2 \theta}{1 - \cos^2 \theta} + \operatorname{cosec}^2 \theta - \sec \theta$$
 is:

- (a) 1 (b) 2
(c) 5 (d) 0

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : $\cot \theta = \frac{1}{\sqrt{3}}$

$\Rightarrow \cot \theta = \cot 60^\circ$

$\Rightarrow \theta = 60^\circ$

$\therefore \frac{2-\sin^2 \theta}{1-\cos^2 \theta} + (\operatorname{Cosec}^2 \theta - \sec \theta) = \frac{2-\sin^2 60^\circ}{1-\cos^2 60^\circ} + (\operatorname{Cosec}^2 60^\circ - \sec 60^\circ)$

$= \left(\frac{2-3/4}{1-1/4} \right) + \left(\frac{4}{3} - 2 \right)$

$= \left(\frac{5/4}{3/4} \right) + \left(\frac{2}{3} \right)$

$= \frac{5}{3} - \frac{2}{3}$

$= \frac{3}{3}$

$= 1$

247. Solve for $\cos^2 \theta - \sin^2 \theta = \frac{1}{2}$, $0 < \theta < 90^\circ$

- (a) 60° (b) 45°
(c) 40° (d) 30°

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (d) : Given

$\cos^2 \theta - \sin^2 \theta = \frac{1}{2}$

$\Rightarrow \cos 2\theta = \cos 60^\circ \quad \therefore (\cos^2 \theta - \sin^2 \theta = \cos 2\theta)$

$\Rightarrow 2\theta = 60^\circ$

$\Rightarrow \theta = 30^\circ$

248. If $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\cos \theta - \tan \theta$ is:

- (a) $\frac{1-2\sqrt{3}}{2}$ (b) $\frac{1+2\sqrt{3}}{2}$
(c) $\frac{2-\sqrt{3}}{2}$ (d) $\frac{2+\sqrt{3}}{2}$

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$

$\Rightarrow 4 - 2(1 - \cos^2 \theta) - 5 \cos \theta = 0$

$\Rightarrow 4 - 2 + 2 \cos^2 \theta - 5 \cos \theta = 0$

$\Rightarrow 2 \cos^2 \theta - 5 \cos \theta + 2 = 0$

$\Rightarrow 2 \cos^2 \theta - 4 \cos \theta - \cos \theta + 2 = 0$

$\Rightarrow 2 \cos \theta (\cos \theta - 2) - 1 (\cos \theta - 2) = 0$

$\Rightarrow \cos \theta - 2 = 0$ or $2 \cos \theta - 1 = 0$

$\Rightarrow \cos \theta = 2$ Unconstrable $\therefore \cos \theta = \frac{1}{2}$

$\Rightarrow \theta = 60^\circ$

$\therefore \cos \theta - \tan \theta = \cos 60^\circ - \tan 60^\circ$

$\Rightarrow \frac{1}{2} - \sqrt{3}$

$\Rightarrow \left(\frac{1-2\sqrt{3}}{2} \right)$

249. If

$4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \times \tan^2 66^\circ \tan^2 24^\circ = \frac{y}{2}$

, then the value of y is:

- (a) 4 (b) 8
(c) -4 (d) -8

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \times \tan^2$

$66^\circ \times \tan^2 24^\circ = \frac{y}{2}$

$\therefore \operatorname{cosec}(90^\circ - \theta) = \sec \theta$ and $\tan(90^\circ - \theta) = \cot \theta$

$\Rightarrow 4(\sec^2 33^\circ - \tan^2 33^\circ) - 0 + y \times \cot^2 24^\circ \times \tan^2 24^\circ$

$= \frac{y}{2}$

$\Rightarrow 4 \times 1 + y \times 1 = \frac{y}{2} \quad \{ \because \sec^2 \theta - \tan^2 \theta = 1 \}$

$\Rightarrow y - \frac{y}{2} = -4$

$\Rightarrow \frac{y}{2} = -4$

$\Rightarrow y = -8$

250. The value of $\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$ is:

- (a) -3 (b) 3
(c) $-\frac{1}{3}$ (d) $\frac{1}{3}$

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : $\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$

$= \frac{\sin^2 52^\circ + \cos^2 52^\circ + 2}{4 \sin^2 47^\circ + 4 \cos^2 47^\circ - 5}$

$\left[\because \sin(90^\circ - \theta) = \cos \theta, \right]$
 $\left[\cos(90^\circ - \theta) = \sin \theta \right]$

$= \frac{1+2}{4 \times 1 - 5} = \frac{3}{-1} = -3 \quad \left[\because \sin^2 \theta + \cos^2 \theta = 1 \right]$

251. If $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ - y \tan^2 66^\circ$

$\tan^2 24^\circ = \frac{y}{2}$ the value of y is:

- (a) $\frac{8}{3}$ (b) 8
(c) $\frac{3}{8}$ (d) $\frac{1}{3}$

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a)

$$4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ - \tan^2 66^\circ \cdot \tan^2 24^\circ = \frac{y}{2}$$

$$4[\operatorname{cosec}^2(90^\circ - 33^\circ) - \tan^2 33^\circ] - 0 - y = \frac{y}{2}$$

($\because \tan A \cdot \tan B = 1$, if $A + B = 90^\circ$)

$$\Rightarrow 4 \times [\sec^2 33^\circ - \tan^2 33^\circ] - y = \frac{y}{2}$$

$$\Rightarrow 4 \times 1 - y = \frac{y}{2} \quad (\because \sec^2 \theta - \tan^2 \theta = 1)$$

$$\Rightarrow 4 - y = \frac{y}{2}$$

$$\Rightarrow 8 - 2y = y$$

$$\Rightarrow y = \frac{8}{3}$$

252. If $\frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$ where $0^\circ < \phi < 90^\circ$, then what is the value of $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$?

(a) $\frac{9+4\sqrt{3}}{6}$

(b) $\frac{3+4\sqrt{3}}{6}$

(c) $\frac{2+\sqrt{3}}{3}$

(d) $\frac{3+2\sqrt{3}}{3}$

SSC CGL (Tier-II) 12-09-2019

Ans. (a) $\frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$

$$\frac{(\sin \phi - 1)(\sin \phi - 2)}{(1 - \sin^2 \phi)} = 1$$

$$\frac{(\sin \phi - 1)(\sin \phi - 2)}{(1 + \sin \phi)(\sin \phi - 1)} = -1$$

$$\frac{(\sin \phi - 2)}{(1 + \sin \phi)} = -1$$

$$\sin \phi - 2 = -\sin \phi - 1$$

$$2 \sin \phi = 1 \Rightarrow \sin \phi = \frac{1}{2}$$

$$\phi = 30^\circ$$

$$\therefore \cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi = \cos 60^\circ + \sin 90^\circ + \operatorname{cosec} 60^\circ$$

$$= \frac{1}{2} + 1 + \frac{2}{\sqrt{3}}$$

$$= \frac{3}{2} + \frac{2}{\sqrt{3}}$$

$$= \frac{3\sqrt{3} + 4}{2\sqrt{3}} = \frac{9 + 4\sqrt{3}}{6}$$

253. If $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = \frac{4}{\sqrt{3}}$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan \theta + \sec \theta)^{-1}$ is :

(a) $3 - \sqrt{2}$

(b) $2 + \sqrt{3}$

(c) $2 - \sqrt{3}$

(d) $3 + \sqrt{2}$

SSC CGL (Tier-II) 13-09-2019

Ans. (c):

$$\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = \frac{4}{\sqrt{3}}$$

$$\frac{\sin^2 \theta + 1 + \cos^2 \theta + 2 \cos \theta}{\sin \theta(1 + \cos \theta)} = \frac{4}{\sqrt{3}}$$

$$\frac{2 + 2 \cos \theta}{\sin \theta(1 + \cos \theta)} = \frac{4}{\sqrt{3}}$$

$$\frac{2}{\sin \theta} = \frac{4}{\sqrt{3}}$$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\theta = 60^\circ$$

$$(\tan 60^\circ + \sec 60^\circ)^{-1} = (\sqrt{3} + 2)^{-1}$$

$$= \frac{1}{\sqrt{3} + 2} \times \frac{\sqrt{3} - 2}{\sqrt{3} - 2} = \frac{\sqrt{3} - 2}{-1} = 2 - \sqrt{3}$$

254. If $(A+B+C) = 90^\circ$, then what is the value of $\sin(A/2) \sin[(180^\circ - B - C)/2] + \cos(A/2) \sin(B+C)/2$?

(a) $1/2$

(b) 1

(c) $1/\sqrt{2}$

(d) $\sqrt{3}/2$

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

$$\sin \frac{A}{2} \cdot \sin \left(\frac{180^\circ - B - C}{2} \right) + \cos \frac{A}{2} \cdot \sin \left(\frac{B+C}{2} \right)$$

$$= \sin \frac{A}{2} \cdot \sin \left(90^\circ - \frac{B+C}{2} \right) + \cos \frac{A}{2} \cdot \sin \left(\frac{B+C}{2} \right)$$

$$= \sin \frac{A}{2} \cdot \cos \frac{B+C}{2} + \cos \frac{A}{2} \cdot \sin \left(\frac{B+C}{2} \right)$$

$$= \sin \left(\frac{A}{2} + \frac{B+C}{2} \right)$$

[$\because \sin(A+B) = \sin A \cdot \cos B + \cos A \cdot \sin B$]

$$= \sin \frac{90^\circ}{2} = \frac{1}{\sqrt{2}}$$

255. What is the value of $\cot(90^\circ - x) \sin^4(90^\circ - x) + \cot(180^\circ - x) \sin^4(180^\circ - x)$?

(a) $(\cos 4x)/4$

(b) $(\sin^2 2x)/2$

(c) $(\cos^2 2x)/2$

(d) $(\sin 4x)/4$

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$\cot(90^\circ - x) \cdot \sin^4(90^\circ - x) + \cot(180^\circ - x) \cdot \sin^4(180^\circ - x)$$

$$= \tan x \cdot \cos^4 x - \cot x \cdot \sin^4 x$$

$$= \sin x \cdot \cos^3 x - \cos x \cdot \sin^3 x$$

$$= \frac{1}{2} \times 2 \sin x \cdot \cos x (\cos^2 x - \sin^2 x)$$

[$\because \sin 2A = 2 \sin A \cdot \cos A$]

$$= \frac{1}{2} \times \sin 2x \times \cos 2x = \frac{\sin 4x}{4}$$

263. The value of $(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$ is :

- (a) 21 (b) $20\frac{1}{2}$
 (c) 22 (d) $22\frac{1}{2}$

SSC CGL (Tier-II) 12-09-2019

Ans. (b) :

$$(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$$

$$(\cot^2 61^\circ - \operatorname{cosec}^2 61^\circ) + (\cot^2 54^\circ - \sec^2 54^\circ)$$

$$= -1 - 1 = -2$$

And $\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 45^\circ + \dots + \sin^2 87^\circ + \sin^2 89^\circ$

if $A + B = 90^\circ$ then $\sin^2 A + \sin^2 B = 1$

Total term = 45

$$= (22 \times 1) + \sin^2 45^\circ = 22 + \frac{1}{2} = 22\frac{1}{2}$$

$$\text{Required Value} = -2 + 22\frac{1}{2}$$

$$= 20\frac{1}{2}$$

264. The value of $\sin^2 64^\circ + \cos 64^\circ \sin 26^\circ + 2 \cos 43^\circ \operatorname{cosec} 47^\circ$ is :

- (a) 4 (b) 2
 (c) 1 (d) 3

SSC CGL (Tier-II) 13-09-2019

Ans. (d) :

$$\sin^2 64^\circ + \cos 64^\circ \sin 26^\circ + 2 \cos 43^\circ \operatorname{cosec} 47^\circ$$

$$= \sin^2 64^\circ + \cos 64^\circ \cos 64^\circ + 2 \cos 43^\circ \sec 43^\circ$$

$$= \sin^2 64^\circ + \cos^2 64^\circ + 2 \times 1$$

$$= 1 + 2 = 3$$

265. What is the value of $\sin(90^\circ + 2A) [4 - \cos^2(90^\circ - 2A)]$?

- (a) $4(\cos^3 A - \sin^3 A)$ (b) $4(\cos^3 A + \sin^3 A)$
 (c) $4(\cos^6 A + \sin^6 A)$ (d) $4(\cos^6 A - \sin^6 A)$

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : $\sin(90^\circ + 2A) [4 - \cos^2(90^\circ - 2A)]$

$$= \cos 2A (4 - \sin^2 2A)$$

$$= (\cos^2 A - \sin^2 A) (4 - 4 \sin^2 A \cos^2 A)$$

$$= 4(\cos^2 A - \sin^2 A) (1 - \sin^2 A \cos^2 A)$$

$$= 4(\cos^2 A - \sin^2 A) [(\sin^2 A + \cos^2 A)^2 - \sin^2 A \cos^2 A]$$

$$= 4(\cos^2 A - \sin^2 A) (\sin^4 A + \cos^4 A + \sin^2 A \cos^2 A)$$

$$= 4[(\cos^2 A)^3 - (\sin^2 A)^3]$$

$$\therefore [a^3 - b^3 \Rightarrow (a - b)(a^2 + b^2 + ab)]$$

$$= 4[\cos^6 A - \sin^6 A]$$

266. What is the value of

$$\frac{1}{\sin^4(90^\circ - \theta)} + \frac{1}{[\cos^2(90^\circ - \theta)] - 1} ?$$

- (a) $\tan^2 \theta \sec^2 \theta$ (b) $\sec^4 \theta$
 (c) $\tan^4 \theta$ (d) $\tan^2 \theta \sin^2 \theta$

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : $\frac{1}{\sin^4(90^\circ - \theta)} + \frac{1}{\cos^2(90^\circ - \theta) - 1}$

$$= \frac{1}{\cos^4 \theta} + \frac{1}{\sin^2 \theta - 1}$$

$$= \frac{1}{\cos^4 \theta} - \frac{1}{\cos^2 \theta} = \frac{1 - \cos^2 \theta}{\cos^4 \theta} = \frac{\sin^2 \theta}{\cos^4 \theta} = \tan^2 \theta \sec^2 \theta$$

267. If $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\sin \theta + \tan \theta$ is :

- (a) $2\sqrt{3}$ (b) $3\sqrt{2}$
 (c) $\frac{3\sqrt{2}}{2}$ (d) $\frac{3\sqrt{3}}{2}$

SSC CGL (Tier-I) - 04.06.2019 (Shift-I)

Ans. (d) : $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$

$$4 - 2(1 - \cos^2 \theta) - 5 \cos \theta = 0$$

$$4 - 2 + 2 \cos^2 \theta - 5 \cos \theta = 0$$

$$2 \cos^2 \theta - 5 \cos \theta + 2 = 0$$

$$2 \cos^2 \theta - 4 \cos \theta - \cos \theta + 2 = 0$$

$$2 \cos \theta (\cos \theta - 2) - 1(\cos \theta - 2) = 0$$

$$(\cos \theta - 2)(2 \cos \theta - 1) = 0$$

$$\therefore \cos \theta = 2, \frac{1}{2}$$

$$\therefore \cos \theta = 2 \text{ (Does not exist)}$$

$$\therefore \cos \theta = \frac{1}{2} = \cos 60^\circ$$

$$\Rightarrow \theta = 60^\circ$$

then, $\sin \theta + \tan \theta = ?$

$$= \sin 60^\circ + \tan 60^\circ$$

$$= \frac{\sqrt{3}}{2} + \sqrt{3}$$

$$= \frac{3\sqrt{3}}{2}$$

268. If $\sin(x + y) = \cos(x - y)$, then the value of $\cos^2 x$ is:

- (a) $\frac{1}{2}$ (b) 3
 (c) $\frac{1}{4}$ (d) 5

SSC CGL (Tier-II) - 18/11/2020

Ans. (a) : $\therefore \sin(x + y) = \cos(x - y)$

$$x + y + x - y = 90^\circ$$

$$\boxed{x = 45^\circ}$$

$$\cos^2 x = \cos^2 45^\circ = \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2}$$

269. If $\operatorname{cosec}39^\circ = x$, then the value of

$$\frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \sec^2 39^\circ}$$

is:

- (a) $1 - x^2$ (b) $\sqrt{x^2 - 1}$
 (c) $x^2 - 1$ (d) $\sqrt{1 - x^2}$

SSC CGL (Tier-II) – 18/11/2020

Ans. (c) : $\operatorname{Cosec} 39^\circ = x$

$$\Rightarrow \frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \cdot \sec^2 39^\circ}$$

$$\Rightarrow \sin^2 51^\circ + \cos^2 51^\circ + \cot^2 39^\circ - \frac{1}{\sin^2 51^\circ \cdot \operatorname{cosec}^2 51^\circ}$$

$$\Rightarrow 1 + \cot^2 39^\circ - 1$$

$$\Rightarrow \cot^2 39^\circ$$

$$\Rightarrow (\operatorname{cosec}^2 39^\circ - 1)$$

$$\Rightarrow x^2 - 1$$

270. What is the value of

$$\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sin^2 90^\circ} - \tan^2 45^\circ?$$

- (a) 0 (b) 1
 (c) -2 (d) -1

SSC CHSL 06/08/2021 (Shift-III)

Ans. (a) : $\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sin^2 90^\circ} - \tan^2 45^\circ$

$$= \frac{\cos^2 20^\circ + \sin^2 20^\circ}{\sin^2 90^\circ} - \tan^2 45^\circ \quad (\because \cos(90^\circ - \theta) = \sin \theta)$$

$$= \frac{1}{1} - 1 = 0$$

271. Simplify the following expression.

$$\cos^2 30^\circ + \cos^2 40^\circ + \cos^2 50^\circ + \cos^2 60^\circ$$

- (a) 1 (b) $\frac{5}{2}$
 (c) $\frac{3}{2}$ (d) 2

SSC CHSL 16/04/2021 (Shift-III)

Ans. (d) : $\cos^2 30^\circ + \cos^2 40^\circ + \cos^2 50^\circ + \cos^2 60^\circ$

$$= \cos^2 30^\circ + \cos^2 (90^\circ - 30^\circ) + \cos^2 40^\circ + \cos^2 (90^\circ - 40^\circ)$$

$$= (\cos^2 30^\circ + \sin^2 30^\circ) + (\cos^2 40^\circ + \sin^2 40^\circ)$$

$$(\because \sin^2 \theta + \cos^2 \theta = 1)$$

$$\therefore = 1 + 1$$

$$= 2$$

272. The value of

$$\frac{3\cos^2 27^\circ - 5 + 3\cos^2 63^\circ}{\tan^2 32^\circ + 4 - \operatorname{cosec}^2 58^\circ} + \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$$

is:

- (a) $-\frac{1}{3}$ (b) $1\frac{2}{3}$
 (c) $\frac{1}{3}$ (d) $-\frac{1}{4}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) :

$$\frac{3\cos^2 27^\circ - 5 + 3\cos^2 63^\circ}{\tan^2 32^\circ + 4 - \operatorname{cosec}^2 58^\circ} + \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$$

$$\frac{3\cos^2 27^\circ + 3\cos^2 (90^\circ - 27^\circ) - 5}{\tan^2 32^\circ + 4 - \operatorname{cosec}^2 58^\circ} = \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$$

$$= \frac{(3\cos^2 27^\circ + 3\sin^2 27^\circ) - 5}{(\cot^2 58^\circ - \operatorname{cosec}^2 58^\circ) + 4} + \sin(35^\circ + 55^\circ)$$

$$= \frac{3 - 5}{-1 + 4} + \sin 90^\circ \quad (\because \operatorname{cosec}^2 \theta - \cot^2 \theta = 1)$$

$$= \left(\frac{-2}{3} + 1 \right)$$

$$= \frac{1}{3}$$

273. The value of

$$\left[\frac{\sin^2 27^\circ + \sin^2 63^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} - \sin^2 69^\circ - \cos 69^\circ \sin 21^\circ \right] \text{ is}$$

- (a) 3 (b) 2
 (c) 0 (d) 1

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : $\frac{\sin^2 27^\circ + \sin^2 63^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} - \sin^2 69^\circ - \cos 69^\circ \sin 21^\circ$

$$\because \sin(90^\circ - \theta) = \cos \theta, \cos(90^\circ - \theta) = \sin \theta$$

$$= \frac{\sin^2 27^\circ + \sin^2 (90^\circ - 27^\circ)}{\cos^2 24^\circ + \cos^2 (90^\circ - 24^\circ)} - \sin^2 69^\circ - \cos 69^\circ \sin (90^\circ - 69^\circ)$$

$$= \frac{\sin^2 27^\circ + \cos^2 27^\circ}{\cos^2 24^\circ + \sin^2 24^\circ} - (\sin^2 69^\circ + \cos^2 69^\circ)$$

$$\{\because \sin^2 \theta + \cos^2 \theta = 1\}$$

$$= 1 - 1 = 0$$

274. $\left(\sqrt{\sec^2 \theta + \operatorname{cosec}^2 \theta} \right) \left(\frac{\sin \theta (1 + \cos \theta)}{1 + \cos \theta - \sin^2 \theta} \right)$, $0^\circ < \theta < 90^\circ$ is

equal to:

- (a) $\sec^2 \theta$ (b) $\operatorname{cosec}^2 \theta$
 (c) $\cot \theta$ (d) $\tan \theta$

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (a) : $\left(\sqrt{\sec^2 \theta + \operatorname{cosec}^2 \theta} \right) \left(\frac{\sin \theta (1 + \cos \theta)}{1 + \cos \theta - \sin^2 \theta} \right)$

$$= \frac{1}{\sin \theta \cos \theta} \left[\frac{\sin \theta (1 + \cos \theta)}{\cos \theta (1 + \cos \theta)} \right]$$

$$\begin{aligned} & \left[\begin{array}{l} \because \sec^2 \theta + \operatorname{cosec}^2 \theta \\ = \sec^2 \theta \cdot \operatorname{cosec}^2 \theta \end{array} \right] \\ & = \frac{1}{\sin \theta \cos \theta} \times \frac{\sin \theta}{\cos \theta} \\ & = \sec^2 \theta \end{aligned}$$

275. The value of $(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ)$

$$\frac{4\cos^2 37^\circ - 7 + 4\cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ}$$

(a) -2 (b) 0
(c) 1 (d) 2

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (d) $(\sin 37^\circ \cdot \cos 53^\circ + \cos 37^\circ \cdot \sin 53^\circ)$

$$\begin{aligned} & \frac{4\cos^2 37^\circ - 7 + 4\cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ} \\ & = \sin(37^\circ + 53^\circ) - \left[\frac{4\cos^2 37^\circ - 7 + 4\sin^2 37^\circ}{\tan^2 47^\circ + 4 - 1 - \sec^2 47^\circ} \right] \\ & = \sin 90^\circ - \frac{4 - 7}{\tan^2 47^\circ + 4 - 1 - \tan^2 47^\circ} \\ & = \sin 90^\circ - \left[\frac{4 - 7}{3} \right] \\ & = 1 - (-1) \\ & = 1 + 1 = 2 \end{aligned}$$

276. The value of

$$\frac{3(\operatorname{cosec}^2 26^\circ - \tan^2 64^\circ) + (\cot^2 42^\circ - \sec^2 48^\circ)}{\cot(22^\circ - \theta) - \operatorname{cosec}^2(62^\circ + \theta) - \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)}$$

is:
(a) 3 (b) 4
(c) -1 (d) -2

SSC CGL (Tier-II) 03/02/2022

Ans : (d)

$$\begin{aligned} & \frac{3(\operatorname{cosec}^2 26^\circ - \tan^2 64^\circ) + (\cot^2 42^\circ - \sec^2 48^\circ)}{\cot(22^\circ - \theta) - \operatorname{cosec}^2(62^\circ + \theta) - \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)} \\ & \frac{3(\operatorname{cosec}^2(90^\circ - 64^\circ) \tan^2 64^\circ) + (\cot^2 42^\circ \sec^2(90^\circ - 42^\circ))}{\cot(90^\circ - (22^\circ - \theta)) - \operatorname{cosec}^2(90^\circ - (62^\circ + \theta)) - \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)} \\ & \frac{3(\sec^2 64^\circ - \tan^2 64^\circ) + (\cot^2 42^\circ - \operatorname{cosec}^2 42^\circ)}{\tan(\theta + 68^\circ) - \sec^2(28^\circ - \theta) - \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)} \\ & \frac{3(1) - 1}{-1} = \frac{2}{-1} = -2 \end{aligned}$$

277. The expression $(\tan \theta + \cot \theta)(\sec \theta + \tan \theta)(1 - \sin \theta)$, $0^\circ < \theta < 90^\circ$, is equal to:

- (a) $\sec \theta$ (b) $\operatorname{cosec} \theta$
(c) $\cot \theta$ (d) $\sin \theta$

SSC CGL (Tier-II) 03/02/2022

Ans : (b) $(\tan \theta + \cot \theta)(\sec \theta + \tan \theta)(1 - \sin \theta)$
On putting the value of $\theta = 30^\circ$
 $= (\tan 30^\circ + \cot 30^\circ)(\sec 30^\circ + \tan 30^\circ)(1 - \sin 30^\circ)$

$$\begin{aligned} & = \left(\frac{1}{\sqrt{3}} + \sqrt{3} \right) \left(\frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} \right) \left(1 - \frac{1}{2} \right) \\ & = \frac{4}{\sqrt{3}} \times \frac{3}{\sqrt{3}} \times \frac{1}{2} \\ & = 2 \end{aligned}$$

From option (b)
 $\operatorname{Cosec} \theta = \operatorname{cosec} 30^\circ = 2$

278. The value of

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\operatorname{cosec}^2 71^\circ + \cos^2 15^\circ - \tan^2 19^\circ + \cos^2 75^\circ}$$

(a) 1 (b) 4
(c) -3 (d) 2

SSC CGL (Tier-II) 03/02/2022

Ans : (d) $\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\operatorname{cosec}^2 71^\circ + \cos^2 15^\circ - \tan^2 19^\circ + \cos^2 75^\circ}$

$$\begin{aligned} & = \frac{(\sin 81^\circ + \sin 81^\circ)(\operatorname{cosec} 81^\circ + \operatorname{cosec} 81^\circ)}{\sec^2 29^\circ + \sin^2 75^\circ - \tan^2 19^\circ + \cos^2 75^\circ} \\ & = \frac{4 \sin 81^\circ \cdot \operatorname{cosec} 81^\circ}{1 + 1} \\ & \frac{4}{2} = 2 \end{aligned}$$

279. If $\sin^2 \theta - \cos^2 \theta - 3 \sin \theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $1 + \sec \theta + \tan \theta$?

- (a) $-1 + \sqrt{3}$ (b) $-1 - \sqrt{3}$
(c) $1 + \sqrt{3}$ (d) $1 - \sqrt{3}$

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (c) Given,
 $\sin^2 \theta - \cos^2 \theta - 3 \sin \theta + 2 = 0$, $0^\circ < \theta < 90^\circ$
Put $\theta = 30^\circ$
 $\sin^2 30^\circ - \cos^2 30^\circ - 3 \sin 30^\circ + 2 = 0$

$$\begin{aligned} & \frac{1}{4} - \frac{3}{4} - \frac{3}{2} + 2 = 0 \\ & = -2 + 2 = 0 \\ & 0 = 0 \end{aligned}$$

Value of $1 + \sec \theta + \tan \theta = ?$

$$\begin{aligned} & = 1 + \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} \\ & = 1 + \frac{3}{\sqrt{3}} \\ & = 1 + \sqrt{3} \end{aligned}$$

280. $(\sin \theta + \cos \theta)^2 = 2$, $0^\circ < \theta < 90^\circ$, then the value of θ is:

- (a) π (b) 0
(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

SSC CHSL -17/03/2020 (Shift-II)

Ans. (d) : $(\sin \theta + \cos \theta)^2 = 2$
By putting the value $\theta = \frac{\pi}{4}$

$$\left(\sin \frac{\pi}{4} + \cos \frac{\pi}{4}\right)^2 = \left(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)^2$$

$$= \left(\frac{2}{\sqrt{2}}\right)^2$$

$$= \frac{4}{2}$$

$$= 2$$

Hence the value of θ is $\frac{\pi}{4}$.

281. If $\sin(A+B) = \cos(A-B) = \frac{\sqrt{3}}{2}$ and A and B are acute angles. The measure of angle A and B (in degrees) will be:
 (a) A = 45 and B = 45 (b) A = 45 and B = 15
 (c) A = 60 and B = 30 (d) A = 15 and B = 45
SSC CHSL -20/10/2020 (Shift-II)

Ans: (b) $\sin(A+B) = \cos(A-B) = \frac{\sqrt{3}}{2}$

$$\sin(A+B) = \frac{\sqrt{3}}{2} = \sin 60^\circ$$

$$A+B = 60^\circ \quad \dots(i)$$

$$\cos(A-B) = \frac{\sqrt{3}}{2} = \cos 30^\circ$$

$$A-B = 30^\circ \quad \dots(ii)$$

From equation (i) and (ii)
 A = 45°, B = 15°

282. If $\sin(A-B) = 1/2$ and $\cos(A+B) = 1/2$, where $A > B > 0^\circ$ and A + B is an acute angle, then the value of A is
 (a) 60° (b) 30°
 (c) 45° (d) 15°
SSC CHSL -21/10/2020 (Shift-II)

Ans: (c) Given,
 $\sin(A-B) = 1/2$
 $\sin(A-B) = \sin 30^\circ$
 $(A-B) = 30^\circ \quad \dots(i)$
 $\cos(A+B) = 1/2$
 $\cos(A+B) = \cos 60^\circ$
 $A+B = 60^\circ \quad \dots(ii)$

On adding the equation (i) and (ii)
 $A-B = 30^\circ$
 $A+B = 60^\circ$
 $2A = 90^\circ$
 $A = 45^\circ$

283. If $\sin 7x = \cos 11x$, $0^\circ < x < 90^\circ$, then the value of $\tan 9x$ is:
 (a) $\frac{\sqrt{3}}{2}$ (b) 1
 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$
SSC CHSL -21/10/2020 (Shift-I)

Ans: (b) $\sin 7x = \cos 11x$
 $\sin 7x = \sin(90^\circ - 11x) \quad \because \sin(90^\circ - \theta) = \cos \theta$
 $7x = 90^\circ - 11x$

$$18x = 90^\circ$$

$$x = 5^\circ$$

$\therefore \tan 9x = \tan 9 \times 5$
 $= \tan 45^\circ$
 $= 1$

284. If $3 - 2 \sin^2 \theta - 3 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$ then find the value of $(2 \operatorname{cosec} \theta + \tan \theta)$?
 (a) $5\sqrt{3}$ (b) $\frac{5\sqrt{3}}{3}$
 (c) $7\sqrt{3}$ (d) $\frac{7\sqrt{3}}{3}$
SSC CHSL 02/07/2019 (Shift-III)

Ans: (d) : $3 - 2 \sin^2 \theta - 3 \cos \theta = 0$
 $-2(1 - \cos^2 \theta) - 3 \cos \theta = -3$
 $-2 + 2 \cos^2 \theta - 3 \cos \theta = -3$
 $2 \cos^2 \theta - 3 \cos \theta + 1 = 0$
 $2 \cos^2 \theta - 2 \cos \theta - \cos \theta + 1 = 0$
 $2 \cos \theta (\cos \theta - 1) - 1(\cos \theta - 1) = 0$
 $(2 \cos \theta - 1)(\cos \theta - 1) = 0$
 $2 \cos \theta = 1 \quad \text{and} \quad \cos \theta = 1$
 $\cos \theta = 1/2 \quad \boxed{\theta = 60^\circ}$
 $\theta = 60^\circ$
 $(2 \operatorname{cosec} \theta + \tan \theta) = ?$

On putting $\theta = 60^\circ$,

$$= \left(2 \times \frac{2}{\sqrt{3}} + \sqrt{3}\right)$$

$$= \left(\frac{4}{\sqrt{3}} + \sqrt{3}\right)$$

$$= \left(\frac{4+3}{\sqrt{3}}\right)$$

$$= \left(\frac{7}{\sqrt{3}}\right)$$

By rationalization of $\sqrt{3}$

$$= \left(\frac{7\sqrt{3}}{3}\right)$$

285. If $2 \cos^2 \theta - 5 \cos \theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then find the value of $(\operatorname{cosec} \theta + \cot \theta)$
 (a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$
 (c) $\frac{1}{3}$ (d) $2\sqrt{3}$
SSC CHSL 01/07/2019 (Shift-III)

Ans: (b) : $2 \cos^2 \theta - 5 \cos \theta + 2 = 0$, $0^\circ < \theta < 90^\circ$

Formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$\cos \theta = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 2 \times 2}}{2 \times 2}$$

$$\cos\theta = \frac{5 \pm 3}{4}$$

$$\cos\theta = \frac{1}{2} = \cos 60^\circ \quad \text{By taking the } (-) \text{ sign.}$$

$$\theta = 60^\circ$$

then, $\operatorname{cosec}\theta + \cot\theta = \operatorname{cosec} 60^\circ + \cot 60^\circ$

$$= \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}}$$

$$= \frac{3}{\sqrt{3}}$$

$$= \sqrt{3}$$

286. Write the exact value of the given below :

$$\left[\frac{\sin^2 25^\circ + \sin^2 65^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} + \sin^2 71^\circ + \cos 71^\circ \sin 19^\circ \right]$$

- (a) 3 (b) 0
(c) 1 (d) 2

SSC CHSL 02/07/2019 (Shift-II)

Ans. (d) : $\left[\frac{\sin^2 25^\circ + \sin^2 65^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} + \sin^2 71^\circ + \cos 71^\circ \sin 19^\circ \right]$

$$= \left[\frac{\sin^2 25^\circ + \sin^2 (90^\circ - 25^\circ)}{\cos^2 24^\circ + \cos^2 (90^\circ - 24^\circ)} + \sin^2 71^\circ + \cos 71^\circ \right]$$

$$= \left[\frac{\sin^2 25^\circ + \cos^2 25^\circ}{\cos^2 24^\circ + \sin^2 24^\circ} + \sin^2 71^\circ + \cos 71^\circ \cdot \sin(90^\circ - 71^\circ) \right]$$

$$= \left[\frac{\sin^2 25^\circ + \cos^2 25^\circ}{\cos^2 24^\circ + \sin^2 24^\circ} + \sin^2 71^\circ + \cos 71^\circ \cdot \cos 71^\circ \right]$$

$$= [1 + \sin^2 71^\circ + \cos^2 71^\circ]$$

$$= 1 + 1 = 2$$

287. If $\tan\theta + \cot\theta = 2$ and θ is acute, then the value of $\tan^{100}\theta + \cot^{100}\theta$ is equal to:

- (a) 2 (b) $\sqrt{3}$
(c) 1 (d) 0

SSC CHSL -26/10/2020 (Shift-I)

Ans. (a) : $\tan\theta + \cot\theta = 2$
Let $\theta = 45^\circ$
 $\tan 45^\circ + \cot 45^\circ = 2$
 $1 + 1 = 2$
 $2 = 2$
As per question
 $\tan^{100}\theta + \cot^{100}\theta = ?$
 $\tan^{100} 45^\circ + \cot^{100} 45^\circ = ?$
 $1 + 1 = 2$

288. If $\frac{(1 + \sin\theta - \cos\theta)}{(1 + \sin\theta + \cos\theta)} + \frac{(1 + \sin\theta + \cos\theta)}{(1 + \sin\theta - \cos\theta)} = 4$, then

which of the following values will be suitable for θ ?

- (a) 30° (b) 90°
(c) 45° (d) 60°

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : $\frac{(1 + \sin\theta - \cos\theta)}{(1 + \sin\theta + \cos\theta)} + \frac{(1 + \sin\theta + \cos\theta)}{(1 + \sin\theta - \cos\theta)} = 4$

$$= \frac{2(1 + \sin^2\theta + 2\sin\theta + \cos^2\theta)}{(1 + \sin\theta)^2 - \cos^2\theta} = 4$$

$$= \frac{2(2 + 2\sin\theta)}{(1 + \sin\theta)^2 - (1 - \sin^2\theta)} = 4$$

$$= \frac{4(1 + \sin\theta)}{2(1 + \sin\theta)\sin\theta} = 4$$

$$\Rightarrow \sin\theta = \frac{1}{2} = \sin 30^\circ$$

$$\Rightarrow \theta = 30^\circ$$

289. Find x if $\cos x = -\frac{1}{2}$.

- (a) $\frac{4\pi}{3}$ (b) $\frac{2\pi}{3}$
(c) $\frac{5\pi}{3}$ (d) $\frac{3\pi}{2}$

SSC CHSL-14/10/2020 (Shift-III)

Ans. (b) : $\cos x = -\frac{1}{2}$
 $\cos x = \cos(180^\circ - 60^\circ)$
 $\cos x = \cos 120^\circ$
 $x = 120^\circ = \frac{2\pi}{3}$

290. If $\frac{1}{\operatorname{cosec}\theta + 1} + \frac{1}{\operatorname{cosec}\theta - 1} = 2\sec\theta$, $0^\circ < \theta < 90^\circ$,

then the value of $\frac{\tan\theta + 2\sec\theta}{\operatorname{cosec}\theta}$

- (a) $\frac{2 + \sqrt{2}}{2}$ (b) $\frac{2 + \sqrt{3}}{2}$
(c) $\frac{4 + \sqrt{3}}{2}$ (d) $\frac{4 + \sqrt{2}}{2}$

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d)

$$\frac{1}{\operatorname{cosec}\theta + 1} + \frac{1}{\operatorname{cosec}\theta - 1} = 2\sec\theta$$

$$\frac{\operatorname{cosec}\theta - 1 + \operatorname{cosec}\theta + 1}{\operatorname{cosec}^2\theta - 1} = 2\sec\theta$$

$$\frac{2\operatorname{cosec}\theta}{\cot^2\theta} = 2 \frac{1}{\cos\theta}$$

$$2 \cdot \frac{1}{\sin\theta} \times \frac{\sin^2\theta}{\cos^2\theta} = 2 \cdot \frac{1}{\cos\theta}$$

$$\tan\theta = 1 = \tan 45^\circ$$

$$\theta = 45^\circ$$

$$\therefore \frac{\tan\theta + 2\sec\theta}{\operatorname{cosec}\theta} = \frac{\tan 45^\circ + 2\sec 45^\circ}{\operatorname{cosec} 45^\circ}$$

$$= \frac{1 + 2\sqrt{2}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{4 + \sqrt{2}}{2}$$

291. If $\sec 3x = \operatorname{cosec}(3x - 45^\circ)$, where $3x$ is an acute angle, then x is equal to:

- (a) 45° (b) 22.5°
 (c) 35° (d) 27.5°

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : $\sec 3x = \operatorname{cosec} (3x - 45^\circ)$

$$\sec 3x = \sec [90^\circ - (3x - 45^\circ)]$$

$$3x = 135^\circ - 3x$$

$$6x = 135^\circ \Rightarrow x = \frac{135^\circ}{6} = 22.5^\circ$$

292. If 4θ is an acute angle, and $\cot 4\theta = \tan(\theta - 5^\circ)$, then what is the value of θ ?

- (a) 24° (b) 45°
 (c) 21° (d) 19°

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : $\cot 4\theta = \tan(\theta - 5^\circ)$

$$\tan(90^\circ - 4\theta) = \tan(\theta - 5^\circ)$$

$$95^\circ = 5\theta$$

$$\theta = 19^\circ$$

293. Find the value of $\frac{\cos^2 30^\circ - \sin^2 30^\circ}{\sin^2 15^\circ + \cos^2 15^\circ}$.

- (a) $\frac{1}{2}$ (b) 0
 (c) $1 - \sqrt{3}$ (d) 1

SSC CHSL -15/10/2020 (Shift-III)

Ans. (a) : $\frac{\cos^2 30^\circ - \sin^2 30^\circ}{\sin^2 15^\circ + \cos^2 15^\circ}$

$$= \frac{\left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2}{1} \quad [\because \sin^2 \theta + \cos^2 \theta = 1]$$

$$= \frac{3-1}{4} = \frac{1}{2}$$

294. Find the value of

$$\frac{4\tan^2 30^\circ + \frac{1}{4}\sin^2 90^\circ + \frac{1}{8}\cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$

- (a) $2\frac{1}{2}$ (b) 4
 (c) $1\frac{3}{4}$ (d) $3\frac{1}{2}$

SSC CHSL (Tier-I) 03/07/2019 (Shift-III)

Ans. (d) :

$$\frac{4\tan^2 30^\circ + \frac{1}{4}\sin^2 90^\circ + \frac{1}{8}\cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cdot \cos 30^\circ - \cos 60^\circ \cdot \sin 30^\circ}$$

$$= \frac{4\left(\frac{1}{\sqrt{3}}\right)^2 + \frac{1}{4}(1)^2 + \frac{1}{8}\left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{\sqrt{2}}\right)^2}{\frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \frac{1}{2}}$$

$$= \frac{\frac{4}{3} + \frac{1}{4} + \frac{1}{24} + \frac{1}{8}}{\frac{3}{4} - \frac{1}{4}}$$

$$= \frac{\frac{32}{24} + \frac{6}{24} + \frac{1}{24} + \frac{3}{24}}{\frac{2}{4}}$$

$$= \frac{42}{24} \times \frac{4}{2}$$

$$= \frac{21}{6} = \frac{7}{2} = 3\frac{1}{2}$$

295. The value of $\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec} (67^\circ + \theta) - \sec (23^\circ - \theta)$ is:

- (a) -2 (b) 0
 (c) -1 (d) 1

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c)

$$\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec} (67^\circ + \theta) - \sec(23^\circ - \theta)$$

$$= \tan^2 48^\circ - \sec^2 48^\circ + \sec(23^\circ - \theta) - \sec(23^\circ - \theta)$$

$$= -1$$

296. If $\sqrt{2} \sin (60^\circ - \alpha) = 1$, $0^\circ < \alpha < 90^\circ$, then α is equal to:

- (a) 15° (b) 30°
 (c) 45° (d) 60°

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (a)

$$\sqrt{2} \sin (60^\circ - \alpha) = 1$$

$$\sin (60^\circ - \alpha) = \frac{1}{\sqrt{2}}$$

$$\sin (60^\circ - \alpha) = \sin 45^\circ$$

$$60^\circ - \alpha = 45^\circ$$

$$\alpha = 15^\circ$$

297. If $0 \leq \theta \leq 90^\circ$, and $\sin (2\theta + 50^\circ) = \cos (4\theta + 16^\circ)$, then what is the value of θ (in degrees)?

- (a) 10° (b) 4°
 (c) 8° (d) 12°

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (b) $\sin(2\theta + 50^\circ) = \cos(4\theta + 16^\circ)$
 $\sin(2\theta + 50^\circ) = \sin(90^\circ - (4\theta + 16^\circ))$
 $2\theta + 50^\circ = 90^\circ - 4\theta - 16^\circ$
 $6\theta = 74^\circ - 50^\circ$
 $\theta = 4^\circ$

298. The value of $\sin^2 38^\circ + \sin^2 52^\circ + \sin^2 30^\circ - \tan^2 45^\circ$ is equal to:

- (a) $\frac{1}{2}$ (b) $\frac{3}{4}$
 (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

SSC CGL (TIER-I)- 10.06.2019 (Shift-II)

Ans. (c) : $\sin^2 38^\circ + \sin^2 52^\circ + \sin^2 30^\circ - \tan^2 45^\circ$
 $= \sin^2 38^\circ + \sin^2 (90^\circ - 38^\circ) + \sin^2 30^\circ - \tan^2 45^\circ$
 $= \sin^2 38^\circ + \cos^2 38^\circ + \sin^2 30^\circ - \tan^2 45^\circ$
 $= 1 + \left(\frac{1}{2}\right)^2 - 1$
 $= \frac{1}{4}$

299. If $\tan 4\theta = \cot(2\theta + 30^\circ)$, then θ is equal to:

- (a) 25° (b) 15°
(c) 20° (d) 10°

SSC CGL (TIER-I) – 11.06.2019 (Shift-I)

Ans. (d) : $\tan 4\theta = \cot(2\theta + 30^\circ)$
 $\tan 4\theta = \tan [90^\circ - (2\theta + 30^\circ)]$
 $4\theta = 90^\circ - (2\theta + 30^\circ)$
 $6\theta = 60^\circ$
 $\theta = 10^\circ$

300. If $\operatorname{cosec} 4\theta = \sec(60^\circ - 2\theta)$ then θ is equal to:

- (a) 20° (b) 15°
(c) 25° (d) 18°

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (b) : $\operatorname{cosec} 4\theta = \sec(60^\circ - 2\theta)$
 $\frac{1}{\sin 4\theta} = \frac{1}{\cos(60^\circ - 2\theta)}$
 $\cos(60^\circ - 2\theta) = \sin 4\theta$
 $\cos(60^\circ - 2\theta) = \cos(90^\circ - 4\theta)$
 $\therefore 60^\circ - 2\theta = 90^\circ - 4\theta$
 $2\theta = 30^\circ$
 $\theta = 15^\circ$

301. The value of

$\frac{\sin^2 30^\circ + \cos^2 60^\circ - \sec 35^\circ \cdot \sin 55^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$ is equal to

- (a) $\frac{1}{8}$ (b) $-\frac{1}{4}$
(c) $\frac{1}{4}$ (d) $-\frac{1}{8}$

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) :
 $\frac{\sin^2 30^\circ + \cos^2 60^\circ - \sec 35^\circ \cdot \sin 55^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$
 $= \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 - \sec 35^\circ \cdot \frac{1}{\sec 35^\circ}}{2 + 2}$
 $= \frac{\frac{1}{4} + \frac{1}{4} - 1}{4} = \frac{\frac{2}{4} - 1}{4}$
 $= \frac{-1}{8}$

302. The value of $\frac{\sin^2 30^\circ + \cos^2 60^\circ + \sec 45^\circ \cdot \sin 45^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$

is:

- (a) $-\frac{3}{8}$ (b) $\frac{1}{4}$
(c) $-\frac{1}{4}$ (d) $\frac{3}{8}$

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : $\frac{\sin^2 30^\circ + \cos^2 60^\circ + \sec 45^\circ \cdot \sin 45^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$

$$= \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + \sqrt{2} \cdot \frac{1}{\sqrt{2}}}{2 + 2}$$

$$= \frac{\frac{1}{4} + \frac{1}{4} + 1}{4}$$

$$= \frac{6}{4} \times \frac{1}{4} = \frac{3}{8}$$

303. If $\sin 3x = \cos(3x - 45^\circ)$, $0^\circ < 3x < 90^\circ$, then x is equal to:

- (a) 22.5° (b) 45°
(c) 35° (d) 27.5°

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : $\sin 3x = \cos(3x - 45^\circ)$, $0^\circ < 3x < 90^\circ$
 If $\sin A = \cos B$ then $A + B$ will be 90° .

$\therefore 3x + (3x - 45^\circ) = 90^\circ$
 $6x = 135^\circ$
 $x = \frac{135}{6}$
 $x = 22.5^\circ$

304. Solve the following.

$\frac{2\sin 22^\circ}{\cos 68^\circ} - \frac{2\cot 75^\circ}{5\tan 15^\circ} - \frac{8\tan 45^\circ \cdot \tan 20^\circ \cdot \tan 40^\circ \cdot \tan 50^\circ \cdot \tan 70^\circ}{5}$?

(a) 2 (b) 1
(c) 3 (d) 0

SSC CGL (Tier-I)– 09/03/2020 (Shift-II)

Ans. (d) :

$$\frac{2\sin 22^\circ}{\cos 68^\circ} - \frac{2\cot 75^\circ}{5\tan 15^\circ} - \frac{8\tan 45^\circ \cdot \tan 20^\circ \cdot \tan 40^\circ \cdot \tan 50^\circ \cdot \tan 70^\circ}{5}$$

$$= \frac{2\cos 68^\circ}{\cos 68^\circ} - \frac{2\cot 75^\circ}{5\cot 75^\circ} - \frac{8 \times 1 \times \tan 20^\circ \cdot \tan 40^\circ \cdot \cot 40^\circ \cdot \cot 20^\circ}{5}$$

$$= 2 - \frac{2}{5} - \frac{8}{5} = 2 - 2 = 0$$

305. Solve the following:

$\sin 0^\circ \sin 30^\circ \sin 45^\circ \sin 60^\circ \sin 90^\circ = ?$

- (a) 1 (b) 4
(c) 0 (d) $\frac{\sqrt{6}}{8}$

SSC CGL (Tier-I) – 06/03/2020 (Shift-II)

Ans. (c) : $\sin 0^\circ \cdot \sin 30^\circ \cdot \sin 45^\circ \cdot \sin 60^\circ \cdot \sin 90^\circ$

$[\because \sin 0^\circ = 0]$

$= 0$

306. Solve the following.

$\frac{\sin 40^\circ}{\cos 50^\circ} + \frac{\operatorname{cosec} 50^\circ}{\sec 40^\circ} - 4\cos 50^\circ \operatorname{cosec} 40^\circ$

- (a) 1 (b) -2
(c) 2 (d) -1

SSC CGL (Tier-I) – 06/03/2020 (Shift-I)

Ans. (b)

$$\begin{aligned} & \frac{\sin 40^\circ}{\cos 50^\circ} + \frac{\operatorname{cosec} 50^\circ}{\sec 40^\circ} - 4 \cos 50^\circ \operatorname{cosec} 40^\circ \\ &= \frac{\cos 50^\circ}{\cos 50^\circ} + \frac{\sec 40^\circ}{\sec 40^\circ} - 4 \times \sin 40^\circ \cdot \operatorname{cosec} 40^\circ \\ & \quad \left[\because \sin(90^\circ - \theta) = \cos \theta \right. \\ & \quad \left. \cos \operatorname{ec}(90^\circ - \theta) = \sec \theta \right] \\ &= 1 + 1 - 4 \times 1 \\ &= -2 \end{aligned}$$

307. Find the value of $\frac{\tan 30^\circ \operatorname{cosec} 60^\circ + \tan 60^\circ \sec 30^\circ}{\sin^2 30^\circ + 4 \cot^2 45^\circ - \sec^2 60^\circ}$?

- (a) $\frac{2}{3}$ (b) $\frac{32}{99}$
(c) $\frac{8}{3}$ (d) $\frac{32}{3}$

SSC CGL (Tier-I)– 04/03/2020 (Shift-I)

Ans. (d) :

$$\begin{aligned} & \frac{\tan 30^\circ \operatorname{cosec} 60^\circ + \tan 60^\circ \sec 30^\circ}{\sin^2 30^\circ + 4 \cot^2 45^\circ - \sec^2 60^\circ} \\ &= \frac{\frac{1}{\sqrt{3}} \times \frac{2}{\sqrt{3}} + \sqrt{3} \times \frac{2}{\sqrt{3}}}{\frac{1}{4} + 4 - 4} \\ &= \frac{\frac{2}{3} + 2}{\frac{1}{4}} = \frac{8 \times 4}{3} = \frac{32}{3} \end{aligned}$$

308. The value of $\cos 0^\circ \cos 30^\circ \cos 45^\circ \cos 60^\circ \cos 90^\circ$ is:

- (a) 3 (b) $\frac{\sqrt{6}}{8}$
(c) 0 (d) 5

SSC CGL (Tier-I) – 05/03/2020 (Shift-III)

Ans. (c) : $\cos 0^\circ \cos 30^\circ \cos 45^\circ \cos 60^\circ \cos 90^\circ$
 $= 0$ [$\because \cos 90^\circ = 0$]

309. If $\sin 3\theta = \cos(20^\circ - \theta)$, then θ is equal to:

- (a) 25 (b) 28
(c) 35 (d) 30

SSC CGL (TIER-I) – 13.06.2019 (Shift-I)

Ans. (c) : As per question,

$$\begin{aligned} \sin 3\theta &= \cos(20^\circ - \theta) \\ \cos(90^\circ - 3\theta) &= \cos(20^\circ - \theta) \\ & \quad \left[\because \cos(90^\circ - x) = \sin x \right] \end{aligned}$$

$$\begin{aligned} \therefore 90^\circ - 3\theta &= 20^\circ - \theta \\ 3\theta - \theta &= 90^\circ - 20^\circ \\ 2\theta &= 70^\circ \\ \theta &= 35^\circ \end{aligned}$$

310. The value of $\frac{\tan 30^\circ + \tan 60^\circ}{\cos 30^\circ}$ is:

- (a) $\frac{8}{3}$ (b) $\sqrt{3} + 3$
(c) $\frac{8}{\sqrt{3}}$ (d) $1 + \sqrt{3}$

SSC CGL (Tier-I)– 03/03/2020 (Shift-III)

Ans. (a) :

$$\begin{aligned} & \frac{\tan 30^\circ + \tan 60^\circ}{\cos 30^\circ} \\ &= \frac{\frac{1}{\sqrt{3}} + \sqrt{3}}{\frac{\sqrt{3}}{2}} \\ &= \frac{4}{\sqrt{3}} = \frac{8}{3} \end{aligned}$$

311. If $2\sin\theta - 8\cos^2\theta + 5 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\tan 2\theta + \operatorname{cosec} 2\theta)$?

- (a) $\frac{5\sqrt{3}}{3}$ (b) $3\sqrt{3}$
(c) $\frac{4\sqrt{3}}{3}$ (d) $2\sqrt{3}$

SSC CGL (Tier-I)– 03/03/2020 (Shift-III)

Ans. (a) : By value putting, $\theta = 30^\circ$

$$\begin{aligned} & 2\sin 30^\circ - 8\cos^2 30^\circ + 5 \\ &= 2 \times \frac{1}{2} - 8 \times \frac{3}{4} + 5 = 0 \\ \therefore \tan 2\theta + \operatorname{cosec} 2\theta &= \tan 60^\circ + \operatorname{cosec} 60^\circ \\ &= \sqrt{3} + \frac{2}{\sqrt{3}} = \frac{5}{\sqrt{3}} = \frac{5\sqrt{3}}{3} \end{aligned}$$

312. The value of the expression $\operatorname{cosec}(85^\circ + \theta) - \sec(5^\circ - \theta) - \tan(55^\circ + \theta) + \cot(35^\circ - \theta)$ is:

- (a) -1 (b) $\frac{3}{2}$
(c) 0 (d) 1

SSC CGL (Tier-I) – 03/03/2020 (Shift-II)

$$\begin{aligned} & \operatorname{cosec}(85^\circ + \theta) - \sec(5^\circ - \theta) - \tan(55^\circ + \theta) + \cot(35^\circ - \theta) \\ &= \operatorname{cosec}[90^\circ - (5^\circ - \theta)] - \sec(5^\circ - \theta) - \tan[90^\circ - (35^\circ - \theta)] \\ &+ \cot(35^\circ - \theta) \\ &= \sec(5^\circ - \theta) - \sec(5^\circ - \theta) - \cot(35^\circ - \theta) + \cot(35^\circ - \theta) \\ &= 0 \end{aligned}$$

313. The value of

$$\frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ} \text{ is :}$$

(a) -1 (b) -2
(c) 2 (d) 0

SSC CGL (Tier-II) 12-09-2019

Ans. (a)

$$\frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$$

$$= \frac{\sin(78^\circ + \theta) - \sin(78^\circ + \theta) + (\cot^2 20^\circ - \operatorname{cosec}^2 20^\circ)}{\sin(25^\circ + 65^\circ)}$$

$$[\because \operatorname{cosec}^2 \theta - \cot^2 \theta = 1]$$

$$\sin(90^\circ - \theta) = \cos \theta$$

$$= \frac{0 - 1}{\sin 90^\circ} = \frac{-1}{1} = -1$$

- 314. The value of $\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ}$ is :**
- (a) 4 (b) $\frac{1}{2}$
(c) 2 (d) $\frac{1}{4}$
- SSC CGL (Tier-II) 11-9-2019**

Ans. (c) :

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ}$$

$$= \frac{(\sin 81^\circ + \sin 81^\circ)(\sec 9^\circ + \sec 9^\circ)}{\sin 56^\circ \cdot \operatorname{cosec} 56^\circ + \cos 25^\circ \cdot \sec 25^\circ} = \frac{4 \sin 81^\circ \times \operatorname{cosec} 81^\circ}{2} = 2$$

- 315. The value of $\operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta) + \cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \cos 60^\circ \operatorname{cosec} 75^\circ$ is :**
- (a) $\frac{1}{2}$ (b) 1
(c) 0 (d) 2
- SSC CGL (Tier-II) 13-09-2019**

Ans. (a) : $\operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta) + \cos 15^\circ \cdot \cos 35^\circ \cdot \operatorname{cosec} 55^\circ \cdot \cos 60^\circ \cdot \operatorname{cosec} 75^\circ$

$$= \sec(23^\circ - \theta) - \sec(23^\circ - \theta)$$

$$+ \cos 15^\circ \cdot \cos 35^\circ \cdot \sec 35^\circ \times \frac{1}{2} \times \sec 15^\circ$$

$$= 0 + \frac{1}{2} = \frac{1}{2}$$

- 316. What is the value of $[\tan^2(90^\circ - \theta) - \sin^2(90^\circ - \theta)] \operatorname{cosec}^2(90^\circ - \theta) \cot^2(90^\circ - \theta)$?**
- (a) 0 (b) 1
(c) -1 (d) 2
- SSC CGL (Tier-II) 17-2-2018**

Ans. (b) :

$$[\tan^2(90^\circ - \theta) - \sin^2(90^\circ - \theta)] \operatorname{cosec}^2(90^\circ - \theta) \cot^2(90^\circ - \theta)$$

$$= [\cot^2 \theta - \cos^2 \theta] \sec^2 \theta \cdot \tan^2 \theta$$

$$= \cos^2 \theta \left[\frac{1}{\sin^2 \theta} - 1 \right] \frac{1}{\cos^2 \theta} \cdot \frac{\sin^2 \theta}{\cos^2 \theta}$$

$$= \cos^2 \theta \left[\frac{1 - \sin^2 \theta}{\sin^2 \theta} \right] \cdot \frac{\sin^2 \theta}{\cos^4 \theta} \quad \{ \because 1 - \sin^2 \theta = \cos^2 \theta \}$$

$$= 1$$

- 317. What is the value of $\cot(90^\circ + 75^\circ)$?**
- (a) $2 + \sqrt{3}$ (b) $-2 - \sqrt{3}$
(c) $\sqrt{3} + 1$ (d) $-\sqrt{3} - 1$
- SSC CGL (Tier-II) 9-3-2018**

Ans. (b) : $\cot(90^\circ + 75^\circ)$

$$= -\tan 75^\circ$$

$$= -\tan(30^\circ + 45^\circ)$$

$$= -\left(\frac{\tan 30^\circ + \tan 45^\circ}{1 - \tan 30^\circ \cdot \tan 45^\circ} \right)$$

$$= -\left(\frac{\frac{1}{\sqrt{3}} + 1}{1 - \frac{1}{\sqrt{3}} \times 1} \right) = -\left(\frac{\sqrt{3} + 1}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1} \right)$$

$$= -\left(\frac{3 + 1 + 2\sqrt{3}}{2} \right) = -2 - \sqrt{3}$$

- 318. What is the value of $\sin(630^\circ + A) + \cos A$?**
- (a) $\sqrt{3}/2$ (b) $1/2$
(c) 0 (d) $2/\sqrt{3}$
- SSC CGL (Tier-II) 18-02-2018**

Ans. (c) : $\sin(630^\circ + A) + \cos A$

$$= \sin[2 \times 360^\circ - (90^\circ - A)] + \cos A$$

$$= -\sin(90^\circ - A) + \cos A$$

$$= -\cos A + \cos A$$

$$= 0$$

- 319. What is the value of $[\cos(90^\circ + A) \div \sec(270^\circ - A)] + [(\sin 270^\circ + A) \div \operatorname{cosec}(630^\circ - A)]$?**
- (a) $3 \sec A$ (b) $\tan A \sec A$
(c) 0 (d) 1
- SSC CGL (Tier-II) 19-02-2018**

Ans. (d) :

$$= [\cos(90^\circ + A) \div \sec(270^\circ - A)] + [\sin(270^\circ + A) \div \operatorname{cosec}(630^\circ - A)]$$

$$= [\sin A \div \cos A] + [\cos A \div \sec A]$$

$$= \sin^2 A + \cos^2 A = 1$$

- 320. Find the value of $\sin^2 35^\circ + \sin^2 55^\circ$.**
- (a) 1 (b) 0
(c) -1 (d) $\frac{1}{2}$
- SSC CHSL -15/10/2020 (Shift-II)**

Ans. (a) :

$$\sin^2 35^\circ + \sin^2 55^\circ = \sin^2 35^\circ + \sin^2(90^\circ - 35^\circ)$$

$$= \sin^2 35^\circ + \cos^2 35^\circ = 1$$

- 321. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then the value of $\cos^2 \alpha + \sin^2 \beta$ is?**
- (a) 1 (b) $1/3$
(c) $1/5$ (d) $1/2$
- SSC CHSL -21/10/2020 (Shift-III)**

Ans. (d) Given,

$$\alpha + \beta = 90^\circ \quad \alpha = 2\beta$$
Let, $\alpha = 60^\circ \quad 60^\circ = 2 \times 30^\circ$
 $\beta = 30^\circ \quad 60^\circ = 60^\circ$

Now the required value of
 $\cos^2 \alpha + \sin^2 \beta = ?$
 $\cos^2 60^\circ + \sin^2 30^\circ = ?$

$$\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 = ?$$

$$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

322. The value of $\frac{\cos 29^\circ \operatorname{cosec} 61^\circ \tan 45^\circ + 2 \sin 35^\circ \sec 55^\circ}{3 \sin^2 42^\circ + 3 \sin^2 48^\circ}$ is:

- (a) 3 (b) 1
(c) 0 (d) 2

SSC CHSL -19/03/2020 (Shift-III)

Ans. (b) :

$$\begin{aligned} & \frac{\cos 29^\circ \operatorname{cosec} 61^\circ \tan 45^\circ + 2 \sin 35^\circ \sec 55^\circ}{3 \sin^2 42^\circ + 3 \sin^2 48^\circ} \\ &= \frac{\frac{\cos 29^\circ}{\sin 61^\circ} \times 1 + 2 \sin 35^\circ \frac{1}{\cos 55^\circ}}{3 \sin^2 42^\circ + 3 \left[\sin^2 (90^\circ - 42^\circ) \right]} \\ &= \frac{\frac{\cos 29^\circ}{\sin (90^\circ - 29^\circ)} + \frac{2 \sin 35^\circ}{\cos (90^\circ - 35^\circ)}}{3 \sin^2 42^\circ + 3 \cos^2 42^\circ} \\ &= \frac{\frac{\cos 29^\circ}{\cos 29^\circ} + \frac{2 \sin 35^\circ}{\sin 35^\circ}}{3 (\sin^2 42^\circ + \cos^2 42^\circ)} = \frac{1+2}{3} = 1 \end{aligned}$$

323. Find the value of $\cos 225^\circ$.

- (a) 0.7071 (b) -0.866
(c) 0.866 (d) -0.7071

SSC CHSL -17/03/2020 (Shift-II)

Ans. (d) : $\cos 225^\circ = \cos (180^\circ + 45^\circ)$
 $= -\cos 45^\circ$
 $= -\frac{1}{\sqrt{2}}$
 $= -0.7071$

324. $\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ}$, then the value of $\cot A$ is:

- (a) 1 (b) 3
(c) 4 (d) 2

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d) :

$$\begin{aligned} \frac{1 - \tan A}{1 + \tan A} &= \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ} \\ &= \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \cot 15^\circ \cot 3^\circ}{\tan 27^\circ \tan 39^\circ \cot 39^\circ \tan 60^\circ \cot 27^\circ} \\ &= \frac{\tan 30^\circ}{\tan 60^\circ} = \frac{1/\sqrt{3}}{\sqrt{3}} = \frac{1}{3} \\ \therefore \frac{1 - \tan A}{1 + \tan A} &= \frac{1}{3} \\ \text{By componendo dividendo rule} \\ \frac{2}{-2 \tan A} &= \frac{4}{-2} \\ \frac{1}{\tan A} &= 2 \quad \Rightarrow \cot A = 2 \end{aligned}$$

325. If $x = \tan 40^\circ$, then the value of $2 \tan 50^\circ$ will be:

- (a) $\frac{2}{x}$ (b) $2x$
(c) $\frac{1}{x}$ (d) $\frac{1}{2x}$

SSC CHSL -19/03/2020 (Shift-II)

Ans. (a) : $\because x = \tan 40^\circ$

$$\begin{aligned} \therefore 2 \tan 50^\circ &= 2 \tan (90^\circ - 40^\circ) \\ &= 2 \cot 40^\circ \\ &= \frac{2}{\tan 40^\circ} \Rightarrow \frac{2}{x} \end{aligned}$$

326. The value of $\frac{\sin 30^\circ \cos 60^\circ + \cos 45^\circ \sin 45^\circ}{\tan 60^\circ \cot 30^\circ}$ is:

- (a) $\frac{1}{\sqrt{3}}$ (b) 2
(c) $\sqrt{3}$ (d) $\frac{1}{4}$

SSC CHSL -19/03/2020 (Shift-I)

Ans. (d) : $\frac{\sin 30^\circ \cos 60^\circ + \cos 45^\circ \sin 45^\circ}{\tan 60^\circ \cot 30^\circ}$

$$\begin{aligned} &= \frac{\frac{1}{2} \times \frac{1}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}{\sqrt{3} \times \frac{1}{\sqrt{3}}} \\ &= \frac{\frac{1}{4} + \frac{1}{2}}{3} \Rightarrow \frac{3/4}{3} \\ &\Rightarrow \frac{3}{4} \times \frac{1}{3} \Rightarrow \frac{1}{4} \end{aligned}$$

327. If $A = 60^\circ$, then what is the value of $(4\cos^3 A - 3\cos A)$?

- (a) $-\frac{\sqrt{3}}{2}$ (b) -1
(c) 1 (d) $\frac{\sqrt{3}}{2}$

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : $4\cos^3 A - 3\cos A = \cos 3A$ (by formula)
 $\cos 3A = \cos 180^\circ$
 by putting the value of $A = 60^\circ$
 $\cos 180^\circ = -1$

328. If $\tan 3\theta = \sin 45^\circ$, $\cos 45^\circ + \cos 60^\circ$ and 3θ is an acute angle, then what will be the value of $\sin 4\theta$?

- (a) $1/2$ (b) $\sqrt{3}/2$
(c) $1/\sqrt{2}$ (d) 1

SSC CHSL 12/08/2021 (Shift-I)

Ans. (b) : $\tan 3\theta = \sin 45^\circ$, $\cos 45^\circ + \cos 60^\circ$ (Given)

$$\tan 3\theta = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} = 1$$

$$\begin{aligned}\tan 3\theta &= 1 = \tan 45^\circ \\ 3\theta &= 45^\circ \\ \theta &= 15^\circ\end{aligned}$$

$$\therefore \sin 4\theta = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

329. What is the value of

$$\frac{\sin 33^\circ \cos 57^\circ + \sec 62^\circ \sin 28^\circ + \cos 33^\circ \sin 57^\circ + \operatorname{cosec} 62^\circ \cos 28^\circ}{\tan 15^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 75^\circ} ?$$

- (a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{3}$
(c) $2\sqrt{3}$ (d) 2

SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) :

$$\begin{aligned}& \frac{\sin 33^\circ \cos 57^\circ + \sec 62^\circ \sin 28^\circ + \cos 33^\circ \sin 57^\circ + \operatorname{cosec} 62^\circ \cos 28^\circ}{\tan 15^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 75^\circ} \\ &= \frac{\sin 33^\circ \sin 33^\circ + \operatorname{cosec} 28^\circ \sin 28^\circ + \cos 33^\circ \cos 33^\circ + \sec 28^\circ \cos 28^\circ}{\cot 75^\circ \cot 55^\circ \tan 60^\circ \tan 55^\circ \tan 75^\circ} \\ &\because \sin \theta \operatorname{cosec} \theta = 1, \sec \theta \cdot \cos \theta = 1 \text{ and } \tan \theta \cdot \cot \theta = 1 \\ &= \frac{\sin^2 33^\circ + 1 + \cos^2 33^\circ + 1}{1 \times 1 \times \sqrt{3}} \\ &= \frac{1+1+1}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}\end{aligned}$$

330. Evaluate the following expression.

$$\frac{\tan^2 60^\circ + \operatorname{cosec} 30^\circ \sin 90^\circ + 3 \sec^2 30^\circ}{4 \sin^2 45^\circ + \sec^2 60^\circ - \cot^2 30^\circ - 5 \cos^2 90^\circ}$$

- (a) $\frac{7}{3}$ (b) 3
(c) $\frac{19}{17}$ (d) -12

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) :
$$\frac{\tan^2 60^\circ + \operatorname{cosec} 30^\circ \sin 90^\circ + 3 \sec^2 30^\circ}{4 \sin^2 45^\circ + \sec^2 60^\circ - \cot^2 30^\circ - 5 \cos^2 90^\circ}$$

$$= \frac{3 + 2 \times 1 + 3 \times \frac{4}{3}}{4 \times \frac{1}{2} + 4 - 3 - 5 \times 0} = \frac{9}{3} = 3$$

331. If $\sin \theta (2 \sin \theta + 3) = 2$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\sec^2 \theta + \cot^2 \theta - \cos^2 \theta)$?

- (a) $13/3$ (b) $31/12$
(c) $7/2$ (d) $43/12$

SSC CHSL 19/04/2021 (Shift-I)

Ans. (d) : $\sin \theta (2 \sin \theta + 3) = 2$ ($0^\circ < \theta < 90^\circ$)

$$\begin{aligned}2 \sin^2 \theta + 3 \sin \theta &= 2 \\ 2 \sin^2 \theta + 3 \sin \theta - 2 &= 0 \\ 2 \sin^2 \theta + 4 \sin \theta - \sin \theta - 2 &= 0 \\ (2 \sin \theta - 1)(\sin \theta + 2) & \\ 2 \sin \theta &= 1 \\ \sin \theta &= \frac{1}{2} = \sin 30^\circ\end{aligned}$$

$$\begin{aligned}\theta &= 30^\circ \\ \sin \theta + 2 &= 0 \\ \sin \theta &= -2\end{aligned}$$

According to the question,

$$\begin{aligned}\sec^2 \theta + \cot^2 \theta - \cos^2 \theta &= ? \\ &= \sec^2 30^\circ + \cot^2 30^\circ - \cos^2 30^\circ \\ &= \frac{4}{3} + 3 - \frac{3}{4} \\ &= \frac{16 + 36 - 9}{12} \\ &= \frac{16 + 27}{12} \\ &= \frac{43}{12}\end{aligned}$$

Trick:-

$$\sin \theta (2 \sin \theta + 3) = 2$$

$$\tan \theta = 30^\circ$$

$$\text{L.H.S} = \sin 30^\circ (2 \sin 30^\circ + 3)$$

$$= \frac{1}{2} \times (4) = 2$$

$$\text{L.H.S} = \text{R.H.S}$$

$$\therefore \sec^2 \theta + \cot^2 \theta - \cos^2 \theta$$

$$\therefore \theta = 30^\circ$$

$$\begin{aligned}&= \frac{4}{3} + 3 - \frac{3}{4} \\ &= \frac{43}{12}\end{aligned}$$

332. If θ is an acute angle and $\sin \theta = \cos \theta$, then the value of $2 \tan^2 \theta + \sin^2 \theta - 1$ is equal to:

- (a) 3 (b) 1
(c) $3/2$ (d) -7

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Ans. (c) : $\sin \theta = \cos \theta$ ($\because \theta = \text{Acute angle}$)

$$\tan \theta = 1$$

$$\tan \theta = \tan 45^\circ$$

$$\theta = 45^\circ$$

According to the question,

$$\begin{aligned}2 \tan^2 \theta + \sin^2 \theta - 1 & \\ &= 2 \tan^2 45^\circ + \sin^2 45^\circ - 1 \\ &= 2 \times 1 + \frac{1}{2} - 1 \\ &= \frac{3}{2}\end{aligned}$$

333. If $3 \tan \theta = 2\sqrt{3} \sin \theta$, $0^\circ < \theta < 90^\circ$, then find the value of $2 \sin^2 \theta - 3 \cos^2 \theta$.

- (a) $-\frac{3}{2}$ (b) $\frac{1}{2}$
(c) $\frac{3}{2}$ (d) 1

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (c) : Given that-

$$3 \tan \theta = 2\sqrt{3} \sin \theta, 0^\circ < \theta < 90^\circ$$

$$\Rightarrow \frac{3 \sin \theta}{\cos \theta} = 2\sqrt{3} \sin \theta$$

$$\Rightarrow \frac{3}{\cos \theta} = 2\sqrt{3}$$

$$\Rightarrow \frac{1}{\cos \theta} = \frac{2\sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$\Rightarrow \frac{1}{\cos \theta} = \frac{2}{\sqrt{3}}$$

$$\Rightarrow \cos \theta = \cos 30^\circ$$

$$\therefore \theta = 30^\circ$$

$$\therefore 2 \sin^2 2\theta - 3 \cos^2 3\theta = 2 \sin^2 (2 \times 30^\circ) - 3 \cos^2 (3 \times 30^\circ)$$

$$= 2 \sin^2 60^\circ - 3 \cos^2 90^\circ$$

$$= 2 \times \left(\frac{\sqrt{3}}{2}\right)^2 - 3 \times 0$$

$$= 2 \times \frac{3}{4}$$

$$2 \sin^2 2\theta - 3 \cos^2 3\theta = \frac{3}{2}$$

334. If $\sin^2 \theta - \cos^2 \theta - 3 \sin \theta + 2 = 0$, $0^\circ < \theta < 90^\circ$,

then what is the value of $\frac{1}{\sqrt{\sec \theta - \tan \theta}}$ is?

(a) $\sqrt[4]{3}$

(b) $\sqrt[4]{2}$

(c) $\sqrt[3]{3}$

(d) $\sqrt[3]{2}$

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Ans. (a) : Given that,

$$\sin^2 \theta - \cos^2 \theta - 3 \sin \theta + 2 = 0$$

$$\sin^2 \theta - 1 + \sin^2 \theta - 3 \sin \theta + 2 = 0$$

$$2 \sin^2 \theta - 3 \sin \theta + 1 = 0$$

$$\sin \theta = 1 \text{ and } \sin \theta = \frac{1}{2}$$

$$\text{Hence } \theta = 30^\circ \quad [\because 0^\circ < \theta < 90^\circ]$$

$$\therefore \frac{1}{\sqrt{\sec 30^\circ - \tan 30^\circ}} = \frac{1}{\sqrt{\frac{2}{\sqrt{3}} - \frac{1}{\sqrt{3}}}} = \sqrt{\sqrt{3}} = \sqrt[4]{3}$$

OR

We can solve this question by value putting method on putting $\theta = 30^\circ$

335. If $2 \cos^2 \theta = 3 \sin \theta$, $0^\circ < \theta < 90^\circ$, then the value of $(\sec^2 \theta - \tan^2 \theta + \cos^2 \theta)$ is :

(a) $\frac{9}{4}$

(b) $\frac{5}{4}$

(c) $\frac{3}{4}$

(d) $\frac{7}{4}$

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (d) : Given, $2 \cos^2 \theta = 3 \sin \theta$, $0^\circ < \theta < 90^\circ$

Put, $\theta = 30^\circ$

$$2 \times \frac{3}{4} = 3 \times \frac{1}{2}$$

$$\frac{3}{2} = \frac{3}{2}$$

$$(\sec^2 \theta - \tan^2 \theta + \cos^2 \theta)$$

$$[\because \sec^2 \theta - \tan^2 \theta = 1]$$

$$\therefore 1 + \cos^2 30^\circ$$

$$= \left[1 + \frac{3}{4}\right]$$

$$= \frac{7}{4}$$

336. If $\cos \theta = \frac{\sqrt{3}}{2}$, then the value of

$\frac{2 - \sin^2 \theta}{1 - \cot^2 \theta} + (\sec^2 \theta + \operatorname{cosec} \theta)$ is:

(a) $\frac{25}{12}$

(b) $\frac{59}{24}$

(c) $-\frac{25}{12}$

(d) $-\frac{59}{24}$

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Ans. (b) : $\cos \theta = \frac{\sqrt{3}}{2}$ -----[Given]

$$\cos \theta = \cos 30^\circ$$

$$\theta = 30^\circ$$

$$\frac{2 - \sin^2 \theta}{1 - \cot^2 \theta} + (\sec^2 \theta + \operatorname{cosec} \theta)$$

$$= \frac{2 - \left(\frac{1}{2}\right)^2}{1 - \left(\frac{1}{\sqrt{3}}\right)^2} + \left(\frac{2}{\sqrt{3}}\right)^2 + 2$$

$$= \frac{2 - \frac{1}{4}}{1 - \frac{1}{3}} + \frac{4}{3} + 2$$

$$= -\frac{7}{4 \times 2} + \frac{4}{3} + 2$$

$$= \frac{-21 + 32 + 48}{24} = \frac{59}{24}$$

337. If $\tan x = \cot (48^\circ + 2x)$, and $0^\circ < x < 90^\circ$, then what is the value of x?

(a) 12°

(b) 14°

(c) 16°

(d) 21°

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Ans. (b) : $\tan x = \cot (48^\circ + 2x)$ ($0^\circ < x < 90^\circ$)

$$\tan x = \cot (2x + 48^\circ)$$

$$\cot (90^\circ - x) = \cot (2x + 48^\circ)$$

On comparing the both side

$$90^\circ - 48^\circ = 2x + x$$

$$3x = 42^\circ$$

$$x = 14^\circ$$

338. If $\cos 53^\circ = \frac{x}{y}$, then $\sec 53^\circ + \cot 37^\circ$ is equal to:

- (a) $\frac{x + \sqrt{y^2 - x^2}}{y}$ (b) $\frac{x + \sqrt{y^2 - x^2}}{x}$
 (c) $\frac{y + \sqrt{y^2 - x^2}}{x}$ (d) $\frac{y + \sqrt{y^2 - x^2}}{y}$

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Ans. (c) $\cos 53^\circ = \frac{x}{y}$

$$\sin 53^\circ = \sqrt{1 - \cos^2 53^\circ}$$

$$= \sqrt{1 - \frac{x^2}{y^2}}$$

$$= \frac{\sqrt{y^2 - x^2}}{y}$$

$$\therefore \sec 53^\circ + \cot 37^\circ = \sec 53^\circ + \tan 53^\circ$$

$$= \frac{1}{\cos 53^\circ} + \frac{\sin 53^\circ}{\cos 53^\circ}$$

$$= \frac{1 + \sin 53^\circ}{\cos 53^\circ}$$

$$= \frac{1 + \frac{\sqrt{y^2 - x^2}}{y}}{\frac{x}{y}}$$

$$= \frac{y + \sqrt{y^2 - x^2}}{x}$$

339. If $\operatorname{cosec} A = \sec B$, where A and B are acute angles, then what is the value of (A + B)?

- (a) 0° (b) 135°
 (c) 90° (d) 145°

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Ans : (c) Given,
 $\operatorname{cosec} A = \sec B$

$$\frac{1}{\sin A} = \sec B \quad \left[\begin{array}{l} \because \text{if } A + B = 90^\circ \\ \sin A \cdot \sec B = 1 \end{array} \right]$$

$$1 = \sin A \cdot \sec B$$

then $A + B = 90^\circ$

340. If $\tan^2 x - 3 \tan x + 2 = 0$ and ($0^\circ < x < 90^\circ$), then the value of x is:

- (a) 90° (b) 30°
 (c) 45° (d) 60°

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Ans.(c) : $\tan^2 x - 3 \tan x + 2 = 0$

$$\tan^2 x - 2 \tan x - \tan x + 2 = 0$$

$$\tan x (\tan x - 2) - 1 (\tan x - 2) = 0$$

$$(\tan x - 2) (\tan x - 1) = 0$$

$$\tan x = 2 \text{ (is not value of any angle)}$$

$$\therefore \tan x = 1 = \tan 45^\circ$$

$$x = 45^\circ$$

341. Solve for θ : $3 \operatorname{cosec} \theta + 4 \sin \theta - 4\sqrt{3} = 0$, where θ is an acute angle.

- (a) 30° (b) 45°
 (c) 15° (d) 60°

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Ans. (d) : $3 \operatorname{cosec} \theta + 4 \sin \theta - 4\sqrt{3} = 0$

Let, $\theta = 60^\circ$

$$\text{L.H.S} = 3 \operatorname{cosec} \theta + 4 \sin \theta - 4\sqrt{3}$$

$$= 3 \times \operatorname{cosec} 60^\circ + 4 \sin 60^\circ - 4\sqrt{3}$$

$$= 3 \times \frac{2}{\sqrt{3}} + 4 \times \frac{\sqrt{3}}{2} - 4\sqrt{3}$$

$$= 2\sqrt{3} + 2\sqrt{3} - 4\sqrt{3} = 0 = \text{R.H.S}$$

L.H.S = R.H.S

Hence, $\theta = 60^\circ$

342. The value of

$$\frac{\tan 50^\circ + \sec 50^\circ}{\cot 40^\circ + \operatorname{cosec} 40^\circ} + \cos^2 65^\circ + \sin 65^\circ \cos 25^\circ + \tan 30^\circ$$

is:

- (a) $\frac{\sqrt{3}(\sqrt{3}+1)}{3}$ (b) $2 + \sqrt{3}$
 (c) $\frac{6 + \sqrt{3}}{3}$ (d) $1 + \sqrt{3}$

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Ans. (c) :

$$\frac{\tan 50^\circ + \sec 50^\circ}{\cot 40^\circ + \operatorname{cosec} 40^\circ} + \cos^2 65^\circ + \sin 65^\circ \cos 25^\circ + \tan 30^\circ$$

$$= \frac{\tan(90^\circ - 40^\circ) + \sec(90^\circ - 40^\circ)}{\cot 40^\circ + \operatorname{cosec} 40^\circ} + \cos^2 65^\circ + \sin 65^\circ$$

$$\times \cos(90^\circ - 65^\circ) + \tan 30^\circ$$

$$= 1 + \cos^2 65^\circ + \sin^2 65^\circ + \frac{1}{\sqrt{3}}$$

$$= 2 + \frac{1}{\sqrt{3}}$$

$$= \frac{2\sqrt{3} + 1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{6 + \sqrt{3}}{3}$$

343. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then the value of $3 \cos^2 \alpha - 2 \sin^2 \beta$ is equal to :

- (a) $\frac{4}{3}$ (b) $\frac{3}{4}$
 (c) $\frac{3}{2}$ (d) $\frac{1}{4}$

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Ans. (d) : $\because \alpha + \beta = 90^\circ$

$$\alpha = 2\beta \text{ (given)}$$

$$3\beta = 90^\circ$$

$$2\beta + \beta = 90^\circ$$

$$\beta = 30^\circ$$

And $\alpha = 60^\circ$

then, $3 \cos^2 \alpha - 2 \sin^2 \beta = ?$
 $3 \cos^2 60^\circ - 2 \sin^2 30^\circ$
 $3 \times \left(\frac{1}{2}\right)^2 - 2 \times \left(\frac{1}{2}\right)^2$
 $\frac{3-2}{4} = \frac{1}{4}$

344. The value of $\sqrt{\tan^2 60^\circ + \sin 90^\circ} - 2 \tan 45^\circ$ is

- (a) 0 (b) 4
 (c) 1 (d) 2

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Ans. (a) : $\sqrt{\tan^2 60^\circ + \sin 90^\circ} - 2 \tan 45^\circ$
 $= \sqrt{3+1} - 2 \times 1$
 $= 2 - 2 = 0$

345. If x, y are acute angles, where $0 < x + y < 90^\circ$ and $\sin(3x - 40^\circ) = \cos(3y + 40^\circ)$, then the value of $\tan(x + y)$ is equal to:

- (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$
 (c) $\sqrt{3}$ (d) $\frac{1}{3}$

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Ans. (b): $\sin(3x - 40^\circ) = \cos(3y + 40^\circ)$
 if $\sin \theta = \cos \alpha$
 then $\theta + \alpha = 90^\circ$
 $\therefore 3x - 40^\circ + 3y + 40^\circ = 90^\circ$
 $3(x+y) = 90^\circ$
 $x + y = 30^\circ$
 Now $\tan(x+y) = \tan 30^\circ = \frac{1}{\sqrt{3}}$

346. The value of $\frac{\sin 23^\circ \cos 67^\circ \tan 45^\circ + \cos 23^\circ \sin 67^\circ \cot 45^\circ}{2 \sin 45^\circ \cos 45^\circ}$ is:

- (a) 0 (b) 2
 (c) 1 (d) $\frac{1}{\sqrt{2}}$

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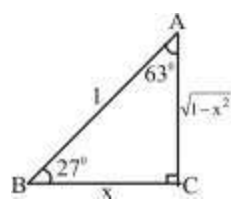
Ans. (c) :
 $\frac{\sin 23^\circ \cos 67^\circ \tan 45^\circ + \cos 23^\circ \sin 67^\circ \cot 45^\circ}{2 \sin 45^\circ \cos 45^\circ}$
 $= \frac{\sin 23^\circ \cdot \cos 67^\circ + \cos 23^\circ \sin 67^\circ}{1}$
 $= \sin(23^\circ + 67^\circ)$
 $= \sin 90^\circ = 1$

347. If $\cos 27^\circ = x$, then the value of $\tan 63^\circ$ is:

- (a) $\frac{\sqrt{1+x^2}}{x}$ (b) $\frac{x}{\sqrt{1+x^2}}$
 (c) $\frac{\sqrt{1-x^2}}{x}$ (d) $\frac{x}{\sqrt{1-x^2}}$

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Ans. (d)



Given : $\cos 27^\circ = \frac{x}{1}$
 $(AB)^2 = (AC)^2 + (BC)^2$
 $(1)^2 = (AC)^2 + (x)^2$
 $1 - x^2 = (AC)^2$
 $\sqrt{1 - x^2} = AC$
 Then, $\tan 63^\circ = \frac{x}{\sqrt{1 - x^2}}$

348. If $\sin(2x - 45^\circ) = \cos x$ and angle x and $(2x - 45^\circ)$ (in degrees) are acute angles, then the value of $\cot x$ is:

- (a) 0 (b) $\frac{1}{2}$
 (c) 1 (d) $\frac{1}{\sqrt{2}}$

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Ans. (c) : $\sin(2x - 45^\circ) = \cos x$
 $\cos[90^\circ - (2x - 45^\circ)] = \cos x$
 $\cos(90^\circ - 2x + 45^\circ) = \cos x$
 $135^\circ = 3x$
 $x = 45^\circ$
 Then, $\cot x = \cot 45^\circ = 1$

349. The value of $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$ is:

- (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{\sqrt{3}}{2}$
 (c) $\frac{1}{2}$ (d) 1

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Ans. (c) : $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$
 $\therefore \sin(A - B) = \sin A \cos B - \cos A \sin B$
 $\therefore \sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ = \sin(60^\circ - 30^\circ)$
 $= \sin 30^\circ = \frac{1}{2}$

350. What is the value of $\cot 35^\circ \cot 40^\circ \cot 45^\circ \cot 50^\circ \cot 55^\circ$?

- (a) 1 (b) 2
 (c) 0 (d) -1

SSC CHSL –16/10/2020 (Shift-III)

Ans. (a) : $\cot 35^\circ \cot 40^\circ \cot 45^\circ \cot 50^\circ \cot 55^\circ$
 $= \cot 35^\circ \cot 40^\circ \cdot \cot 45^\circ \cot(90^\circ - 40^\circ) \cdot \cot(90^\circ - 35^\circ)$
 $= \cot 35^\circ \cot 40^\circ \times 1 \times \tan 40^\circ \tan 35^\circ$
 $= \tan 35^\circ \cot 35^\circ \cdot \tan 40^\circ \cot 40^\circ \left[\because \tan \theta = \frac{1}{\cot \theta} \right]$
 $= 1 \times 1 = 1$

351. Which of the following values for A to make the equation $\frac{A \tan 62^\circ \sec 28^\circ \cot 38^\circ}{\operatorname{cosec} 62^\circ \tan 11^\circ} = 1$ is true?

- (a) $\frac{\tan 38^\circ}{\tan 79^\circ \tan 28^\circ}$ (b) $\frac{\tan 38^\circ \tan 79^\circ}{\tan 28^\circ}$
 (c) $\frac{\tan 28^\circ \tan 79^\circ}{\tan 38^\circ}$ (d) $\frac{\tan 28^\circ \tan 38^\circ}{\tan 79^\circ}$

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Ans. (d) :

$$\frac{A \tan 62^\circ \sec 28^\circ \cot 38^\circ}{\operatorname{cosec} 62^\circ \tan 11^\circ} = 1$$

$$\frac{A \cot 28^\circ \operatorname{cosec} 62^\circ \cot 38^\circ}{\operatorname{cosec} 62^\circ \cot 79^\circ} = 1$$

$$A = \frac{\cot 79^\circ}{\cot 28^\circ \cot 38^\circ} = \frac{\tan 28^\circ \tan 38^\circ}{\tan 79^\circ}$$

(V) Miscellaneous

352. If $3 \sin x + 4 \cos x = 2$, then the value of $3 \cos x - 4 \sin x$ is equal to:

- (a) $\sqrt{23}$ (b) $\sqrt{29}$
 (c) 21 (d) $\sqrt{21}$

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Ans. (d) : $\because 3 \sin x + 4 \cos x = 2$

By squaring the both side.

$$\begin{aligned} (3 \sin x + 4 \cos x)^2 &= (2)^2 \\ 9 \sin^2 x + 16 \cos^2 x + 24 \sin x \cdot \cos x &= 4 \\ 9(1 - \cos^2 x) + 16(1 - \sin^2 x) + 24 \sin x \cdot \cos x &= 4 \\ 9 - 9 \cos^2 x + 16 - 16 \sin^2 x + 24 \sin x \cdot \cos x &= 4 \\ 9 + 16 - 4 &= 9 \cos^2 x + 16 \sin^2 x - 24 \sin x \cdot \cos x \\ 21 &= (3 \cos x - 4 \sin x)^2 \end{aligned}$$

Hence $3 \cos x - 4 \sin x = \sqrt{21}$

353. What is the value of $\frac{\{(\sin 4x + \sin 4y) [(\tan (2x - 2y))] / (\sin 4x - \sin 4y)\}}{(\sin 4x - \sin 4y)}$?

- (a) $\tan 2(2x + 2y)$
 (b) \tan^2
 (c) $\cot(x - y)$
 (d) $\tan(2x + 2y)$

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Ans. (d):

$$\frac{\{(\sin 4x + \sin 4y) [\tan(2x - 2y)]\}}{(\sin 4x - \sin 4y)}$$

$$= \frac{2 \sin\left(\frac{4x + 4y}{2}\right) \cdot \cos\left(\frac{4x - 4y}{2}\right)}{2 \cos\left(\frac{4x + 4y}{2}\right) \cdot \sin\left(\frac{4x - 4y}{2}\right)} \times \frac{\sin(2x - 2y)}{\cos(2x - 2y)}$$

$$= \frac{\sin(2x + 2y) \cdot \cos(2x - 2y)}{\cos(2x + 2y) \cdot \sin(2x - 2y)} \times \frac{\sin(2x - 2y)}{\cos(2x - 2y)}$$

$$= \tan(2x + 2y)$$

354. What is the value of $[\cos 3\theta + 2\cos 5\theta + \cos 7\theta] \div (\cos \theta + 2 \cos 3\theta + \cos 5\theta) + \sin 2\theta \tan 3\theta$?

- (a) $\cos 2\theta$ (b) $\sin 2\theta$
 (c) $\tan 2\theta$ (d) $\cot \theta \sin 2\theta$

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$$\text{Ans. (a) : } \frac{(\cos 3\theta + 2 \cos 5\theta + \cos 7\theta)}{\cos \theta + 2 \cos 3\theta + \cos 5\theta} + \sin 2\theta \cdot \tan 3\theta$$

$$= \frac{\cos 3\theta + \cos 7\theta + 2 \cos 5\theta}{\cos \theta + \cos 5\theta + 2 \cos 3\theta} + \sin 2\theta \cdot \tan 3\theta$$

$$= \frac{2 \cos 5\theta \cdot \cos 2\theta + 2 \cos 5\theta}{2 \cos 3\theta \cdot \cos 2\theta + 2 \cos 3\theta} + \sin 2\theta \cdot \tan 3\theta$$

$$= \frac{2 \cos 5\theta (\cos 2\theta + 1)}{2 \cos 3\theta (\cos 2\theta + 1)} + \sin 2\theta \times \frac{\sin 3\theta}{\cos 3\theta}$$

$$= \frac{\cos 5\theta + \sin 2\theta \cdot \sin 3\theta}{\cos 3\theta}$$

$$= \frac{\cos(2\theta + 3\theta) + \sin 2\theta \cdot \sin 3\theta}{\cos 3\theta}$$

$$= \frac{\cos 2\theta \cdot \cos 3\theta}{\cos 3\theta} = \cos 2\theta$$

355. What is the value of $\frac{(\tan 5\theta + \tan 3\theta)}{4 \cos 4\theta} \cos 4\theta$?

- (a) $\sin 2\theta$ (b) $\cos 2\theta$
 (c) $\tan 4\theta$ (d) $\cot 2\theta$

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Ans. (b) :

$$= \frac{(\tan 5\theta + \tan 3\theta)}{4 \cos 4\theta (\tan 5\theta - \tan 3\theta)}$$

$$= \frac{\frac{\sin 5\theta}{\cos 5\theta} + \frac{\sin 3\theta}{\cos 3\theta}}{4 \cos 4\theta \left(\frac{\sin 5\theta}{\cos 5\theta} - \frac{\sin 3\theta}{\cos 3\theta}\right)}$$

$$= \frac{\frac{\sin 5\theta \cdot \cos 3\theta + \cos 5\theta \cdot \sin 3\theta}{\cos 5\theta \cdot \cos 3\theta}}{4 \cos 4\theta \left(\frac{\sin 5\theta \cdot \cos 3\theta - \cos 5\theta \cdot \sin 3\theta}{\cos 5\theta \cdot \cos 3\theta}\right)} = \frac{\sin(5\theta + 3\theta)}{4 \cos 4\theta (\sin(5\theta - 3\theta))}$$

$$= \frac{\sin 8\theta}{4 \cos 4\theta \cdot \sin 2\theta} = \frac{2 \sin 4\theta \cdot \cos 4\theta}{4 \cos 4\theta \cdot \sin 2\theta} = \frac{2 \sin 2\theta \cdot \cos 2\theta}{2 \cdot \sin 2\theta} = \cos 2\theta$$

356. What is the value of $\frac{(\sin 7x - \sin 5x)}{(\cos 7x + \cos 5x)} - \frac{(\cos 6x - \cos 4x)}{(\sin 6x + \sin 4x)}$?

- (a) 1 (b) $2 \tan x$
 (c) $\tan 2x$ (d) $\tan(3x/2)$

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Ans. (b) : Given-

$$\Rightarrow \frac{\sin 7x - \sin 5x}{\cos 7x + \cos 5x} - \left[\frac{\cos 6x - \cos 4x}{\sin 6x + \sin 4x} \right]$$

$$\Rightarrow \frac{2 \cos\left(\frac{7x + 5x}{2}\right) \cdot \sin\left(\frac{7x - 5x}{2}\right)}{2 \cos\left(\frac{7x + 5x}{2}\right) \cos\left(\frac{7x - 5x}{2}\right)} - \left[\frac{\sin\left(\frac{6x + 4x}{2}\right) \cdot \sin\left(\frac{6x - 4x}{2}\right)}{2 \sin\left(\frac{6x + 4x}{2}\right) \cos\left(\frac{6x - 4x}{2}\right)} \right]$$

$$= \tan x + \tan x$$

$$= 2 \tan x$$

357. What is the value of $[\sin(y-z) + \sin(y+z) + 2 \sin y] / [\sin(x-z) + \sin(x+z) + 2 \sin x]$?
 (a) $\cos x \sin y$ (b) $(\sin y) / (\sin x)$
 (c) $\sin z$ (d) $\sin x \tan y$

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Ans. (b) :

$$\frac{[\sin(y-z) + \sin(y+z) + 2 \sin y]}{[\sin(x-z) + \sin(x+z) + 2 \sin x]}$$

$$= \frac{\left[2 \sin \left(\frac{y-z+y+z}{2} \right) \cos \left(\frac{y-z-y-z}{2} \right) + 2 \sin y \right]}{\left[2 \sin \left(\frac{x-z+x+z}{2} \right) \cos \left(\frac{x-z-x-z}{2} \right) + 2 \sin x \right]}$$

$$= \frac{2[\sin y \cos(-z) + \sin y]}{2[\sin x \cos(-z) + \sin x]}$$

$$= \frac{\sin y [\cos(-z) + 1]}{\sin x [\cos(-z) + 1]} = \frac{\sin y}{\sin x}$$

358. What is the value of $\{[\sin(x+y) - 2 \sin x + \sin(x-y)] / [\cos(x-y) + \cos(x+y) - 2 \cos x]\} \times [(\sin 10x - \sin 8x) / (\cos 10x + \cos 8x)]$?
 (a) 0 (b) $\tan^2 x$
 (c) 1 (d) $2 \tan x$

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Ans. (b):

$$\left\{ \frac{[\sin(x+y) - 2 \sin x + \sin(x-y)]}{[\cos(x-y) + \cos(x+y) - 2 \cos x]} \right\} \times \frac{(\sin 10x - \sin 8x)}{(\cos 10x + \cos 8x)}$$

$$= \frac{[2 \sin x \cos y - 2 \sin x]}{[2 \cos x \cos y - 2 \cos x]} \times \frac{2 \cos \left(\frac{10x+8x}{2} \right) \cdot \sin \left(\frac{10x-8x}{2} \right)}{2 \cos \left(\frac{10x+8x}{2} \right) \cdot \cos \left(\frac{10x-8x}{2} \right)}$$

$$= \frac{2 \sin x (\cos y - 1)}{2 \cos x (\cos y - 1)} \times \frac{2 \cos 9x \cdot \sin x}{2 \cos 9x \cdot \cos x}$$

$$= \frac{\sin^2 x}{\cos^2 x} = \tan^2 x$$

359. If $\tan \theta + \sec \theta = (x-2)/(x+2)$, then what is the value of $\cos \theta$?
 (a) $(x^2 - 1) / (x^2 + 1)$ (b) $(2x^2 - 4) / (2x^2 + 4)$
 (c) $(x^2 - 4) / (x^2 + 4)$ (d) $(x^2 - 2) / (x^2 + 2)$

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : $\tan \theta + \sec \theta = (x-2)/(x+2)$ (i)

$$\therefore \sec^2 \theta - \tan^2 \theta = 1$$

$$\Rightarrow (\sec \theta - \tan \theta)(\sec \theta + \tan \theta) = 1$$

$$\Rightarrow (\sec \theta - \tan \theta) = \frac{1}{\sec \theta + \tan \theta}$$

$$\Rightarrow \sec \theta - \tan \theta = \frac{x+2}{x-2} \dots \dots \dots \text{(ii)}$$

$$\Rightarrow 2 \sec \theta = \left(\frac{x-2}{x+2} \right) + \left(\frac{x+2}{x-2} \right)$$

$$2 \sec \theta = \frac{(x^2 - 4x + 4) + (x^2 + 4x + 4)}{x^2 - 4}$$

$$\Rightarrow 2 \sec \theta = \frac{2(x^2 + 4)}{x^2 - 4}$$

$$\Rightarrow \cos \theta = \frac{x^2 - 4}{x^2 + 4}$$

360. $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta}$ is equal to:

- (a) $\frac{1}{\sec \theta - \tan \theta}$ (b) $\frac{1}{\sec \theta + \tan \theta}$
 (c) $(\sec \theta + \tan \theta)^2$ (d) $(\sec \theta - \tan \theta)^2$

SSC CHSL -26/10/2020 (Shift-II)

Ans. (c) : $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} \times \frac{\sec \theta + \tan \theta}{\sec \theta + \tan \theta}$
 (By rationalization)

$$\frac{(\sec \theta + \tan \theta)^2}{\sec^2 \theta - \tan^2 \theta}$$

$$(\sec \theta + \tan \theta)^2 \quad (\because \sec^2 \theta - \tan^2 \theta = 1)$$

361. If $\sec \theta = \frac{13}{5}$, then the value of $\frac{10 \tan \theta + 24 \operatorname{cosec} \theta}{39 \sin \theta - 10 \sec \theta}$ is:

- (a) 2 (b) $\frac{1}{5}$
 (c) 3 (d) 5

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : $\because \sec \theta = \frac{13}{5} = \frac{\text{Hypotenuse}}{\text{Base}}$

From triplet, Perpendicular = 12

$$\text{then, } \frac{10 \tan \theta + 24 \operatorname{cosec} \theta}{39 \sin \theta - 10 \sec \theta} = \frac{10 \times \frac{12}{5} + 24 \times \frac{13}{12}}{39 \times \frac{12}{13} - 10 \times \frac{13}{5}}$$

$$= \frac{24 + 26}{36 - 26} = \frac{50}{10} = 5$$

362. If $1 + \tan \theta = \sqrt{3}$, then $\sqrt{3} \cot \theta - 1 =$ _____.

- (a) $\frac{\sqrt{3}+1}{2}$ (b) $\frac{\sqrt{3}-1}{2}$
 (c) $\frac{2\sqrt{3}-1}{2}$ (d) $\frac{2\sqrt{3}+1}{2}$

SSC CHSL 03/06/2022 (Shift-II)

Ans. (a) : $1 + \tan \theta = \sqrt{3}$

$$\tan \theta = \sqrt{3} - 1$$

$$\frac{1}{\cot \theta} = \sqrt{3} - 1$$

$$\cot \theta = \frac{1}{\sqrt{3} - 1}$$

On multiplying $\sqrt{3} + 1$ in numerator and denominator

$$\cot\theta = \frac{1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$\cot\theta = \frac{\sqrt{3}+1}{2} \dots\dots\dots (i)$$

$$\sqrt{3} \cot\theta - 1$$

Putting value from eqⁿ (i)

$$= \sqrt{3} \times \frac{\sqrt{3}+1}{2} - 1$$

$$= \frac{3 + \sqrt{3} - 2}{2}$$

$$= \frac{\sqrt{3}+1}{2}$$

363. If $\operatorname{cosec}^2\theta + \cot^2\theta = \frac{1}{3}$, where $0 \leq \theta \leq \frac{\pi}{2}$, then the value of $\operatorname{cosec}^4\theta - \cot^4\theta$ is:

- (a) $\frac{2}{3}$ (b) $-\frac{1}{3}$
 (c) $\frac{1}{3}$ (d) $-\frac{2}{3}$

SSC CHSL 09/06/2022 (Shift- I)

Ans. (c) : $\operatorname{cosec}^2\theta + \cot^2\theta = \frac{1}{3}$ (Given)

$$\therefore \operatorname{cosec}^4\theta - \cot^4\theta = (\operatorname{cosec}^2\theta - \cot^2\theta) (\operatorname{cosec}^2\theta + \cot^2\theta)$$

$$\therefore (\operatorname{cosec}^2\theta - \cot^2\theta) = 1$$

$$= \frac{1}{3} \times 1$$

$$= \frac{1}{3}$$

364. The value of $\frac{\sin 4\theta}{(1 - \cos 4\theta)}$ is :

- (a) $\cot\theta$ (b) $\cot 2\theta$
 (c) $\tan\theta$ (d) $\tan 2\theta$

SSC CHSL 01/06/2022 (Shift- III)

Ans. (b) : $\frac{\sin 4\theta}{(1 - \cos 4\theta)}$

$$\left\{ \begin{array}{l} \because \sin 2\theta = 2 \sin \theta \cos \theta \\ 2 \sin^2 \theta = 1 - \cos 2\theta \end{array} \right\}$$

$$\frac{\sin 2(2\theta)}{1 - \cos 2(2\theta)} = \frac{2 \sin 2\theta \cdot \cos 2\theta}{2 \sin^2 2\theta} = \frac{\cos 2\theta}{\sin 2\theta} = \cot 2\theta$$

365. The value of $(1 + \tan 10^\circ)(1 + \tan 35^\circ)$ is:

- (a) $\frac{1}{2}$ (b) $\frac{3}{4}$
 (c) 1 (d) 2

SSC CHSL 25/05/2022 (Shift- III)

Ans. (d) : If $A + B = 45^\circ$

$$\therefore (1 + \tan A)(1 + \tan B) = 2$$

here,

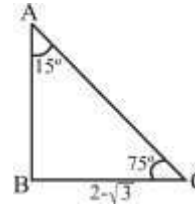
$$\therefore (1 + \tan 10^\circ)(1 + \tan 35^\circ) = 2$$

366. If $\cot 75^\circ = 2 - \sqrt{3}$. Find the value of $\cot 15^\circ$.

- (a) $2 - \sqrt{3}$ (b) $2 + \sqrt{3}$
 (c) $\sqrt{3} + 1$ (d) $\sqrt{3} - 1$

SSC CHSL 24/05/2022 (Shift- III)

Ans. (b) :



$$\cot 75^\circ = 2 - \sqrt{3}, \cot 15^\circ = ?$$

From ΔABC ,

$$\cot 15^\circ = \frac{1}{2 - \sqrt{3}}$$

$$= \frac{1}{2 - \sqrt{3}} \times \frac{2 + \sqrt{3}}{2 + \sqrt{3}}$$

$$= \frac{2 + \sqrt{3}}{4 - 3}$$

$$= 2 + \sqrt{3}$$

$$\Rightarrow \cot 15^\circ = 2 + \sqrt{3}$$

367. What is the value of $[2 \cot(\pi - A)/2] / [1 + \tan^2(2\pi - A)/2]$?

- (a) $2 \sin^2 A/2$ (b) $\cos A$
 (c) $\sin A$ (d) $2 \cos^2 A/2$

SSC CGL (Tier-II) 21-02-2018

Ans. (c) :

$$\frac{2 \cot\left(\frac{\pi - A}{2}\right)}{1 + \tan^2\left(\frac{2\pi - A}{2}\right)} = \frac{2 \cot\left(\frac{\pi - A}{2}\right)}{1 + \tan^2\left(\pi - \frac{A}{2}\right)} = \frac{2 \tan A/2}{1 + \tan^2 A/2} = \sin A$$

(From the formula)

368. What is the value of $[1 - \sin(90^\circ - 2A)] / [1 + \sin(90^\circ + 2A)]$?

- (a) $\sin A \cos A$ (b) $\cot^2 A$
 (c) $\tan^2 A$ (d) $\sin^2 A \cos A$

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $\frac{1 - \sin(90^\circ - 2A)}{1 + \sin(90^\circ + 2A)}$

$$= \frac{1 - \cos 2A}{1 + \cos 2A}$$

$$= \frac{1 - (1 - 2 \sin^2 A)}{1 + 2 \cos^2 A - 1}$$

$$= \frac{2 \sin^2 A}{2 \cos^2 A} = \tan^2 A$$

369. If $\frac{\cos^2 \theta}{\cot^2 \theta - \cos^2 \theta} = 3$, where $0^\circ < \theta < 90^\circ$ then the value of θ is :
- (a) 60° (b) 45°
 (c) 50° (d) 30°

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : $\frac{\cos^2 \theta}{\cot^2 \theta - \cos^2 \theta} = 3$ where $0^\circ < \theta < 90^\circ$
 On dividing by $\cos^2 \theta$ in numerator and denominator in left side.

$$\frac{1}{\operatorname{cosec}^2 \theta - 1} = 3$$

$$\frac{1}{\cot^2 \theta} = 3$$

$$\tan^2 \theta = 3$$

$$\tan \theta = \sqrt{3}$$

$\therefore \theta = 60^\circ$

370. If $3 \cot A = 4 \tan A$ and A is an acute angle, then what will be the value of $\sec A$?

- (a) $\frac{\sqrt{7}}{2}$ (b) $\frac{\sqrt{21}}{3}$
 (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{2}$

SSC CHSL 06/08/2021 (Shift-III)

Ans. (a) : $3 \cot A = 4 \tan A$.

$$\tan^2 A = \frac{3}{4}$$

$$\therefore \sec^2 A = 1 + \tan^2 A$$

$$\text{So, } \sec^2 A = 1 + \frac{3}{4} = \frac{7}{4}$$

$$\sec A = \frac{\sqrt{7}}{2}$$

371. If $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 3$, then the value of $\sin^4 \theta - \cos^4 \theta$ is equal to:

- (a) $\frac{2}{5}$ (b) $\frac{4}{5}$
 (c) $\frac{3}{5}$ (d) $\frac{1}{5}$

SSC CHSL 19/04/2021 (Shift-III)

Ans. (c) : $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 3$

$$3 \sin \theta - 3 \cos \theta = \sin \theta + \cos \theta$$

$$4 \cos \theta = 2 \sin \theta$$

$$\tan \theta = 2$$

$$\therefore \sec^2 = 1 + \tan^2 \theta \Rightarrow \sec^2 \theta = 1 + (2)^2 = 5$$

$$\cos \theta = \frac{1}{\sqrt{5}}$$

$$\sin \theta = \frac{2}{\sqrt{5}}$$

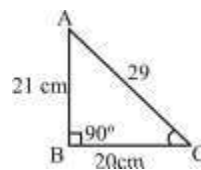
$$\therefore \sin^4 \theta - \cos^4 \theta = \frac{16}{25} - \frac{1}{25} = \frac{15}{25} = \frac{3}{5}$$

372. In ΔABC , if $\angle B = 90^\circ$, $AB = 21 \text{ cm}$ and $BC = 20 \text{ cm}$, then $\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A}$ is equal to:

- (a) $\frac{3}{5}$ (b) $-\frac{3}{5}$
 (c) $\frac{2}{5}$ (d) $-\frac{2}{5}$

SSC CHSL 12/04/2021 (Shift-III)

Ans : (c)



$$\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A} = \frac{1 + \frac{20}{29} - \frac{21}{29}}{1 + \frac{20}{29} + \frac{21}{29}}$$

$$= \frac{29 - 1}{29 + 41}$$

$$= \frac{28}{70} = \frac{4}{10} = \frac{2}{5}$$

373. What is the value of $[\tan(90^\circ - A) + \cot(90^\circ - A)]^2 \div [2 \sec^2(90^\circ - 2A)]$?

- (a) 0 (b) 1
 (c) 2 (d) -1

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :

$$\frac{[\tan(90^\circ - A) + \cot(90^\circ - A)]^2}{[2 \sec^2(90^\circ - 2A)]}$$

$$\left(\frac{(\cot A + \tan A)^2}{2 \operatorname{cosec}^2 2A} \right)$$

$$\left(\frac{\frac{\cos A}{\sin A} + \frac{\sin A}{\cos A}}{2 \operatorname{cosec}^2 2A} \right)^2 = \left(\frac{\frac{\cos^2 A + \sin^2 A}{\sin A \cdot \cos A}}{2 \operatorname{cosec}^2 2A} \right)$$

$$= \frac{(2/\sin 2A)^2}{2 \operatorname{cosec}^2 2A}$$

$$= \frac{4 \operatorname{cosec}^2 2A}{2 \operatorname{cosec}^2 2A}$$

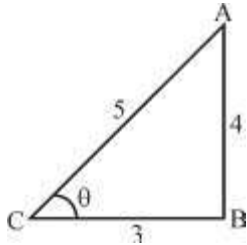
$$= 2$$

374. If $2\sin\theta + 15\cos^2\theta = 7$, $0^\circ < \theta < 90^\circ$, then $\tan\theta + \cos\theta + \sec\theta =$

- (a) 4 (b) $3\frac{4}{5}$
 (c) $3\frac{3}{5}$ (d) 3

SSC CGL (Tier-I) – 03/03/2020 (Shift-II)

Ans. (c) :



$$2\sin\theta + 15\cos^2\theta = 7$$

$$15 - 15\sin^2\theta + 2\sin\theta = 7$$

$$15\sin^2\theta - 2\sin\theta - 8 = 0$$

$$15\sin^2\theta - 12\sin\theta + 10\sin\theta - 8 = 0$$

$$3\sin\theta(5\sin\theta - 4) + 2(5\sin\theta - 4) = 0$$

$$(5\sin\theta - 4)(3\sin\theta + 2) = 0$$

$$3\sin\theta + 2 = 0 \Rightarrow \sin\theta = -\frac{2}{3}$$

$$\text{And } 5\sin\theta - 4 = 0 \Rightarrow \sin\theta = \frac{4}{5}$$

$$\therefore \tan\theta = \frac{4}{3}, \cos\theta = \frac{3}{5} \text{ तथा } \sec\theta = \frac{5}{3}$$

then, $\tan\theta + \cos\theta + \sec\theta$

$$= \frac{4}{3} + \frac{3}{5} + \frac{5}{3}$$

$$= 3 + \frac{3}{5} = 3\frac{3}{5}$$

375. If $7\sin^2\theta - \cos^2\theta + 2\sin\theta = 2$, $0^\circ < \theta < 90^\circ$, then

the value of $\frac{\sec 2\theta + \cot 2\theta}{\operatorname{cosec} 2\theta + \tan 2\theta}$ is:

- (a) $\frac{2}{5}(1 + \sqrt{3})$ (b) $\frac{1}{5}(1 + 2\sqrt{3})$
 (c) 1 (d) $\frac{2\sqrt{3} + 1}{3}$

SSC CGL (Tier-I) – 04/03/2020 (Shift-II)

Ans. (b) : $7\sin^2\theta - \cos^2\theta + 2\sin\theta = 2$

Putting the value of $\theta = 30^\circ$,

$$7 \times \frac{1}{4} - \frac{3}{4} + 2 \times \frac{1}{2} = 2$$

$$\frac{4}{4} + 1 = 2$$

$$2 = 2$$

$$\therefore \frac{\sec 2\theta + \cot 2\theta}{\operatorname{cosec} 2\theta + \tan 2\theta} = \frac{\sec 60^\circ + \cot 60^\circ}{\operatorname{cosec} 60^\circ + \tan 60^\circ}$$

$$= \frac{2 + \frac{1}{\sqrt{3}}}{\frac{2}{\sqrt{3}} + \sqrt{3}} = \frac{2\sqrt{3} + 1}{5} = \frac{1}{5}(1 + 2\sqrt{3})$$

376. If $11\sin^2\theta - \cos^2\theta + 4\sin\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$,

then what is the value of $\frac{\cos 2\theta + \cot 2\theta}{\sec 2\theta - \tan 2\theta}$?

- (a) $\frac{12 + 7\sqrt{3}}{6}$ (b) $\frac{10 + 5\sqrt{3}}{3}$
 (c) $\frac{10 + 7\sqrt{3}}{6}$ (d) $\frac{12 + 5\sqrt{3}}{3}$

SSC CGL (Tier-I) – 05/03/2020 (Shift-II)

Ans. (a) : $11\sin^2\theta - \cos^2\theta + 4\sin\theta - 4 = 0$

Putting the value of $\theta = 30^\circ$,

$$11 \times \frac{1}{4} - \frac{3}{4} + 4 \times \frac{1}{2} - 4$$

$$\frac{8}{4} + 2 - 4 = 0$$

$$\therefore \text{LHS} = \text{RHS}$$

Hence,

$$\begin{aligned} \frac{\cos 60^\circ + \cot 60^\circ}{\sec 60^\circ - \tan 60^\circ} &= \frac{\frac{1}{2} + \frac{1}{\sqrt{3}}}{2 - \sqrt{3}} = \frac{\sqrt{3} + 2}{(2 - \sqrt{3})2\sqrt{3}} \times \frac{(2 + \sqrt{3})}{(2 + \sqrt{3})} \\ &= \frac{7 + 4\sqrt{3}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{12 + 7\sqrt{3}}{6} \end{aligned}$$

377. If $12\cos^2\theta - 2\sin^2\theta + 3\cos\theta = 3$, $0^\circ < \theta < 90^\circ$,

then what is the value of $\frac{\operatorname{cosec}\theta + \sec\theta}{\tan\theta + \cot\theta}$?

- (a) $\frac{2 + \sqrt{3}}{4}$ (b) $\frac{1 + 2\sqrt{2}}{2}$
 (c) $\frac{1 + \sqrt{3}}{2}$ (d) $\frac{4 + \sqrt{3}}{4}$

SSC CGL (Tier-I) – 05/03/2020 (Shift-I)

Ans. (c) : $12\cos^2\theta - 2\sin^2\theta + 3\cos\theta = 3$

By putting the value $\theta = 60^\circ$

$$12 \times \frac{1}{4} - 2 \times \frac{3}{4} + 3 \times \frac{1}{2} = 3$$

$$3 = 3$$

$$\begin{aligned} \therefore \frac{\operatorname{cosec} 60^\circ + \sec 60^\circ}{\tan 60^\circ + \cot 60^\circ} &= \frac{\frac{2}{\sqrt{3}} + 2}{\sqrt{3} + \frac{1}{\sqrt{3}}} = \frac{\frac{2 + 2\sqrt{3}}{\sqrt{3}}}{\frac{4}{\sqrt{3}}} \\ &= \frac{1 + \sqrt{3}}{2} \end{aligned}$$

378. If $(\cos^2\theta - 1)(1 + \tan^2\theta) + 2\tan^2\theta = 1$, $0^\circ \leq \theta \leq 90^\circ$ then θ is:

- (a) 90° (b) 30°
 (c) 45° (d) 60°

SSC CGL (Tier-I) – 06/03/2020 (Shift-II)

Ans. (c) : $(\cos^2\theta - 1)(1 + \tan^2\theta) + 2\tan^2\theta = 1$
 $-\sin^2\theta \times \sec^2\theta + 2\tan^2\theta = 1$
 $-\tan^2\theta + 2\tan^2\theta = 1$
 $\tan^2\theta = 1$
 $\tan^2\theta = \tan^2 45^\circ, \theta = 45^\circ$

379. If $(2\sin A + \operatorname{cosec} A) = 2\sqrt{2}$, $0^\circ < A < 90^\circ$, then the value of $2(\sin^4 A + \cos^4 A)$ is:
 (a) 2 (b) 1
 (c) 4 (d) 0
SSC CGL (Tier-I) – 06/03/2020 (Shift-I)

Ans. (b) : $2\sin A + \operatorname{cosec} A = 2\sqrt{2}$
 By putting the value $A = 45^\circ$,
 $2 \times \frac{1}{\sqrt{2}} + \sqrt{2} = 2\sqrt{2}$
 $\therefore 2(\sin^4 A + \cos^4 A)$
 $= 2(\sin^4 45^\circ + \cos^4 45^\circ)$
 $= 2 \left(\frac{1}{4} + \frac{1}{4} \right) = 1$

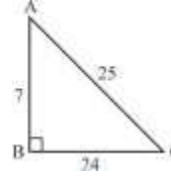
380. If $5 \cos^2 \theta + 1 = 3 \sin^2 \theta$, $0^\circ < \theta < 90^\circ$, then what is the value of $\frac{\tan \theta + \sec \theta}{\cot \theta + \operatorname{cosec} \theta}$?
 (a) $\frac{3+2\sqrt{3}}{3}$ (b) $\frac{2+3\sqrt{3}}{2}$
 (c) $\frac{2+3\sqrt{3}}{3}$ (d) $\frac{3+2\sqrt{3}}{2}$
SSC CGL (Tier-I) – 07/03/2020 (Shift-III)

Ans. (a) : $5 \cos^2 \theta + 1 = 3 \sin^2 \theta$
 $5 \cos^2 \theta + 5 \sin^2 \theta + 1 = 8 \sin^2 \theta$
 $(5 \times 1) + 1 = 8 \sin^2 \theta$
 $8 \sin^2 \theta = 6$
 $\sin \theta = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2}$
 $\theta = 60^\circ$
 $\therefore \frac{\tan 60^\circ + \sec 60^\circ}{\cot 60^\circ + \operatorname{cosec} 60^\circ} = \frac{\sqrt{3} + 2}{\frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}} = \frac{\sqrt{3} + 2}{\sqrt{3} + \sqrt{3}}$
 $= \frac{3 + 2\sqrt{3}}{3}$

381. In a ΔABC , right angled at B, $AB = 7\text{cm}$ and $(AC - BC) = 1\text{ cm}$. The value of $(\sec C + \cot A)$ is:
 (a) $\frac{4}{3}$ (b) $\frac{3}{4}$
 (c) $\frac{19}{24}$ (d) 1
SSC CGL (TIER-I) – 10.06.2019 (Shift-I)

Ans. (a) : Right angle ΔABC
 $AC - BC = 1$ (Given) (i)
 $AC^2 = AB^2 + BC^2$
 $AC^2 - BC^2 = AB^2$
 $(AC - BC)(AC + BC) = 7^2$
 $AC + BC = 49$ (ii)

By solving the equation (i) and (ii).
 $AC = 25, BC = 24$



$\therefore \sec C + \cot A = \frac{25}{24} + \frac{7}{24} = \frac{32}{24} = \frac{4}{3}$

382. If $0^\circ < \theta < 90^\circ$ and $\cos^2 \theta = 3(\cot^2 \theta - \cos^2 \theta)$ then the value of $\left(\frac{1}{2} \sec \theta + \sin \theta\right)^{-1}$ is:
 (a) $2(\sqrt{3} - 1)$ (b) $\sqrt{3} + 1$
 (c) $\sqrt{3} + 2$ (d) $2(2 - \sqrt{3})$
SSC CGL (TIER-I) – 04.06.2019 (Shift-II)

Ans. (d) :
 $\cos^2 \theta = 3 \cot^2 \theta - 3 \cos^2 \theta$
 $4 \cos^2 \theta = \frac{3 \cos^2 \theta}{\sin^2 \theta}$
 $\sin^2 \theta = \frac{3}{4}$
 $\sin \theta = \frac{\sqrt{3}}{2}$
 $\theta = 60^\circ$
 $\therefore \left(\frac{1}{2} \sec \theta + \sin \theta\right)^{-1}$
 $= \left(\frac{1}{2} \times 2 + \frac{\sqrt{3}}{2}\right)^{-1}$
 $= \left(\frac{2 + \sqrt{3}}{2}\right)^{-1}$
 $= \frac{2(2 - \sqrt{3})}{(2 + \sqrt{3})(2 - \sqrt{3})}$
 $= 2(2 - \sqrt{3})$

383. If $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$, $0^\circ < \theta < 90^\circ$ then the value of $\cos \theta + \tan \theta$ is :
 (a) $\frac{1 - 2\sqrt{3}}{2}$ (b) $\frac{2 + \sqrt{3}}{2}$
 (c) $\frac{1 + 2\sqrt{3}}{2}$ (d) $\frac{2 - \sqrt{3}}{2}$
SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$
 $\Rightarrow 4 - 2(1 - \cos^2 \theta) - 5 \cos \theta = 0$
 $\Rightarrow 4 - 2 + 2 \cos^2 \theta - 5 \cos \theta = 0$
 $\Rightarrow 2 \cos^2 \theta - 5 \cos \theta + 2 = 0$

$$\begin{aligned} \Rightarrow 2 \cos^2 \theta - 4 \cos \theta - \cos \theta + 2 &= 0 \\ \Rightarrow 2 \cos \theta (\cos \theta - 2) - 1(\cos \theta - 2) &= 0 \\ \Rightarrow (2 \cos \theta - 1)(\cos \theta - 2) &= 0 \\ \Rightarrow 2 \cos \theta - 1 = 0 \text{ or } \cos \theta - 2 &= 0 \\ \Rightarrow \cos \theta = \frac{1}{2} \text{ or } \cos \theta = 2 \text{ (Does not exist)} \\ [\because -1 \leq \cos \theta \leq 1] \\ \Rightarrow \cos \theta = \cos 60^\circ \Rightarrow \theta = 60^\circ \\ \therefore \cos \theta + \tan \theta = \cos 60^\circ + \tan 60^\circ \\ &= \frac{1}{2} + \sqrt{3} \\ &= \frac{1 + 2\sqrt{3}}{2} \end{aligned}$$

384. If $\tan(110) = \cot(70)$, then what is the value of $\sin^2(60) + \sec^2(90) + \operatorname{cosec}^2(120)$?

- (a) $\frac{43}{12}$ (b) $\frac{23}{6}$
(c) $\frac{31}{12}$ (d) $\frac{35}{12}$

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a) $\tan(110) = \tan(90^\circ - 70)$
 $110 = 90^\circ - 70$
 $\theta = 5^\circ$
 $\therefore \sin^2 30^\circ + \sec^2 45^\circ + \operatorname{cosec}^2 60^\circ$
 $= \left(\frac{1}{2}\right)^2 + (\sqrt{2})^2 + \left(\frac{2}{\sqrt{3}}\right)^2$
 $= \frac{1}{4} + 2 + \frac{4}{3}$
 $= \frac{43}{12}$

385. If $\sin \theta - \cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\sin^4 \theta + \cos^4 \theta$ is:

- (a) $\frac{1}{3}$ (b) 1
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c)
 $\sin \theta - \cos \theta = 0$
 $\sin \theta = \cos \theta$
 $\sin \theta = \sin(90^\circ - \theta)$
 $\theta = 90^\circ - \theta$
 $\theta = 45^\circ$
Hence $\sin^4 \theta + \cos^4 \theta = \sin^4 45^\circ + \cos^4 45^\circ$
 $= \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4$
 $= \frac{1}{4} + \frac{1}{4}$
 $= \frac{1}{2}$

386. If $\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta} = 4$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\sec \theta + \operatorname{cosec} \theta + \cot \theta)$?

- (a) $2 + \sqrt{3}$ (b) $\frac{2 + \sqrt{3}}{3}$
(c) $1 + 2\sqrt{3}$ (d) $\frac{1 + 2\sqrt{3}}{3}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)
 $\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta} = 4$
 $\frac{\cos \theta + \cos \theta \sin \theta + \cos \theta - \cos \theta \cdot \sin \theta}{1 - \sin^2 \theta} = 4$
 $\frac{2 \cos \theta}{\cos^2 \theta} = 4$
 $\cos \theta = \frac{1}{2} = \cos 60^\circ$
 $\theta = 60^\circ$
 $\therefore \sec \theta + \operatorname{cosec} \theta + \cot \theta = \sec 60^\circ + \operatorname{cosec} 60^\circ + \cot 60^\circ$
 $2 + \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{2\sqrt{3} + 2 + 1}{\sqrt{3}}$
 $= 2 + \sqrt{3}$

387. If $0^\circ \leq \theta \leq 90^\circ$, and $\sec^{107} \theta + \cos^{107} \theta = 2$, then, $(\sec \theta + \cos \theta)$ is equal to:

- (a) $1/2$ (b) 2
(c) 1 (d) 2^{-107}

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b) $\sec^{107} \theta + \cos^{107} \theta = 2$ $0^\circ \leq \theta \leq 90^\circ$
By putting the value of $\theta = 0^\circ$
 $1 + 1 = 2 \Rightarrow 2 = 2$
Hence $\sec \theta + \cos \theta = \sec 0^\circ + \cos 0^\circ$
 $= 1 + 1 = 2$

388. If $\sin \theta \cdot \sec^2 \theta = \frac{2}{3}$, $0^\circ < \theta < 90^\circ$ then find the value of $(\tan^2 \theta + \cos^2 \theta)$:

- (a) $\frac{11}{12}$ (b) $\frac{5}{4}$
(c) $\frac{13}{12}$ (d) $\frac{7}{6}$

SSC CHSL 03/07/2019 (Shift-I)

Ans. (c) : $\sin \theta \cdot \sec^2 \theta = \frac{2}{3}$
 $\Rightarrow \frac{\sin \theta}{\cos \theta} \cdot \sec \theta = \frac{2}{3}$
 $\Rightarrow \tan \theta \cdot \sec \theta = \frac{2}{3}$
 $\Rightarrow \tan \theta \cdot \sec \theta = \frac{1}{\sqrt{3}} \cdot \frac{2}{\sqrt{3}}$
Hence it is clear that, $\tan \theta \cdot \sec \theta = \tan 30^\circ \cdot \sec 30^\circ$
 $\therefore \theta = 30^\circ$
 $\Rightarrow \tan^2 \theta + \cos^2 \theta = \tan^2 30^\circ + \cos^2 30^\circ$

$$= \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{3} + \frac{3}{4}$$

$$= \frac{4+9}{12} = \frac{13}{12}$$

389. If $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = k + \tan^2\theta + \cot^2\theta$, then the value of k is equal to :
- (a) 7 (b) 5
(c) 9 (d) 2

SSC CGL (Tier-II) – 18/11/2020

Ans. (a) : $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = k + \tan^2\theta + \cot^2\theta$
 $\sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta \cdot \operatorname{cosec}\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta \cdot \sec\theta = k + \tan^2\theta + \cot^2\theta$
 $(\sin^2\theta + \cos^2\theta) + (\operatorname{cosec}^2\theta - \cot^2\theta) + (\sec^2\theta - \tan^2\theta) + 2 + 2 = k$
 $1 + 1 + 2 + 2 = k$
 $k = 7$

OR

On putting $\theta = 45^\circ$,
 $(\sin 45^\circ + \operatorname{cosec} 45^\circ)^2 + (\cos 45^\circ + \sec 45^\circ)^2 = k + \tan^2 45^\circ + \cot^2 45^\circ$
 $\left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2 + \left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2 = k + 1^2 + 1^2$
 $\frac{9}{2} + \frac{9}{2} = k + 2 \quad k = 7$

390. Let $a = \frac{2\sin x}{1 + \sin x + \cos x}$ and $b = \frac{c}{1 + \sin x}$. Then $a = b$, if $c = ?$
- (a) $1 + \sin x - \cos x$ (b) $1 - \sin x \cos x$
(c) $1 + \sin x \cos x$ (d) $1 + \cos x - \sin x$

SSC CGL (TIER-I) – 06.06.2019 (Shift-II)

Ans. (a) : यदि $x = 90^\circ$

$$a = \frac{2\sin 90^\circ}{1 + \sin 90^\circ + \cos 90^\circ}$$

$$a = \frac{2}{2} = 1$$

And, $b = \frac{c}{1 + \sin x} = \frac{c}{1 + \sin 90^\circ} = \frac{c}{2}$

But $a = b$

i.e. $1 = \frac{c}{2} \Rightarrow c = 2$

From option (a),
 $c = 1 + \sin x - \cos x$
 $c = 1 + \sin 90^\circ - \cos 90^\circ = 2$

391. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, $0^\circ < \theta < 90^\circ$, then the value of $\cot\theta + \operatorname{cosec}\theta$ is:

- (a) $\frac{\sqrt{3}}{2}$ (b) $\sqrt{3}$
(c) $-2\sqrt{3}$ (d) $\frac{3\sqrt{3}}{4}$

SSC CGL (TIER-I) – 06.06.2019 (Shift-II)

Ans. (b) : $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$

$$\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} \Rightarrow \frac{\cos^2\theta \cdot \sin^2\theta}{\cos^2\theta(1 - \sin^2\theta)} = 3$$

$$\Rightarrow \tan^2\theta = 3 \Rightarrow \tan\theta = \sqrt{3}$$

$$\theta = 60^\circ$$

$$\therefore \cot\theta + \operatorname{cosec}\theta = \cot 60^\circ + \operatorname{cosec} 60^\circ$$

$$= \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

392. If $3\sin\theta = 2\cos^2\theta$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan^2\theta + \sec^2\theta - \operatorname{cosec}^2\theta)$ is :

- (a) $\frac{7}{3}$ (b) $-\frac{7}{3}$
(c) -2 (d) 2

SSC CGL (TIER-I) – 10.06.2019 (Shift-I)

Ans. (b) : $\because 3\sin\theta = 2\cos^2\theta$ (Given)

$$3\sin\theta = 2(1 - \sin^2\theta) \quad \{\because \sin^2\theta + \cos^2\theta = 1\}$$

$$3\sin\theta = 2 - 2\sin^2\theta$$

$$2\sin^2\theta + 3\sin\theta - 2 = 0$$

$$2\sin^2\theta + 4\sin\theta - \sin\theta - 2 = 0$$

$$2\sin\theta(\sin\theta + 2) - 1(\sin\theta + 2) = 0$$

$$(\sin\theta + 2)(2\sin\theta - 1) = 0$$

$$\sin\theta + 2 = 0 \quad \text{or} \quad 2\sin\theta - 1 = 0$$

$$\sin\theta = -2 \quad (\text{Unconsidered})$$

$$\sin\theta = \frac{1}{2} \quad \sin\theta = \sin 30^\circ$$

$$\theta = 30^\circ$$

$$\therefore \tan^2\theta + \sec^2\theta - \operatorname{cosec}^2\theta = \tan^2 30^\circ + \sec^2 30^\circ - \operatorname{cosec}^2 30^\circ$$

$$= \frac{1}{3} + \frac{4}{3} - 4$$

$$= \frac{5-12}{3} = \frac{-7}{3}$$

393. If $x = 4\cos A + 5\sin A$ and $y = 4\sin A - 5\cos A$, then the value of $x^2 + y^2$ is:

- (a) 16 (b) 25
(c) 0 (d) 41

SSC CGL (Tier-I) – 03/03/2020 (Shift-I)

Ans. (d) : $x = 4\cos A + 5\sin A$ (i)
 $y = 4\sin A - 5\cos A$ (ii)

By adding the square of equation (i) and (ii)

$$x^2 + y^2 = 16\cos^2 A + 25\sin^2 A + 40\sin A \cdot \cos A + 16\sin^2 A + 25\cos^2 A - 40\sin A \cdot \cos A$$

$$= 16(\cos^2 A + \sin^2 A) + 25(\sin^2 A + \cos^2 A)$$

$$= 16 + 25 = 41$$

394. If $x\cos A - y\sin A = 1$ and $x\sin A + y\cos A = 4$, then the value of $17x^2 + 17y^2$ is

- (a) 289 (b) 49
(c) 7 (d) 0

SSC CGL (Tier-I) – 06/03/2020 (Shift-I)

Ans. (a) : $x \cos A - y \sin A = 1$ (i)
 $x \sin A + y \cos A = 4$ (ii)
 By adding the square of equation (i) and (ii)
 $x^2 \cos^2 A + y^2 \sin^2 A - 2yx \sin A \cos A + x^2 \sin^2 A + y^2 \cos^2 A + 2yx \sin A \cos A = 17$
 $x^2 (\cos^2 A + \sin^2 A) + y^2 (\sin^2 A + \cos^2 A) = 17$
 $x^2 + y^2 = 17$
 $\therefore 17x^2 + 17y^2 = 289$

- 395. What is the value of $[(\cos^3 2\theta + 3 \cos 2\theta) \div (\cos^6 \theta - \sin^6 \theta)]$?**
 (a) 0 (b) 1
 (c) 4 (d) 2

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Given-

$$\frac{\cos^3 2\theta + 3 \cos 2\theta}{\cos^6 \theta - \sin^6 \theta}$$

 Put $\theta = 30^\circ$

$$\frac{\cos^3 60^\circ + 3 \cos 60^\circ}{\cos^6 30^\circ + \sin^6 30^\circ}$$

$$= \frac{\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + 3 \times \frac{1}{2}}{\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} - \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4}}$$

$$= \frac{\frac{1}{8} + \frac{3}{2}}{\frac{27}{64} - \frac{1}{64}}$$

$$= \frac{\frac{13}{8}}{\frac{26}{64}} = \frac{13}{8} \times \frac{64}{26} = 4$$

- 396. If $\sin x = 1/2$ and $\sin y = 2/3$, then what is the value of $[(6\cos^2 x - 4\cos^4 x) / (18\cos^2 y - 27\cos^4 y)]$?**
 (a) 27/20 (b) 15/14
 (c) 25/21 (d) 17/14

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $\because \sin x = \frac{1}{2}, \sin y = \frac{2}{3}$
 $\therefore \cos x = \frac{\sqrt{3}}{2}, \cos y = \frac{\sqrt{5}}{3}$

$$\frac{6\cos^2 x - 4\cos^4 x}{18\cos^2 y - 27\cos^4 y} = \frac{2\cos^2 x [3 - 2\cos^2 x]}{9\cos^2 y [2 - 3\cos^2 y]}$$

$$= \frac{2 \times \frac{3}{4} \times [3 - 2 \times \frac{3}{4}]}{9 \times \frac{5}{9} \times [2 - 3 \times \frac{5}{9}]} = \frac{\frac{3}{2} \times \frac{3}{2}}{5 \times \frac{1}{3}} = \frac{27}{20}$$

- 397. What is the value of $[(\sin x + \sin y) (\sin x - \sin y)] / [(\cos x + \cos y) (\cos y - \cos x)]$?**
 (a) 0 (b) 1
 (c) -1 (d) 2

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :
$$\frac{(\sin x + \sin y)(\sin x - \sin y)}{(\cos x + \cos y)(\cos y - \cos x)}$$

 From value putting,
 By putting the value $x = 90^\circ$ and $y = 0^\circ$

$$= \frac{(\sin 90^\circ + \sin 0^\circ)(\sin 90^\circ - \sin 0^\circ)}{(\cos 90^\circ + \cos 0^\circ)(\cos 0^\circ - \cos 90^\circ)}$$

$$= \frac{(1+0)(1-0)}{(0+1)(1-0)} = \frac{1}{1} = 1$$

- 398. If $2\cos^2 \theta + 3\sin \theta = 3$, where $0^\circ < \theta < 90^\circ$, then what is the value of $\sin^2 2\theta + \cos^2 \theta + \tan^2 2\theta + \operatorname{cosec}^2 2\theta$?**

- (a) $\frac{29}{6}$ (b) $\frac{29}{3}$
 (c) $\frac{35}{6}$ (d) $\frac{35}{12}$

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : $2\cos^2 \theta + 3\sin \theta = 3$
 $2(1 - \sin^2 \theta) + 3\sin \theta - 3 = 0$
 $-2\sin^2 \theta + 3\sin \theta - 1 = 0$
 $2\sin^2 \theta - 3\sin \theta + 1 = 0$
 $2\sin^2 \theta - 2\sin \theta - \sin \theta + 1 = 0$
 $2\sin \theta (\sin \theta - 1) - 1 (\sin \theta - 1) = 0$
 $(\sin \theta - 1) (2\sin \theta - 1) = 0$
 $\therefore \sin \theta = 1$
 $\theta = 90^\circ$ (अमान्य) [$\because 0^\circ < \theta < 90^\circ$]
 $\therefore \sin \theta = \frac{1}{2}$
 $\theta = 30^\circ$
 $\sin^2 2\theta + \cos^2 \theta + \tan^2 2\theta + \operatorname{cosec}^2 2\theta$
 $= \sin^2 60^\circ + \cos^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec}^2 60^\circ$
 $= \frac{3}{4} + \frac{3}{4} + 3 + \frac{4}{3}$
 $= \frac{3}{2} + \frac{13}{3}$
 $= \frac{35}{6}$

- 399. If θ lies in the first quadrant and $\cos^2 \theta - \sin^2 \theta = \frac{1}{2}$ then the value of $\tan^2 2\theta + \sin^2 3\theta$ is :**

- (a) $\frac{4}{3}$ (b) 3
 (c) $\frac{7}{2}$ (d) 4

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :
 $\cos^2 \theta - \sin^2 \theta = \frac{1}{2}$
 $\cos 2\theta = \cos 60^\circ$
 $2\theta = 60^\circ$
 $\theta = 30^\circ$

$$\begin{aligned}\therefore \tan^2 2\theta + \sin^2 3\theta &= \tan^2(2 \times 30^\circ) + \sin^2(3 \times 30^\circ) \\ &= \tan^2 60^\circ + \sin^2 90^\circ \\ &= (\sqrt{3})^2 + (1)^2 = 3 + 1 = 4\end{aligned}$$

400. $\frac{(1 + \cos\theta)^2 + \sin^2\theta}{(\operatorname{cosec}^2\theta - 1)\sin^2\theta} = ?$

- (a) $\cos\theta(1 + \sin\theta)$ (b) $\sec\theta(1 + \sin\theta)$
(c) $2\cos\theta(1 + \sec\theta)$ (d) $2\sec\theta(1 + \sec\theta)$

SSC CGL (Tier-II) 11-9-2019

Ans. (d) :

$$\begin{aligned}&\frac{(1 + \cos\theta)^2 + \sin^2\theta}{(\operatorname{cosec}^2\theta - 1)\sin^2\theta} \\ &= \frac{1 + \cos^2\theta + 2\cos\theta + \sin^2\theta}{\operatorname{cosec}^2\theta \cdot \sin^2\theta - \sin^2\theta} \\ &= \frac{1 + 2\cos\theta + 1}{1 - \sin^2\theta} \\ &= \frac{2(1 + \cos\theta)}{\cos^2\theta} \\ &= 2\left(\frac{1}{\cos^2\theta} + \frac{\cos\theta}{\cos^2\theta}\right) \\ &= 2(\sec^2\theta + \sec\theta) \\ &= 2\sec\theta(1 + \sec\theta)\end{aligned}$$

401. If $7 \sin^2\theta + 3 \cos^2\theta = 4$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan^2 2\theta + \operatorname{cosec}^2 2\theta)$ is:

- (a) 7 (b) $15/4$
(c) $13/3$ (d) $13/4$

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (c) $7 \sin^2\theta + 3 \cos^2\theta = 4$
 $3 \sin^2\theta + 3 \cos^2\theta + 4 \sin^2\theta = 4$
 $3(\sin^2\theta + \cos^2\theta) + 4 \sin^2\theta = 4$
 $(3 \times 1) + 4 \sin^2\theta = 4$
 $4 \sin^2\theta = 1$
 $\sin\theta = 1/2$
 $\theta = 30^\circ$
 $\therefore \tan^2 2\theta + \operatorname{cosec}^2 2\theta$
 $= \tan^2 60^\circ + \operatorname{cosec}^2 60^\circ$
 $= (\sqrt{3})^2 + \left(\frac{2}{\sqrt{3}}\right)^2$
 $= 3 + \frac{4}{3} = \frac{13}{3}$

402. If $3 + \cos^2\theta = 3(\cot^2\theta + \sin^2\theta)$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\cos\theta + 2\sin\theta)$?

- (a) $\frac{\sqrt{3} + 2}{2}$ (b) $3\sqrt{2}$
(c) $\frac{2\sqrt{3} + 1}{2}$ (d) $\frac{3\sqrt{3} + 1}{2}$

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (c) $3 + \cos^2\theta = 3(\cot^2\theta + \sin^2\theta)$
 $3 + 1 - \sin^2\theta = 3[\operatorname{cosec}^2\theta - 1 + \sin^2\theta]$
 $4 - \sin^2\theta = \frac{3}{\sin^2\theta} - 3 + 3\sin^2\theta$

$$7 = \frac{3}{\sin^2\theta} + 4\sin^2\theta$$

$$4\sin^4\theta - 4\sin^2\theta - 3\sin^2\theta + 3 = 0$$

$$4\sin^2\theta(\sin^2\theta - 1) - 3(\sin^2\theta - 1) = 0$$

$$(\sin^2\theta - 1)(4\sin^2\theta - 3) = 0$$

$$\therefore \sin^2\theta = 1$$

$$\theta = 90^\circ \text{ (Unconsideable) } [0^\circ < \theta < 90^\circ]$$

$$\therefore \sin^2\theta = \frac{3}{4}$$

$$\sin\theta = \frac{\sqrt{3}}{2}$$

$$\theta = 60^\circ$$

$$\text{Hence } \cos 60^\circ + 2\sin 60^\circ = \frac{1}{2} + 2 \times \frac{\sqrt{3}}{2} = \frac{2\sqrt{3} + 1}{2}$$

403. If $\sec\theta = 4x$ and $\tan\theta = \frac{4}{x}$, ($x \neq 0$) then value

of $8\left(x^2 - \frac{1}{x^2}\right)$ is :

- (a) $\frac{1}{8}$ (b) $\frac{1}{2}$
(c) $\frac{1}{16}$ (d) $\frac{1}{4}$

SSC CHSL 05/07/2019 (Shift-II)

Ans. (b) : $\sec\theta = 4x$ and $\tan\theta = \frac{4}{x}$

And $\sec^2\theta = (4x)^2$

$$\sec^2\theta = 16x^2 \quad \dots\dots\dots(i)$$

and $\tan^2\theta = \frac{16}{x^2} \quad \dots\dots\dots(ii)$

By subtracting equation (ii), from equation (i),

$$\sec^2\theta - \tan^2\theta = 16x^2 - \frac{16}{x^2}$$

$$1 = 16\left(x^2 - \frac{1}{x^2}\right) \quad \{\because \sec^2\theta - \tan^2\theta = 1\}$$

$$\frac{1}{2} = 8\left(x^2 - \frac{1}{x^2}\right)$$

By dividing from 2 in both equations.

$$\text{Hence } 8\left(x^2 - \frac{1}{x^2}\right) = \frac{1}{2}$$

404. If $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$ then the value of $4\operatorname{cosec}\theta + \cot\theta$ is :

- (a) 3 (b) $3\sqrt{3}$
(c) 4 (d) $4\sqrt{3}$

SSC CHSL 02/07/2019 (Shift-I)

Ans. (b) $\cos^2 \theta - \sin^2 \theta - 3 \cos \theta + 2 = 0$
 $\cos^2 \theta - (1 - \cos^2 \theta) - 3 \cos \theta + 2 = 0$
 $\Rightarrow \cos^2 \theta - 1 + \cos^2 \theta - 3 \cos \theta + 2 = 0$
 $\Rightarrow 2 \cos^2 \theta - 3 \cos \theta + 1 = 0$
 $\Rightarrow 2 \cos^2 \theta - 2 \cos \theta - \cos \theta + 1 = 0$
 $\Rightarrow 2 \cos \theta (\cos \theta - 1) - 1(\cos \theta - 1) = 0$
 $\Rightarrow (2 \cos \theta - 1)(\cos \theta - 1) = 0$

$\cos \theta = \frac{1}{2}, \cos \theta = 1$
 $\theta = 60^\circ, \theta = 0^\circ$ Unconsidered
 $[\because 0^\circ < \theta < 90^\circ]$
 $\therefore 4 \operatorname{cosec} 60^\circ + \cot 60^\circ$
 $= 4 \times \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= 3\sqrt{3}$

405. If $\left(\frac{1}{1 + \operatorname{cosec} \theta} - \frac{1}{1 - \operatorname{cosec} \theta} \right) \cos \theta = 2, 0^\circ < \theta < 90^\circ$

then the value $\sin^2 \theta + \cot^2 \theta + \sec^2 \theta$ **is :**

- (a) $2\frac{1}{2}$ (b) $3\frac{1}{2}$
 (c) 2 (d) 1

SSC CHSL 03/07/2019 (Shift-III)

Ans. (b) : $\left(\frac{1}{1 + \operatorname{cosec} \theta} - \frac{1}{1 - \operatorname{cosec} \theta} \right) \cos \theta = 2$
 $\Rightarrow \left(\frac{(1 - \operatorname{cosec} \theta) - (1 + \operatorname{cosec} \theta)}{(1 + \operatorname{cosec} \theta)(1 - \operatorname{cosec} \theta)} \right) \cos \theta = 2$
 $\Rightarrow \left(\frac{1 - \operatorname{cosec} \theta - 1 - \operatorname{cosec} \theta}{1 - \operatorname{cosec}^2 \theta} \right) \cos \theta = 2$
 $\Rightarrow \left(\frac{-2 \operatorname{cosec} \theta}{-\cot^2 \theta} \right) \cos \theta = 2$
 $\Rightarrow \left(\frac{2}{\sin \theta} \times \frac{\sin^2 \theta}{\cos^2 \theta} \right) \cos \theta = 2$
 $\Rightarrow 2 \tan \theta = 2$
 $\Rightarrow \tan \theta = 1$
 $\Rightarrow \theta = 45^\circ$

$\therefore \sin^2 \theta + \cot^2 \theta + \sec^2 \theta = \sin^2 45^\circ + \cot^2 45^\circ + \sec^2 45^\circ$
 $= \left(\frac{1}{\sqrt{2}} \right)^2 + (1)^2 + (\sqrt{2})^2$
 $= \frac{1}{2} + 1 + 2$
 $= 3\frac{1}{2}$

406. If $2 \sin^2 \theta + 5 \cos \theta - 4 = 0, 0^\circ < \theta < 90^\circ$ **then the value of** $\tan \theta + \sin \theta$ **is :**

- (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{2}{\sqrt{3}}$
 (c) $\frac{3\sqrt{3}}{2}$ (d) $\frac{\sqrt{3}}{3}$

SSC CHSL 04/07/2019 (Shift-III)

Ans. (c) : $2 \sin^2 \theta + 5 \cos \theta - 4 = 0, 0^\circ < \theta < 90^\circ$

$2(1 - \cos^2 \theta) + 5 \cos \theta - 4 = 0$
 $2 - 2 \cos^2 \theta + 5 \cos \theta - 4 = 0$
 $2 \cos^2 \theta - 5 \cos \theta + 2 = 0$
 $\cos \theta = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 2 \times 2}}{2 \times 2}$

$\cos \theta = \frac{5-3}{4}$ By taking the sign

$\cos \theta = \frac{1}{2} = \cos 60^\circ$

$\theta = 60^\circ$

$\therefore \tan \theta + \sin \theta = \tan 60^\circ + \sin 60^\circ$

$= \sqrt{3} + \frac{\sqrt{3}}{2}$

$= \frac{3\sqrt{3}}{2}$

407. for $0^\circ < \theta < 90^\circ$, **If** $2 \cos^2 \theta = 3 \sin \theta$ **then the value of** $(\operatorname{cosec}^2 \theta - \cot^2 \theta + \cos^2 \theta)$ **is :**

- (a) $1\frac{1}{2}$ (b) $1\frac{3}{4}$
 (c) $2\frac{1}{4}$ (d) $2\frac{3}{4}$

SSC CHSL 04/07/2019 (Shift-I)

Ans. (b) : $0^\circ < \theta < 90^\circ$

Given,

$2 \cos^2 \theta = 3 \sin \theta$

$2(1 - \sin^2 \theta) = 3 \sin \theta$

$2 \sin^2 \theta + 3 \sin \theta - 2 = 0$

$(2 \sin \theta - 1)(\sin \theta + 2) = 0$

$\sin \theta = \frac{1}{2}, \sin \theta = -2$ (Unconsidered)

$\theta = 30^\circ$

Hence $\operatorname{cosec}^2 \theta - \cot^2 \theta + \cos^2 \theta$
 $= \operatorname{cosec}^2(30^\circ) - \cot^2(30^\circ) + \cos^2 30^\circ$
 $= (2)^2 - (\sqrt{3})^2 + \left(\frac{\sqrt{3}}{2} \right)^2$

$= 4 - 3 + \frac{3}{4}$

$= 1 + \frac{3}{4} = 1\frac{3}{4}$

408. If $\sec\theta = 3x$ and $\tan\theta = \frac{3}{x}, (x \neq 0)$ then the value of $9\left(x^2 - \frac{1}{x^2}\right)$ is :

- (a) $\frac{1}{2}$ (b) 1
(c) $\frac{1}{3}$ (d) $\frac{1}{4}$

SSC CHSL 05/07/2019 (Shift-III)

Ans. (b) : $\sec\theta = 3x \Rightarrow \sec^2\theta = 9x^2$ (By squaring the both side)

$$\tan\theta = \frac{3}{x} \Rightarrow \tan^2\theta = \frac{9}{x^2}$$

$$\therefore \sec^2\theta - \tan^2\theta = 1$$

$$\Rightarrow 9x^2 - \frac{9}{x^2} = 1$$

$$\Rightarrow 9\left(x^2 - \frac{1}{x^2}\right) = 1$$

409. If $A = 2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$

then the value of 3α such that $\cos\alpha = \sqrt{\frac{3+A}{5+A}}$

is:

- (a) 135° (b) 45°
(c) 180° (d) 90°

SSC CHSL -13/10/2020 (Shift-I)

Ans. (a) : $A = 2(2\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$

$$A = 2\left[(\sin^2\theta)^3 + (\cos^2\theta)^3\right] - 3(\sin^4\theta + \cos^4\theta)$$

$$A = 2\left[(\sin^2\theta + \cos^2\theta)(\sin^4\theta + \cos^4\theta - \sin^2\theta\cos^2\theta)\right] - 3(\sin^4\theta + \cos^4\theta)$$

$$A = 2\sin^4\theta + 2\cos^4\theta - 2\sin^2\theta\cos^2\theta - 3\sin^4\theta - 3\cos^4\theta$$

$$A = -(\sin^2\theta + \cos^2\theta)^2$$

$$A = -1$$

$$\cos\alpha = \sqrt{\frac{3+A}{5+A}} = \frac{1}{\sqrt{2}}$$

$$\cos\alpha = \cos 45^\circ$$

$$\alpha = 45^\circ$$

$$3\alpha = 3 \times 45^\circ = 135^\circ$$

410. If $a \sin A + b \cos A = c$, then $a \cos A - b \sin A$ is equal to:

- (a) $\sqrt{a^2 - b^2 - c^2}$ (b) $\sqrt{a^2 - b^2 + c^2}$
(c) $\sqrt{a^2 + b^2 - c^2}$ (d) $\sqrt{a^2 + b^2 + c^2}$

SSC CHSL -18/03/2020 (Shift-I)

Ans. (c) : $a \sin A + b \cos A = c$ _____ (i)

Let $a \cos A - b \sin A = x$ _____ (ii)

By squaring the equation (i),

$$a^2 \sin^2 A + b^2 \cos^2 A + 2ab \sin A \cos A = c^2 \text{ _____ (iii)}$$

By squaring the equation (ii)

$$a^2 \cos^2 A + b^2 \sin^2 A - 2ab \sin A \cos A = x^2 \text{ _____ (iv)}$$

By adding the equation (iii) and (iv)

$$a^2(\sin^2 A + \cos^2 A) + b^2(\sin^2 A + \cos^2 A) = c^2 + x^2$$

$$c^2 + x^2 = a^2 + b^2$$

$$x^2 = a^2 + b^2 - c^2$$

$$x = \sqrt{a^2 + b^2 - c^2}$$

411. If $\sin\theta + \operatorname{cosec}\theta = 2$ then find the value of $(\sin^{153}\theta + \operatorname{cosec}^{253}\theta)$ is :

- (a) $\frac{253}{153}$ (b) $\frac{1}{153 \times 253}$
(c) $\frac{153}{253}$ (d) 2

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d) : $\sin\theta + \operatorname{cosec}\theta = 2$

$$\therefore \sin 90^\circ + \operatorname{cosec} 90^\circ = 2 \text{ On put the value of } \theta = 90^\circ$$

$$(1+1) = 2$$

$$2 = 2$$

L.H.S = R.H.S (is true)

$$\therefore \sin^{153}\theta + \operatorname{cosec}^{253}\theta = (\sin 90^\circ)^{153} + (\operatorname{cosec} 90^\circ)^{253}$$

$$= 1 + 1$$

$$= 2$$

412. If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$ then find the value

of $2\cot^2 x + 3\operatorname{cosec}^2 x$:

- (a) 8 (b) 16
(c) 14 (d) 18

SSC CHSL 09/07/2019 (Shift-I)

Ans. (d) : $\cos x = \frac{-\sqrt{3}}{2}$ $\pi < x < \frac{3\pi}{2}$ or $180^\circ < x < 270^\circ$

$$\cos x = -\cos 30^\circ$$

$$\Rightarrow \cos x = \cos(180^\circ + 30^\circ)$$

$$\Rightarrow \cos x = \cos 210^\circ$$

$$\Rightarrow x = 210^\circ$$

$$2\cot^2 x + 3\operatorname{cosec}^2 x = 2 \times \cot^2 210^\circ + 3\operatorname{cosec}^2 210^\circ$$

$$= 2\cot^2(180^\circ + 30^\circ) + 3\operatorname{cosec}^2(180^\circ + 30^\circ)$$

$$= 2 \times (\sqrt{3})^2 + 3 \times (-2)^2$$

$$= 6 + 12 = 18$$

413. If $\cot\theta = 5x$ and $\operatorname{cosec}\theta = \frac{5}{x} (x \neq 0)$ then value

of $5\left(x^2 - \frac{1}{x^2}\right)$:

- (a) $\frac{1}{5}$ (b) $\frac{1}{2}$
(c) $-\frac{1}{4}$ (d) $-\frac{1}{5}$

SSC CHSL 08/07/2019 (Shift-III)

Ans. (d) : Given- $\cot \theta = 5x$ and $\operatorname{cosec} \theta = \frac{5}{x}$

$$\Rightarrow \cot^2 \theta = 25x^2 \quad \dots\dots\dots(i)$$

And $\operatorname{cosec}^2 \theta = \frac{25}{x^2} \quad \dots\dots\dots(ii)$

From equation (i) and (ii)

$$\cot^2 \theta - \operatorname{cosec}^2 \theta = 25x^2 - \frac{25}{x^2}$$

$$\Rightarrow \cot^2 \theta - \operatorname{cosec}^2 \theta = 25 \left(x^2 - \frac{1}{x^2} \right)$$

$$\Rightarrow -1 = 5 \times 5 \left(x^2 - \frac{1}{x^2} \right) \quad \{1 + \cot^2 \theta = \operatorname{cosec}^2 \theta\}$$

$$\Rightarrow 5 \left(x^2 - \frac{1}{x^2} \right) = -\frac{1}{5}$$

414. If $\frac{5 \cot \theta + \sqrt{3} \operatorname{cosec} \theta}{2\sqrt{3} \operatorname{cosec} \theta + 3 \cot \theta} = 1$, $0^\circ < \theta < 90^\circ$, then

the value of $\frac{7 \cot^2 \theta - \frac{3}{4} \operatorname{cosec}^2 \theta}{4 \sin^2 \theta + \frac{3}{2} \tan^2 \theta}$ will be:

- (a) 2 (b) 7
(c) 5 (d) 3

SSC CHSL 10/082021 (Shift-II)

Ans. (c) : $\frac{5 \cot \theta + \sqrt{3} \operatorname{cosec} \theta}{2\sqrt{3} \operatorname{cosec} \theta + 3 \cot \theta} = 1$

$$5 \cot \theta + \sqrt{3} \operatorname{cosec} \theta = 2\sqrt{3} \operatorname{cosec} \theta + 3 \cot \theta$$

$$2 \cot \theta = \sqrt{3} \operatorname{cosec} \theta$$

$$\cos \theta = \frac{\sqrt{3}}{2} = \cos 30^\circ$$

$$\theta = 30^\circ$$

$$\frac{7 \cot^2 \theta - \frac{3}{4} \operatorname{cosec}^2 \theta}{4 \sin^2 \theta + \frac{3}{2} \tan^2 \theta} = \frac{7 \times \cot^2 30^\circ - \frac{3}{4} \operatorname{cosec}^2 30^\circ}{4 \sin^2 30^\circ + \frac{3}{2} \tan^2 30^\circ}$$

$$= \frac{\frac{7}{2} \times 3 - \frac{3}{4} \times 4}{4 \times \frac{1}{4} + \frac{3}{2} \times \frac{1}{3}} = \frac{15}{\frac{3}{2}} = 5$$

415. If $\cot^2 \theta + \cot^4 \theta = 2$, then the value of $2 \sin^4 \theta + \sin^2 \theta$ is:

- (a) 1 (b) 3
(c) 5 (d) 2

SSC CHSL 11/082021 (Shift-II)

Ans. (a) : $\cot^2 \theta + \cot^4 \theta = 2$

On putting the value of $\theta = 45^\circ$

$$\text{L.H.S} = \cot^2 45^\circ + \cot^4 45^\circ = 1 + 1 = 2 = \text{R.H.S}$$

$$\text{So, } 2 \sin^4 \theta + \sin^2 \theta = 2 \times \sin^4 45^\circ + \sin^2 45^\circ$$

$$= 2 \times \frac{1}{4} + \frac{1}{2} = \frac{1}{2} + \frac{1}{2} = 1$$

416. If $5k = \tan \theta$ and $\frac{5}{k} = \sec \theta$, then what is the value of $10 \left(k^2 - \frac{1}{k^2} \right)$?

- (a) $\frac{2}{5}$ (b) $-\frac{2}{5}$
(c) -2 (d) 2

SSC CHSL 16/04/2021 (Shift-III)

Ans.(b) : $5k = \tan \theta \Rightarrow k = \frac{\tan \theta}{5} \rightarrow (i)$

$$\frac{5}{k} = \sec \theta \Rightarrow \frac{1}{k} = \frac{\sec \theta}{5} \rightarrow (ii)$$

by equation (i) and (ii)

$$k^2 - \frac{1}{k^2} = \frac{\tan^2 \theta}{25} - \frac{\sec^2 \theta}{25} = \frac{-1}{25} \quad (\because \sec^2 \theta - \tan^2 \theta = 1)$$

$$\therefore 10 \left(k^2 - \frac{1}{k^2} \right) = 10 \times \frac{-1}{25} = \frac{-2}{5}$$

417. What is the value of

$$\tan \left(\frac{\pi}{4} + A \right) \times \tan \left(\frac{3\pi}{4} + A \right) ?$$

- (a) 1 (b) 0
(c) $\cot A/2$ (d) -1

SSC CGL (Tier-II) 18-02-2018

Ans. (d) :

$$\tan \left(\frac{\pi}{4} + A \right) \times \tan \left(\frac{3\pi}{4} + A \right)$$

$$\therefore \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$$

$$\therefore \frac{\tan \frac{\pi}{4} + \tan A}{1 - \tan \frac{\pi}{4} \cdot \tan A} \times \frac{\tan \frac{3\pi}{4} + \tan A}{1 - \tan \frac{3\pi}{4} \tan A}$$

$$\therefore \tan \frac{3\pi}{4} = -1, \tan \frac{\pi}{4} = 1$$

$$= \left(\frac{1 + \tan A}{1 - \tan A} \right) \times \left(\frac{-1 + \tan A}{1 + \tan A} \right) = -1$$

418. Which are increased continuously in the range $0^\circ < \theta > 90^\circ$

- (a) $\operatorname{cosec} \theta$ (b) $\cos \theta$
(c) $\cot \theta$ (d) $\tan \theta$

SSC CHSL (Tier-I) 09/07/2019 (Shift-III)

Ans. (d) : The value of $\sin \theta$ is increased between 0° to 90° and the value of $\cos \theta$ is decrease b/w 0° to 90°

Hence the value of $\operatorname{cosec} \theta$ is decrease and the value of $\sec \theta$ is increase continuously.

$$\therefore \tan \theta = \frac{\sin \theta}{\cos \theta}$$

Hence, the value of $\tan \theta$ will be increased and the value of \cot will be decreased continuously.

419. For all α_i ($i = 1, 2, 3, \dots, 20$) between 0^0 and 90^0 given that $\cos\alpha_1 + \cos\alpha_2 + \cos\alpha_3 + \dots + \cos\alpha_{20} = 20$ then find the value of $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$:

- (a) 0^0 (b) 900^0
(c) 1800^0 (d) 20^0

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (a) : Maximum value of $\cos\alpha = 1$
 $\alpha = 0^0$
 $\cos\alpha_1 + \cos\alpha_2 + \dots + \cos\alpha_{20} = 20$ is possible when,
 $\cos\alpha_1 = \cos\alpha_2 = \dots = \cos\alpha_{20} = 1$
 $\alpha_1 = \alpha_2 = \dots = \alpha_{20} = 0^0$
 $\therefore \alpha_1 + \alpha_2 + \dots + \alpha_{20} = 0 + 0 + \dots + 0 = 0^0$

420. Between 0^0 and 90^0 for all α_i ($i = 1, 2, 3, 4, \dots, 20$) given that $\sin\alpha_1 + \sin\alpha_2 + \sin\alpha_3 + \dots + \sin\alpha_{20} = 20$ then what is the value of $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$ in degree.

- (a) 20 (b) 1800
(c) 900 (d) 0

SSC CHSL (Tier-I) 11/07/2019 (Shift-I)

Ans. (b) : we know that the maximum value of $\sin\theta = 1$
 $\sin\alpha_1 + \sin\alpha_2 + \sin\alpha_3 + \dots + \sin\alpha_{20} = 20$,
 By taking the value of $\alpha_1 = \alpha_2 = \alpha_3, \dots, \alpha_{20} = 90^0$
 $\sin 90^0 + \sin 90^0 + \sin 90^0 + \dots + \sin 90^0 = 20$
 $\Rightarrow 1 + 1 + 1 + \dots + 1 = 20$
 $\Rightarrow 20 = 20$
 $\therefore \alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20} = 90 \times 20 = 1800$

421. If $x = \operatorname{cosec} A + \cos A$ and $y = \operatorname{cosec} A - \cos A$,

then find the value of $\left(\frac{2}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 - 1$.

- (a) 2 (b) 1
(c) 0 (d) 3

SSC CHSL -19/10/2020 (Shift-I)

Ans. (c) : $x = \operatorname{cosec} A + \cos A$, $y = \operatorname{cosec} A - \cos A$
 $x + y = 2 \operatorname{cosec} A$
 $x - y = 2 \cos A$
 \therefore
 $\left(\frac{2}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 - 1 = \left(\frac{2}{2\operatorname{cosec} A}\right)^2 + \left(\frac{2\cos A}{2}\right)^2 - 1$
 $= (\sin^2 A + \cos^2 A) - 1$
 $= 1 - 1 = 0$

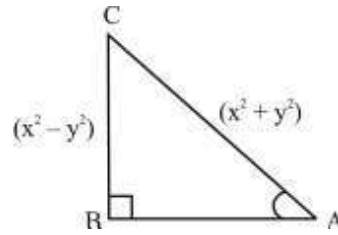
422. If $\operatorname{cosec} \theta = \frac{(x^2 + y^2)}{(x^2 - y^2)}$, then what will be the value of $\tan \theta$?

- (a) $\frac{(x^2 - y^2)}{2xy}$ (b) $\frac{(x^2 - y^2)}{(x^2 + y^2)}$

- (c) $\frac{(x^2 + y^2)}{2xy}$ (d) $\frac{2xy}{(x^2 - y^2)}$

SSC CHSL -16/10/2020 (Shift-I)

Ans. (a) : $\because \operatorname{cosec} \theta = \frac{x^2 + y^2}{x^2 - y^2}$



In right angle triangle ΔABC

$$AC^2 = AB^2 + BC^2$$

$$(x^2 + y^2)^2 = AB^2 + (x^2 - y^2)^2$$

or

$$AB^2 = (x^2 + y^2)^2 - (x^2 - y^2)^2$$

$$= (x^4 + y^4 + 2x^2y^2) - (x^4 + y^4 - 2x^2y^2)$$

$$= 4x^2y^2$$

$$\therefore AB = 2xy$$

$$\text{Hence } \tan \theta = \frac{x^2 - y^2}{2xy}$$

423. The general solution of the equation

$$\tan 3x + \cot\left(2x + \frac{\pi}{3}\right) = 0 \text{ is:}$$

- (a) $2n\pi \pm \frac{\pi}{3}, n \in \mathbb{Z}$ (b) $2n\pi \pm \frac{\pi}{6}, n \in \mathbb{Z}$
(c) $n\pi + \frac{\pi}{3}, n \in \mathbb{Z}$ (d) $n\pi + \frac{5\pi}{6}, n \in \mathbb{Z}$

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : $\tan 3x + \cot\left(2x + \frac{\pi}{3}\right) = 0$

$$\tan 3x = -\cot\left(2x + \frac{\pi}{3}\right)$$

$$\tan 3x = \cot\left(-2x - \frac{\pi}{3}\right)$$

$$\tan 3x = \tan\left(\frac{\pi}{2} - \left(-2x - \frac{\pi}{3}\right)\right)$$

$$\tan 3x = \tan\left(\frac{\pi}{2} + 2x + \frac{\pi}{3}\right)$$

or $3x = 2x + \frac{5\pi}{6}$

$$x = \frac{5\pi}{6}$$

So its general solution is $x = n\pi + \frac{5\pi}{6}, n \in \mathbb{Z}$

03.

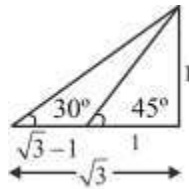
Height and Distance

1. The length of the shadow of a vertical tower on level ground increases by 8.4 cm when the altitude of the sun changes from 45° to 30° . What is the height of the tower (in m)?

- (a) $4.2(\sqrt{3}-1)$ (b) $8.4(\sqrt{3}+3)$
 (c) $4.2(\sqrt{3}+3)$ (d) $4.2(\sqrt{3}+1)$

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (d)



Given,

$$\sqrt{3}-1 \text{ unit} = 8.4$$

$$1 \text{ unit} = \frac{8.4 \times \sqrt{3} + 1}{2}$$

$$1 \text{ unit} = 4.2(\sqrt{3}+1)$$

Hence height of the tower is $4.2(\sqrt{3}+1)$ m.

2. A ladder 18m long rests against a wall so that the angle between the ladder and the wall is 30° . How far (in m) is the base of the ladder from the wall?

- (a) 18 (b) $9\sqrt{3}$
 (c) 9 (d) $18\sqrt{3}$

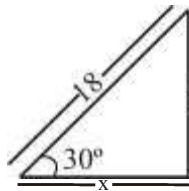
SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (b) Let the base of the ladder from the wall = x m.

$$\cos 30^\circ = \frac{x}{18}$$

$$\frac{\sqrt{3}}{2} = \frac{x}{18}$$

$$x = 9\sqrt{3} \text{ m}$$



3. The angle of depression of the boat from the masthead of a 180m high ship is 60° . Find the distance (in m) of the boat from the ship.

- (a) 360 (b) $60\sqrt{3}$
 (c) $180\sqrt{3}$ (d) 180

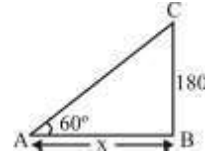
SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (b) Let the distance of the boat from the ship is x m.

$$\tan 60^\circ = \frac{180}{x}$$

$$\sqrt{3} = \frac{180}{x}$$

$$x = 60\sqrt{3}$$



4. The angle of elevation of the top of a tower $25\sqrt{3}$ m high from two points on the level ground on its opposite sides are 45° and 60° . What is the distance (in m) between the two points (correct to one decimal place)?

- (a) 45.3 (b) 58.4
 (c) 68.3 (d) 50.6

SSC CGL (Tier-II) 29/01/2022

Ans : (c)

Height of tower (AB) = $25\sqrt{3}$

In $\triangle ABC$,

$$\tan 60^\circ = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{25\sqrt{3}}{BC}$$

$$\Rightarrow BC = 25 \text{ cm}$$

Again, In $\triangle ABD$,

$$\tan 45^\circ = \frac{AB}{BD}$$

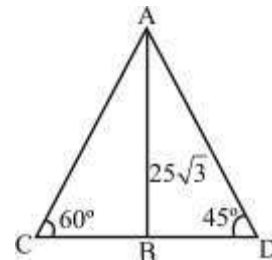
$$1 = \frac{25\sqrt{3}}{BD}$$

$$\Rightarrow BD = 25\sqrt{3}$$

Now, distance between the two points, $CD = CB + BD$

$$= 25 + 25\sqrt{3}$$

$$= 68.3 \text{ cm}$$



5. From a point P on a level ground, the angle of elevation of the top of the tower is 30° . If the distance of point P from the foot of the tower is 510 m, then 50% of the height of the tower (in m) is:

- (a) 85 (b) $\frac{85\sqrt{3}}{3}$
 (c) $85\sqrt{3}$ (d) $150\sqrt{3}$

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

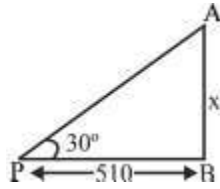
Ans : (c) Let the height of the tower is x m.

$$\tan 30^\circ = \frac{x}{510}$$

$$\frac{1}{\sqrt{3}} = \frac{x}{510}$$

$$x = 170\sqrt{3}$$

$$\begin{aligned} 50\% \text{ of the height of the tower} &= 170 \times \frac{50 \times \sqrt{3}}{100} \\ &= 85\sqrt{3} \end{aligned}$$



6. The length of the shadow on the ground of a tall tree of height 30m is $10\sqrt{3}$ m. What is the angle (in degrees) of elevation of the sun?

- (a) 60° (b) 15°
(c) 30° (d) 45°

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (a) From diagram,

$$\tan \theta = \frac{AC}{BC}$$

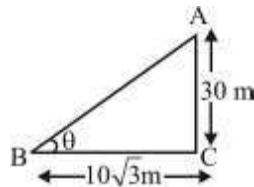
$$\tan \theta = \frac{30}{10\sqrt{3}}$$

$$\tan \theta = \sqrt{3}$$

$$\tan \theta = \tan 60^\circ$$

$$\theta = 60^\circ$$

Hence, the angle of elevation of the sun is 60° .

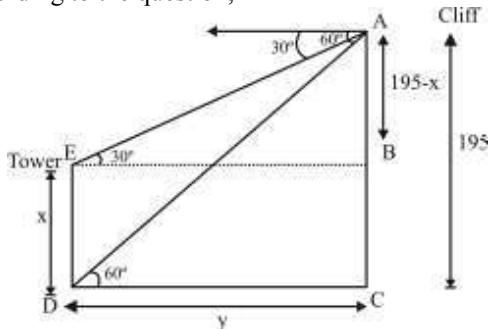


7. From the top of a 195-m high cliff, the angles of depression of the top and bottom of a tower are 30° and 60° , respectively, Find the height of the tower (in m).

- (a) $195\sqrt{3}$ (b) 195
(c) 130 (d) 65

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (c) Let, distance between cliff and tower = y m
Height of the tower = x m
According to the question,



In $\triangle AEB$,

$$\tan 30^\circ = \frac{195 - x}{y}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{195 - x}{y}$$

$$\Rightarrow y = \frac{195 - x}{\frac{1}{\sqrt{3}}}$$

$$y = (195 - x)\sqrt{3} \text{ -----(i)}$$

In $\triangle ADC$,

$$\tan 60^\circ = \frac{195}{y}$$

$$\Rightarrow \sqrt{3} = \frac{195}{y}$$

$$y = \frac{195}{\sqrt{3}} \text{ -----(ii)}$$

On putting the value of y in equation (i),

$$\frac{195}{\sqrt{3}} = (195 - x)\sqrt{3}$$

$$\Rightarrow 195 = (195 - x)3$$

$$\Rightarrow 195 = 585 - 3x$$

$$\Rightarrow 3x = 390$$

$$\therefore x = 130 \text{ m}$$

Hence, option (c) is correct.

8. From a point P on a level ground, the angle of elevation of the top of a tower is 30° . If the tower is $110\sqrt{3}$ m high, what is the distance (in m) of point P from the foot of the tower?

- (a) 330 (b) 220
(c) 115 (d) 110

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(a) According to the question,

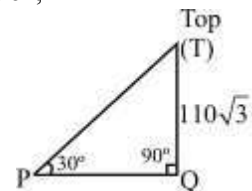
$$\therefore \tan 30^\circ = \frac{TQ}{PQ}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{110\sqrt{3}}{PQ}$$

$$\Rightarrow PQ = 110\sqrt{3} \times \sqrt{3}$$

$$\Rightarrow PQ = 110 \times 3$$

$$\therefore PQ = 330 \text{ m}$$

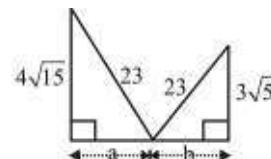


9. A pole 23 m long reaches a window which is $3\sqrt{5}$ m above the ground on one side of a street. Keeping its foot at the same point, the pole is turned to the other side of the street to reach a window $4\sqrt{15}$ m high. What is the width (in m) of the street?

- (a) 17 (b) 35
(c) 39 (d) 22

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (c)



$$a = \sqrt{(23)^2 - (4\sqrt{15})^2}$$

$$a = \sqrt{529 - 240}$$

$$a = \sqrt{289}$$

$$a = 17$$

$$b = \sqrt{(23)^2 - (3\sqrt{5})^2}$$

$$b = \sqrt{529 - 45}$$

$$b = 22$$

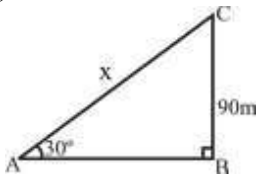
Width of the street $(a + b) = 22 + 17 = 39$ m.

10. A kite is attached to a string. Find the length of the string (in m) when the height of the kite is 90m and the string makes an angle of 30° with the ground.

- (a) 180 (b) $90\sqrt{3}$
(c) 45 (d) $60\sqrt{3}$

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (a)



Let the length of the string $(AC) = x$

$$\sin 30^\circ = \frac{BC}{AC}$$

$$\frac{1}{2} = \frac{90}{x}$$

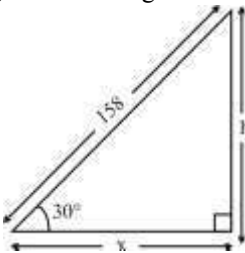
$$x = 180 \text{ m.}$$

11. The string of a kite is 158 m long and it makes an angle of 30° with the horizontal. What is the height (in m) of the kite? Assume there is no slack in the string.

- (a) 100 (b) 99
(c) 79 (d) 80

SSC CHSL 04/08/2021 (Shift-I)

Ans. (c) : Let the height of the kite be m.



$$\sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

$$\sin 30^\circ = \frac{h}{158}$$

$$\frac{1}{2} = \frac{h}{158}$$

$$h = \frac{158}{2}$$

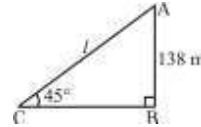
$$h = 79 \text{ cm}$$

12. A kite is flying at a height of 138 m above the ground. It is attached to a string inclined at 45° to the horizontal. What is the approximate length (in m) of the string?

- (a) 195 (b) 193
(c) 194 (d) 190

SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) :



Let the length of string $= l$ m

In $\triangle ABC$,

$$\sin 45^\circ = \frac{138}{l}$$

$$\frac{1}{\sqrt{2}} = \frac{138}{l}$$

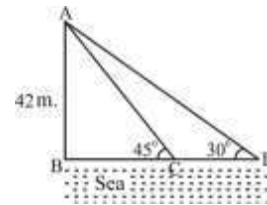
$$l = 138\sqrt{2} = 138 \times 1.414 = 195.13 \approx 195 \text{ m}$$

13. As observed from the top of a lighthouse, 42m high above sea-level, the angle of depression of a ship sailing directly towards it changes from 30° to 45° . The distance travelled by the ship during the period of observation is:

- (a) $42(1 - \sqrt{3})$ (b) $42(\sqrt{3} + 1)$
(c) $42(\sqrt{3} - 1)$ (d) 42

SSC CHSL 04/08/2021 (Shift-III)

Ans. (c) :



In $\triangle ABC$,

$$\tan 45^\circ = \frac{42}{BC}$$

$$BC = 42 \text{ m.}$$

In $\triangle ABD$,

$$\tan 30^\circ = \frac{42}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{42}{42 + CD}$$

$$42 + CD = 42\sqrt{3}$$

$$CD = 42(\sqrt{3} - 1) \text{ m.}$$

Hence, required distance $CD = 42(\sqrt{3} - 1)$

14. A straight vertical pole was broken during a cyclone in such a way that its top touched the ground at a distance of $6\sqrt{3}$ m from the bottom of the pole and made an angle of 30° with the horizontal. What was the height (in m) of the pole?

- (a) 12 (b) 18
(c) $12\sqrt{3}$ (d) $18\sqrt{3}$

SSC CHSL 13/04/2021 (Shift-II)

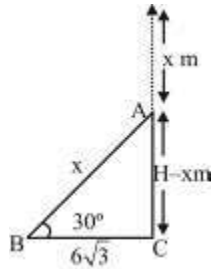
Ans. (b) : Let, the height of pole is H m.

In $\triangle ABC$

$$\sin 30^\circ = \frac{H-x}{x}$$

$$\frac{1}{2} = \frac{H-x}{x}$$

$$3x = 2H \Rightarrow H = \frac{3x}{2}$$



Now, $\cos 30^\circ = \frac{6\sqrt{3}}{x} \Rightarrow \frac{\sqrt{3}}{2} = \frac{6\sqrt{3}}{x}$

$$x = 12\text{m}$$

$$\therefore \text{height of the pole} = H = \frac{3x}{2}$$

$$= 3 \times \frac{12}{2}$$

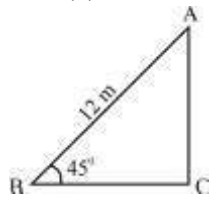
$$= 18\text{ m}$$

15. The angle of elevation of a ladder against a wall is 45° . The length of the ladder is 12 m. What is the distance between the wall and the foot of the ladder?

- (a) $4\sqrt{3}$ m (b) $6\sqrt{2}$ m
(c) $3\sqrt{2}$ m (d) $5\sqrt{3}$ m

SSC CHSL 06/082021 (Shift-II)

Ans. (b) :



$$\cos 45^\circ = \frac{BC}{AB} = \frac{BC}{12}$$

$$\frac{1}{\sqrt{2}} \times 12 = BC \Rightarrow BC = 6\sqrt{2}\text{ m}$$

\therefore Distance between the wall and the foot of the ladder (BC) = $6\sqrt{2}$ m

16. The length of the shadow of a vertical tower on level ground increases by 10 m when the altitude of the sun changes from 45° to 30° . The height of the tower is:

- (a) $10(\sqrt{3}+1)$ m (b) $5(\sqrt{3}+1)$ m
(c) $5(\sqrt{3})$ m (d) $10\sqrt{3}$ m

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the height of the tower = h m

In $\triangle ABC$,

$$\tan 30^\circ = \frac{h}{x+10}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{x+10} \text{ ---- (1)}$$

Again in $\triangle DBC$

$$\tan 45^\circ = \frac{h}{x}$$

$$1 = \frac{h}{x}$$

$$x = h \text{ ---- (2)}$$

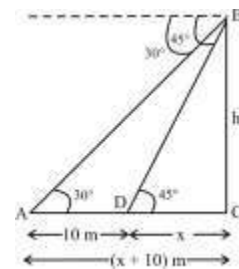
From equations (1) and (2)

$$\frac{1}{\sqrt{3}} = \frac{h}{h+10}$$

$$\Rightarrow h+10 = \sqrt{3}h \Rightarrow 10 = \sqrt{3}h - h$$

$$\Rightarrow h = \frac{10}{(\sqrt{3}-1)} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$h = 5(\sqrt{3}+1)\text{ m}$$



17. Seema flies a kite on a 16m string at an inclination of 60° . What is the height (h) of the kite above the ground?

- (a) $4\sqrt{3}$ m (b) $16\sqrt{3}$ m
(c) $6\sqrt{3}$ m (d) $8\sqrt{3}$ m

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

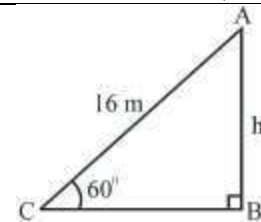
Ans. (d)

In $\triangle ABC$,

$$\sin 60^\circ = \frac{h}{16}$$

$$\frac{\sqrt{3}}{2} = \frac{h}{16}$$

$$h = 8\sqrt{3}\text{ m}$$



18. The angle of elevation of an aeroplane from a point on the ground is 60° . After flying for 30 seconds, the angle of elevation changes to 30° . If the aeroplane is flying at a height of 4500 m, then what is the speed (in m/s) of aeroplane?

- (a) $50\sqrt{3}$ (b) $100\sqrt{3}$
(c) $200\sqrt{3}$ (d) $300\sqrt{3}$

SSC CGL (Tier-II) 20-02-2018

Ans. (b) :

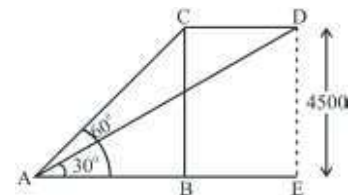
In $\triangle ABC$,

$$\tan 60^\circ = \frac{4500}{AB}$$

$$AB = 1500\sqrt{3} \text{(1)}$$

In $\triangle AED$,

$$\tan 30^\circ = \frac{4500}{AB+BE}$$



On putting the value of AB, from equation (1)

$$\frac{1}{\sqrt{3}} = \frac{4500}{1500\sqrt{3} + BE}$$

$$1500\sqrt{3} + BE = 4500\sqrt{3}$$

$$BE = 3000\sqrt{3}$$

$$\therefore \text{Speed of aeroplane} = \frac{3000\sqrt{3}}{30} = 100\sqrt{3} \text{ m/sec}$$

19. A kite is flying in the sky. The length of string between a point on the ground and kite is 420 m. The angle of elevation of string with the ground is 30° . Assuming that there is no slack in the string, then what is the height (in metres) of the kite ?

- (a) 210 (b) $140\sqrt{3}$
(c) $210\sqrt{3}$ (d) 150

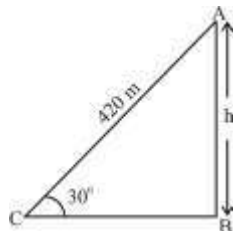
SSC CGL (Tier-II) 20-02-2018

Ans. (a) : Let the height of the kite (AB) = h m.

In $\triangle ABC$,

$$\sin 30^\circ = \frac{h}{420}$$

$$h = 420 \times \frac{1}{2} = 210 \text{ m}$$



20. A balloon leaves from a point P rises at a uniform speed. After 6 minutes, an observer situated at a distance of $450\sqrt{3}$ metres from point P observes that angle of elevation of the balloon is 60° . Assume that point of observation and point P are on the same level. What is the speed (in m/s) of the balloon ?

- (a) 4.25 (b) 3.75
(c) 4.5 (d) 3.45

SSC CGL (Tier-II) 20-02-2018

Ans. (b) :

In $\triangle ABP$,

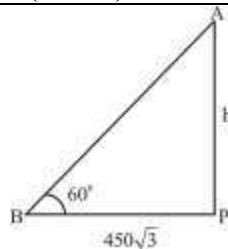
$$\tan 60^\circ = \frac{h}{450\sqrt{3}}$$

$$h = 450 \times \sqrt{3} \times \sqrt{3}$$

$$h = 1350 \text{ m}$$

$$\therefore \text{Speed of the Balloon} = \frac{1350}{6 \times 60} \text{ m/s}$$

$$= 3.75 \text{ m/s}$$

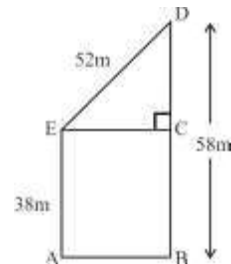


21. The distance between the tops of two building 38 metres and 58 metres high is 52 metres. What will be the distance (in metres) between two buildings ?

- (a) 46 (b) 42
(c) 44 (d) 48

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :



$$DC = 58 - 38 = 20 \text{ m.}$$

In $\triangle DCE$ –

$$EC = \sqrt{(DE)^2 - (DC)^2}$$

$$= \sqrt{(52)^2 - (20)^2}$$

$$= \sqrt{(52 + 20)(52 - 20)}$$

$$= \sqrt{72 \times 32}$$

$$= \sqrt{9 \times 8 \times 8 \times 4}$$

$$= 3 \times 8 \times 2$$

$$= 48$$

Hence, the distance between the two buildings = 48m.

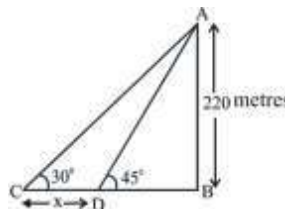
22. The angles of elevation of the top of a tree 220 metres high from two points lie on the same plane are 30° and 45° . What is the distance (in metres) between the two points ?

- (a) 193.22 (b) 144.04
(c) 176.12 (d) 161.05

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :

In $\triangle ABD$



In $\triangle ABD$

$$\tan 45^\circ = \frac{AB}{BD}$$

$$\Rightarrow BD = 220 \text{ m.(i)}$$

In $\triangle ABC$

$$\tan 30^\circ = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{220}{(220 + x)} \quad \{\text{From equation (i)}\}$$

$$\Rightarrow 220 + x = 220\sqrt{3}$$

$$\Rightarrow x = 220(\sqrt{3} - 1)$$

$$\Rightarrow x = 220 \times 0.732$$

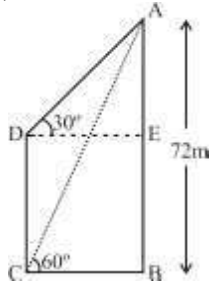
$$\Rightarrow x = 161.05 \text{ m}$$

23. The angles of elevation of the top of a tower 72 meters high from the top and bottom of a building are 30° and 60° respectively. What is the height (in metres) of building ?

- (a) 42 (b) $20\sqrt{3}$
(c) $24\sqrt{3}$ (d) 48

SSC CGL (Tier-II) 21-02-2018

Ans. (d)



In ΔABC

$$\tan 60^\circ = \frac{72}{BC} \Rightarrow BC = \frac{72}{\sqrt{3}}$$

In ΔAED

$$\tan 30^\circ = \frac{AE}{DE} \quad (\because DE = BC)$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AE}{\left(\frac{72}{\sqrt{3}}\right)}$$

$$\Rightarrow AE = 24$$

$$\begin{aligned} \text{Height of the building (DC)} &= AB - AE \\ &= 72 - 24 \\ &= \boxed{48 \text{ m}} \end{aligned}$$

24. On walking 100 metres towards a building in a horizontal line, the angle of elevation of its top changes from 45° to 60° . What will be the height (in metres) of the building?

- (a) $50(3 + \sqrt{3})$ (b) $100(\sqrt{3} + 1)$
(c) 150 (d) $100 + \sqrt{3}$

SSC CGL (Tier-II) 19-02-2018

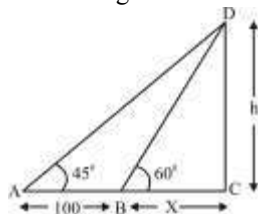
Ans. (a) : Let the height of the building = h m.

In ΔDBC

$$\tan 60^\circ = \frac{h}{x}$$

$$\sqrt{3} = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}} \quad \text{-----(i)}$$



In ΔDAC ,

$$\tan 45^\circ = \frac{h}{100 + x}$$

$$1 = \frac{h}{100 + x}$$

$$h = 100 + x$$

$$h = 100 + \frac{h}{\sqrt{3}} \quad [\text{From equation (i)}]$$

$$\frac{h(\sqrt{3}-1)}{\sqrt{3}} = 100$$

$$h = \frac{100\sqrt{3}}{(\sqrt{3}-1)}$$

$$h = 50(3 + \sqrt{3}) \text{ m.}$$

25. The upper part of a tree broken over by the wind make an angle of 60° with the ground. The distance between the root and the point where top of the tree touches the ground is 25 meters. What was the height (in meter) of the tree?

- (a) 84.14 (b) 93.3
(c) 98.25 (d) 120.24

SSC CGL (Tier-II) 19-02-2018

Ans. (b):

In ΔBAC

$$\tan 60^\circ = \frac{h}{25}$$

$$\sqrt{3} = \frac{h}{25}$$

$$h = 25\sqrt{3}$$

Again in ΔBAC

$$\cos 60^\circ = \frac{25}{AC}$$

$$\frac{1}{2} = \frac{25}{AC}$$

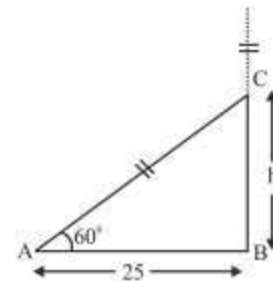
$$AC = 50 \text{ m.}$$

Hence, the total height of the tree = AC + BC

$$= 50 + 25\sqrt{3}$$

$$= 50 + 43.3$$

$$= 93.3 \text{ m.}$$

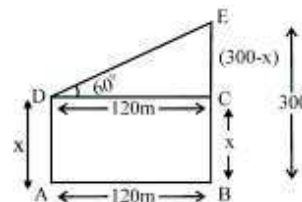


26. The height of a tower is 300 metres. When its top is seen from top of another tower, then the angle of elevation of 60° . The horizontal distance between the bases of the two towers is 120 metres. What is the height (in meters) of the small tower?

- (a) 88.24 (b) 106.71
(c) 92.15 (d) 112.64

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :



Let the height of the small tower be x meters—

In ΔCDE

$$\tan 60^\circ = \frac{300-x}{120}$$

$$\sqrt{3} = \frac{300-x}{120}$$

$$x = 300 - 120\sqrt{3} = 300 - 207.84$$

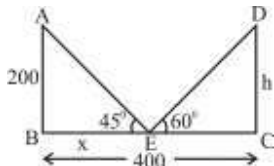
∴ Height of small tower (x) = 92.16m ≈ 92.15m

27. Two trees are standing along the opposite sides of a road. Distance between the two trees is 400 metres. There is a point on the road between the trees. The angle of depressions of the point from the top of the trees are 45° and 60°. If the height of the tree which makes 45° angle is 200 metres, then what will be the height (in metres) of the other tree ?

- (a) 200 (b) 200√3
(c) 100√3 (d) 250

SSC CGL (Tier-II) 18-02-2018

Ans. (b):



In ΔABE,

$$\tan 45^\circ = \frac{200}{x} \Rightarrow x = 200\text{m}$$

In ΔDCE,

$$\tan 60^\circ = \frac{h}{400 - 200} \Rightarrow h = 200\sqrt{3} \text{ m}$$

28. A tower stands on the top of a building which is 40 metres high. The angle of depression of a point situated on the ground from the top and bottom of the tower are found to be 60° and 45° respectively. What is the height (in metres) of tower ?

- (a) 20√3 (b) 30(√3 + 1)
(c) 40(√3 - 1) (d) 50(√3 - 1)

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Let, height of tower = x

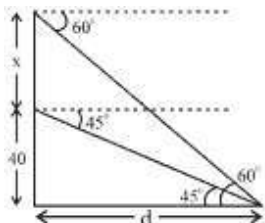
$$\tan 45^\circ = \frac{40}{d}$$

$$d = 40 \text{ m}$$

$$\tan 60^\circ = \frac{x+40}{d}$$

$$\sqrt{3} = \frac{x+40}{40}$$

$$x = 40(\sqrt{3} - 1) \text{ m}$$

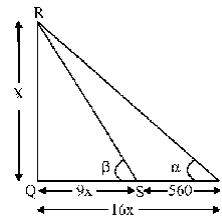


29. From a point P, the angle of elevation of a tower is such that its tangent is 3/4. On walking 560 metres towards the tower the tangent of the angle of elevation of the tower becomes 4/3. What is the height (in metres) of the tower ?

- (a) 720 (b) 960
(c) 840 (d) 1030

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :



Let the height of the tower be x meters.

$$\tan \alpha = \frac{3}{4}$$

$$\tan \beta = \frac{4}{3}$$

$$\tan \alpha = \left(\frac{4 \times 3}{4 \times 4} \right) \times x$$

$$\tan \beta = \left(\frac{4 \times 3}{3 \times 3} \right) \times x$$

According to question—

on walking 560m towards the tower—

$$(16x - 9x) = 560$$

$$x = 80$$

$$\text{Height of the tower} = 12x$$

$$= 12 \times 80$$

$$= 960 \text{ m.}$$

30. A flag of height 4 metres is standing on the top of a building. The angle of elevation of the top of the flag from a point X is 45° and the angle of elevation of the top of building from X is 30°. Point X is on the ground level. What is the height (in metres) of the building?

- (a) √3 + 2 (b) 2(√3 + 1)
(c) 4(√3 + 1) (d) (√3 + 1)

SSC CGL (Tier-II) 9-3-2018

Ans. (b):

Let the height of building (AB) = h m.

In ΔCBX,

$$\tan 45^\circ = \frac{4+h}{XB}$$

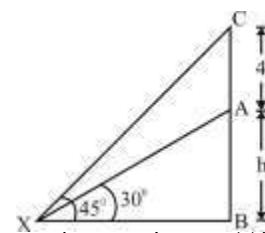
$$XB = 4 + h \dots\dots\dots (1)$$

In ΔABX,

$$\tan 30^\circ = \frac{h}{XB}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{4+h}$$

$$\sqrt{3}h - h = 4$$



$$h(\sqrt{3}-1) = 4$$

$$h = \frac{4}{\sqrt{3}-1} = 2(\sqrt{3}+1)\text{m}$$

31. Height of a tower is 120 metres. The angle of elevation of the top of tower from a point B is 75° . Point B is on the ground level. What is the distance (in metres) of point B from the base of tower?

- (a) $120(2-\sqrt{3})$ (b) $180(3-\sqrt{3})$
 (c) $180(\sqrt{3}-1)$ (d) $150(\sqrt{3}-1)$

SSC CGL (Tier-II) 9-3-2018

Ans. (a):

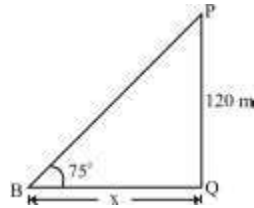
In ΔPQB ,

$$\tan 75^\circ = \frac{120}{x}$$

$$2 + \sqrt{3} = \frac{120}{x}$$

$$x = \frac{120}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - \sqrt{3}}$$

$$x = 120(2 - \sqrt{3})\text{m}$$



32. Mohit is standing at some distance from a 60 metres tall building. Mohit is 1.8 metres tall. When Mohit walks towards the building, then the angle of elevation from his head becomes 60° from 45° . How much distance (in metres) Mohit covered towards the building?

- (a) $18.6(4-\sqrt{3})$ (b) $58.2-24.6\sqrt{3}$
 (c) $19.4(\sqrt{3}+1)$ (d) $19.4(3-\sqrt{3})$

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

In ΔAGC ,

$$\tan 45^\circ = \frac{58.2}{CG}$$

$$1 = \frac{58.2}{CG}$$

$$CG = 58.2\text{m}$$

In ΔAGE ,

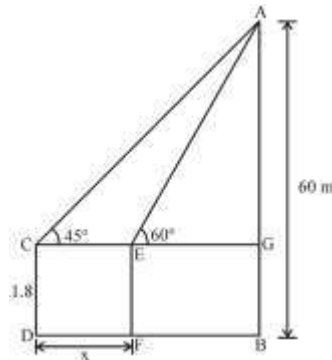
$$\tan 60^\circ = \frac{58.2}{EG}$$

$$EG = \frac{58.2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= 19.4\sqrt{3}\text{m}$$

$$\therefore x = 58.2 - 19.4\sqrt{3}$$

$$= 19.4(3 - \sqrt{3})\text{m}$$



33. A pole is standing on the top of a house. Height of house is 25 metres. The angle of elevation of the top of house from point P is 45° and the angle of elevation of the top of pole from P is 60° . Point P is on the ground level. What is the height (in metres) of pole?

(a) $10(\sqrt{3}+1)$

(b) $15(\sqrt{3}+1)$

(c) $25(\sqrt{3}-1)$

(d) $20(\sqrt{3}-1)$

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

Let the height of the pole = h m.

In ΔABP ,

$$\tan 45^\circ = \frac{25}{PB}$$

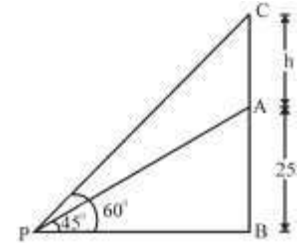
$$PB = 25 \dots\dots (i)$$

In ΔCBP ,

$$\tan 60^\circ = \frac{25+h}{PB}$$

$$\sqrt{3} = \frac{25+h}{25}$$

$$h = 25(\sqrt{3}-1)\text{m}$$



34. A ladder is placed against a wall such that it just reaches the top of the wall. The foot of the ladder is at a distance of 5 metres from the wall. The angle of elevation of the top of the wall from the base of the ladder is 15° . What is the length (in metres) of the ladder?

(a) $5\sqrt{6} - 5\sqrt{3}$

(b) $5\sqrt{6} - 5\sqrt{2}$

(c) $5\sqrt{2} - 1$

(d) $5\sqrt{3} + 5\sqrt{2}$

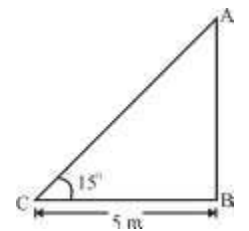
SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let the length of the ladder (AC) = l m.

In ΔABC ,

$$\cos 15^\circ = \frac{5}{l}$$

$$\frac{\sqrt{3}+1}{2\sqrt{2}} = \frac{5}{l}$$



$$\left[\because \cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}} \right]$$

$$l = \frac{10\sqrt{2}}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \frac{10(\sqrt{6}-\sqrt{2})}{2} = (5\sqrt{6} - 5\sqrt{2})\text{m.}$$

35. An aeroplane is flying horizontally at a height of 1.8 km above the ground. The angle of elevation of plane from point X is 60° and after 20 seconds, its angle of elevation from X is become 30° . If point X is on ground, then what is the speed (in km/hr) of aeroplane?

(a) $216\sqrt{3}$

(b) $105\sqrt{3}$

(c) $201\sqrt{3}$

(d) $305\sqrt{3}$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

In ΔABX ,

$$\tan 60^\circ = \frac{AB}{XB} = \frac{1.8}{XB}$$

$$XB = \frac{1.8}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 0.6\sqrt{3}\text{km}$$

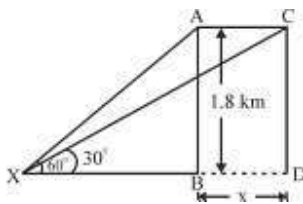
In ΔCDX ,

$$\tan 30^\circ = \frac{1.8}{0.6\sqrt{3} + x}$$

$$0.6\sqrt{3} + x = 1.8\sqrt{3}$$

$$x = 1.2\sqrt{3}\text{km}$$

$$\begin{aligned} \text{Speed of the aeroplane} &= \frac{1.2\sqrt{3}}{20} \times 3600\text{km/h} \\ &= 216\sqrt{3}\text{km/h} \end{aligned}$$



36. Two points P and Q are at the distance of x and y (where $y > x$) respectively from the base of a building and on a straight line. If the angles of elevation of the top of the building from points P and Q are complementary, then what is the height of the building?

- (a) xy (b) $\sqrt{(y/x)}$
(c) $\sqrt{(x/y)}$ (d) $\sqrt{(xy)}$

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

In ΔABP ,

$$\frac{h}{x} = \tan(90^\circ - \theta)$$

$$h = x \cot\theta \text{ -----(i)}$$

In ΔABQ ,

$$\frac{h}{y} = \tan\theta$$

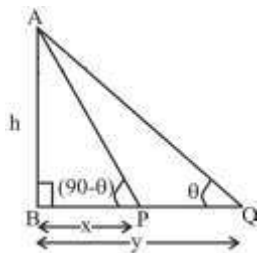
$$h = y \tan\theta \text{ -----(ii)}$$

From equations (i) and (ii)

$$h^2 = xy \cot\theta \cdot \tan\theta$$

$$h^2 = xy$$

$$h = \sqrt{xy}$$



37. The tops of two poles of height 60 metres and 35 metres are connected by a rope. If the rope makes an angle with the horizontal whose tangent is $5/9$ metres, then what is the distance (in metres) between the two poles?

- (a) 63 (b) 30
(c) 25 (d) 45

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

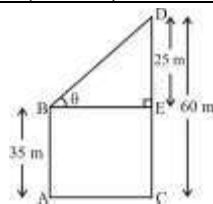
Given,

$$\tan\theta = \frac{5}{9}$$

$$5 \text{ Unit} = 25$$

$$9 \text{ Unit} = 45\text{m}$$

Hence, It is clear that the distance between the poles = 45m

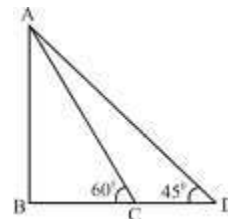


38. A Navy captain going away from a lighthouse at the speed of $4[(\sqrt{3}) - 1]$ m/s. He observes that it takes him 1 minute to change the angle of elevation of the top of the lighthouse from 60° to 45° . What is the height (in metres) of the lighthouse?

- (a) $240\sqrt{3}$ (b) $480[(\sqrt{3}) - 1]$
(c) $360\sqrt{3}$ (d) $280\sqrt{2}$

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :



$$CD = 4(\sqrt{3} - 1) \times 60 = 240(\sqrt{3} - 1)\text{m}$$

$$\tan 60^\circ = \frac{AB}{BC} \Rightarrow AB = \sqrt{3}BC \text{(i)}$$

$$\tan 45^\circ = \frac{AB}{BC + CD} \Rightarrow AB = BC + 240(\sqrt{3} - 1) \text{(ii)}$$

From equation (i) and (ii)–

$$\sqrt{3}BC = BC + 240(\sqrt{3} - 1)$$

$$(\sqrt{3} - 1)BC = 240(\sqrt{3} - 1)$$

$$BC = 240 \text{ m}$$

From equation (i),

$$AB = 240\sqrt{3} \text{ m}$$

39. P and Q are two points on the ground on either side of a pole. The angles of elevation of the top of the pole as observed from P and Q are 60° and 30° , respectively and the distance between them is $84\sqrt{3}$ m. What is the height (in m) of the pole?

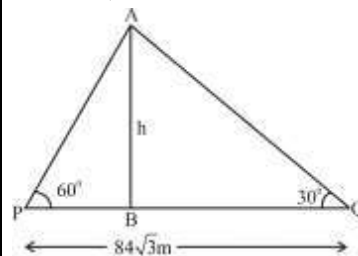
- (a) 60 (b) 63
(c) 52.5 (d) 73.5

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

Let the height of the pole (AB) = h m.

In ΔABP ,



$$\tan 60^\circ = \frac{h}{PB}$$

$$PB = \frac{h}{\sqrt{3}} \text{(1)}$$

In ΔABQ ,

$$\tan 30^\circ = \frac{h}{BQ}$$

$$BQ = h\sqrt{3} \dots\dots(2)$$

$$\therefore PQ = PB + BQ$$

$$84\sqrt{3} = \frac{h}{\sqrt{3}} + h\sqrt{3}$$

$$252 = h + 3h$$

$$4h = 252$$

$$h = 63 \text{ m}$$

40. From a point exactly midway between the foot of two towers P and Q, the angles of elevation of their tops are 30° and 60° , respectively. The ratio of the height of P to that of Q is :

- (a) 1 : 3 (b) 1 : $2\sqrt{3}$
 (c) 1 : 2 (d) 2 : $3\sqrt{3}$

SSC CGL (Tier-II) 12-09-2019

Ans. (a) :

In ΔPOA ,

$$\tan 30^\circ = \frac{h_1}{OP}$$

$$h_1 = OP \times \frac{1}{\sqrt{3}} \dots\dots(i)$$

In ΔQOB –

$$\tan 60^\circ = \frac{h_2}{OQ}$$

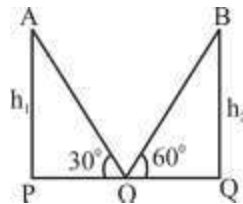
$$h_2 = OQ \times \sqrt{3} \dots\dots(ii)$$

From equations (i) and (ii)–

$$\frac{h_1}{h_2} = \frac{OP \times \frac{1}{\sqrt{3}}}{OQ \times \sqrt{3}} \quad \therefore OP = OQ$$

$$\frac{h_1}{h_2} = \frac{1}{3}$$

$$\therefore h_1 : h_2 = 1 : 3$$

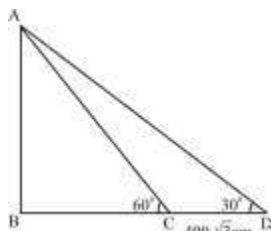


41. From the top of a tower, the angles of depression of two objects on the ground on the same side of it, are observed to be 60° and 30° respectively and the distance between the objects is $400\sqrt{3}$ m. The height (in m) of the tower is :

- (a) 600 (b) $600\sqrt{3}$
 (c) 800 (d) $800\sqrt{3}$

SSC CGL (Tier-II) 11-9-2019

Ans. (a) :



Let the height of the tower (AB) = h m
 In ΔABC

$$\tan 60^\circ = \frac{h}{BC} \Rightarrow h = BC \cdot \sqrt{3} \quad \text{---(i)}$$

In ΔABD

$$\tan 30^\circ = \frac{h}{BC + 400\sqrt{3}} \Rightarrow h = \frac{BC + 400\sqrt{3}}{\sqrt{3}} \quad \text{---(ii)}$$

From equations (i) and (ii)–

$$BC \cdot \sqrt{3} = \frac{BC + 400\sqrt{3}}{\sqrt{3}}$$

$$3BC = BC + 400\sqrt{3}$$

$$BC = 200\sqrt{3}$$

From equation (i)

$$\therefore h = BC \cdot \sqrt{3} = 200\sqrt{3} \times \sqrt{3}$$

$$h = 600 \text{ m.}$$

42. A ladder is resting against a wall. The angle between the foot of the ladder and wall is 60° , and the foot of the ladder is 3.6 m away from the wall. The length of the ladder (in m) is:

- (a) 3.6 (b) 7.2
 (c) 14.4 (d) 5.4

SSC CPO-SI 24/11/2020 (Shift-II)

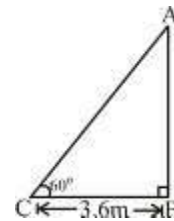
Ans. (b) : Let AC be the ladder.

In ΔABC ,

$$\cos 60^\circ = \frac{3.6}{AC}$$

$$\frac{1}{2} = \frac{3.6}{AC}$$

$$AC = 7.2 \text{ m}$$

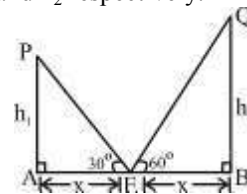


43. Let A and B be two towers with same base. From the midpoint of the line joining their feet, the angles of elevation of the tops of A and B are 30° and 60° , respectively. The ratio of the heights of B and A is:

- (a) 1 : 2 (b) 1 : $\sqrt{3}$
 (c) 3 : 1 (d) 1 : 3

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : Let A and B be the heights of towers with equal bases h_1 and h_2 respectively.



$\therefore AE = EB = x$ (Suppose)

In ΔPAE ,

$$\tan 30^\circ = \frac{h_1}{x}$$

$$x = \frac{h_1}{\tan 30^\circ} = \sqrt{3}h_1 \quad \text{---(i)}$$

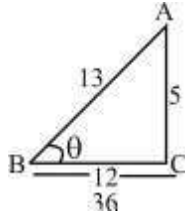
In ΔQBE ,

$$\tan 60^\circ = \frac{h_2}{x}$$

48. The length of the shadow of a vertical pole on the ground is 36 m. If the angle of elevation of the sun at that time is θ , such that $\sec \theta = \frac{13}{12}$, then what is the height (in cm) of the pole?
- (a) 12 (b) 15
(c) 9 (d) 18

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b):



$$12 : 36 = 1 : 3$$

The length of the shadow = 36

$$\therefore \sec \theta = \frac{13}{12} = \frac{\text{Hypotenuse}}{\text{Base}}$$

$$\text{Hypotenuse}^2 = \text{Perpendicular}^2 + \text{Base}^2$$

$$13^2 = \text{Perpendicular}^2 + 12^2$$

$$\text{Perpendicular (AC)} = 5$$

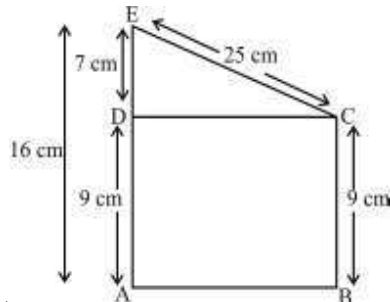
$$\text{Length of the pole} = 5 \times 3 = 15 \text{ cm}$$

49. Asha and Suman's mud forts have heights 9 cm and 16 cm. If the fort tops are at 25 cm apart from each other, then the distance (in cm) between two forts is:

- (a) 24 (b) 16
(c) 7 (d) 25

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : The height of both the houses are 9 cm and 16 cm respectively and the tops of the houses are 25 cm away from each other.



In $\triangle DEC$,

From Pythagoras theorem

$$EC^2 = DE^2 + DC^2$$

$$625 = 49 + DC^2$$

$$DC^2 = 625 - 49$$

$$DC^2 = 576$$

$$DC = 24 \text{ cm.}$$

Hence, the distance between two forts = 24 cm.

50. The length of the shadow of a vertical pole on the ground is 18 m. If the angle of elevation of the sun at that time is θ , such that $\cos \theta = \frac{12}{13}$, then what is the height (in m) of the pole?

- (a) 7.5 (b) 9
(c) 18 (d) 12

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : $\therefore \cos \theta = \frac{12}{13}$

Let the height of the pole = h

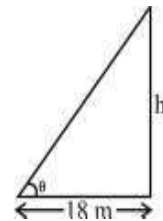
$$\therefore \cos \theta = \frac{12}{13} = \frac{\text{Base}}{\text{Hypotenuse}}$$

\therefore Perpendicular = 5 (From Triplet)

$$\tan \theta = \frac{h}{18}$$

$$\frac{5}{12} = \frac{h}{18}$$

$$h = \frac{5 \times 3}{2} = 7.5$$



51. A person was standing on a road near a mall. He was 1425 m away from the mall and able to see the top of the mall from the road in such a way that the top of a tree, which is in between him and the mall, was exactly in line of sight with the top of the mall. The tree height is 10 m and it is 30 m away from him. How tall (in m) is the mall?

- (a) 525 (b) 475
(c) 425 (d) 300

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) :

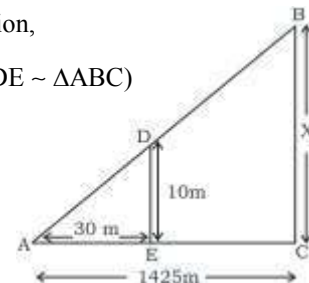
Let the height of the mall = x m.

According to the question,

$$\frac{DE}{BC} = \frac{AE}{AC} \text{ ---- } (\triangle ADE \sim \triangle ABC)$$

$$\frac{10}{x} = \frac{30}{1425}$$

$$x = 475$$



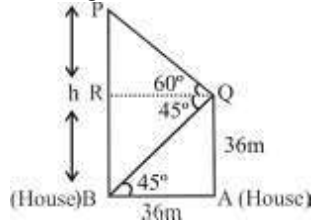
Hence, the height of the mall is 475 m.

52. From the top of a house A in a street, the angles of elevation and depression of the top and foot of another house B on the opposite side of the street are 60° and 45° , respectively. If the height of house A is 36 m, then what is the height of house B? (Your answer should be nearest to an integer)

- (a) 98m (b) 91m
(c) 94m (d) 93m

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (a) : Let the height of house B = h m



In ΔQAB , $\tan 45^\circ = \frac{36}{AB} \Rightarrow AB = 36 \Rightarrow AB = RQ$

In ΔPRQ , $\tan 60^\circ = \frac{PR}{RQ} \Rightarrow \sqrt{3} = \frac{PR}{36}$

$PR = 36\sqrt{3} = 36 \times 1.732$

$PR = 62.352$

$PB = PR + RB (\because RB = QA)$

$= 62.352 + 36$

$PB = 98.352 \approx 98\text{m}$

53. The angles of elevation of the top of a tower from two points on the ground at distances 32m and 18 m from its base and in the same straight line with it are complementary. The height (in m) of the tower is _____.

- (a) 20 (b) 28
(c) 24 (d) 16

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c) : Let the height of the tower = h m.

And the angle of elevation are θ and $(90^\circ - \theta)$ respectively.

In ΔABC ,

$\tan \theta = \frac{AB}{BC} = \frac{h}{32} \dots\dots\dots(i)$

In ΔABD ,

$\tan(90^\circ - \theta) = \frac{AB}{BD} = \frac{h}{18}$

$\cot \theta = \frac{h}{18}$

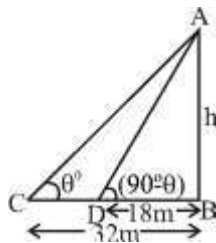
$\tan \theta = \frac{18}{h} \dots(ii)$

From equations (i) and (ii),

$\frac{h}{32} = \frac{18}{h}$

$h^2 = 18 \times 32 = 576$

$h = 24\text{m}$



54. A clock tower stands at the crossing of two roads which point in the north-south and the east-west directions. P,Q,R and S are points on the roads due north, east, south and west respectively, where the angles of elevations of the top of the tower are respectively. α, β, γ and δ . Then $\left(\frac{PQ}{RS}\right)^2$ is equal to:

δ . Then $\left(\frac{PQ}{RS}\right)^2$ is equal to:

- (a) $\frac{\cot^2 \alpha + \cot^2 \beta}{\cot^2 \gamma + \cot^2 \delta}$ (b) $\frac{\tan^2 \alpha + \tan^2 \delta}{\tan^2 \beta + \tan^2 \gamma}$

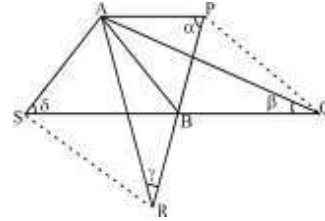
- (c) $\frac{\tan^2 \alpha + \tan^2 \delta}{\tan^2 \gamma + \tan^2 \delta}$ (d) $\frac{\cot^2 \alpha + \cot^2 \delta}{\cot^2 \beta + \cot^2 \gamma}$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (a) : Let the height of the clock house = AB

And $\angle PBA = \angle QBA = \angle RBA = \angle SBA = 90^\circ$

(Since, AB is perpendicular to the ground)



In ΔABP ,

$BP = AB \cot \alpha$

In ΔABQ

$BQ = AB \cot \beta$

In ΔABR

$BR = AB \cot \gamma$

In ΔABS

$BS = AB \cot \delta$

$\frac{PQ^2}{RS^2} = \frac{PB^2 + BQ^2}{BS^2 + BR^2}$

$= \frac{AB^2 \cot^2 \alpha + AB^2 \cot^2 \beta}{AB^2 \cot^2 \delta + AB^2 \cot^2 \gamma}$

$= \frac{\cot^2 \alpha + \cot^2 \beta}{\cot^2 \delta + \cot^2 \gamma}$

55. A pole stands vertically on a road, which goes in the north-south direction. P, Q are two points towards the north of the pole, such that $PQ = b$, and the angles of elevation of the top of the pole at P, Q are α, β respectively. Then the height of the pole is:

- (a) $\frac{b \tan \alpha}{\tan \beta}$ (b) $\frac{b}{\cot \beta - \cot \alpha}$
(c) $\frac{b}{\tan \beta + \tan \alpha}$ (d) $\frac{b}{\tan \beta - \tan \alpha}$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b) :

$\tan \beta = \frac{SR}{b + QR} \dots(i)$

$\tan \alpha = \frac{SR}{QR}$

$QR = \frac{SR}{\tan \alpha} \dots(ii)$

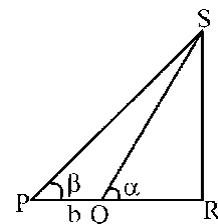
From equations (i) and (ii)–

$\tan \beta = \frac{SR}{b + \frac{SR}{\tan \alpha}}$

$\frac{1}{\cot \beta} = \frac{SR}{b + SR \cdot \cot \alpha}$

$b = (\cot \beta - \cot \alpha)SR$

$SR = \frac{b}{\cot \beta - \cot \alpha}$



56. A 22m long ladder (whose foot is on the ground) leans against a wall making an angle of 60° with the wall. What is the height (in m) of the point where the ladder touches the wall from the ground?

- (a) $11\sqrt{2}$ (b) $11\sqrt{3}$
 (c) 11 (d) $\frac{22\sqrt{2}}{3}$

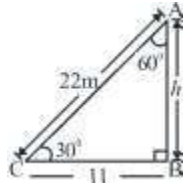
SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) : In $\triangle ABC$,

$$\sin 30^\circ = \frac{h}{22}$$

$$\frac{1}{2} = \frac{h}{22}$$

$$h = 11 \text{ m}$$



57. As observed from the top of a lighthouse, 45m high above the sea-level, the angle of depression of a ship, sailing directly towards it, changes from 30° to 45° . The distance travelled by the ship during the period of observation is: (Your answer should be correct to one decimal place.)

- (a) 24.8m (b) 33.4m
 (c) 36.9m (d) 32.9m

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) : In $\triangle ABC$,

$$\tan 45^\circ = \frac{45}{BC}$$

$$1 = \frac{45}{BC}$$

$$BC = 45 \dots (i)$$

In $\triangle ABD$,

$$\tan 30^\circ = \frac{45}{BD}$$

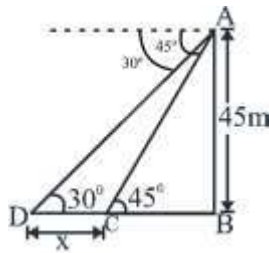
$$\frac{1}{\sqrt{3}} = \frac{45}{BD}$$

$$BD = 45\sqrt{3} \dots (ii)$$

From equation (ii) – equation (i):–

$$x = BD - BC = 45\sqrt{3} - 45 = 45(\sqrt{3} - 1)$$

$$x = 45(1.732 - 1) = 45 \times 0.732 = 32.94\text{m} = 32.9\text{m}$$



58. A kite is flying at a height of 123m. The thread attached to it is assumed to be stretched straight and makes an angle of 60° with level ground. The length of the string is (nearest to a whole number)

- (a) 142m (b) 139m
 (c) 140m (d) 138m

SSC CPO-SI – 11/12/2019 (Shift-I)

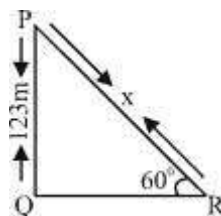
Ans. (a) : In $\triangle PQR$,

$$\sin 60^\circ = \frac{PQ}{PR} = \frac{123}{x}$$

$$\frac{\sqrt{3}}{2} = \frac{123}{x}$$

$$x = 41\sqrt{3} \times 2 = 82 \times 1.732$$

$$\boxed{x = 142\text{m}}$$

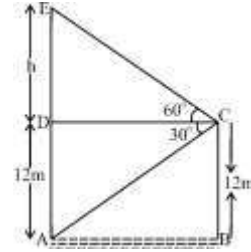


59. From a point 12 m above the water level, the angle of elevation of the top of a hill is 60° and the angle of depression of the base of the hill is 30° . What is the height (in m) of the hill?

- (a) 48 (b) $48\sqrt{3}$
 (c) $36\sqrt{3}$ (d) 36

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a)



Let the angle of elevation and depression of the top and the base of the hill from point C 12m above the water level AB be 60° and 30° respectively.

$$\text{Height of the hill (AE)} = (h + 12) \text{ m}$$

In $\triangle ADC$,

$$\tan 30^\circ = \frac{AD}{CD} = \frac{12}{CD}$$

$$\Rightarrow CD = 12\sqrt{3}\text{m}$$

Again, in $\triangle CDE$,

$$\tan 60^\circ = \frac{ED}{CD} = \frac{h}{12\sqrt{3}}$$

$$\sqrt{3} = \frac{h}{12\sqrt{3}} \Rightarrow h = 36 \text{ m}$$

Since, height of the hill = $(h + 12) = (36 + 12) = 48 \text{ m}$

60. The angle of elevation of the top of a tree from a point on the ground which is 300 m away from the tree is 30° . When the tree grew up, its angle of elevation of the top of it became 60° from the same point. How much did the tree grow? (nearest to an integer)

- (a) 346 m (b) 364 m
 (c) 342 m (d) 384 m

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a)

Let the initial height of the tree = BD

In $\triangle BDC$

$$\tan 30^\circ = \frac{BD}{300}$$

$$BD = 100\sqrt{3}\text{m}$$

Total height of the tree = AB

$$\tan 60^\circ = \frac{AB}{300}$$

$$AB = 300\sqrt{3}$$

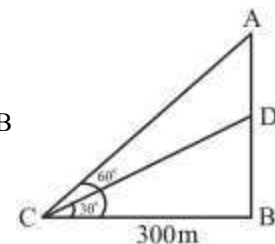
$$AD + BD = 300\sqrt{3}$$

$$AD = 300\sqrt{3} - 100\sqrt{3}$$

$$AD = 200\sqrt{3} = 200 \times 1.73 = 346.4$$

$$AD = 346\text{m}$$

Hence, the increase in the height of the tree = 346m



61. From the top of a lamp post of height x metres, two objects on the ground on the same side of it (and in line with the foot of the lamp post) are observed at angles of depression of 30° and 60° , respectively. The distance between the objects is $32\sqrt{3}$ m. The value of x is:

- (a) 45 (b) 36
(c) 48 (d) 54

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) Let the lighthouse be PQ and the height of PQ be x .

In ΔPQA ,

$$\tan 60^\circ = \frac{PQ}{QA}$$

$$\sqrt{3} = \frac{x}{\ell}$$

$$\boxed{x = \sqrt{3}\ell} \quad \dots(i)$$

In ΔPQB ,

$$\tan 30^\circ = \frac{PQ}{QB}$$

$$\frac{1}{\sqrt{3}} = \frac{x}{\ell + 32\sqrt{3}}$$

$$\boxed{x = \frac{\ell + 32\sqrt{3}}{\sqrt{3}}} \quad \dots(ii)$$

From equations (i) and (ii)–

$$\sqrt{3}\ell = \frac{\ell + 32\sqrt{3}}{\sqrt{3}}$$

$$3\ell = \ell + 32\sqrt{3}$$

$$\boxed{\ell = 16\sqrt{3}}$$

$$\therefore x = \sqrt{3}\ell = \sqrt{3} \times 16\sqrt{3} \quad (\text{from equation i})$$

$$x = 48\text{m}$$

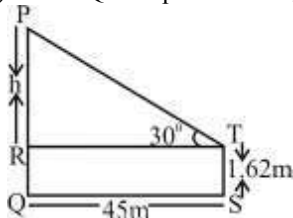
Hence, Height of the lighthouse $x = 48\text{m}$.

62. An observer who is 1.62m tall is 45 m away from a pole. The angle of elevation of the top of the pole from his eyes is 30° . The height (in m) of the pole is closest to:

- (a) 26.2 (b) 27.6
(c) 25.8 (d) 26.8

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b) : Let PQ be a pole and height of PR = h



$$\therefore (TS = RQ)$$

$$PQ = h + RQ$$

$$PQ = h + 1.62\text{ m}$$

In ΔPRT

$$\tan 30^\circ = \frac{PR}{RT}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{45}$$

$$h = \frac{45}{\sqrt{3}} = 15\sqrt{3}$$

$$= 15 \times 1.732$$

$$h = 25.98\text{m}$$

\therefore Height of the pole (PQ) = $h + 1.62$

$$PQ = 25.98 + 1.62$$

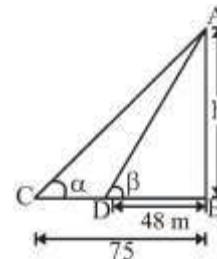
$$PQ = 27.6\text{m}$$

63. The angles of elevation of a pole from two points which are 75 m and 48 m away from its base are α and β , respectively. If α and β are complementary, then the height of the tower is:

- (a) 60m (b) 50m
(c) 61.5m (d) 54.5m

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) :



Let the height of the pole = h m

$$\tan \alpha = \frac{h}{75} \quad \dots(i)$$

$$\tan \beta = \frac{h}{48} \quad \dots(ii)$$

On multiplying equations (i) and (ii)–

$$\tan \alpha \cdot \tan \beta = \frac{h}{75} \times \frac{h}{48}$$

$$\tan \alpha \cdot \tan (90 - \alpha) = \frac{h}{75} \times \frac{h}{48}$$

$$\therefore \tan (90 - \alpha) = \cot \alpha$$

$$\cot \alpha = \frac{1}{\tan \alpha}$$

$$1 = \frac{h^2}{75 \times 48}$$

$$h = 60\text{m}$$

64. Two points A and B are on the ground and on opposite sides of a tower. A is closer to the foot of tower by 42 m than B. If the angles of elevation of the tower, as observed from A and B are 60° and 45° , respectively, then the height of the tower is closest to:

- (a) 98.6m (b) 87.6m
(c) 99.4m (d) 88.2m

SSC CPO-SI 13/12/2019 (Shift-II)

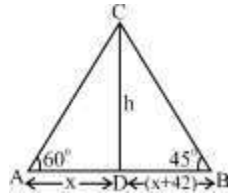
Ans. (c) Let the height of the tower CD = h m

In $\triangle CDA$,

$$\tan 60^\circ = \frac{h}{x}$$

$$\sqrt{3} = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}} \text{----- (i)}$$



In $\triangle CDB$,

$$\tan 45^\circ = \frac{h}{x+42}$$

$$1 = \frac{h}{x+42}$$

$$h = x + 42$$

From equation (i)–

$$h = \frac{h}{\sqrt{3}} + 42$$

$$\sqrt{3}h = h + 42\sqrt{3}$$

$$h(\sqrt{3} - 1) = 42\sqrt{3}$$

$$h = \frac{42\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{42\sqrt{3}(\sqrt{3}+1)}{2}$$

$$h = 63 + 21\sqrt{3}$$

$$h = 63 + 21 \times 1.732 = 63 + 36.372$$

$$h = 99.4 \text{ m (Approx)}$$

65. A ladder leaning against a window of a house makes an angle of 60° with the ground. If the distance of the foot of the ladder from the wall is 4.2m, then the height of the point, where the ladder touches the window from the ground is closest to:

- (a) 6.8m (b) 7.3m
(c) 7m (d) 7.8m

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) : Height of the wall (PQ) = h m, QR = 4.2m

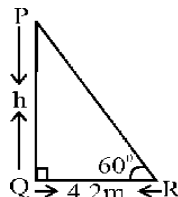
In $\triangle PQR$,

$$\tan 60^\circ = \frac{h}{4.2}$$

$$h = 1.732 \times 4.2$$

$$= 7.2744$$

$$\approx 7.3\text{m}$$

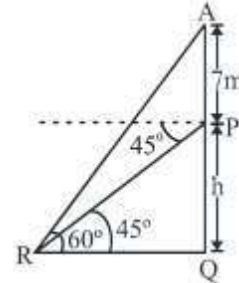


66. A pole of length 7m is fixed vertically on the top of a tower. The angle of elevation of the top of the pole observed from a point on the ground is 60° and the angle of depression of the same point on the ground from the top of the tower is 45° . The height (in m) of the tower is:

- (a) $7\sqrt{3}$ (b) $7(2\sqrt{3}-1)$
(c) $\frac{7}{2}(\sqrt{3}+2)$ (d) $\frac{7}{2}(\sqrt{3}+1)$

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) : Let the height of tower PQ be h meters.



In $\triangle PQR$,

$$\tan 45^\circ = \frac{h}{QR}$$

$$QR = h$$

In $\triangle AQR$,

$$\tan 60^\circ = \frac{7+h}{QR}$$

$$\sqrt{3}h = 7+h$$

$$h(\sqrt{3}-1) = 7$$

$$h = \frac{7}{\sqrt{3}-1} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

$$h = \frac{7}{2}(\sqrt{3}+1)\text{m}$$

67. The shadow of a tree is $\frac{1}{\sqrt{3}}$ times the length of the tree. Find the angle of elevation.

- (a) 45° (b) 90°
(c) 60° (d) 30°

SSC CHSL-18/03/2020 (Shift-III)

Ans. (c) :

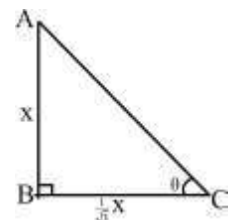
In $\triangle ABC$,

$$\tan \theta = \frac{x}{\frac{1}{\sqrt{3}}x}$$

$$\tan \theta = \sqrt{3}$$

$$\tan \theta = \tan 60^\circ$$

$$\theta = 60^\circ$$



(I) Problems based on Lines and Angles

1. The angles of a triangle are $(8x - 15)^\circ$, $(6x - 11)^\circ$ and $(4x - 10)^\circ$. what is the value of x ?
- (a) 12° (b) 16°
 (c) 15° (d) 18°

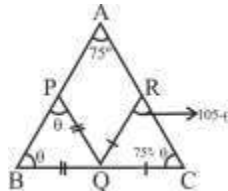
SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(a) From question,
 \therefore Sum of all angles of a triangle = 180°
 $\therefore 8x - 15^\circ + 6x - 11^\circ + 4x - 10^\circ = 180^\circ$
 $\Rightarrow 18x - 36^\circ = 180^\circ$
 $\Rightarrow 18x = 216^\circ \therefore x = 12^\circ$

2. In a $\triangle ABC$, Points P, Q and R are taken on AB, BC and CA, respectively, such that $BQ = PQ$ and $QC = QR$. If $\angle BAC = 75^\circ$, what is the measure of $\angle PQR$ (in degrees)?
- (a) 40 (b) 30
 (c) 50 (d) 75

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

Ans. (b)

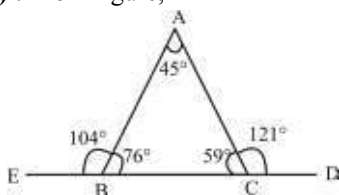


$\angle RQC = 180^\circ - 105^\circ + \theta - 105^\circ + \theta$
 $\angle RQC = 2\theta - 30^\circ$
 $\angle PQB = 180^\circ - 2\theta$
 $\angle PQR + \angle PQB + \angle RQC = 180^\circ$
 $\angle PQR = 180^\circ - 180^\circ + 2\theta - 2\theta + 30^\circ$
 $\angle PQR = 30^\circ$

3. The exterior angle obtained on producing the base of a triangle both the ways are 121° and 104° . What is the measure of the largest angle of the triangle?
- (a) 66° (b) 75°
 (c) 76° (d) 74°

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : From figure,



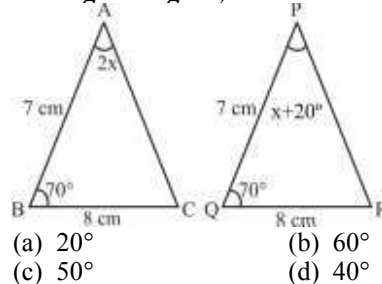
2

$\therefore \angle ABE = 104^\circ$ (\therefore given)
 $\therefore \angle ABC = 180^\circ - 104^\circ = 76^\circ$
 $\therefore \angle ACD = 121^\circ$ (\therefore given)
 $\therefore \angle ACB = 180^\circ - 121^\circ = 59^\circ$
 $\angle A = 180^\circ - (\angle B + \angle C)$
 $= 180^\circ - (76^\circ + 59^\circ)$
 $= 180^\circ - 135^\circ$
 $\angle A = 45^\circ$
 $\angle B = 76^\circ$
 $\angle C = 59^\circ$

Hence, measure of the largest angle of the triangle $\angle B = 76^\circ$

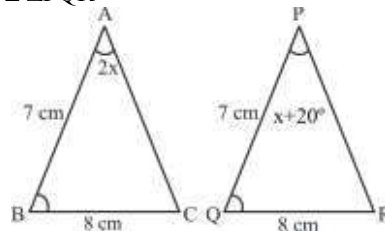
(II) Problems based on Congruency and Similarity of Triangles

4. In the given figure, the measure of $\angle A$ is:



SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : From Side – Angle – Side Congruency Rule,
 $\triangle ABC \cong \triangle PQR$



$\therefore \angle A = \angle P$
 $2x = x + 20^\circ$
 $x = 20^\circ$
 $\therefore \angle A = 2x = 2 \times 20^\circ = 40^\circ$

5. The perimeters of two similar triangles, $\triangle ABC$ and $\triangle PQR$ are 48.4 cm and 12.1 cm, respectively. What is the ratio of the areas of $\triangle ABC$ and $\triangle PQR$?

- (a) 4 : 1 (b) 1 : 16
 (c) 16 : 1 (d) 1 : 4

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (c) $\frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle PQR} = \frac{\text{Side of } \triangle ABC}{\text{Side of } \triangle PQR}$

$$\frac{48.4}{12.1} = \frac{\text{Side of } \triangle ABC}{\text{Side of } \triangle PQR}$$

$$\frac{4}{1} = \frac{\text{Side of } \triangle ABC}{\text{Side of } \triangle PQR}$$

$$\frac{\text{area of } \triangle ABC}{\text{area of } \triangle PQR} = \left(\frac{4}{1}\right)^2 = 16 : 1$$

6. In a triangle ABC, points P and Q are on AB and AC, respectively, such that AP = 4cm, PB = 6 cm, AQ = 5 cm and QC = 7.5 cm. If PQ = 6 cm, then find BC (in cm).

- (a) 10 (b) 9
(c) 15 (d) 12

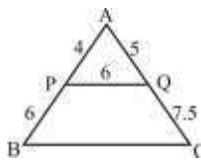
SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (c)

$$\frac{AP}{AB} = \frac{PQ}{BC}$$

$$\frac{4}{10} = \frac{6}{BC}$$

$$BC = 15\text{cm.}$$

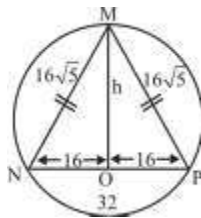


7. An isosceles $\triangle MNP$ is inscribed in a circle. If $MN = MP = 16\sqrt{5}$ cm, and $NP = 32$ cm, what is the radius (in cm) of the circle?

- (a) 20 (b) $18\sqrt{5}$
(c) 18 (d) $20\sqrt{5}$

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (a)



$$\therefore R = \frac{abc}{4\Delta}$$

$$R = \frac{16\sqrt{5} \times 16\sqrt{5} \times 32}{4 \times \frac{1}{2} \times 32 \times 32}$$

$$R = 20\text{cm.}$$

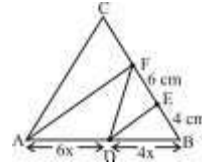
$$\begin{aligned} \therefore h &= \sqrt{(16\sqrt{5})^2 - (16)^2} \\ h &= \sqrt{256(5-1)} \\ h &= 32\text{cm} \end{aligned}$$

8. In a triangle ABC, a point D lies on AB and points E and F lie on BC such that DF is parallel to AC and DE is parallel to AF. If BE = 4 cm, EF = 6 cm, then find the length (in cm) of BC.

- (a) 30 (b) 20
(c) 25 (d) 15

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (c) :



$\triangle BDE$ similar to $\triangle ABF$ and

$$\begin{cases} AD = 6x \\ DB = 4x \end{cases}$$

$\triangle DBF$ similar to $\triangle ABC$

$$\therefore \frac{AB}{BC} = \frac{DB}{BF}$$

$$\Rightarrow \frac{10x}{BC} = \frac{4x}{10}$$

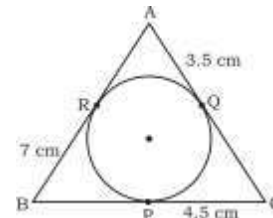
$$BC = 25\text{ cm}$$

9. A circle is inscribed in a triangle ABC. It touches sides AB, BC and AC at points R, P and Q, respectively. If $AQ = 3.5$ cm, $PC = 4.5$ cm and $BR = 7$ cm, then the perimeter (in cm) of the triangle $\triangle ABC$ is:

- (a) 30 (b) 45
(c) 15 (d) 28

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) :



Tangents drawn from external point of a circle are equal.

Hence, $AR = AQ = 3.5$ cm (Given $AQ = 3.5$ cm)

$BP = BR = 7$ cm (Given $BP = 7$ cm)

$CQ = CP = 4.5$ cm (Given $CP = 4.5$ cm)

Perimeter of $\triangle ABC = AB + BC + CA$.

$= (AR+BR) + (BP+CP) + (AQ+CQ)$

$= (3.5+7) + (7+4.5) + (3.5+4.5)$

$= 10.5 + 11.5 + 8 = 30$ cm.

10. A circle is inscribed in a triangle ABC. It touches side AB, BC and AC at points R, P and Q, respectively. If $AQ = 2.6$ cm, $PC = 2.7$ cm and $BR = 3$ cm, then the perimeter (in cm) of the triangle $\triangle ABC$ is:

- (a) 30 (b) 16.6
(c) 33.2 (d) 28

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Given,

$AQ = 2.6$ cm

$PC = 2.7$ cm

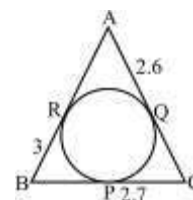
$BR = 3$ cm

\therefore Perimeter of $\triangle ABC$

$= 2 \times (AQ + PC + BR)$

$= 2 \times (2.6+2.7+3)$

$= 2 \times 8.3 = 16.6$ cm



11. Let $\Delta ABC \sim \Delta PQR$ and $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{64}{169}$. If

$AB = 10$ cm, $BC = 7$ cm and $AC = 16$ cm, then PR (in cm) is equal to:

- (a) 21 (b) 13
(c) 26 (d) 15

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (c) $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{64}{169}$

$$\frac{\text{Side}(\Delta ABC)}{\text{Side}(\Delta PQR)} = \frac{8}{13}$$

$$\frac{AC}{PR} = \frac{\text{Side}(\Delta ABC)}{\text{Side}(\Delta PQR)}$$

$$\frac{8}{13} = \frac{16}{PR}$$

$$PR = 26 \text{ cm.}$$

12. The sides PQ and PR of ΔPQR are produced to points S and T , respectively. The bisectors of $\angle SQR$ and $\angle TRQ$ meet at point U . If $\angle QUR = 69^\circ$, then the measure of $\angle P$ is:

- (a) 31° (b) 69°
(c) 21° (d) 42°

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

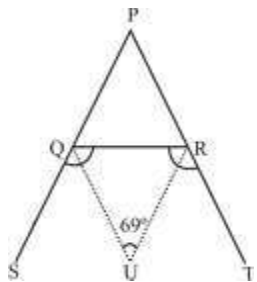
Ans : (d)

$$\therefore \angle QUR = 90^\circ - \frac{1}{2} \angle P$$

$$\Rightarrow 69^\circ = 90^\circ - \frac{1}{2} \angle P$$

$$\Rightarrow \frac{1}{2} \angle P = 21^\circ$$

$$\Rightarrow \angle P = 42^\circ$$



13. In ΔABC , $AB = 7$ cm, $BC = 10$ cm and $AC = 8$ cm. If AD is the angle bisector of $\angle BAC$, where D is a point of BC , then DC (in cm) = ?

- (a) $14/3$ (b) $16/3$
(c) $11/3$ (d) $17/3$

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (b) $DC = x$ (say)

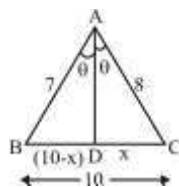
$$\Rightarrow BD = (10 - x)$$

$$\frac{AB}{AC} = \frac{BD}{DC}$$

$$\frac{7}{8} = \frac{10 - x}{x}$$

$$15x = 80$$

$$x = \frac{16}{3} \text{ cm}$$



[From Angle bisector theorem]

14. A circle is inscribed in ΔABC , touching AB , BC and AC at the points P , Q and R , respectively. If $AB - BC = 4$ cm, $AB - AC = 2$ cm and the perimeter of $\Delta ABC = 32$ cm, then $\frac{BC}{2}$ (in cm) = ?

- (a) $\frac{20}{3}$ (b) $\frac{13}{3}$
(c) $\frac{11}{3}$ (d) $\frac{10}{3}$

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (b) Given-

$$AB - BC = 4 \text{ (i)}$$

$$AB - AC = 2 \text{ (ii)}$$

$$\text{Perimeter of } \Delta ABC = 32$$

$$AB + BC + AC = 32 \text{ (iii)}$$

On adding equation (i), (ii) and (iii)

$$3AB = 32 + 4 + 2$$

$$\Rightarrow 3AB = 38$$

$$\Rightarrow AB = \frac{38}{3}$$

From equation (i) -

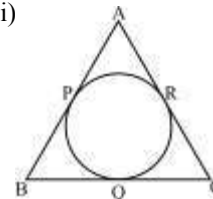
$$AB - BC = 4$$

$$BC = AB - 4$$

$$BC = \frac{38}{3} - 4$$

$$BC = \frac{26}{3}$$

$$\therefore \frac{BC}{2} = \frac{26}{3 \times 2} = \frac{13}{3} \text{ cm}$$



15. In a ΔABC , D , E and F are the mid-points of side BC , CA and AB respectively. If $BC = 14.4$ cm, $CA = 15.2$ cm and $AB = 12.4$ cm, what is the perimeter (in cm) of the ΔDEF ?

- (a) 42 (b) 28
(c) 21 (d) 35

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (c) Since D , E and F are the midpoints of side BC , CA and AB respectively.

$$\text{Thus, } \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = 2$$

$$\Delta ABC \sim \Delta DEF$$

Now

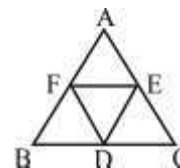
$$\text{Perimeter of } \Delta DEF = DE + EF + DF$$

$$= \frac{AB}{2} + \frac{BC}{2} + \frac{AC}{2}$$

$$= \frac{12.4}{2} + \frac{14.4}{2} + \frac{15.2}{2}$$

$$= 6.2 + 7.2 + 7.6$$

$$= 21 \text{ cm}$$



16. In ΔPQR , S is a point on the side QR such that PS is the bisector of $\angle QPR$. If $PQ = 12$ cm, $QS = 3$ cm and $QR = 7$ cm, then what is the length of side PR ?

- (a) 18 cm (b) 14 cm
(c) 15 cm (d) 16 cm

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (d) From question,

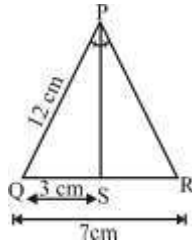
As we know that,

$$\frac{PQ}{PR} = \frac{QS}{SR}$$

$$\frac{12}{PR} = \frac{3}{(7-3)}$$

$$\frac{12}{PR} = \frac{3}{4}$$

$$\therefore PR = 16 \text{ cm}$$

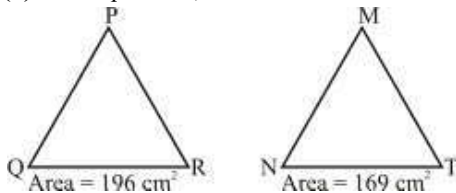


17. The area of similar triangles PQR and MNT are 196 cm^2 and 169 cm^2 respectively. If the longest side of the larger ΔPQR be 28 cm then what is the length (in cm) of the longest side of the smaller ΔMNT ?

- (a) 26 (b) 24
(c) 25 (d) 27

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (a) From question,



Longest side = 28cm

We know that,

$$\frac{\text{Area of } \Delta PQR}{\text{Area of } \Delta MNT} = \left(\frac{\text{Side of } \Delta PQR}{\text{Side of } \Delta MNT} \right)^2$$

$$\frac{196}{169} = \left(\frac{28}{\text{Side of } \Delta MNT} \right)^2$$

$$\sqrt{\frac{196}{169}} = \frac{28}{\text{Side of } \Delta MNT}$$

$$\frac{14}{13} = \frac{28}{\text{Side of } \Delta MNT}$$

$$\therefore \text{Longest side of smaller } \Delta MNT = 13 \times 2 = 26 \text{ cm}$$

18. In ΔABC , $AB = 7 \text{ cm}$, $BC = 10 \text{ cm}$, and $AC = 8 \text{ cm}$. If AD is the angle bisector of $\angle BAC$, where D is a point on BC , then $\frac{DC}{4}$ (in cm) is equal to:

- (a) $\frac{14}{3}$ (b) $\frac{4}{3}$
(c) $\frac{11}{3}$ (d) $\frac{7}{3}$

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b)

By angle bisector rule,

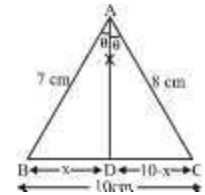
$$AB \times CD = AC \times BD$$

$$7 \times (10 - x) = 8 \times x$$

$$70 - 7x = 8x$$

$$x = \frac{70}{15} = \frac{14}{3} \text{ cm}$$

$$\text{Hence, } \frac{DC}{4} = \frac{(10 - 14/3)}{4} = \frac{16}{3 \times 4} = \frac{4}{3} \text{ cm}$$

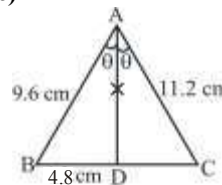


19. In a ΔABC , the bisector of $\angle A$ meets BC at D . If $AB = 9.6 \text{ cm}$, $AC = 11.2 \text{ cm}$ and $BD = 4.8 \text{ cm}$, the perimeter (in cm) of ΔABC is:

- (a) 30.4 (b) 28.6
(c) 31.2 (d) 32.8

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (c)



$$\therefore \frac{AB}{BD} = \frac{AC}{CD} \text{ [By Angle bisector theorem]}$$

$$\frac{9.6}{4.8} = \frac{11.2}{DC}$$

$$\Rightarrow DC = 5.6 \text{ cm}$$

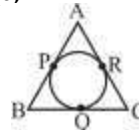
$$\text{So, the perimeter of } \Delta ABC = 9.6 + 11.2 + 4.8 + 5.6 = 31.2 \text{ cm}$$

20. A circle is inscribed in ΔABC , touching AB , BC and AC at the points P , Q and R , respectively. If $AB - BC = 4 \text{ cm}$, $AB - AC = 2 \text{ cm}$, and the perimeter of $\Delta ABC = 32 \text{ cm}$, then AC (in cm) = ?

- (a) $\frac{35}{3}$ (b) $\frac{38}{3}$
(c) $\frac{32}{3}$ (d) $\frac{26}{3}$

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (c)



Given, $AB - BC = 4 \text{ cm}$

$AB - AC = 2 \text{ cm}$

Perimeter of triangle = $AB + BC + CA = 32$ _____ (i)

Let, $AB = x \text{ cm}$

$\therefore x - BC = 4 \text{ cm}$, $x - AC = 2 \text{ cm}$

$BC = (x - 4) \text{ cm}$

$AC = (x - 2) \text{ cm}$

Now, by equation (i)

$$x + x - 4 + x - 2 = 32$$

$$3x = 38$$

$$x = \frac{38}{3} \text{ cm}$$

$$\therefore AC = x - 2 = \frac{38}{3} - 2 = \frac{32}{3} \text{ cm}$$

21. In a triangle ABC, D and E are points on BC such that AD = AE and $\angle BAD = \angle CAE$. If $AB = (2p+3)$, $BD = 2p$, $AC = (3q-1)$ and $CE = q$, then find the value of $(p+q)$
- (a) 3 (b) 4.5
(c) 3.6 (d) 2

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (a) $\because \angle ABC = \angle ACB$

Then, $AB = AC$

$$2p + 3 = 3q - 1$$

$$\therefore \angle BAD = \angle EAC \text{ [Given]}$$

$$\therefore BD = EC$$

$$2p = q$$

$$2p + 3 = 3(2p) - 1$$

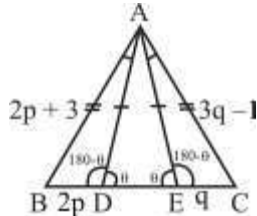
$$-4p = -4$$

$$p = 1$$

$$2p = q$$

$$q = 2$$

$$p + q = 2 + 1 = 3$$



22. In $\triangle ABC$, D is a point on side BC such that $\angle ADC = \angle BAC$. If $CA = 12 \text{ cm}$, $CD = 8 \text{ cm}$, then CB (in cm) = ?
- (a) 18 (b) 12
(c) 15 (d) 10

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (a) In $\triangle CDA$ & $\triangle CBA$,

$\angle C = \angle C$ (Common)

$\angle CDA = \angle BAC$ [given]

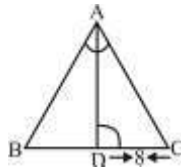
$\triangle CDA \sim \triangle CAB$ [By similarity]

$$\frac{CA}{CB} = \frac{AD}{AB} = \frac{CD}{AC}$$

$$CA = 12 \text{ cm}, CD = 8 \text{ cm}$$

$$\frac{8}{12} = \frac{12}{BC}$$

$$\Rightarrow BC = 18 \text{ cm}$$



23. In $\triangle LMN$, the bisectors of $\angle L$ and $\angle N$ intersect at an angle of 112° . What is the measure (in degrees) of $\angle M$?
- (a) 62 (b) 60
(c) 44 (d) 72

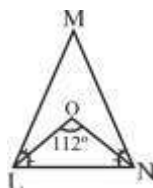
SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (c) $\angle LON = 90^\circ + \frac{\angle M}{2}$

$$112^\circ = 90^\circ + \frac{\angle M}{2}$$

$$\frac{\angle M}{2} = 112^\circ - 90^\circ = 22^\circ$$

$$\angle M = 44^\circ$$

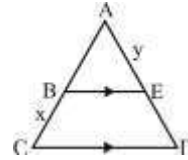


24. In $\triangle ACD$, B and E are two points on side AC and AD respectively, such that BE is parallel to CD. $CD = 9 \text{ cm}$, $BE = 6 \text{ cm}$, $AB = 5 \text{ cm}$ and $ED = 2 \text{ cm}$. What are the measures of the lengths (in cm) of AE and BC?

- (a) 4, 2.5 (b) 3, 4
(c) 4, 3 (d) 2.5, 4

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (a)



From Thales theorem -

$$\frac{AB}{AC} = \frac{BE}{CD}$$

$$\frac{5}{5+x} = \frac{6}{9}$$

$$\frac{5}{5+x} = \frac{2}{3}$$

$$10 + 2x = 15$$

$$x = 2.5$$

$$BC = 2.5 \text{ cm}$$

$$\frac{AB}{AC} = \frac{AE}{AD}$$

$$\frac{5}{7.5} = \frac{y}{y+2}$$

$$5y + 10 = 7.5y$$

$$2.5y = 10$$

$$y = 4$$

$$AE = 4 \text{ cm}$$

25. An equilateral triangle ABC is inscribed in a circle with centre O. D is a point on the minor arc BC and $\angle CBD = 40^\circ$.

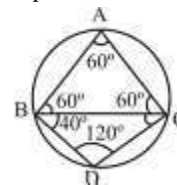
Find the measure of $\angle BCD$.

- (a) 30° (b) 50°
(c) 20° (d) 40°

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

Ans. (c) Given,

Triangle ABC is an equilateral so all angles will be 60° .



$\therefore ABCD$ is a cyclic quadrilateral.

$$\therefore \angle BAC + \angle BDC = 180^\circ$$

$$\angle BDC = 120^\circ$$

In $\triangle BDC$,

$$\angle BCD + \angle CBD + \angle BDC = 180^\circ$$

$$\angle BCD = 180^\circ - 40^\circ - 120^\circ$$

$$\angle BCD = 20^\circ$$

26. In $\triangle PQR$, the bisector of $\angle R$ meets side PQ at S, $PR = 10 \text{ cm}$, $RQ = 14 \text{ cm}$ and $PQ = 12 \text{ cm}$. What is the length of SQ?

- (a) 5 cm (b) 6 cm
(c) 7 cm (d) 8 cm

SSC CGL (Tier-II) 03/02/2022

Ist condition

$$\frac{AB}{AE} = \frac{BC}{DE} = \frac{AC}{AD}$$

$$\frac{AD+2}{6} = \frac{5}{3} = \frac{6+EC}{AD}$$

$$\frac{AD+2}{6} = \frac{5}{3}$$

$$AD = 8 \text{ cm}$$

IInd condition

$$\frac{BC}{DE} = \frac{AC}{AD}$$

$$\frac{5}{3} = \frac{6+EC}{8}$$

$$40 = 18 + 3EC$$

$$EC = \frac{22}{3} \text{ cm}$$

Then, $AB+AC = AD + BD + AE + EC$

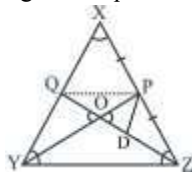
$$= 8+2+6+\frac{22}{3} = 16+\frac{22}{3} = \frac{70}{3} \text{ cm}$$

30. In $\triangle XYZ$, P is the midpoint of side XZ and Q is a point on side XY such that QZ bisects PY. If $XQ = 24 \text{ cm}$, then what is the length (in cm) of QY?

- (a) 6 (b) 18
(c) 8 (d) 12

SSC CHSL 05/08/2021 (Shift-I)

Ans. (d) : According to the question,



Let D be the midpoint of QZ.

According to the Midpoint theorem,

$$PD/XQ = \frac{1}{2}$$

So, $PD = 12 \text{ cm}$.

$PD \parallel XQ$

So, also $PD \parallel QY$

$\angle QYO = \angle OPD$ (Alternate Angle)

$\angle YQO = \angle ODP$ (Alternate Angle)

$\angle QOY = \angle DOP$ (Vertically opposite Angle)

$\therefore \triangle POD \cong \triangle QOY$ (By AAA rule)

$\Rightarrow PO = YO$

$\therefore QY = PD = 12 \text{ cm}$.

\therefore The length of QY is 12 cm.

31. $\triangle ABC \sim \triangle PQR$. The perimeters of $\triangle ABC$ and $\triangle PQR$ are 72 cm and 43.2 cm, respectively. What is the ratio of the area of $\triangle ABC$ to the area of $\triangle PQR$?

- (a) 25 : 9
(c) 16 : 9

- (b) 9 : 4
(d) 36 : 25

SSC CHSL 15/04/2021 (Shift-I)

Ans. (a) :

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \left(\frac{72}{43.2}\right)^2 = \left(\frac{720}{432}\right)^2 = \left(\frac{5}{3}\right)^2 = \left(\frac{25}{9}\right)$$

32. $\triangle ABC \sim \triangle EDF$, Area of $\triangle ABC$: area $\triangle DEF = 49 : 4$. If AB, AC, BC are respectively, 10 cm, 14 cm, 21 cm then what is the length (in cm) of EF?

- (a) 4 (b) 4.5
(c) 3.5 (d) 6

SSC CHSL 15/04/2021 (Shift-I)

Ans. (a) : $\triangle ABC \sim \triangle EDF$

$$\frac{\triangle ABC \text{ area of}}{\triangle EDF \text{ area of}} = \left(\frac{AC}{EF}\right)^2$$

$$\frac{49}{4} = \left(\frac{14}{EF}\right)^2$$

$$\frac{7}{2} = \frac{14}{EF}$$

$$EF = 4 \text{ cm}$$

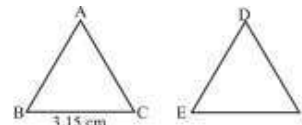
33. $\triangle ABC \sim \triangle DEF$ and the area of $\triangle ABC$ is 13.5 cm^2 and the area of $\triangle DEF$ is 24 cm^2 . If $BC = 3.15 \text{ cm}$, then the length (in cm) of EF is :

- (a) 4.8 (b) 5.1
(c) 4.2 (d) 3.9

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (c) : From question,

$\triangle ABC \sim \triangle DEF$



Area of $\triangle ABC = 13.5 \text{ cm}^2$

Area of $\triangle DEF = 24 \text{ cm}^2$

\therefore The ratio of the areas of two similar triangles is equal to the ratio of the square of their corresponding sides.

$$\therefore \frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle DEF} = \frac{(BC)^2}{(EF)^2}$$

$$\Rightarrow \frac{13.5}{24} = \frac{(3.15)^2}{(EF)^2}$$

$$\Rightarrow \frac{9}{16} = \frac{(3.15)^2}{(EF)^2}$$

$$\Rightarrow \sqrt{\frac{9}{16}} = \frac{3.15}{EF}$$

$$\Rightarrow EF = 3.15 \times \frac{4}{3}$$

$$\therefore \boxed{EF = 4.2 \text{ cm}}$$

34. In triangle ABC, AD is the bisector of $\angle A$. If $AB = 5$ cm, $AC = 7.5$ cm and $BC = 10$ cm, then what is the distance of D from the mid-point of BC (in cm)?

- (a) 2 (b) 1.5
(c) 2.2 (d) 1

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (d) : By Angle bisector theorem,

$$\frac{AB}{AC} = \frac{BD}{DC}$$

$$\therefore \frac{BD}{DC} = \frac{5}{7.5} = \frac{2}{3}$$

$$\frac{3}{2} = \frac{DC}{BD}$$

Adding 1 to both sides, we get

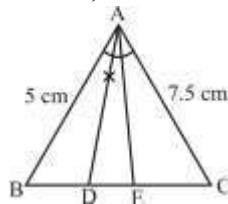
$$\frac{3}{2} + 1 = \frac{DC}{BD} + 1$$

$$\frac{5}{2} = \frac{BD + DC}{BD} = \frac{BC}{BD}$$

$$\therefore BD = BC \times \frac{2}{5} = 10 \times \frac{2}{5} = 4 \text{ cm}$$

$BE = 5$ cm (\because E is the midpoint of BC)

$$\therefore DE = 5 - 4 = 1 \text{ cm}$$



35. In $\triangle ABC$, $\angle A = 50^\circ$. If the bisectors of the angle C and angle B meet at a point O, then $\angle BOC$ is equal to :

- (a) 130° (b) 65°
(c) 50° (d) 115°

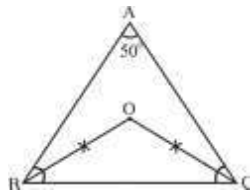
SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (d) :

By theorem,

$$\angle BOC = 90^\circ + \frac{\angle A}{2}$$

$$= 90^\circ + \frac{50^\circ}{2} = 115^\circ$$



36. Let $\triangle ABC \sim \triangle RPQ$ and $\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle RPQ)} = \frac{16}{25}$. If

$PQ = 4$ cm, $QR = 6$ cm and $PR = 7$ cm, then AC (in cm) is equal to :

- (a) 6 (b) 4.8
(c) 3.6 (d) 7.2

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

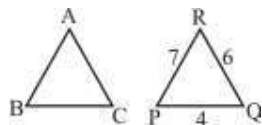
Ans. (b) :

$$\therefore \triangle ABC \sim \triangle RPQ$$

$$\therefore \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle RPQ)} = \left(\frac{AC}{RQ}\right)^2$$

$$\frac{16}{25} = \left(\frac{AC}{6}\right)^2$$

$$\frac{AC}{6} = \frac{4}{5}, AC = 4.8 \text{ cm}$$

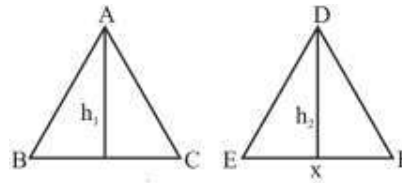


37. $\triangle ABC \sim \triangle DEF$. If the areas of $\triangle ABC$ and $\triangle DEF$ are 100 cm^2 and 81 cm^2 , respectively and the altitude of $\triangle DEF$ is 6.3 cm, then the corresponding altitude of $\triangle ABC$ is :

- (a) 9 cm (b) 5.6 cm
(c) 7 cm (d) 8.4 cm

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (c) : $\triangle ABC \sim \triangle DEF$,



The ratio of the areas of a triangle is equal to the square of the ratio of their heights.

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle DEF} = \left(\frac{h_1}{h_2}\right)^2$$

$$\frac{100}{81} = \left(\frac{h}{6.3}\right)^2$$

$$\frac{10}{9} = \frac{h_1}{6.3}$$

$$h_1 = 7 \text{ cm}$$

Height of $\triangle ABC = 7$ cm.

38. In a triangle ABC, $AB : AC = 5 : 2$, $BC = 9$ cm. BA is produced to D, and the bisector of the Angle CAD meets BC produced at E. What is the length (in cm) of CE?

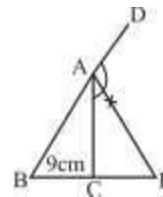
- (a) 9 (b) 10
(c) 3 (d) 6

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (d) : Given,

$$AB : AC = 5 : 2$$

$$BC = 9 \text{ cm}$$



According to the given question,

$$AB/AC = BE/CE \text{ (bisector theorem)}$$

$$5/2 = (9 + CE)/CE$$

$$5CE = 18 + 2CE$$

$$3CE = 18$$

$$CE = 6 \text{ cm.}$$

39. In a triangle ABC, point D lies on AB, and points E and F lie on BC such that DF is parallel to AC and DE is parallel to AF. If $BE = 4$ cm, $CF = 3$ cm, then find the length (in cm) of EF :

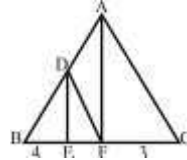
- (a) 5 (b) 3
(c) 2 (d) 1.5

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (c) : In ΔABC , $DF \parallel AC$

$$\frac{BD}{AB} = \frac{BF}{BC} \dots\dots\dots(i)$$

In ΔBAF ,
 $DE \parallel AF$



$$\Rightarrow \frac{BE}{BF} = \frac{BD}{AB}$$

$$\Rightarrow \frac{BE}{BF} = \frac{BF}{BC} \quad (\text{from equation (i)})$$

$$\Rightarrow 4(4+3+EF) = (4+EF)^2$$

$$\Rightarrow 28 + 4EF = 16 + 8EF + EF^2$$

$$\Rightarrow EF^2 + 4EF - 12 = 0$$

$$\Rightarrow EF^2 + 6EF - 2EF - 12 = 0$$

$$\Rightarrow EF(EF + 6) - 2(EF + 6) = 0$$

$$(EF - 2) = 0, \quad (EF + 6) = 0$$

$$EF - 2 = 0, \quad EF + 6 = 0$$

$$EF = 2, \quad EF = -6 \text{ (not possible)}$$

\therefore Length of EF is 2cm.

40. ΔABC is an equilateral triangle. D is a point on side BC such that $BD : BC = 1:3$. If $AD = 5\sqrt{7}$ cm, then the side of the triangle is:
 (a) 20 cm (b) 18 cm
 (c) 15 cm (d) 12 cm

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,

$$BD : BC = (1 : 3) \times 2 \Rightarrow 2 : 6$$

$$AD = 5\sqrt{7}\text{cm}$$

ΔABC is an equilateral triangle.

$$BE = EC$$

$$\text{In } \Delta AEC, \quad P^2 = 36a^2 - 9a^2$$

$$P^2 = 27a^2$$

$$\text{In } \Delta ADE, \quad a^2 + P^2 = AD^2$$

$$25 \times 7 = 28a^2 = (\therefore AD = 5\sqrt{7})$$

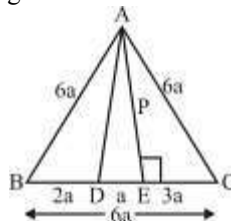
$$a^2 = \frac{25}{4}$$

$$a = \frac{5}{2}$$

$$\text{Side of the triangle} = 6a$$

$$= 6 \times \frac{5}{2}$$

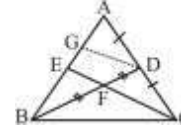
$$= 15 \text{ cm.}$$



41. In ΔABC , D is the mid-point of side AC and E is a point on side AB such that EC bisects BD at F. If $AE = 30$ cm, then the length of EB is :
 (a) 20 cm (b) 10 cm
 (c) 18 cm (d) 15 cm

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (d)



Draw line parallel to EC from point D on side AE at G.
 $DG \parallel EC$

In ΔAEC , $DG \parallel EC$

$$\Rightarrow \frac{AG}{GE} = \frac{AD}{DC}$$

$$\Rightarrow AG = GE \text{ as } AD = DC$$

In ΔBGD , $GD \parallel EF$

$$\Rightarrow \frac{EB}{EG} = \frac{BF}{FD}$$

$$\Rightarrow EB = GE \text{ as } BF = FD$$

$$\Rightarrow AE = AG + GE = 30$$

$$\Rightarrow AG = GE = 15 \text{ cm.}$$

$$\therefore EB = 15 \text{ cm}$$

42. In ΔABC , AB and AC are produced to points D and E respectively. If the bisectors of angle CBD and angle BCE meet at point O, such that $\angle BOC = 63^\circ$, then $\angle A = ?$
 (a) 36° (b) 27°
 (c) 54° (d) 63°

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (c) : According to the question-

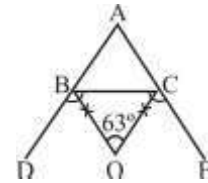
$$\angle BOC = 63^\circ$$

$$\therefore \angle BOC = 90^\circ - \frac{\angle BAC}{2}$$

$$\Rightarrow 63^\circ = 90^\circ - \frac{\angle BAC}{2}$$

$$\Rightarrow \angle BAC = (90^\circ - 63^\circ) \times 2$$

$$= 27^\circ \times 2 = 54^\circ$$



43. The side of an equilateral ΔABC is $3\sqrt{7}$ cm. P is a point on side BC such that $BP : PC = 1 : 2$. The length (in cm) of AP is :
 (a) 6 (b) 7
 (c) $7\sqrt{3}$ (d) $6\sqrt{3}$

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (b) : Let the length of BP and PC is x and 2x respectively.

$$3x = 3\sqrt{7}$$

$$x = \sqrt{7}$$

$$\cos 60^\circ = \frac{(3\sqrt{7})^2 + (\sqrt{7})^2 - AP^2}{2 \times 3\sqrt{7} \times \sqrt{7}}$$

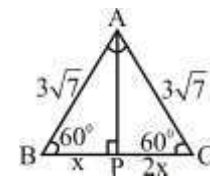
$$\frac{1}{2} = \frac{63 + 7 - AP^2}{2 \times 3 \times 7}$$

$$21 = 70 - AP^2$$

$$AP^2 = 70 - 21$$

$$AP^2 = 49$$

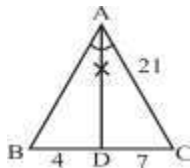
$$AP = 7 \text{ cm.}$$



44. In ΔABC , AD is the bisector of $\angle A$ meeting BC at D. If AC = 21 cm, BC = 11 cm and the length of BD is 3 cm less than DC, then the length (in cm) of side AB is :
- (a) 10 (b) 15
(c) 18 (d) 12

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (d) :



According to the angle bisector theorem-

$$\frac{AB}{BD} = \frac{AC}{DC}$$

$$AB = \frac{AC \times BD}{DC}$$

$$AB = \frac{21 \times 4}{7}$$

$$AB = 12 \text{ cm}$$

45. Angle between the internal bisectors of two angles $\angle B$ and $\angle C$ of a ΔABC is 132° , then the value of $\angle A$ is:
- (a) 60° (b) 72°
(c) 84° (d) 48°

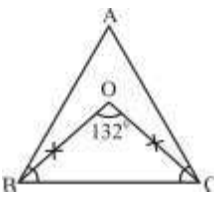
SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (c) :

$$\angle BOC = 90^\circ + \frac{\angle A}{2}$$

$$\therefore \frac{\angle A}{2} = 132^\circ - 90^\circ$$

$$\angle A = 2 \times 42^\circ = 84^\circ$$



46. $\Delta ABC \sim \Delta PQR$. The areas of ΔABC and ΔPQR are 64 cm^2 and 81 cm^2 , respectively and AD and PT are the medians of ΔABC and ΔPQR , respectively. If PT = 10.8 cm, then AD = ?
- (a) 8.4 cm (b) 9 cm
(c) 9.6 cm (d) 12 cm

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (c) : $\because \Delta ABC \sim \Delta PQR$

\therefore If two triangles are similar, ratio of areas of these triangle is equal to ratio of the squares of their medians.

$$\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \left(\frac{AD}{PT}\right)^2$$

$$\frac{64}{81} = \left(\frac{AD}{10.8}\right)^2$$

$$\frac{AD}{10.8} = \frac{8}{9}$$

$$AD = \frac{8}{9} \times 10.8 = 9.6 \text{ cm}$$

47. Let $\Delta ABC \sim \Delta PQR$ and $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta QPR)} = \frac{144}{49}$. If

AB = 12 cm, BC = 7 cm and AC = 9 cm, then PR (in cm) is equal to :

- (a) $\frac{49}{12}$ (b) $\frac{108}{7}$
(c) $\frac{21}{4}$ (d) 12

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (c) : $\because \Delta ABC \sim \Delta PQR$

$$\therefore \frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta QPR)} = \left(\frac{AC}{PR}\right)^2$$

$$\frac{144}{49} = \left(\frac{AC}{PR}\right)^2$$

$$\frac{AC}{PR} = \frac{12}{7}$$

$$\frac{9}{PR} = \frac{12}{7}$$

$$PR = \frac{21}{4} \text{ cm}$$

48. In ΔABC , D and E are points on sides AB and BC, respectively, such that BD : DA = 1 : 2 and CE : EB = 1 : 4. If DC and AE intersect at F, then FD : FC is equal to:
- (a) 3 : 2 (b) 5 : 2
(c) 8 : 3 (d) 4 : 1

SSC CHSL 19/04/2021 (Shift-I)

Ans. (c) : By Ceva theorem,

$$\frac{BD}{DA} \times \frac{AG}{GC} \times \frac{CE}{BE} = 1$$

$$\frac{1}{2} \times \frac{AG}{GC} \times \frac{1}{4} = 1$$

$$\frac{AG}{GC} = 8$$

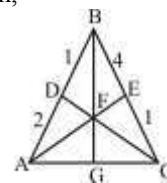
$$AG : GC = 8 : 1$$

Now, according to the theorem

$$\frac{CF}{FD} = \frac{GC}{AG} + \frac{CE}{BE}$$

$$\frac{CF}{FD} = \frac{1}{8} + \frac{1}{4} \quad \left(\because \frac{AG}{GC} = \frac{8}{1}\right)$$

$$\frac{CF}{FD} = \frac{3}{8} \quad \therefore FD : CF = 8 : 3$$

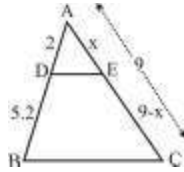


49. In ΔABC , $DE \parallel BC$, where D and E are points on the sides AB and AC, respectively. If AD = 2 cm, BD = 5.2 cm, AC = 9 cm and AE = x cm, then what is the value of x?

- (a) 3.5 (b) 4
(c) 3 (d) 2.5

SSC CHSL 19/04/2021 (Shift-I)

Ans. (d) : Given,
 $AD = 2$ cm, $DB = 5.2$ cm
 $AC = 9$ cm, $AE = ?$



From Thales Theorem-

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{2}{5.2} = \frac{x}{9-x}$$

$$18 - 2x = 5.2x$$

$$7.2x = 18$$

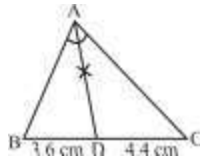
$$x = 2.5 \text{ cm}$$

50. In triangle ABC, AD is the internal bisector of $\angle A$ meeting BC at D. If $BD = 3.6$ cm and $BC = 8$ cm, then the ratio of AB to AC will be:

- (a) 11 : 9 (b) 7 : 13
 (c) 13 : 7 (d) 9 : 11

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) :



By Angle Bisector theorem,

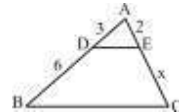
$$\frac{AB}{AC} = \frac{BD}{DC} = \frac{3.6}{4.4} = \frac{9}{11}$$

51. In $\triangle ABC$, points D and E are on AB and AC, respectively, such that DE is parallel to BC. If $AD = 3$ cm, $BD = 6$ cm and $AE = 2$ cm, then find the length of CE.

- (a) 6 cm (b) 16 cm
 (c) 8 cm (d) 4 cm

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) :



In $\triangle ADE$ and $\triangle ABC$,

$\therefore DE \parallel BC (\therefore \triangle ADE \sim \triangle ABC)$

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{3}{6} = \frac{2}{x}$$

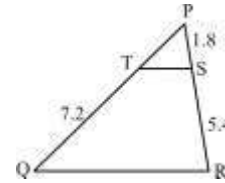
$$x = 4 \text{ cm}$$

52. In $\triangle PQR$, points T and S are on PQ and PR, respectively, such that TS is parallel to QR. If $TQ = 7.2$ cm, $PS = 1.8$ cm and $SR = 5.4$ cm, then find the length of PT.

- (a) 2 cm (b) 2.4 cm
 (c) 1.35 cm (d) 3.6 cm

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) : Let $PT = x$ cm



In $\triangle PTS$ and $\triangle PQR$

$\therefore TS \parallel QR$

$\therefore \triangle PTS \sim \triangle PQR$

$$\therefore \frac{PT}{TQ} = \frac{PS}{SR}$$

$$\frac{x}{7.2} = \frac{1.8}{5.4}$$

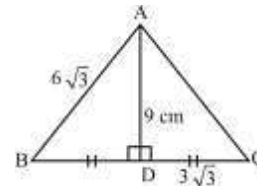
$$x = 2.4 \text{ cm}$$

53. The altitude AD of a triangle ABC is 9 cm. If $AB = 6\sqrt{3}$ cm and $CD = 3\sqrt{3}$ cm, then what will be the measure of $\angle A$?

- (a) 60° (b) 90°
 (c) 45° (d) 30°

SSC CHSL 12/04/2021 (Shift-I)

Ans : (a)



In $\triangle ADC$,

$$AC^2 = 9^2 + (3\sqrt{3})^2 = 81 + 27 = \sqrt{108} = 6\sqrt{3} \text{ cm}$$

Hence $\triangle ABC$ is an equilateral triangle

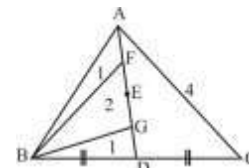
Hence, $\angle A = 60^\circ$

54. In $\triangle ABC$, AD is a median. If points E, F and G are midpoints of AD, AE and DE, respectively, then what will be the area $\triangle BFG$?

- (a) $\frac{1}{8}$ (Area $\triangle ABC$) (b) $\frac{1}{2}$ (Area $\triangle BGC$)
 (c) $\frac{1}{4}$ (Area $\triangle ABC$) (d) $\frac{1}{2}$ (Area $\triangle ABC$)

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c)



$\therefore AD$ is the median of BC

The median divides the triangle into equal parts.

Let Area of $\triangle ABC = 8$ unit

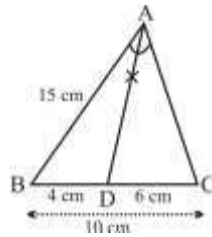
Hence, Area of $\Delta BFG = \frac{2}{8} \times \text{Area of } \Delta ABC$
 $= \frac{1}{4} \times \text{Area of } \Delta ABC$

55. In ΔABC , AD is the bisector of A meeting BC at D . If $AB = 15$ cm, $BC = 10$ cm and the length of BD is 2 cm less than that of DC , then the length of AC is.

- (a) 18.5 cm (b) 16 cm
 (c) 22.5 cm (d) 18 cm

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) :



By angle bisector theorem,

$$\frac{AB}{AC} = \frac{BD}{DC}$$

$$\frac{15}{AC} = \frac{4}{6}$$

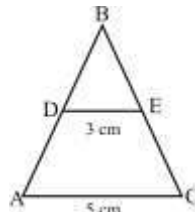
$$AC = \frac{90}{4} = 22.5 \text{ cm}$$

56. In ΔABC , D and E are points on AB and BC , respectively, such that DE is parallel to AC . If $DE = 3$ cm, $AC = 5$ cm and the area of trapezium $ACED = 32$ cm², then what will be the area of ΔBDE ?

- (a) $\frac{48}{5}$ cm² (b) $\frac{144}{17}$ cm²
 (c) 18 cm² (d) 16 cm²

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) :



Let, Area of $\Delta ABC = (5)^2 = 25$ unit

Area of $\Delta BDE = (3)^2 = 9$ unit

\therefore Area of trapezium $ACED = 32$ cm² (given)

$\therefore (25 - 9)$ unit = 32 cm²

16 unit = 32 cm²

1 unit = 2 cm²

Then,

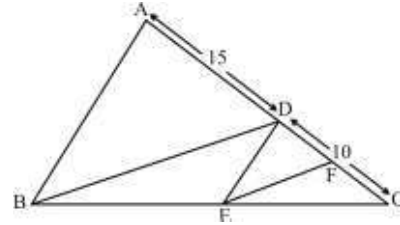
Area of $\Delta BDE = 9$ unit = $9 \times 2 = 18$ cm²

57. In ΔABC , $DE \parallel AB$, where D and E are points on sides AC and BC , respectively. F is a point between C and D such that $EF \parallel BD$. If $AD = 15$ cm, $DC = 10$ cm, then the length of CF is:

- (a) 3 cm (b) 7.5 cm
 (c) 4 cm (d) 5 cm

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) :



In ΔABC ,

$\therefore DE \parallel AB$

By basic proportionality theorem

$$\frac{CD}{AC} = \frac{CE}{CB}$$

Again

In ΔCDB ,

$EF \parallel BD$

$$\frac{CF}{CD} = \frac{CE}{CB}$$

$$\Rightarrow \frac{CF}{10} = \frac{10}{25}$$

$$CF = 4 \text{ cm}$$

58. If $\Delta ABC \sim \Delta PQR$, $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{4}{9}$, $AC = 12$ cm, $AB = 18$ cm and $BC = 10$ cm, then PR (in cm) is equal to:

- (a) 8 (b) 10
 (c) 15 (d) 18

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : When, $\Delta ABC \sim \Delta PQR$

Then,

$$\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \left(\frac{BC}{PR}\right)^2$$

So,

$$\frac{4}{9} = \left(\frac{10}{PR}\right)^2$$

$$\frac{2}{3} = \frac{10}{PR}$$

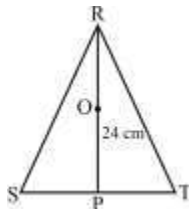
$$PR = 15 \text{ cm}$$

59. If O is the centroid and RP is the median with length 24 cm of ΔRST , where P is a point on ST , then the value of RO is:

- (a) 18 cm (b) 14 cm
 (c) 20 cm (d) 16 cm

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) :



∴ We know that, centroid divides the median into 2:1 ratio. Where, O → centroid

$$(2+1) \text{ unit} \rightarrow 24 \text{ cm}$$

$$1 \text{ unit} \rightarrow 8 \text{ cm}$$

$$2 \text{ unit} \rightarrow 16 \text{ cm}$$

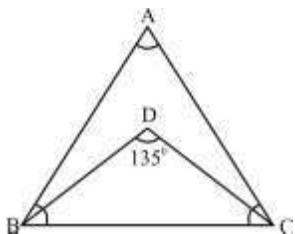
Hence, RO = 2 unit = 16 cm.

60. In triangle ABC, if BD and CD bisect $\angle B$ and $\angle C$, respectively and $\angle BDC = 135^\circ$, then find the measure of $\angle BAC$.

- (a) 90° (b) 45°
(c) 75° (d) 65°

SSC CHSL 04/08/2021 (Shift-II)

Ans. (a) :



From the theorem,

$$135^\circ = 90^\circ + \frac{\angle A}{2}$$

$$\frac{\angle A}{2} = 45^\circ \Rightarrow \angle A = 90^\circ$$

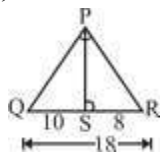
Hence, $\angle BAC = 90^\circ$

61. If S is a point on side QR of a triangle PQR such that QS = 10 cm, QR = 18 cm and $\angle PSR = \angle QPR$, then length of PR will be :

- (a) 14 cm (b) 16 cm
(c) 12 cm (d) 15 cm

SSC CHSL 10/08/2021 (Shift-II)

Ans. (c) : Given,



$$QS = 10 \text{ cm.}$$

$$QR = 18 \text{ cm.}$$

$$\angle PSR = \angle QPR \text{ ----- [Given]}$$

and $\angle QRP = \angle SRP$ ----- (common)

So, In $\triangle PQR$ and $\triangle SPR$,

$$\Rightarrow \frac{QR}{PR} = \frac{PR}{SR}$$

$$\Rightarrow PR^2 = QR \times SR$$

$$\Rightarrow PR^2 = 18 \times 8$$

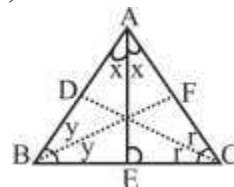
$$\Rightarrow PR = \sqrt{144} \\ = 12 \text{ cm.}$$

62. Points D, E and F are on the sides AB, BC and AC, respectively of triangle ABC such that AE, BF and CD bisect $\angle A$, $\angle B$ and $\angle C$, respectively. If AB = 6 cm, BC = 7 cm and AC = 8 cm, then what will be the length of BE?

- (a) 4 cm (b) 3 cm
(c) 3.6 cm (d) 3.5 cm

SSC CHSL 06/08/2021 (Shift-III)

Ans. (b) : Given,



$$AB = 6 \text{ cm.}$$

$$BC = 7 \text{ cm.}$$

$$AC = 8 \text{ cm.}$$

In $\triangle ABC$,

$$\frac{BE}{EC} = \frac{AB}{AC}$$

$$\frac{BE}{7 - BE} = \frac{6}{8}$$

$$\Rightarrow 8BE = 42 - 6BE$$

$$\Rightarrow 14BE = 42$$

$$\Rightarrow BE = 42/14$$

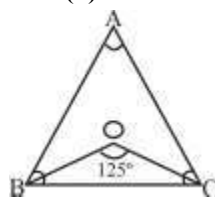
$$\Rightarrow \boxed{BE = 3 \text{ cm.}}$$

63. If the angle between the internal bisectors of two angles $\angle B$ and $\angle C$ of a triangle ABC is 125° , then the value of $\angle A$ is:

- (a) 65° (b) 70°
(c) 72° (d) 62°

SSC CHSL 06/08/2021 (Shift-III)

Ans. (b) : We know that,



$$\angle BOC = 90^\circ + \frac{\angle A}{2}$$

$$125^\circ = 90^\circ + \frac{\angle A}{2} \text{ ----- [Given } \angle BOC = 125^\circ]$$

$$\frac{\angle A}{2} = 125^\circ - 90^\circ = 35^\circ$$

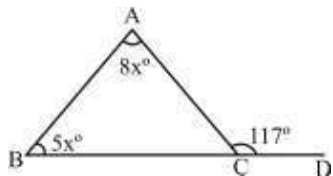
$$\angle A = 35^\circ \times 2 = 70^\circ$$

Hence, $\angle A = 70^\circ$

64. The side BC of a triangle ABC is extended to a point D. If $\angle ACD = 117^\circ$ and $\angle ABC = \frac{5}{8}\angle BAC$, then what is the measure of $\angle ABC$?
- (a) 72° (b) 45°
(c) 54° (d) 36°

SSC CHSL 13/04/2021 (Shift-III)

Ans.(b) : Given –



$$\angle ACD = 117^\circ$$

$$\angle ABC = \frac{5}{8}\angle BAC$$

$$\angle ABC = 5x^\circ \text{ and } \angle BAC = 8x^\circ$$

$\Rightarrow 5x^\circ + 8x^\circ = 117^\circ$ (sum of interior opposite angle is equal to exterior angles)

$$\Rightarrow 13x = 117^\circ$$

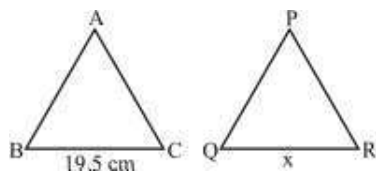
$$\Rightarrow x = 9^\circ$$

$$\begin{aligned} \therefore \angle ABC &= 5x \\ &= 5 \times 9 \\ &= 45^\circ \end{aligned}$$

65. The perimeters of two similar ABC and PQR are 156 cm and 46.8 cm, respectively. If BC = 19.5 cm and QR = x cm, then the value of x is:
- (a) 5.85 cm (b) 6.75 cm
(c) 3.76 cm (d) 4.29 cm

SSC CHSL 04/08/2021 (Shift-III)

Ans. (a) :



$$\frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle PQR} = \frac{19.5}{x}$$

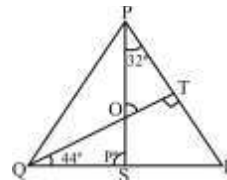
$$\begin{aligned} \frac{156}{46.8} &= \frac{19.5}{x} \\ x &= \frac{19.5 \times 46.8}{156} \end{aligned}$$

$$x = 5.85 \text{ cm}$$

66. In $\triangle PQR$, $QT \perp PR$ and S is a point on QR such that $\angle PSQ = p^\circ$. If $\angle TQR = 44^\circ$ and $\angle SPR = 32^\circ$, then the value of p is:
- (a) 76° (b) 78°
(c) 82° (d) 72°

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) : Given –



$$QT \perp PR$$

$$\angle TQR = 44^\circ$$

and, $\angle SPR = 32^\circ$

Let PS and QT intersect each other at O.

$$\angle QTP = 90^\circ$$

$$\therefore \angle POT = (180^\circ - 32^\circ - 90^\circ) = 58^\circ$$

We know that $\angle POT = \angle QOS$

In $\triangle QOS$,

$$44^\circ + P + 58^\circ = 180^\circ$$

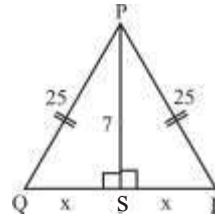
$$\Rightarrow P = 180^\circ - 102^\circ$$

$$\Rightarrow P = 78^\circ.$$

67. $\triangle PQR$ is an isosceles triangle with $PQ = PR = 25$ cm. If PS is the median on QR from P such that $PS = 7$ cm, then the length of QR is:
- (a) 42 cm (b) 48 cm
(c) 45 cm (d) 38 cm

SSC CHSL 12/04/2021 (Shift-III)

Ans : (b) In isosceles triangle PQR, median PS will be perpendicular on QR and divides QR in two equal parts.



Let $QS = SR = x$

In $\triangle PSQ$, from Pythagoras theorem,

$$x^2 = (25)^2 - (7)^2$$

$$x^2 = 576$$

$$x = \sqrt{(576)} = 24 \text{ cm}$$

$$\text{Hence } QR = x + x = 24 + 24 = 48 \text{ cm}$$

68. If a and b are the lengths of two sides of a triangle such that the product $ab = 24$, where a and b are integers, then how many such triangles are possible?
- (a) 18 (b) 12
(c) 16 (d) 15

SSC CHSL 12/04/2021 (Shift-III)

Ans : (c) Given –

Product of two sides a and b = 24

Let a, b and c are the sides of a triangle, where $(a-b) < c < (a+b)$

$$\therefore ab = 24$$

We can have different possible values at a and b such that

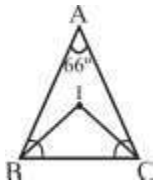
$1 \times 24 :-$
 $(24 - 1) < c < (24 + 1), c = 24$
 $2 \times 12 :-$
 $(12 - 2) < c < (12 + 2), c = 11, 12, 13$
 $3 \times 8 :-$
 $(8 - 3) < c < (8 + 3), c = 6, 7, 8, 9, 10$
 $4 \times 6 :-$
 $(6 - 4) < c < (6 + 4), c = 3, 4, 5, 6, 7, 8, 9$
 From the given conditions, the third side, c can take 16 different values.
 The number of triangles possible for $ab = 24$ is **16**.

69. In ΔABC , $\angle A = 66^\circ$. If I is the incentre of the triangle, then measure of $\angle BIC$ will be:

- (a) 109° (b) 123°
 (c) 112° (d) 119°

SSC CHSL 05/08/2021 (Shift-II)

Ans. (b) :



In ΔABC ,
 $\angle A = 66^\circ$ -----[Given]
 \therefore Point I is the incentre of ΔABC

Then,

$$\angle BIC = 90^\circ + \frac{\angle A}{2}$$

$$= 90^\circ + \frac{66^\circ}{2}$$

$$= 90^\circ + 33^\circ = 123^\circ$$

Hence, $\angle BIC = 123^\circ$

70. In ΔPQR , $\angle PQR = 135^\circ$, $PQ = 8\sqrt{2}$ cm and $PR = 17$ cm. What is the length (in cm) of QR ?

- (a) 10 (b) 7
 (c) 9 (d) 8

SSC CHSL 19/08/2021 (Shift-II)

Ans. (b) : In ΔPQR ,
 Let $QR = x$ cm
 From formula,

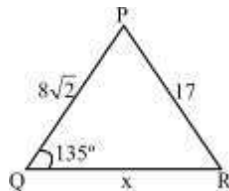
$$\cos Q = \frac{QP^2 + QR^2 - PR^2}{2QP \times QR}$$

$$\cos 135^\circ = \frac{(8\sqrt{2})^2 + (x)^2 - (17)^2}{2 \times 8\sqrt{2} \times x}$$

$$-\frac{1}{\sqrt{2}} = \frac{128 + x^2 - 289}{16\sqrt{2}x}$$

$$-1 = \frac{x^2 - 161}{16x}$$

$$x^2 + 16x - 161 = 0$$



$$x^2 + 23x - 7x - 161 = 0$$

$$x(x + 23) - 7(x + 23) = 0$$

$$(x + 23)(x - 7) = 0$$

$$x = -23, 7$$

Hence $QR = x = 7$ cm

71. The perimeters of ΔABC and ΔDEF are 39.6 cm and 26.4 cm, respectively, and $\Delta ABC \sim \Delta DEF$. What is the ratio of the areas of ΔABC and ΔDEF ?

- (a) 9 : 4 (b) 16 : 9
 (c) 3 : 2 (d) 9 : 2

SSC CHSL 19/08/2021 (Shift-II)

Ans. (a) : Given –

Perimeter of $\Delta ABC = 39.6$ cm.

Perimeter of $\Delta DEF = 26.4$ cm.

$\therefore \Delta ABC \sim \Delta DEF$

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF} = \frac{(\text{Perimeter of } \Delta ABC)^2}{(\text{Perimeter of } \Delta DEF)^2}$$

$$= \left(\frac{39.6}{26.4}\right)^2$$

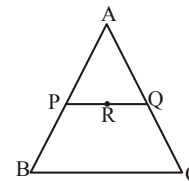
$$= 9 : 4$$

72. In ΔABC , P and Q are the mid-points of the sides AB and AC , respectively. R is a point on the segment PQ such that $PR:RQ=1:3$. If $PR = 4$ cm, then BC is equal to:

- (a) 24 cm (b) 36 cm
 (c) 32 cm (d) 28 cm

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : Given –



$$PR : RQ = 1 : 3$$

$$\Rightarrow \text{Let, } PR = x, RQ = 3x$$

$$\therefore RQ = 3x \quad \{ \because PR = x = 4 \text{ cm} \}$$

$$= 3 \times 4 = 12 \text{ cm}$$

Now, $PQ = PR + RQ \Rightarrow PQ = (4 + 12) = 16$ cm

The line joining the mid point of two sides of a triangle is parallel and half of the third side.

$$\therefore BC = 2PQ$$

$$\Rightarrow BC = 2 \times 16$$

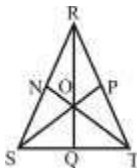
$$\Rightarrow BC = 32 \text{ cm.}$$

73. The three medians RQ , SP and TN of ΔRST intersect at point O . If the area of ΔRST is 48 cm^2 , then the area of the quadrilateral $SQON$ is:

- (a) 20 cm^2 (b) 12 cm^2
 (c) 16 cm^2 (d) 18 cm^2

SSC CHSL 15/04/2021 (Shift-III)

Ans. (c)



In ΔRST if RQ , SP and TN are the medians and intersect to each others at point O .

Then we know that ,

Area of $\Delta RST = 3 \times$ area of $\square SQON$

Hence $3 \times$ Area of $\square SQON = 48$ -----[Given]

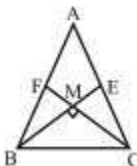
$$\text{Area of quadrilateral } SQON = \frac{48}{3} = 16\text{cm}^2$$

74. In ΔABC , medians BE and CF are perpendicular to each other and intersect at M . If $BE = 9$ and $CF = 13$ cm. Then the area of ΔABC will be:

- (a) 68 cm^2 (b) 76 cm^2
 (c) 78 cm^2 (d) 75 cm^2

SSC CHSL 15/04/2021 (Shift-III)

Ans.(c)



We know that, centroid of a triangle divides the median in the ratio $2 : 1$.

Now, $BE = 9$ cm

3 unit \rightarrow 9 cm

2 unit \rightarrow 6 cm

$\Rightarrow BM = 6$ cm

Again, $CF = 13$ cm

3 unit \rightarrow 13 cm

2unit $\rightarrow \frac{26}{3}$ cm

$\Rightarrow CM = \frac{26}{3}$ cm

In ΔCMB ,

$$\text{Area of } \Delta CMB = \frac{1}{2} \times \frac{26}{3} \times 6$$

$$= 26\text{cm}^2$$

Now, Area of $\Delta ABC = 3 \times$ Area of ΔCMB

\Rightarrow Area of $\Delta ABC = 3 \times 26$

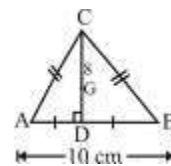
$$= 78 \text{ cm}^2$$

75. In ΔABC , $AC = BC$, and the length of the base AB is 10 cm. If $CG = 8$ cm, where G is the centroid, then what is the length of AC ?

- (a) 15 cm (b) 12 cm
 (c) $\sqrt{91}$ cm (d) 13 cm

SSC CHSL 12/08/2021 (Shift-III)

Ans. (d) The medians are divided into $2 : 1$ by the centroid



$\therefore CD$ is median,

So $GD = 4$ cm

$\therefore AD = BD = 10/2 = 5$ cm.

$\therefore \Delta ABC$ is an isosceles triangle

\therefore Median will make 90° on AB

$$\therefore AC = \sqrt{(CD)^2 + (AD)^2}$$

$$\Rightarrow AC = \sqrt{(12)^2 + (5)^2}$$

$$\Rightarrow AC = \sqrt{169}$$

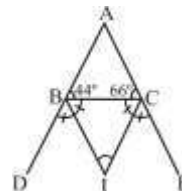
$$\Rightarrow AC = 13 \text{ cm.}$$

76. The sides AB and AC of a ΔABC are produced up to points D and E . The bisectors of the exterior angles so formed, intersect each other at point I . If $\angle ACB$ is 66° and $\angle ABC = 44^\circ$, then what is the measure (in degrees) of $\angle BIC$?

- (a) 48 (b) 55
 (c) 50 (d) 52

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b) Given –



$$\angle ACB = 66^\circ$$

$$\angle ABC = 44^\circ$$

$$\therefore \angle BAC = 180^\circ - (\angle ACB + \angle ABC)$$

$$\Rightarrow \angle BAC = 180^\circ - (66^\circ + 44^\circ)$$

$$\Rightarrow \angle BAC = 70^\circ$$

$$\therefore \angle BIC = 90^\circ - \frac{\angle BAC}{2}$$

$$= 90^\circ - \frac{70^\circ}{2}$$

$$= 90^\circ - 35^\circ$$

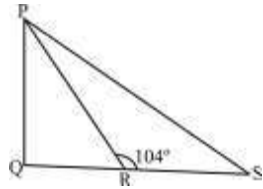
$$= 55^\circ$$

77. The side QR of a triangle PQR is extended to a point S . If $\angle PRS = 104^\circ$ and $\angle RQP = \frac{3}{5} \angle QPR$, then the value of $\angle QPR$ is:

- (a) 55° (b) 58°
 (c) 65° (d) 45°

SSC CHSL 12/08/2021 (Shift-II)

Ans. (c) : Given –



$$\angle PRS = 104^\circ$$

$$\angle RQP = \frac{3}{5} \angle QPR$$

Let $\angle QPR = x$

$$\therefore \angle QPR + \angle PQR = \angle PRS$$

$$\Rightarrow x + \frac{3}{5}x = 104^\circ$$

$$\Rightarrow 8x = 104^\circ \times 5$$

$$\Rightarrow x = 65^\circ$$

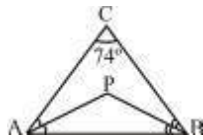
$$\Rightarrow \angle QPR = 65^\circ$$

78. If one of the angles of a triangle is 74° , then the angle between the bisectors of the other two interior angles is :

- (a) 53° (b) 106°
(c) 127° (d) 16°

SSC CGL–(Tier-I) 16/08/2021 (Shift II)

Ans. (c) :



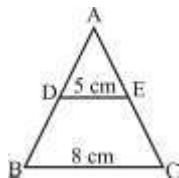
$$\begin{aligned} \angle APB &= 90^\circ + \frac{\angle C}{2} \\ &= 90^\circ + \frac{74^\circ}{2} \\ &= 90^\circ + 37^\circ \\ &= 127^\circ \end{aligned}$$

79. In $\triangle ABC$, D and E are the points on sides AB and AC, respectively and $DE \parallel BC$. BC = 8 cm and DE = 5 cm. If the area of $\triangle ADE = 45 \text{ cm}^2$, then what is the area (in cm^2) of $\triangle ABC$?

- (a) 115.2 (b) 105.2
(c) 125 (d) 64

SSC CGL–(Tier-I) 17/08/2021 (Shift I)

Ans. (a) :



$$\therefore \frac{\text{ar of } \triangle ABC}{\text{ar of } \triangle ADE} = \left(\frac{BC}{DE}\right)^2$$

$$\text{ar of } \triangle ABC = \frac{64}{25} \times 45 = 115.2 \text{ cm}^2$$

80. In a triangle ABC, D is a point on BC such that $\frac{AB}{AC} = \frac{BD}{DC}$. If $\angle B = 68^\circ$ and $\angle C = 52^\circ$, then measure of $\angle BAD$ is equal to :

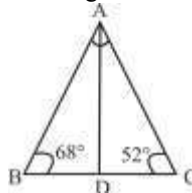
- (a) 60° (b) 30°
(c) 50° (d) 40°

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : It is given that, $\frac{AB}{AC} = \frac{BD}{DC}$

$$\frac{AB}{BD} = \frac{AC}{DC}$$

\therefore AD is the angle bisector of $\angle BAC$.



$$\angle BAD = ?$$

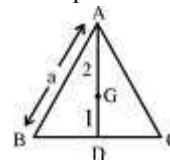
$$\begin{aligned} \therefore \angle B &= 68^\circ \quad \text{and} \quad \angle C = 52^\circ \\ \angle A &= 180^\circ - [\angle B + \angle C] \\ &= 180^\circ - [68^\circ + 52^\circ] = 180^\circ - 120^\circ \\ \angle A &= 60^\circ \\ \angle BAD &= \frac{60^\circ}{2} = 30^\circ \end{aligned}$$

81. G is the centroid of the equilateral triangle ABC. If $AB = 8\sqrt{3} \text{ cm}$, then the length of AG is equal to :

- (a) 4 cm (b) 6 cm
(c) 8 cm (d) 9 cm

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

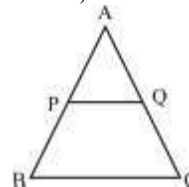
Ans. (c) : Let height of equilateral triangle be h.



$$h = \frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 8\sqrt{3} = 12 \text{ cm}$$

$$\therefore AG = 12 \times \frac{2}{3} = 8 \text{ cm}$$

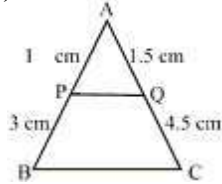
82. In a triangle ABC, P and Q are points AB and AC, respectively, such that AP = 1 cm, PB = 3 cm, AQ = 1.5 cm and CQ = 4.5 cm. If the area of $\triangle APQ$ is 12 cm^2 , then find the area of BPQC.



- (a) 192 cm^2 (b) 180 cm^2
(c) 190 cm^2 (d) 182 cm^2

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b)



From figure,

$$\frac{AP}{AB} = \frac{1}{4}$$

and $\frac{AQ}{AC} = \frac{1.5}{6.0} = \frac{1}{4}$

$\therefore \frac{AP}{AB} = \frac{AQ}{AC}$

$\Rightarrow \Delta APQ$ and ΔABC will be similar.

$$\frac{\text{area of } \Delta APQ}{\text{area of } \Delta ABC} = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

$\Rightarrow \Delta APQ = 12 \text{ cm}^2$ (Given)

$\Delta ABC = 16 \times 12 = 192 \text{ cm}^2$

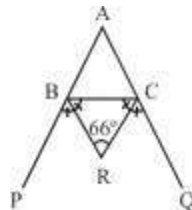
$\therefore \text{area } (\Delta ABC) - \text{area } (\Delta APQ) = 192 - 12 = 180 \text{ cm}^2$

83. In a ΔABC , the sides AB and AC are extended to P and Q respectively. The bisectors of $\angle PBC$ and $\angle QCB$ intersect at a point R . If $\angle R = 66^\circ$, then the measure of $\angle A$ is:

- (a) 72° (b) 48°
(c) 36° (d) 24°

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (b) :



By theorem, $\angle BRC = 90^\circ - \frac{\angle A}{2}$

$$66^\circ = 90^\circ - \frac{\angle A}{2}$$

$$\frac{\angle A}{2} = 24^\circ$$

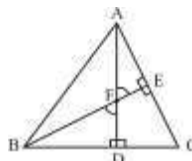
$$\angle A = 48^\circ$$

84. In ΔABC , $AD \perp BC$ and $BE \perp AC$. AD and BE intersect each other at F . If $BF = AC$, then the measure of $\angle ABC$ is:

- (a) 60° (b) 45°
(c) 50° (d) 70°

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b) :



In ΔABC ,
 $AD \perp BC$ and $BE \perp AC$

In ΔDFB and ΔAEF ,

$\angle FDB = \angle FEA$ [Right angle]

$\angle DFB = \angle EFA$ [Vertically opposite angle]

$\Delta DFB \sim \Delta AEF$ (i)

In ΔADC and ΔAEF ,

$\angle ADC = \angle AEF$ [Both are 90°]

$\angle DAC = \angle FAE$ [Common angle in both triangle]

$\Delta ADC \sim \Delta AEF$ (ii)

From equation (i) and (ii) we can say

$\Delta DFB \sim \Delta ADC$

$$\Rightarrow \frac{BF}{AC} = \frac{BD}{AD}$$

But, $BF = AC$ [Given]

$$\Rightarrow \frac{BF}{AC} = \frac{1}{1} = \frac{BD}{AD}$$

$$\Rightarrow \angle ABD = \angle DAB$$

$\therefore \angle ADB = 90^\circ$

$\therefore \angle ABD = \angle ABC = 45^\circ$

85. In ΔABC , D is a point on AC such that $AB = DC$. If $\angle BAD = 70^\circ$, then the measure of $\angle B$ is:

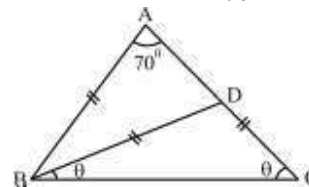
- (a) 82° (b) 75°
(c) 70° (d) 80°

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (b) : In ΔABD , D is a point on AC such that $AB = BD = DC$. If $\angle BAD = 70^\circ$, then the measure of $\angle B$ is :

$AB = BD$

$\angle ADB = \angle BAD = 70^\circ$



$\angle BDC = 180^\circ - \angle ADB$

(Linear pair of angle)

$$= 180^\circ - 70^\circ = 110^\circ$$

In ΔBDC ,

$$\theta + \theta + 110^\circ = 180^\circ$$

$$2\theta = 70^\circ$$

$$\theta = 35^\circ$$

In ΔABC ,

$$\angle B = 180^\circ - (\angle A + \angle C)$$

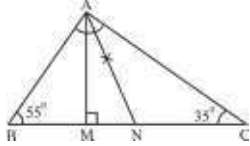
$$= 180^\circ - (70^\circ + 35^\circ) = 75^\circ$$

86. In ΔABC $AM \perp BC$ and AN is the bisector of $\angle A$. What is the measure of $\angle MAN$ if $\angle B = 55^\circ$ and $\angle C = 35^\circ$

- (a) 12° (b) 10°
(c) 5° (d) 15°

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (b) : In $\triangle ABC$,



$$\begin{aligned} \angle MAN &= \frac{\angle B + \angle C}{2} \text{ (By formula)} \\ &= \frac{55^\circ + 35^\circ}{2} \\ &= 45^\circ \end{aligned}$$

87. In $\triangle ABC$, AD bisects $\angle A$ which meets BC at D. If $BC = a$, $AC = b$ and $AB = c$, then $DC = ?$

- (a) $\frac{ac}{a+c}$ (b) $\frac{ab}{b+c}$
 (c) $\frac{bc}{a+c}$ (d) $\frac{ac}{a+b}$

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (b) : Given that,

In $\triangle ABC$,

$$\begin{aligned} BC &= a \\ AC &= b \\ AB &= c \end{aligned}$$

$$\frac{BD}{DC} = \frac{AB}{AC} = \frac{c}{b}$$

(from angle bisector theorem)

$$\begin{aligned} BD &= cK \text{ (say)} && \dots\dots\dots \text{(i)} \\ DC &= bK && \dots\dots\dots \text{(ii)} \end{aligned}$$

$$BC = (c+b)K \Rightarrow K = \frac{a}{b+c}$$

from equation (i),

$$\begin{aligned} BD &= c \cdot \frac{a}{b+c} \\ &= \frac{ac}{b+c} \end{aligned}$$

and, $DC = \frac{a}{b+c} \cdot b$

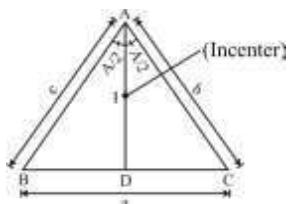
$$\Rightarrow DC = \frac{ab}{b+c}$$

88. In $\triangle ABC$, AD bisects $\angle A$ and intersects BC at D. If $BC = a$, $AC = b$ and $AB = c$, then $BD = ?$

- (a) $\frac{ac}{b+c}$ (b) $\frac{ca}{a+b}$
 (c) $\frac{ab}{b+c}$ (d) $\frac{bc}{c+a}$

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (a) :



\therefore AD is the angle bisector of $\angle A$

then, $\frac{BD}{DC} = \frac{AB}{AC} = \frac{c}{b} = K$ (say)

let, $BD = cK$

and, $DC = bK$

or, $BC = cK + bK$

or, $BC = K(c + b)$

or, $a = K(c + b)$

or, $K = \frac{a}{b+c}$

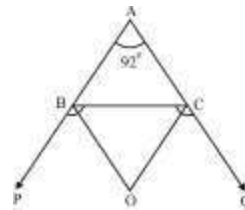
\therefore $BD = cK$, $BD = \frac{ca}{b+c}$

89. The sides AB and AC of a $\triangle ABC$ are extended to P and Q respectively. If the bisectors of $\angle PBC$ and $\angle QCB$ intersect at O, and $\angle A = 92^\circ$, then $\angle BOC$ is equal to:

- (a) 88° (b) 44°
 (c) 46° (d) 42°

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (b):



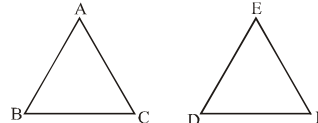
$$\begin{aligned} \therefore \angle BOC &= 90^\circ - \frac{\angle A}{2} \\ &= 90^\circ - \frac{92^\circ}{2} = 44^\circ \end{aligned}$$

90. $\triangle ABC \sim \triangle EDF$ and $AB = 5$ cm, $BC = 8$ cm and $AC = 10$ cm. If $\text{ar}(\triangle ABC) : \text{ar}(\triangle DEF) = 9 : 4$, then DF is equal to :

- (a) $\frac{10}{3}$ cm (b) $\frac{32}{9}$ cm
 (c) $\frac{16}{3}$ cm (d) $\frac{20}{3}$ cm

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (c) : $\therefore \triangle ABC \sim \triangle EDF$



$$\begin{aligned} \therefore \frac{AB}{ED} &= \frac{BC}{DF} = \frac{AC}{EF} \\ \frac{\text{ar of}(\triangle ABC)}{\text{ar of}(\triangle EDF)} &= \left(\frac{BC}{DF}\right)^2 \end{aligned}$$

$$\frac{9}{4} = \left(\frac{8}{DF}\right)^2$$

$$\frac{3}{2} = \frac{8}{DF}$$

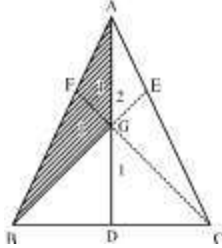
$$DF = \frac{16}{3} \text{ cm}$$

91. In ΔABC , AD is median and G is the point on AD such that $AG : GD = 2 : 1$. Then $\text{ar}(\Delta ABG) : \text{ar}(\Delta ABC)$ is equal to:

- (a) 1 : 5 (b) 1 : 6
(c) 1 : 3 (d) 1 : 4

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (c) :



\therefore we know that, all three medians divide triangle into six equal areas.

If area of $\Delta ABC = 6$

\Rightarrow area of $\Delta ABG = 2$

$\therefore \text{ar}(\Delta ABG) : \text{ar}(\Delta ABC) = 2 : 6 = 1 : 3$

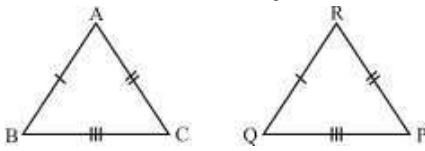
92. $\Delta ABC \sim \Delta RQP$ and $AB = 4$ cm, $BC = 6$ cm and $AC = 5$ cm. If $\text{ar}(\Delta ABC) : \text{ar}(\Delta PQR) = 9 : 4$, then PQ is equal to:

- (a) 4 cm (b) $\frac{8}{3}$ cm
(c) $\frac{10}{3}$ cm (d) $\frac{20}{9}$ cm

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (a) : Given that,

$\Delta ABC \sim \Delta RQP$



and $AB = 4$ cm, $BC = 6$ cm, $AC = 5$ cm

$\therefore \frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{9}{4}$

$$\left(\frac{BC}{PQ}\right)^2 = \frac{9}{4}$$

$$\left(\frac{BC}{PQ}\right) = \frac{3}{2}$$

$$\frac{6}{PQ} = \frac{3}{2}$$

$$\Rightarrow PQ = \frac{6 \times 2}{3}$$

$$\boxed{PQ = 4\text{cm}}$$

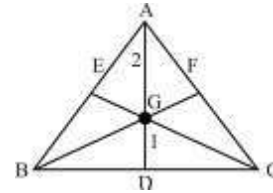
93. In ΔABC , AD is the median and G is a point on AD such that $AG : GD = 2 : 1$. Then $\text{ar}(\Delta BDG) : \text{ar}(\Delta ABC)$ is equal to :

- (a) 1 : 3 (b) 1 : 4
(c) 1 : 9 (d) 1 : 6

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (d) : Given that,

In ΔABC ,



$AG : GD = 2 : 1$

Median = AD

Centroid = G

Theorem– All the three medians divide triangle into six equal areas.

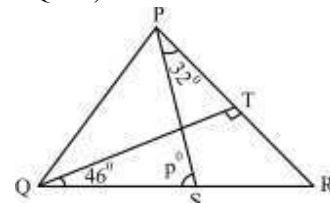
$$\therefore \frac{\text{area of } \Delta BDG}{\text{area of } \Delta ABC} = \frac{1}{6} \Rightarrow 1 : 6$$

94. In ΔPQR , $QT \perp PR$ and S is a point on QR such that $\angle PSQ = p^\circ$, If $\angle TQR = 46^\circ$ and $\angle SPR = 32^\circ$, then the value of p is:

- (a) 76° (b) 78°
(c) 82° (d) 72°

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (a) : In ΔQTR ,



$$\begin{aligned} \angle QRT &= 180^\circ - (46^\circ + 90^\circ) \\ &= 44^\circ \end{aligned}$$

$\therefore \angle PSQ$ is the exterior angle of ΔPSR

$\therefore \angle PSQ = \angle SPR + \angle PRS$

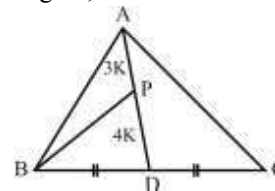
$$p = 32^\circ + 44^\circ = 76^\circ$$

95. In ΔABC , AD is median and P is a point on AD such that $AP : PD = 3 : 4$. Then $\text{ar}(\Delta BPD) : \text{ar}(\Delta ABC)$ is equal to:

- (a) 4 : 7 (b) 2 : 5
(c) 1 : 3 (d) 2 : 7

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d): From figure,



Theorem– If a point divides a line in $m : n$ ratio, then the line made from the point and opposite vertex also divides the triangle in $m : n$ ratio.

From question,

$$\frac{\text{ar } \Delta ABP}{\text{ar } \Delta BPD} = \frac{3K}{4K}$$

\therefore AD is the median

$$\therefore \text{ar}(\triangle ABD) = \text{ar}(\triangle ACD) = 7K$$

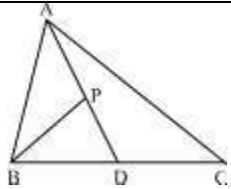
$$\therefore \frac{\text{ar}(\triangle BPD)}{\text{ar}(\triangle ABC)} = \frac{4K}{14K} = \frac{2}{7} = \boxed{2:7}$$

96. In $\triangle ABC$, AD is a median and P is a point on AD such that AP : PD = 3 : 4. Then ar($\triangle APB$) : ar($\triangle ABC$) is equal to:

- (a) 3 : 7 (b) 2 : 7
(c) 3 : 4 (d) 3 : 14

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (d) : If a point divides a line in m : n ratio, then the line made from the point and opposite vertex also divides the triangle in m : n ratio.



$$\therefore AP : PD = 3 : 4$$

$$\frac{\text{ar}(\triangle APB)}{\text{ar}(\triangle BPD)} = \frac{3}{4}$$

$$\therefore AD \text{ is the median}$$

$$\therefore \text{ar}(\triangle ABD) = \text{ar}(\triangle ADC) = 3k + 4k = 7k$$

$$\therefore \frac{\text{ar}(\triangle APB)}{\text{ar}(\triangle ABC)} = \frac{3k}{7k + 7k} = \frac{3}{14} = 3 : 14$$

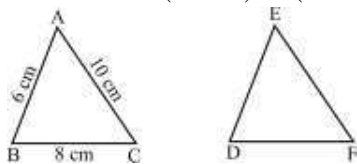
97. $\triangle ABC \sim \triangle EDF$ and ar ($\triangle ABC$) : ar ($\triangle DEF$) = 4 : 9. If AB = 6 cm, BC = 8 cm and AC = 10 cm, then DF is equal to:

- (a) 9 cm (b) 12 cm
(c) 15 cm (d) 18 cm

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (b) : According to question,

$$\triangle ABC \sim \triangle EDF \text{ and } \text{ar}(\triangle ABC) : \text{ar}(\triangle DEF) = 4 : 9$$



$$\therefore \triangle ABC \sim \triangle EDF$$

$$\therefore \frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{BC^2}{DF^2}$$

$$DF^2 = BC^2 \times \frac{\text{area of } \triangle DEF}{\text{area of } \triangle ABC}$$

$$DF^2 = 8^2 \times \frac{9}{4}$$

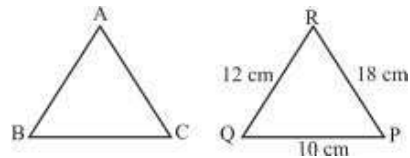
$$DF = 8 \times \frac{3}{2} = 12 \text{ cm}$$

98. $\triangle ABC \sim \triangle RQP$ and PQ = 10 cm, QR = 12 cm and RP = 18 cm. If ar ($\triangle ABC$): ar ($\triangle PQR$) = $\frac{4}{9}$, then AB is equal to:

- (a) $\frac{20}{3}$ cm (b) 8 cm
(c) 9 cm (d) 12 cm

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (b) :



$$\therefore \triangle ABC \sim \triangle RQP$$

$$\Rightarrow \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle RQP)} = \frac{AB^2}{RQ^2}$$

$$\frac{4}{9} = \frac{AB^2}{12^2}$$

$$AB^2 = \frac{4 \times 144}{9}$$

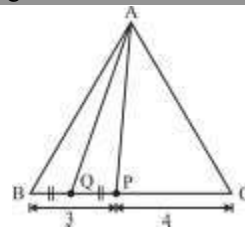
$$AB = 8 \text{ cm}$$

99. In $\triangle ABC$, P is a point on BC such that BP : PC = 3 : 4 and Q is the midpoint of BP. Then ar($\triangle ABQ$) : ar($\triangle ABC$) is equal to:

- (a) 3 : 8 (b) 2 : 7
(c) 3 : 14 (d) 1 : 4

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (c) : If a point divides a line in m : n ratio, then the line made from the point and opposite vertex also divides the triangle in m : n ratio.



$$\therefore BP : PC = 3 : 4$$

$$\frac{\text{ar}(\triangle ABP)}{\text{ar}(\triangle APC)} = \frac{3}{4}$$

$$\therefore Q \text{ is the mid point of } BP$$

$$\therefore \text{ar}(\triangle ABQ) = \text{ar}(\triangle APQ) = \frac{3k}{2}$$

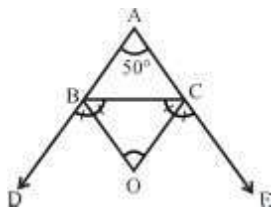
$$\Rightarrow \frac{\text{ar}(\triangle ABQ)}{\text{ar}(\triangle ABC)} = \frac{\frac{3k}{2}}{7k} = \frac{3}{14} = 3 : 14$$

100. In $\triangle ABC$, $\angle A = 50^\circ$. Its sides AB and AC are produced to the point D and E. If the bisectors of the $\angle CBD$ and $\angle BCE$ meet at the point O, then $\angle BOC$ will be equal to:

- (a) 65° (b) 75°
(c) 40° (d) 55°

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (a) : $\angle BOC = 90^\circ - \frac{\angle A}{2}$
 $= 90^\circ - \frac{50^\circ}{2} = 65^\circ$

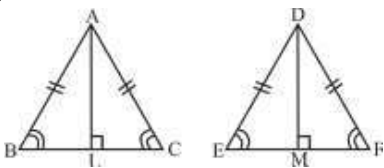


101. In $\triangle ABC$, $AB = AC$ and AL is perpendicular to BC at L . In $\triangle DEF$, $DE = DF$ and DM is perpendicular to EF at M . If (area of $\triangle ABC$) : (area of $\triangle DEF$) = 9:25, then $\frac{DM+AL}{DM-AL}$ is equal to:

- (a) 5 (b) 4
(c) 6 (d) 3

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b) :



$$\therefore \frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \left(\frac{AL}{DM}\right)^2$$

$$\Rightarrow \frac{9}{25} = \left(\frac{AL}{DM}\right)^2$$

$$\Rightarrow \frac{3}{5} = \frac{AL}{DM}$$

$$\Rightarrow \frac{DM}{AL} = \frac{5}{3}$$

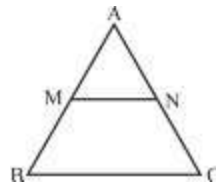
By componendo-dividendo,

$$\frac{DM+AL}{DM-AL} = \frac{5+3}{5-3}$$

$$\frac{DM+AL}{DM-AL} = \frac{8}{2}$$

$$\frac{DM+AL}{DM-AL} = 4$$

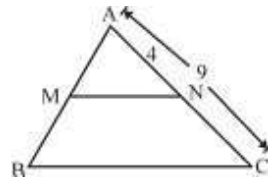
102. In $\triangle ABC$, $MN \parallel BC$, the area of quadrilateral $MBCN = 130$ sq cm. If $AN : NC = 4 : 5$, then the area of $\triangle MAN$ is:



- (a) 40 cm² (b) 32 cm²
(c) 65 cm² (d) 45 cm²

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) :



$\therefore MN \parallel BC$

$\therefore \triangle AMN \sim \triangle ABC$

$$\therefore \frac{\text{area of } \triangle MAN}{\text{area of quadrilateral } MBCN} = \frac{4^2}{9^2 - 4^2}$$

$$\frac{\text{area of } \triangle MAN}{130} = \frac{16}{81-16} = \frac{16}{65}$$

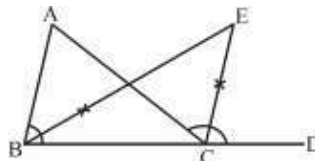
$$\text{area of } \triangle MAN = 32 \text{ cm}^2$$

103. In $\triangle ABC$, $\angle B = 72^\circ$ and $\angle C = 44^\circ$. Side BC is produced to D . The bisectors of $\angle B$ and $\angle ACD$ meet at E . What is the measure of $\angle BEC$?

- (a) 58° (b) 46°
(c) 36° (d) 32°

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d) :



$$\angle A = 180^\circ - (72^\circ + 44^\circ) = 64^\circ$$

$$\angle BEC = \frac{\angle BAC}{2} \text{ (Theorem)}$$

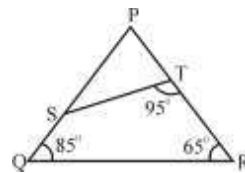
$$= \frac{64^\circ}{2} = 32^\circ$$

104. In $\triangle PQR$, $\angle Q = 85^\circ$ and $\angle R = 65^\circ$. Points S and T are on the sides PQ and PR , respectively such that $\angle STR = 95^\circ$, and the ratio of the QR and ST is $9 : 5$. If $PQ = 21.6$ cm, then the length of PT is:

- (a) 9.6 cm (b) 9 cm
(c) 10.5 cm (d) 12 cm

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) :



$$\angle PTS = 180^\circ - 95^\circ = 85^\circ$$

$\therefore \triangle PST \sim \triangle PRQ$

$$\frac{ST}{QR} = \frac{PT}{PQ}$$

$$\Rightarrow \frac{5}{9} = \frac{PT}{21.6}$$

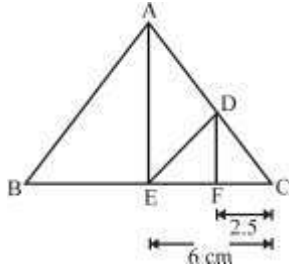
$$PT = 12 \text{ cm}$$

105. In $\triangle ABC$, D and E are the points on sides AC and BC, respectively such that $DE \parallel AB$. F is a point on CE such that $DF \parallel AE$. If $CE = 6\text{ cm}$, and $CF = 2.5\text{ cm}$, then BC is equal to:

- (a) 15.6 cm (b) 12 cm
(c) 14.4 cm (d) 14 cm

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (c) :



In $\triangle AEC$,

$\therefore DF \parallel AE$

$$\therefore \frac{CD}{CA} = \frac{CF}{CE}$$

$$\frac{CD}{CA} = \frac{2.5}{6} = \frac{5}{12}$$

In $\triangle ABC$, $DE \parallel AB$

$$\therefore \frac{CD}{CA} = \frac{CE}{CB}$$

$$= \frac{5}{12} = \frac{6}{CB}$$

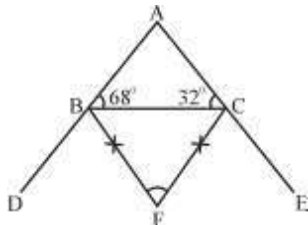
$$BC = \frac{72}{5} = 14.4\text{ cm}$$

106. In $\triangle ABC$, $\angle B = 68^\circ$ and $\angle C = 32^\circ$. Sides AB and AC are produced to points D and E, respectively. The bisectors of $\angle DBC$ and $\angle BCE$ meet at F. What is the measure of $\angle BFC$?

- (a) 55° (b) 65°
(c) 39° (d) 50°

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d) :



$$\angle A = 180^\circ - (68^\circ + 32^\circ) = 80^\circ$$

We know that,

$$\angle BFC = 90^\circ - \frac{\angle A}{2} \quad (\text{By theorem})$$

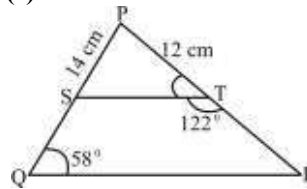
$$= 90^\circ - 40^\circ = 50^\circ$$

107. In $\triangle PQR$, $PQ = 24\text{ cm}$ and $\angle Q = 58^\circ$. S and T are the points on side PQ and PR, respectively, such that $\angle STR = 122^\circ$. If $PS = 14\text{ cm}$ and $PT = 12\text{ cm}$, then the length of RT is:

- (a) 14.8 cm (b) 15 cm
(c) 16 cm (d) 16.4 cm

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (c) :



$$\angle PTS = 180^\circ - 122^\circ = 58^\circ$$

$$\therefore \triangle PTS \sim \triangle PQR$$

$$\therefore \frac{PT}{PQ} = \frac{PS}{PR}$$

$$\frac{12}{24} = \frac{14}{PR}$$

$$PR = 28\text{ cm}$$

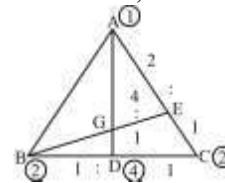
$$\therefore RT = 28 - 12 = 16\text{ cm}$$

108. D is the midpoint of side BC of $\triangle ABC$. Point E lies on AC such that $CE = \frac{1}{3}AC$. BE and AD intersect at G. What is $\frac{AG}{GD}$?

- (a) 8 : 3 (b) 5 : 2
(c) 4 : 1 (d) 3 : 1

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (c) : By MPG Theorem,



$$AG : GD = 4 : 1$$

109. In a triangle, if the measures of two sides are 5 cm and 8 cm, then the third side can be:

- (a) 3 cm (b) 4 cm
(c) 14 cm (d) 2 cm

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (b) : Third side of a triangle is always greater than difference of other two sides but less than the sum of the other two sides.

$$\text{or } |a-b| < c < |a+b|$$

$$\therefore (8-5) < c < (8+5)$$

$$3 < c < 13$$

Hence, third side can be 4 cm.

110. ABC is an equilateral triangle. P, Q and R are the midpoints of sides AB, BC and CA, respectively. If the length of the side of the triangle ABC is 8 cm, then the area of $\triangle PQR$ is:

- (a) $\frac{\sqrt{3}}{3}\text{ cm}^2$ (b) $8\sqrt{3}\text{ cm}^2$

- (c) $4\sqrt{3}\text{ cm}^2$ (d) $\frac{\sqrt{3}}{4}\text{ cm}^2$

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

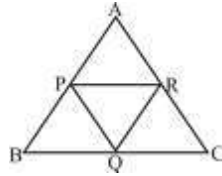
Ans. (c)

$$\begin{aligned} \text{Area of } \Delta ABC &= \frac{\sqrt{3}}{4} \times 8 \times 8 \\ &= 16\sqrt{3} \text{ cm}^2 \end{aligned}$$

We know that,

$$\text{area of } \Delta PQR = \frac{1}{4} \times \text{area of } \Delta ABC$$

$$\begin{aligned} &= \frac{1}{4} \times 16\sqrt{3} \\ &= 4\sqrt{3} \text{ cm}^2 \end{aligned}$$

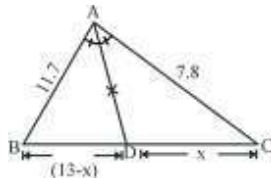


111. In ΔABC , D is a point on BC such that AD is the bisector of $\angle A$, AB = 11.7 cm, AC = 7.8 cm and BC = 13 cm. What is the length (in cm) of DC ?

- (a) 7.8 (b) 6.5
(c) 5.6 (d) 5.2

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) : DC = x (say)



\therefore AD is the angle bisector of $\angle A$

$$\therefore \frac{AB}{BD} = \frac{AC}{CD}$$

$$\frac{11.7}{13-x} = \frac{7.8}{x}$$

$$3x = 26 - 2x$$

$$5x = 26$$

$$x = 5.2 \text{ cm}$$

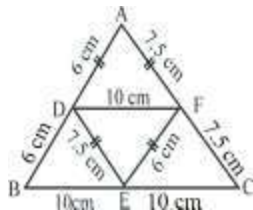
112. In ΔABC , D, E and F are the midpoints of sides AB, BC and CA, respectively. If AB = 12 cm, BC = 20 cm and CA = 15 cm, then the value of

$\frac{1}{2}(DE + EF + DF)$ is:

- (a) 23.5 cm (b) 5.88 cm
(c) 11.75 cm (d) 15.67 cm

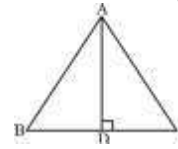
SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (c) :



$$\begin{aligned} \therefore \frac{1}{2}(DE + EF + DF) &= \frac{1}{2} \times 23.5 \\ &= 11.75 \text{ cm} \end{aligned}$$

113. In the given figure, ΔABC is an isosceles triangle, in which AB = AC, $AD \perp BC$, BC = 6 cm and AD = 4 cm. The length of AB is:



- (a) 7 cm (b) 6 cm
(c) 5 cm (d) 4 cm

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (c) : \therefore In isosceles triangle, perpendicular drawn from a vertex to opposite side of triangle, divides the side in two equal parts.

$$\therefore BD = \frac{DC}{2} = \frac{6}{2} = 3 \text{ cm}$$

In ΔADB ,

$$AB^2 = AD^2 + BD^2 = 4^2 + 3^2$$

$$AB = 5 \text{ cm}$$

114. Triangle PQR is inscribed in the circle whose radius is 14 cm. If PQ is the diameter of the circle and PR = 10 cm, then what is the area of the triangle PQR ?

- (a) 196 (b) $30\sqrt{19}$
(c) $40\sqrt{17}$ (d) $35\sqrt{21}$

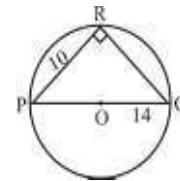
SSC CGL (Tier-II) 21-02-2018

Ans. (b):

$$\therefore PQ = 2 \times 14 = 28$$

$$PR = 10$$

In ΔPRQ ,



$$RQ = \sqrt{(28)^2 - (10)^2} = \sqrt{38 \times 18} = 6\sqrt{19}$$

$$\Rightarrow \text{area of } \Delta PQR = \frac{1}{2} \times PR \times QR$$

$$= \frac{1}{2} \times 10 \times 6\sqrt{19}$$

$$= \boxed{30\sqrt{19} \text{ cm}^2}$$

115. PQR is an equilateral triangle whose side is 10 cm. What is the value (in cm) of the radius of triangle PQR ?

- (a) $5/\sqrt{3}$ (b) $10/\sqrt{3}$
(c) $10/\sqrt{3}$ (d) $5/\sqrt{2}$

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Given that,

Side of equilateral ΔPQR (a) = 10 cm

$$\therefore \text{Inradius of } \Delta PQR = \frac{a}{2\sqrt{3}}$$

$$= \frac{10}{2\sqrt{3}}$$

$$= \boxed{\frac{5}{\sqrt{3}}}$$

116. What is the area (in cm^2) of the circumcircle of a triangle whose sides are 6 cm, 8 cm and 10 cm respectively ?

- (a) $275/7$ (b) $550/7$
(c) $2200/7$ (d) $1100/7$

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given that,

Sides of triangle are 6 cm, 8 cm, and 10 cm.

$$\therefore 6^2 + 8^2 = 10^2$$

It is a right angled triangle.

Circumradius = Hypotenuse/2 = $10/2 = 5$ cm.

$$\text{Area of Circumcircle} = \pi r^2 = \frac{22}{7} \times 25$$

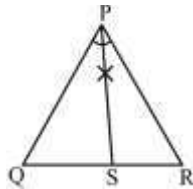
$$= \frac{550}{7} \text{ cm}^2$$

117. PQR is a triangle, whose area is 180 cm^2 . S is a point on side QR, such that PS is the angle bisector of $\angle QPR$. If $PQ : PR = 2 : 3$, then what is the area (in cm^2) triangle PSR ?

- (a) 90 (b) 108
(c) 144 (d) 72

SSC CGL (Tier-II) 20-02-2018

Ans. (b) :



By angle bisector theorem,

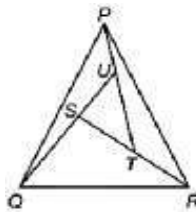
$$\frac{QS}{SR} = \frac{PQ}{PR} = \frac{2}{3}$$

\therefore In a triangle, line drawn from vertex divides the area of triangle in which ratio it divides the base of triangle.

$$\frac{\text{ar}(\triangle PSQ)}{\text{ar}(\triangle PSR)} = \frac{2}{3}$$

$$\text{ar}(\triangle PSR) = 180 \times \frac{3}{5} = 108 \text{ cm}^2$$

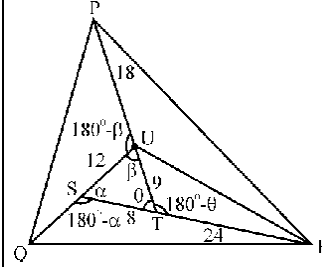
118. In the given figure, in triangle STU, $ST = 8$ cm, $TU = 9$ cm and $SU = 12$ cm. $QU = 24$ cm, $SR = 32$ cm and $PT = 27$ cm. What is the ratio of the area of triangle PQU and area of triangle PTR?



- (a) 1 : 1 (b) 1 : 4
(c) 2 : 3 (d) 5 : 2

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Ans. (*) : $QU = 24$ cm



$$\Rightarrow \text{Area of triangle} = \frac{1}{2} ab \sin \theta$$

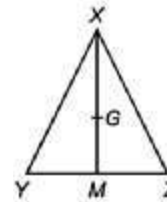
$$\frac{\text{ar}(\triangle PUQ)}{\text{ar}(\triangle STU)} = \frac{\frac{1}{2} \times 18 \times 24 \times \sin(180^\circ - \beta)}{\frac{1}{2} \times 12 \times 9 \times \sin \beta} \dots\dots (i)$$

$$\frac{\text{ar}(\triangle PTR)}{\text{ar}(\triangle STU)} = \frac{\frac{1}{2} \times 27 \times 24 \times \sin(180^\circ - \theta)}{\frac{1}{2} \times 8 \times 9 \times \sin \theta} \dots\dots (ii)$$

On dividing eqⁿ(i) by (ii),

$$\frac{\text{ar}(\triangle PQU)}{\text{ar}(\triangle PTR)} = \frac{4}{9}$$

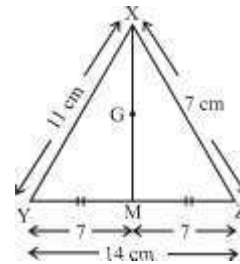
119. In triangle XYZ, G is the centroid. If $XY = 11$ cm, $YZ = 14$ cm and $XZ = 7$ cm, then what is the value (in cm) of GM ?



- (a) 6 (b) 4
(c) 2 (d) 3

SSC CGL (Tier-II) 20-02-2018 (Shift-I)

Ans. (c) :



By Apollonius Theorem,

$$XY^2 + XZ^2 = 2(XM^2 + YM^2)$$

$$121 + 49 = 2(XM^2 + 49)$$

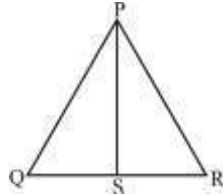
$$85 = XM^2 + 49$$

$$XM = 6 \text{ cm}$$

Centroid divides median in 2 : 1 ratio

$$GM = 6 \times \frac{1}{3} = 2 \text{ cm}$$

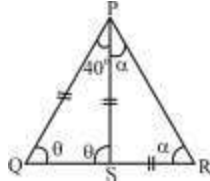
120. The given figure, $PQ = PS = SR$ and $\angle QPS = 40^\circ$, then what is the value of $\angle QPR$ (in degrees)?



- (a) 45 (b) 60
(c) 75 (d) 50

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :



In ΔPQS ,

$$2\theta = 180^\circ - 40^\circ$$

$$\theta = 70^\circ$$

$$\angle PSR = \theta + 40^\circ = 110^\circ \text{ [External angle]}$$

In ΔPSR ,

$$2\alpha = 180^\circ - 110^\circ$$

$$\alpha = 35^\circ$$

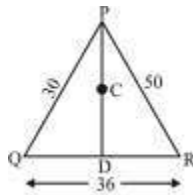
$$\angle QPR = 40^\circ + 35^\circ = 75^\circ$$

121. In triangle PQR, C is the centroid, $PQ = 30$ cm, $QR = 36$ cm and $PR = 50$ cm. If D is the midpoint of QR, then what is the length (in cm) of CD?

- (a) $(4\sqrt{86})/3$ (b) $(2\sqrt{86})/3$
(c) $(5\sqrt{86})/3$ (d) $(5\sqrt{86})/2$

SSC CGL (Tier-II) 19-02-2018

Ans. (a) :



$$\text{Median (PD)} = \frac{1}{2} \sqrt{2PQ^2 + 2PR^2 - QR^2}$$

$$= \frac{1}{2} \sqrt{2 \times 900 + 2 \times 2500 - 1296}$$

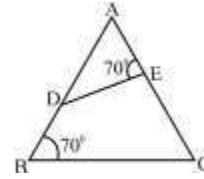
$$= \frac{1}{2} \sqrt{6800 - 1296}$$

$$= \frac{1}{2} \sqrt{5504}$$

$$= \frac{1}{2} \times 8\sqrt{86} \text{ cm}$$

$$CD = \frac{1}{3} PD = \frac{4\sqrt{86}}{3} \text{ cm}$$

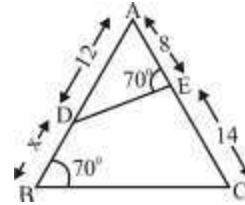
122. In the given figure, if $AD = 12$ cm, $AE = 8$ cm and $EC = 14$ cm, then what is the value (in cm) of BD?



- (a) 50/3 (b) 15
(c) 8/3 (d) 44/3

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :



$$\Delta AED \sim \Delta ABC$$

$$\frac{AE}{AB} = \frac{AD}{AC}$$

$$\frac{8}{12+x} = \frac{12}{22}$$

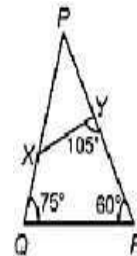
$$36 + 3x = 44$$

$$3x = 8$$

$$x = \frac{8}{3} \text{ cm}$$

$$x = \frac{8}{3} \text{ cm}$$

123. In the given figure, if $\frac{QR}{XY} = \frac{14}{9}$ and $PY = 18$ cm, then what is the value (in cm) of PQ?



- (a) 28 (b) 18
(c) 21 (d) 24

SSC CGL (Tier-II) 18-02-2018

Ans. (a) :

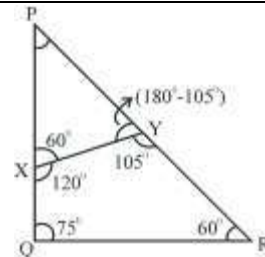
$$\therefore \Delta PQR \sim \Delta PYX$$

$$\frac{QR}{XY} = \frac{PQ}{PY}$$

$$\frac{14}{9} = \frac{PQ}{18}$$

$$PQ = 28 \text{ cm}$$

$$PQ = 28 \text{ cm}$$

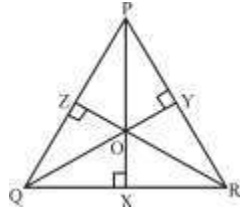


124. In a triangle PQR, PX, QY and RZ be altitudes intersecting at O. If $PO = 6$ cm, $PX = 8$ cm and $QO = 4$ cm, then what is the value (in cm) of QY?

- (a) 6.3 (b) 5.8
(c) 6 (d) 7

SSC CGL (Tier-II) 18-02-2018 (Shift-I)

Ans. (d) :



Given that,

$$PO = 6, PX = 8, OX = 2$$

$$OQ = 4$$

$$\angle OXQ = \angle PYO = 90^\circ \text{ [Given]}$$

$$\angle QOX = \angle POY \text{ [Vertically opposite angle]}$$

$$\Delta QOX \sim \Delta POY$$

$$\frac{OQ}{PO} = \frac{OX}{OY}$$

$$\frac{4}{6} = \frac{2}{OY}$$

$$OY = 3$$

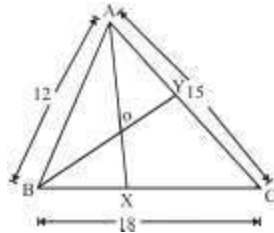
$$QY = OQ + OY = 4 + 3 = 7 \text{ cm}$$

125. In a triangle ABC, AB = 12, BC = 18 and AC = 15. The medians AX and BY intersect sides BC and AC at X and Y respectively. If AX and BY intersect each other at O, then what is the value of OX ?

- (a) $4\sqrt{23}$ (b) $\sqrt{23}$
(c) $2\sqrt{23}$ (d) $(\sqrt{23})/(\sqrt{2})$

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :



$$\text{Median } AX = \frac{1}{2} \sqrt{2AB^2 + 2AC^2 - BC^2}$$

$$= \frac{1}{2} \sqrt{2 \times 144 + 2 \times 225 - 324}$$

$$= \frac{1}{2} \sqrt{288 + 450 - 324}$$

$$= \frac{1}{2} \sqrt{414}$$

$$= 3\sqrt{\frac{23}{2}} \text{ cm}$$

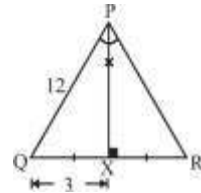
$$OX = \frac{1}{3} AX = \frac{\sqrt{23}}{\sqrt{2}} \text{ cm}$$

126. In a triangle PQR, PX bisects QR, PX is the angle bisector of angle P. If PQ = 12 cm and QX = 3 cm, then what is the area (in cm^2) of triangle PQR ?

- (a) $12\sqrt{3}$ (b) $8\sqrt{15}$
(c) $18\sqrt{2}$ (d) $9\sqrt{15}$

SSC CGL (Tier-II) 9-3-2018 (Shift-II)

Ans. (d) :



\therefore PX is the bisector of QR and bisector of angle QPR.

$\therefore \Delta PQR$ is isosceles triangle

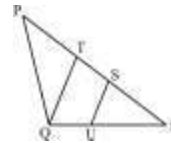
$\therefore PX \perp QR$

In ΔPXQ ,

$$PX = \sqrt{144 - 9} = 3\sqrt{15} \text{ cm}$$

$$\text{area of } \Delta PQR = \frac{1}{2} \times QR \times PX = \frac{1}{2} \times 6 \times 3\sqrt{15} = 9\sqrt{15} \text{ cm}^2$$

127. In the given figure $PT : TS : SR = 2 : 1 : 1$ and SU is parallel to TQ. If RU = 10 cm, RS = 8 cm and SU = 6 cm, then what is the value (in cm) of PQ ?



- (a) 12 (b) 10
(c) 20 (d) 30

SSC CGL (Tier-II) 9-3-2018

Ans. (c) \therefore In ΔRQT ,

SU \parallel TQ

From Thales Theorem,

$$\frac{RS}{RT} = \frac{SU}{TQ}$$

$$\frac{1}{2} = \frac{6}{TQ}$$

$$TQ = 12 \text{ cm}$$

\therefore 6, 8, 10 are the sides of a right angled triangle

$\therefore \angle USR = 90^\circ$

$\angle QTR = 90^\circ$ [Corresponding Angle]

$\therefore \Delta PQT$ is a right angle triangle.

$\therefore PT : SR = 2 : 1$

SR = 8 cm

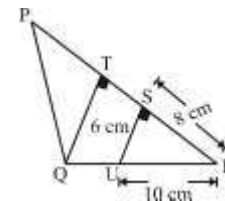
$\therefore PT = 16 \text{ cm}$

In ΔPQT ,

$$PQ^2 = PT^2 + TQ^2$$

$$= 256 + 144$$

$$PQ = 20 \text{ cm}$$

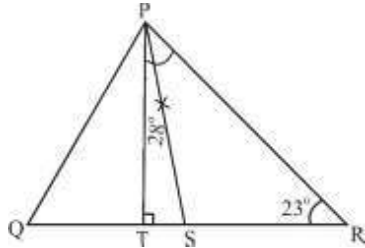


128. In ΔPQR , $\angle Q > \angle R$, PS is the bisector of $\angle P$, $PT \perp QR$. If $\angle SPT = 28^\circ$ and $\angle R = 23^\circ$, then the measure of $\angle Q$ is :

- (a) 79° (b) 89°
 (c) 74° (d) 82°

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

Ans. (a) :



We know that,

$$\angle SPT = \frac{\angle Q - \angle R}{2}$$

$$28^\circ = \frac{\angle Q - 23^\circ}{2}$$

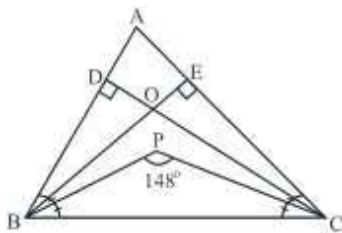
$$\angle Q = 56^\circ + 23^\circ = 79^\circ$$

129. In ΔABC , $BE \perp AC$, $CD \perp AB$ and BE and CD intersect each other at O. The bisectors of $\angle OBC$ and $\angle OCB$ meet at P. If $\angle BPC = 148^\circ$, then what is the measure of $\angle A$?

- (a) 64° (b) 28°
 (c) 56° (d) 32°

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

Ans. (a) :



In ΔOBC ,

BP and CP are the angle bisector of $\angle OBC$ and $\angle OCB$ respectively.

$$\therefore \angle BPC = 90^\circ + \frac{\angle BOC}{2}$$

$$148^\circ = 90^\circ + \frac{\angle BOC}{2}$$

$$\angle BOC = 116^\circ$$

$$\therefore \angle DOE = 116^\circ \text{ [vertically opposite angle]}$$

In quadrilateral ADOE,

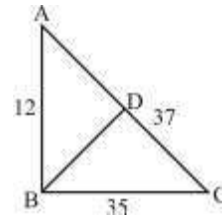
$$\begin{aligned} \angle A &= 360^\circ - (90^\circ + 90^\circ + 116^\circ) \\ &= 360^\circ - 296^\circ = 64^\circ \end{aligned}$$

130. The sides of a triangle are 12 cm, 35 cm and 37 cm. What is the circumradius of the triangle?

- (a) 17 cm (b) 19 cm
 (c) 18.5 cm (d) 17.5 cm

SSC CGL (Tier-II) 13-09-2019

Ans. (c) :



$$\therefore 37^2 = 35^2 + 12^2$$

These are the sides of right angled triangle.

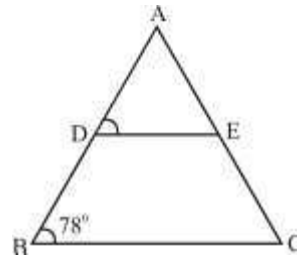
$$\therefore \text{Circumradius (BD)} = \frac{AC}{2} = \frac{37}{2} = 18.5 \text{ cm}$$

131. In ΔABC , D and E are the points on AB and AC respectively such that $AD \times AC = AB \times AE$. If $\angle ADE = \angle ACB + 30^\circ$ and $\angle ABC = 78^\circ$, then $\angle A = ?$

- (a) 68° (b) 48°
 (c) 56° (d) 54°

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

Ans. (d) :



$$\therefore AD \times AC = AB \times AE$$

$$\frac{AD}{AB} = \frac{AE}{AC}$$

By Thales Theorem, $DE \parallel BC$

$$\angle ADE = \angle ABC = 78^\circ \text{ [Corresponding angle]}$$

$$\therefore \angle ACB = \angle ADE - 30^\circ$$

$$= 78^\circ - 30^\circ = 48^\circ$$

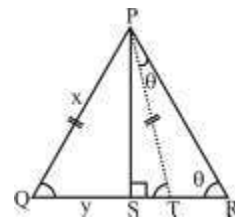
$$\angle A = 180^\circ - (78^\circ + 48^\circ) = 180^\circ - 126^\circ = 54^\circ$$

132. If in ΔPQR , $\angle P = 120^\circ$, $PS \perp QR$ at S and $PQ = QS = SR$, then the measure of $\angle Q$ is :

- (a) 20° (b) 50°
 (c) 40° (d) 30°

SSC CGL (Tier-II) 13-09-2019

Ans. (c) :



Let $PQ = x$

$$QS = y$$

T is a point on SR such that

$QS = ST$ and Join PT.

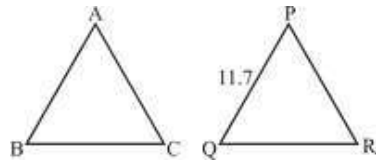
$\therefore \Delta PQT$ is a isosceles triangle

$\therefore PQ + QS = ST + TR$
 $x + y = y + TR$
 $TR = x$
 $\therefore \Delta PTR$ is also an isosceles triangle.
 $\therefore \angle TPR = \angle PRT = \theta$
 $\angle PTQ = 2\theta$
 In ΔPQT , $PQ = PT$
 $\angle PTQ = \angle PQT = 2\theta$
 In ΔPQR , $2\theta + \theta + 120^\circ = 180^\circ$
 $3\theta = 60^\circ$
 $\theta = 20^\circ$
 $\therefore \angle Q = 2 \times 20^\circ = 40^\circ$

133. The perimeters of two similar triangles ABC and PQR are 78 cm and 46.8 cm, respectively. If PQ = 11.7, then the length of AB is :
- (a) 23.4 cm (b) 20 cm
 (c) 24 cm (d) 19.5 cm

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :



$\Delta ABC \sim \Delta PQR$

$$\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta PQR} = \left(\frac{AB}{PQ}\right)$$

$$\frac{78}{46.8} = \frac{AB}{11.7}$$

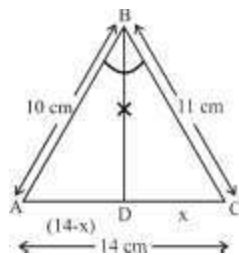
$$\therefore AB = \frac{78}{4} = 19.5 \text{ cm}$$

134. The bisector of $\angle B$ in ΔABC meets AC at D. If AB = 10 cm, BC = 11 cm and AC = 14 cm, then the length of AD is :

- (a) 7 cm (b) $\frac{22}{3}$ cm
 (c) cm (d) $\frac{20}{3}$ cm

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :



By Angle bisector theorem,

$$\frac{AB}{AD} = \frac{BC}{CD} \quad \left(\begin{array}{l} \therefore CD = x \\ \therefore AD = (14-x) \end{array} \right)$$

$$\frac{10}{(14-x)} = \frac{11}{x} \Rightarrow 10x = 11 \times 14 - 11x$$

$$21x = 11 \times 14$$

$$x = \frac{11 \times 14}{21} = \frac{22}{3}$$

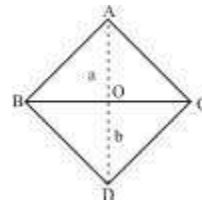
$$\therefore AD = (14-x) = 14 - \frac{22}{3} = \frac{20}{3} \text{ cm.}$$

135. ΔABC and ΔDBC are on the same base BC but on opposite sides of it. AD and BC intersect each other at O. If AO = a cm, DO = b cm and the area of $\Delta ABC = x \text{ cm}^2$, then what is the area (in cm^2) of ΔDBC ?

- (a) $\frac{(a+b)}{2}x$ (b) $\frac{ab}{2}x$
 (c) $\frac{a}{b}x$ (d) $\frac{bx}{a}$

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :



Let, AO = a cm
 OD = b cm

Given,

$$\text{Area of } \Delta ABC = \frac{1}{2} \times BC \times a = x \Rightarrow BC = \frac{2x}{a}$$

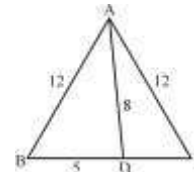
$$\therefore \text{Area of } \Delta DBC = \frac{1}{2} \times BC \times b = \frac{1}{2} \times \frac{2x}{a} \times b = \frac{bx}{a}$$

136. In ΔABC , AB = AC and D is a point on BC. If BD = 5 cm, AB = 12 cm and AD = 8 cm, then the length of CD is :

- (a) 14.8 cm (b) 16 cm
 (c) 16.2 cm (d) 14 cm

SSC CGL (Tier-II) 12-09-2019 (Shift-II)

Ans. (b) :



$\therefore AB = AC = 12 \text{ cm}$ [Given]

AD = 8 cm

BD = 5 cm

[By Stewart theorem],
 $AD^2 = AB^2 - BD \times CD$

or,

$$AB^2 = AD^2 + BD \times CD$$

$$144 = 64 + 5 \times CD$$

$$5 \times CD = 80$$

$$CD = 16 \text{ cm}$$

137. A circle is inscribed in $\triangle ABC$, touching AB, BC and AC at the points P, Q and R respectively. If $AB - BC = 4$ cm, $AB - AC = 2$ cm and the perimeter of $\triangle ABC = 32$ cm, then $PB + AR$ is equal to :

- (a) $\frac{38}{3}$ cm (b) 12 cm
(c) 13 cm (d) $\frac{33}{5}$ cm

SSC CGL (Tier-II) 11-9-2019 (Shift-I)

Ans. (a) $AB - BC = 4 \Rightarrow BC = AB - 4$

$AB - AC = 2 \Rightarrow AC = AB - 2$

Perimeter of $\triangle ABC = 32$ cm

$AB + BC + AC = 32$

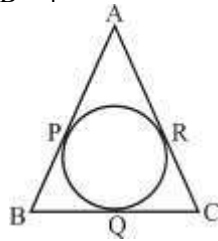
$AB + AB - 4 + AB - 2 = 32$

$3AB = 32 + 6$

$$AB = \frac{38}{3}$$

$$PB + AP = \frac{38}{3}$$

$$PB + AR = \frac{38}{3} \text{ cm}$$



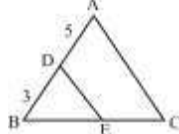
$[\because AP = AR]$

138. In $\triangle ABC$, D and E are the points on sides AB and BC respectively such that $DE \parallel AC$. If $AD : DB = 5 : 3$, then what is the ratio of the area of $\triangle BDE$ to that of the trapezium ACED ?

- (a) 9 : 55 (b) 9 : 64
(c) 4 : 25 (d) 1 : 6

SSC CGL (Tier-II) 11-9-2019 (Shift-I)

Ans. (a) $\because \triangle BDE \sim \triangle BAC$



Required ratio

$$= \text{ar. of } \triangle BDE : (\text{ar. of } \triangle ABC - \text{ar. of } \triangle BDE)$$

$$= 3^2 : (8^2 - 3^2)$$

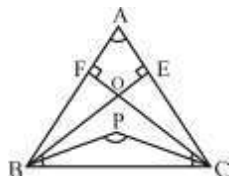
$$= 9 : (64 - 9) = 9 : 55$$

139. In $\triangle ABC$, $\angle A = 52^\circ$ and O is the orthocentre of the triangle (BO and CO meet AC and AB at E and F respectively when produced). If the bisectors of $\angle OBC$ and $\angle OCB$ meet at P, then the measure of $\angle BPC$ is :

- (a) 124° (b) 132°
(c) 138° (d) 154°

SSC CGL (Tier-II) 11-9-2019 (Shift-I)

Ans. (d) :



In Quadrilateral AEOF,

$$\angle FOE = 360^\circ - (90^\circ + 52^\circ + 90^\circ)$$

$$= 128^\circ$$

$$\angle BOC = \angle FOE = 128^\circ \quad [\text{Vertically opposite angle}]$$

$$\therefore \angle BPC = 90^\circ + \frac{\angle BOC}{2}$$

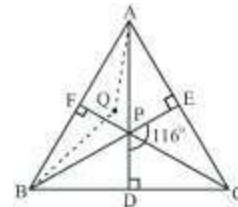
$$= 90^\circ + 64^\circ = 154^\circ$$

140. In $\triangle ABC$, the perpendiculars drawn from A, B and C meet the opposite sides at D, E and F, respectively. AD, BE and CF intersect at point P. If $\angle EPD = 116^\circ$ and the bisectors of $\angle A$ and $\angle B$ meet at Q, then the measure of $\angle AQB$ is :

- (a) 96° (b) 64°
(c) 122° (d) 124°

SSC CGL (Tier-II) 12-09-2019

Ans. (c) :



$$\angle EPD = 116^\circ, \angle D = \angle E = 90^\circ \quad [\text{Given}]$$

$$\therefore \angle C = 360^\circ - (90^\circ + 90^\circ + 116^\circ) = 64^\circ$$

Where Q is incentre

$$\therefore \angle AQB = 90^\circ + \frac{\angle C}{2}$$

$$= 90^\circ + 32^\circ$$

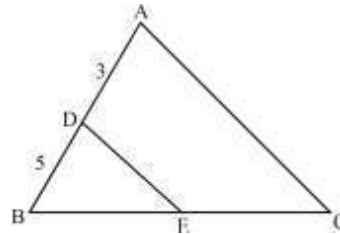
$$= 122^\circ$$

141. If in $\triangle ABC$, D and E are the points on AB and BC respectively such that $DE \parallel AC$, and $AD : AB = 3 : 8$, then (area of $\triangle BDE$) : (area of quadrilateral DECA) = ?

- (a) 8 : 13 (b) 9 : 55
(c) 9 : 64 (d) 25 : 39

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

Ans. (d) :



$\therefore DE \parallel AC$

$\triangle BDE \sim \triangle BAC$,

$$\therefore \frac{\text{area of } \triangle BDE}{\text{area of quadrilateral DECA}} = \frac{BD^2}{AB^2 - BD^2}$$

$$= \frac{5^2}{8^2 - 5^2}$$

$$= \frac{25}{64 - 25} = \frac{25}{39} = 25 : 39$$

142. Let $\Delta ABC \sim \Delta RPQ$ and $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{4}{9}$. If $AB = 3$ cm, $BC = 4$ cm and $AC = 5$ cm, then RP (in cm) is equal to:
- (a) 6 (b) 5
(c) 4.5 (d) 12

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Given,

ΔABC and ΔRPQ are similar

If two triangles are similar then ratio of their areas are the square of their sides.

$$\frac{AB}{RP} = \frac{BC}{PQ} = \frac{AC}{RQ} = \frac{2}{3}$$

$$\Rightarrow \frac{AB}{RP} = \frac{2}{3}$$

$$\Rightarrow \frac{3}{RP} = \frac{2}{3}$$

$$\Rightarrow RP = \frac{3}{2} \times 3$$

$$RP = 4.5 \text{ cm}$$

143. In ΔABC , AB and AC are produced to points D and E , respectively. If the bisectors of $\angle CBD$ and $\angle BCE$ meet at the point O , and $\angle BOC = 57^\circ$, then $\angle A$ is equal to:
- (a) 66° (b) 114°
(c) 57° (d) 93°

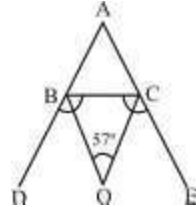
SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) :

$$\angle BOC = 90^\circ - \frac{\angle A}{2}$$

$$\frac{\angle A}{2} = 90^\circ - 57^\circ = 33^\circ$$

$$\angle A = 33 \times 2 = 66^\circ$$

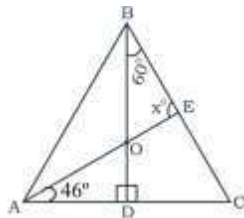


144. In ΔABC , $BD \perp AC$ at D . E is a point on BC such that $\angle BEA = x^\circ$. If $\angle EAC = 46^\circ$ and $\angle EBD = 60^\circ$ then the value of x is :
- (a) 76° (b) 78°
(c) 72° (d) 68°

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : $\angle ABC$,

In ΔAOD



$$\therefore \angle OAD = 46^\circ$$

$$\text{and } \angle ODA = 90^\circ$$

$$\therefore \angle AOD = 44^\circ$$

$$\angle AOD = \angle BOE = 44^\circ$$

[vertically opposite angle]

$$\angle BOE + \angle OBE + \angle OEB = 180^\circ$$

$$44^\circ + 60^\circ + \angle OEB = 180^\circ$$

$$104^\circ + x^\circ = 180^\circ$$

$$x^\circ = 180^\circ - 104^\circ$$

$$x^\circ = 76^\circ$$

145. D is point on the side BC of a ΔABC such that $\angle ADC = \angle BAC$. If $CA = 10$ cm and $BC = 16$ cm, then the length of CD is:

- (a) 7 cm (b) 6.5 cm
(c) 6.25 cm (d) 6 cm

SSC CPO-SI - 09/12/2019 (Shift-II)

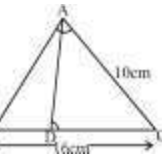
Ans. (c)

In ΔABC and ΔADC ,

$$\angle BAC = \angle ADC$$

$$\angle ACB = \angle ACD$$

$$\therefore \Delta ACB \sim \Delta DCA$$



(A-A Similarity)

$$\therefore \frac{AC}{DC} = \frac{CB}{CA}$$

$$\frac{10}{DC} = \frac{16}{10}$$

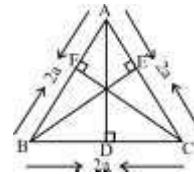
$$CD = \frac{100}{16} = 6.25 \text{ cm}$$

146. ABC is an equilateral triangle in which D , E and F are the points on sides BC , AC and AB , respectively, such that $AD \perp BC$, $BE \perp AC$ and $CF \perp AB$. Which of the following is true?

- (a) $3AC^2 = 4BE^2$ (b) $2AB^2 = 3AD^2$
(c) $7AB^2 = 9AD^2$ (d) $4AC^2 = 5BE^2$

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (a)



Let sides of equilateral triangle is $2a$

$$\therefore \text{Length of altitude} = \frac{\sqrt{3}}{2} \times \text{side} = a\sqrt{3}$$

$$\text{In } \Delta ABC, \quad AB = BC = AC = 2a$$

$$\text{and, altitude,} \quad AD = BE = CF = a\sqrt{3}$$

By option (a),

$$3AC^2 = 4BE^2$$

$$3.(2a)^2 = 4.(a\sqrt{3})^2$$

$$3 \times 4a^2 = 4 \times a^2 \times 3$$

$$12a^2 = 12a^2$$

$$\boxed{\text{L.H.S} = \text{R.H.S}}$$

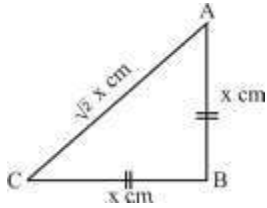
Hence, option (a) is correct.

147. If the perimeter of an isosceles right triangle is $(16\sqrt{2} + 16)$ cm, then the area of the triangle is:

- (a) 58 sq.cm (b) 64 sq.cm
(c) 76 sq.cm (d) 66 sq.cm

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b)



Let length of equal sides of isosceles triangle be x .

\therefore Length of hypotenuse = $\sqrt{2} x$ cm

According to question ,

$$x + x + \sqrt{2} x = 16\sqrt{2} + 16$$

$$2x + \sqrt{2}x = 16(\sqrt{2} + 1)$$

$$x\sqrt{2} (\sqrt{2} + 1) = 16(\sqrt{2} + 1)$$

$$x = 8\sqrt{2}$$

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} \times x \times x = \frac{1}{2} \times 8\sqrt{2} \times 8\sqrt{2} \\ &= 64 \text{ sq. cm} \end{aligned}$$

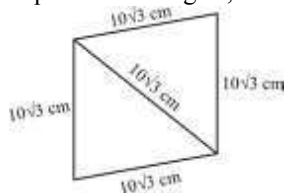
148. Two equilateral triangles of side $10\sqrt{3}$ cm are joined to form a quadrilateral. What is the altitude of the quadrilateral?

- (a) 12 cm (b) 15 cm
(c) 16 cm (d) 14 cm

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b)

On adding two equilateral triangles,



Height of quadrilateral = Height of triangle.

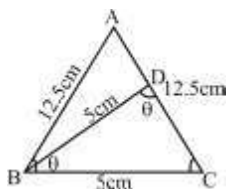
$$\begin{aligned} &= \frac{\sqrt{3}}{2} \times \text{side} = \frac{\sqrt{3}}{2} \times 10\sqrt{3} \\ &= 15 \text{ cm} \end{aligned}$$

149. In ΔABC , $AB = AC$ and D is point on side AC such that $BD = BC$. If $AB = 12.5$ cm and $BC = 5$ cm, then what is the measure of DC ?

- (a) 2 cm (b) 1.8 cm
(c) 3 cm (d) 2.5 cm

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)



Given, $AB = AC$

and $BD = BC$

In ΔABC ,

$$\angle ABC = \angle ACB (\because AB = AC)$$

In ΔBDC ,

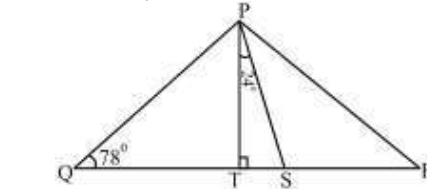
$$\angle ACB = \angle BDC (\because BD = BC)$$

$\therefore \Delta BCA \sim \Delta CDB$

$$\frac{BC}{CD} = \frac{BA}{CB} \Rightarrow \frac{5}{DC} = \frac{12.5}{5}$$

$$DC = 2 \text{ cm}$$

150. In the figure, in ΔPQR , $PT \perp QR$ at T and PS is the bisector of $\angle QPR$. If $\angle PQR = 78^\circ$ and $\angle TPS = 24^\circ$, then the measure of $\angle PRQ$ is:



- (a) 42° (b) 39°
(c) 40° (d) 30°

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Ans. (d)

$$\angle TPS = \frac{1}{2} (\angle PQR - \angle PRQ) \quad [\text{by theorem}]$$

$$24^\circ = \frac{1}{2} (78^\circ - \angle PRQ)$$

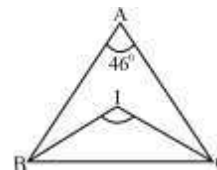
$$\angle PRQ = 78^\circ - 48^\circ = 30^\circ$$

151. I is the incentre of ΔABC of $\angle A = 46^\circ$, then $\angle BIC = ?$

- (a) 134° (b) 90°
(c) 113° (d) 124°

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Ans. (c)



\therefore Inter section point of angle bisectors of a triangle is called incentre.

$$\angle BIC = 90^\circ + \frac{\angle A}{2} \quad (\text{By formula})$$

$$= 90^\circ + \frac{46^\circ}{2}$$

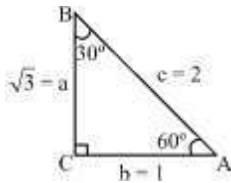
$$= 113^\circ$$

152. In ΔABC , $AB = c$ cm, $AC = b$ cm and $CB = a$ cm. If $\angle A = 2\angle B$, then which of the following is true?

- (a) $a^2 = b^2 - ac$ (b) $a^2 = b^2 - bc$
(c) $a^2 = b^2 + ac$ (d) $a^2 = b^2 + bc$

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Ans. (d) Let, $\angle B = 30^\circ$
 $\therefore \angle A = 60^\circ$



From $30^\circ, 60^\circ, 90^\circ$
 $a : b : c = \sqrt{3} : 1 : 2$

By option (d),
 $a^2 = b^2 + bc$
 $(\sqrt{3})^2 = (1)^2 + (1 \times 2)$
 $3 = 3$

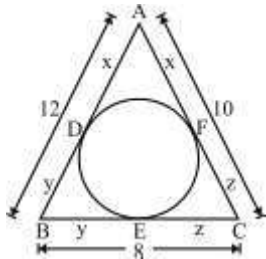
LHS = RHS
Hence, option (d) is correct.

153. The sides AB, BC and AC of a ΔABC are 12cm, 8cm and 10 cm respectively. A circle is inscribed in the triangle touching AB, BC and AC at D, E and F, respectively. The difference between the lengths of AD and CE is:

- (a) 5cm (b) 3cm
(c) 2cm (d) 4cm

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d)



$$\begin{aligned} x + y &= 12 && \dots(i) \\ y + z &= 8 && \dots(ii) \\ x + z &= 10 && \dots(iii) \end{aligned}$$

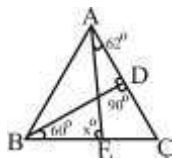
From eqⁿ (i) + (ii) + (iii),
 $2(x+y+z) = 30$
 $x+y+z = 15 \dots(iv)$
 $\therefore x = 7, y = 5, z = 3$
 $AD - CE = x - z = 7 - 3 = 4\text{cm}$

154. In ΔABC , $BD \perp AC$ at D. E is a point on BC such that $\angle BEA = x^\circ$. If $\angle EAC = 62^\circ$ and $\angle EBD = 60^\circ$, then the value of x is:

- (a) 68° (b) 92°
(c) 76° (d) 78°

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) :



In ΔBDC ,
 $\angle BCD = 180^\circ - (\angle CBD + \angle BDC)$

$$\begin{aligned} &= 180^\circ - (60^\circ + 90^\circ) \\ &= 30^\circ \end{aligned}$$

In ΔAEC ,

$\therefore \angle AEB$ is an exterior angle of ΔAEC .

$$\Rightarrow x^\circ = \angle EAC + \angle ECA$$

$$\Rightarrow x^\circ = 62^\circ + 30^\circ$$

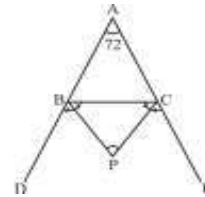
$$\Rightarrow x^\circ = 92^\circ$$

155. The sides AB and AC of triangle ΔABC produced to D and E respectively. Bisectors of $\angle CBD$ and $\angle BCE$ meet at a point P. If $\angle A = 72^\circ$, then measure of $\angle P$ is:

- (a) 36° (b) 45°
(c) 60° (d) 54°

SSC CHSL (Tier-I) 01/07/2019 (Shift-III)

Ans. (d):



$$\angle BPC = 90^\circ - \frac{\angle BAC}{2}$$

$$\angle BPC = 90^\circ - \frac{72^\circ}{2}$$

$$\angle BPC = 90^\circ - 36^\circ$$

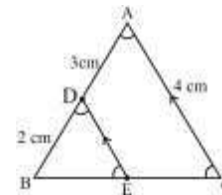
$$\angle BPC = 54^\circ$$

156. In ΔABC , a point D on the side AB is such that $BD = 2\text{ cm}$ and $DA = 3\text{ cm}$. E is a point on the side BC such that $DE \parallel AC$ and $AC = 4\text{ cm}$, then ar (ΔBDE) : ar ($\square ACED$) is:

- (a) 4 : 21 (b) 2 : 5
(c) 1 : 5 (d) 4 : 25

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Ans. (a) :



In ΔBDE and ΔABC ,

$$\angle DBE = \angle ABC \text{ [Common angle]}$$

$$\angle BDE = \angle BAC \text{ [corresponding angle]}$$

$$\angle BED = \angle BCA \text{ [corresponding angle]}$$

$\Rightarrow \Delta BDE \sim \Delta BAC$ [Angle-Angle-Angle similarity]

$$BD : BA = 2 : 5$$

$$\text{ar}(\Delta BDE) : \text{ar}(\Delta ABC) = BD^2 : (BA^2 - BD^2)$$

$$= 2^2 : (5^2 - 2^2)$$

$$= 4 : (25 - 4)$$

$$= 4 : 21$$

157. In $\triangle ABC$, $AB = 7$ cm, $BC = 24$ cm and $AC = 25$ cm. If G is the centroid of triangle, then the length of BG is :

- (a) $8\frac{2}{3}$ (b) 10
(c) 9 (d) $8\frac{1}{3}$

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Ans. (d) : Given,

$$AC = 25 \text{ cm}, \quad BC = 24 \text{ cm}, \quad AB = 7 \text{ cm}$$

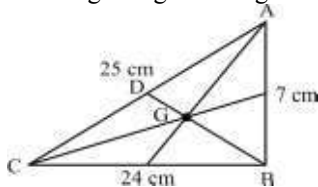
$$\therefore AB^2 + BC^2 = AC^2$$

$$7^2 + 24^2 = 25^2$$

$$49 + 576 = 625$$

$$625 = 625$$

$\Rightarrow \triangle ABC$ is a right angled triangle.



\therefore Diameter of circumcircle in right angled triangle

$$\therefore AD = CD = BD = \frac{25}{2} \text{ } (\triangle ABC \text{ circumradius})$$

$$BD = \frac{25}{2} \text{ cm}$$

$$\therefore BG = \frac{2}{3} \times \frac{25}{2}$$

(Centroid divides median in 2:1 ratio)

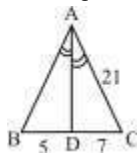
$$= 8\frac{1}{3}$$

158. In $\triangle ABC$, AD is the angle bisector of $\angle BAC$ which meets BC at D . If $AC = 21$ cm, $BC = 12$ and the length of BD is 2 cm less than DC , then the length of side AB is :

- (a) 14 cm (b) 10 cm
(c) 18 cm (d) 15 cm

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Ans. (d) : According to the question,



By angle bisector theorem,

$$\frac{AC}{DC} = \frac{AB}{BD}$$

$$\Rightarrow \frac{21}{7} = \frac{AB}{5}$$

$$\Rightarrow AB = \frac{21 \times 5}{7}$$

$$\Rightarrow AB = 15 \text{ cm}$$

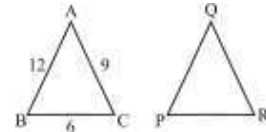
159. Let $\triangle ABC \sim \triangle QPR$ and $\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle PQR)} = \frac{9}{4}$. If $AB =$

12 cm, $BC = 6$ cm and $AC = 9$ cm then QR is equal to :

- (a) 6 cm (b) 12 cm
(c) 9 cm (d) 15 cm

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Ans. (a):



$\therefore \triangle ABC \sim \triangle QPR$

$$\therefore \frac{\text{area of } (\triangle ABC)}{\text{area of } (\triangle PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{PR}\right)^2 = \left(\frac{AC}{QR}\right)^2$$

$$\frac{9}{4} = \left(\frac{9}{QR}\right)^2$$

$$\Rightarrow \sqrt{\frac{9}{4}} = \frac{9}{QR}$$

$$\Rightarrow \frac{3}{2} = \frac{9}{QR}$$

$$\Rightarrow QR = \frac{18}{3}$$

$$\Rightarrow QR = 6 \text{ cm}$$

160. In $\triangle ABC$, Points D and E on sides AB and AC are such that $AD : DB = 2 : 3$ and $DE \parallel AC$. If area of $\triangle ADE$ is 18 cm^2 then area of $\triangle ABC$ (in cm^2) is :

- (a) 54 (b) 75
(c) 40.5 (d) 45

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Ans. (b) :

In $\triangle ADE$ and $\triangle BDE$,

$$\frac{\text{area of } (\triangle BDE)}{\text{area of } (\triangle ADE)} = \frac{3}{2}$$

$$\frac{\text{area of } (\triangle BDE)}{18} = \frac{3}{2}$$

$$\text{area of } \triangle BDE = 27 \text{ cm}^2$$

In $\triangle BDC$ & $\triangle ABC$,

$$\angle BDE = \angle BAC \quad [\text{Corresponding angle}]$$

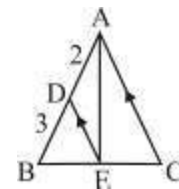
$$\angle BED = \angle BCA \quad [\text{Corresponding angle}]$$

$$\angle DBE = \angle ABC \quad [\text{Common angle}]$$

$\therefore \triangle BDE \sim \triangle BAC$

$$\frac{BD}{BA} = \frac{DE}{AC} = \frac{BE}{BC}$$

$$\frac{\text{area of } (\triangle BDE)}{\text{area of } (\triangle ABC)} = \left(\frac{BD}{BA}\right)^2 \quad [\text{Theorem}]$$



$$\frac{27}{\text{area of } (\Delta ABC)} = \frac{3^2}{5^2}$$

$$\text{area of } (\Delta ABC) = \frac{27 \times 25}{9} = 75 \text{ cm}^2$$

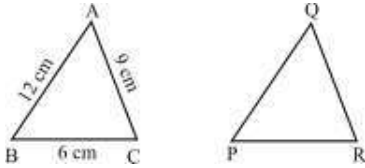
161. Let $\Delta ABC \sim \Delta QPR$ and $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{9}{16}$. If

$AB = 12 \text{ cm}$, $BC = 6 \text{ cm}$ and $AC = 9 \text{ cm}$, then QR is equal to ;

- (a) 8 cm (b) 9 cm
(c) 16 cm (d) 12 cm

SSC CHSL (Tier-I) 03/07/2019 (Shift-II)

Ans. (d) :



$\therefore \Delta ABC \sim \Delta QPR$

$$\therefore \frac{\text{area of } (\Delta ABC)}{\text{area of } (\Delta PQR)} = \left(\frac{BC}{PR}\right)^2 = \left(\frac{AB}{QP}\right)^2 = \left(\frac{AC}{QR}\right)^2$$

$$\frac{9}{16} = \left(\frac{9}{QR}\right)^2 \Rightarrow \frac{9}{QR} = \sqrt{\frac{9}{16}}$$

$$\Rightarrow \frac{9}{QR} = \frac{3}{4}$$

$$\Rightarrow QR = \frac{36}{3}$$

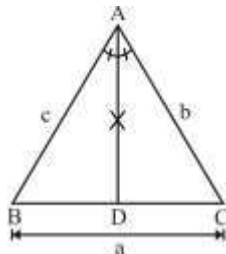
$$QR = 12 \text{ cm}$$

162. In ΔABC , AD is the bisector of $\angle A$ which meets BC at D . If $BC = a$, $AC = b$ and $AB = c$, then $BD - DC$ is equal to :

- (a) $\frac{a(c-b)}{c+b}$ (b) $\frac{ab}{b+c}$
(c) $\frac{ac}{b+c}$ (d) $\frac{a(c+b)}{c-b}$

SSC CHSL (Tier-I) 03/07/2019 (Shift-II)

Ans. (a) :



If AD is bisector of $\angle A$,

$$\text{then, } \frac{BD}{DC} = \frac{AB}{AC} = \frac{c}{b}$$

Let, $BD = cK$ and $DC = bK$

$$\Rightarrow BD + DC = cK + bK$$

$$\Rightarrow BD + DC = K(c+b)$$

$$\Rightarrow a = K(c+b)$$

$$\Rightarrow K = \frac{a}{b+c}$$

$$\Rightarrow BD = c\left(\frac{a}{b+c}\right), DC = b\left(\frac{a}{b+c}\right)$$

According to the question,

$$\Rightarrow BD - DC = \frac{ac}{b+c} - \frac{ab}{b+c}$$

$$\Rightarrow BD - DC = \frac{ac - ab}{b+c}$$

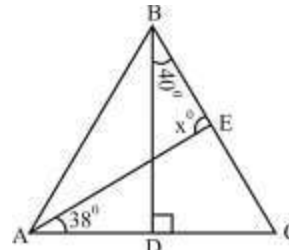
$$\Rightarrow BD - DC = \frac{a(c-b)}{b+c}$$

163. In ΔABC , $BD \perp AC$, E is a point on BC where $\angle BEA = x^\circ$. If $\angle EAC = 38^\circ$ and $\angle EBD = 40^\circ$ then the value of x is :

- (a) 72° (b) 68°
(c) 88° (d) 78°

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Ans. (c) :



In right angle triangle ΔBDC ,
 $\angle C = 180 - (90 + 40^\circ)$
 $\angle C = 50^\circ$

$\therefore \angle BEA$ is exterior angle of $\angle ECA$ and $\angle EAC$

Since, exterior angle is the sum of opposite interior angles of a triangle.

$$\therefore \angle BEA = \angle EAC + \angle C$$

$$x^\circ = 38^\circ + 50^\circ$$

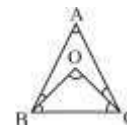
$$x^\circ = 88^\circ$$

164. In a ΔABC , bisectors of $\angle B$ and $\angle C$ meet at point O inside the triangle. If $\angle BOC$ is given, then which of the following option is true ?

- (a) $\angle A = 180^\circ - \angle BOC$
(b) $\angle A = 2(\angle BOC - 90^\circ)$
(c) $\angle A = 90^\circ + \angle BOC$
(d) $\angle A = 2(90^\circ - \angle BOC)$

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Ans. (b) :



$$\angle BOC = 90^\circ + \frac{\angle A}{2} \quad (\text{Theorem})$$

$$2\angle BOC = 180^\circ + \angle A$$

$$\angle A = 2\angle BOC - 180^\circ$$

$$\angle A = 2(\angle BOC - 90^\circ)$$

165. In $\triangle ABC$ a point D on side BC is such that

$$\angle BAD = \frac{1}{2}\angle ADC, \angle BAC = 87^\circ \text{ and } \angle C = 42^\circ$$

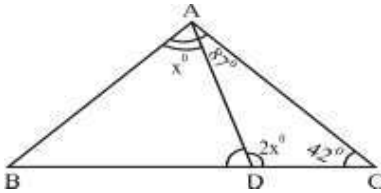
then what is the measure of $\angle ADB$?

- (a) 68° (b) 78°
(c) 94° (d) 102°

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Ans. (b) : In $\triangle ABC$,

Let $\angle BAD = x^\circ$
then $\angle ADC = 2 \times \angle BAD$
 $\angle ADC = 2x^\circ$



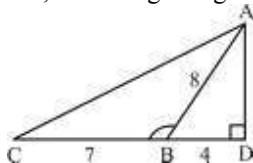
then $\angle DAC = \angle BAC - \angle BAD$
 $\angle DAC = 87^\circ - x^\circ$
 $\angle ADB = 180^\circ - \angle ADC$ [linear pair]
 $\angle ADB = 180^\circ - 2x^\circ$
 $\angle ADB = \angle DAC + \angle ACD$ [exterior angle]
 $180^\circ - 2x^\circ = 87^\circ - x^\circ + 42^\circ$
 $180^\circ - 129^\circ = x^\circ$
 $x^\circ = 51^\circ$
 $\Rightarrow \angle ADB = 180^\circ - 2 \times 51^\circ$
 $= 180^\circ - 102^\circ$
 $\angle ADB = 78^\circ$

166. $\triangle ABC$ is such a triangle which $\angle B$ is obtuse. CB is produced to D and $AD \perp CB$. If $AB = 8$ cm, $BC = 7$ cm and $BD = 4$ cm then AC is equal to :

- (a) 15 cm (b) 14 cm
(c) 12 cm (d) 13 cm

SSC CHSL (Tier-I) 04/07/2019 (Shift-I)

Ans. (d) : In $\triangle ADB$, $\angle D$ is right angle.



then, $AD = \sqrt{AB^2 - BD^2}$
 $AD^2 = 8^2 - 4^2$
 $AD^2 = 48$

\Rightarrow In $\triangle ADC$,
 $AC = \sqrt{AD^2 + CD^2}$
 $AC = \sqrt{48 + (7+4)^2}$
 $AC = \sqrt{48 + 121}$
 $AC = 13$ cm

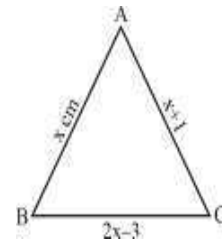
167. In $\triangle ABC$, the length of BC is 3 cm less than twice of the length of AB . The length of AC is 1 more than the length of AB . The perimeter of triangle is 34 cm. Find the shortest length is :

- (a) 7 (b) 10
(c) 8 (d) 9

SSC CHSL (Tier-I) 08/07/2019 (Shift-I)

Ans. (d) :

Let, Side $AB = x$ cm
then, Side $BC = (2x - 3)$ cm
Side $AC = (x + 1)$ cm
Perimeter of $\triangle ABC = 34$ cm
 $\Rightarrow AB + BC + CA = 34$
 $\Rightarrow x + 2x - 3 + x + 1 = 34$
 $\Rightarrow 4x = 36$
 $\Rightarrow x = 9$



Sides of $\triangle ABC$ (AB) = $x = 9$ cm
 $BC = 2x - 3 = 15$ cm
 $AC = x + 1 = 10$ cm
Length of smaller side = 9 cm

168. In a triangle ABC , AC is parallel to PQ such that $ar(\triangle ABC) : ar(\triangle PBQ) = 3 : 1$ then $CB : CQ$ is equal to :

- (a) $\frac{\sqrt{3}}{2}(\sqrt{3}-1)$ (b) $\frac{\sqrt{3}-2}{2}$
(c) $\frac{\sqrt{3}}{2}(\sqrt{3}+1)$ (d) $\frac{\sqrt{3}}{2}$

SSC CHSL (Tier-I) 09/07/2019 (Shift-III)

Ans. (c) :

$\therefore PQ \parallel AC$

$\therefore \triangle BAC \sim \triangle BPQ$

$\therefore \frac{ar(\triangle ABC)}{ar(\triangle PBQ)} = \left(\frac{BC}{BQ}\right)^2$

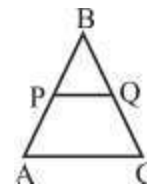
$\frac{BC}{BQ} = \frac{\sqrt{3}}{1}$

$CQ = BC - BQ$

$= \sqrt{3}K - K$

$= (\sqrt{3}-1)K$

$\frac{CB}{CQ} = \frac{\sqrt{3}K}{(\sqrt{3}-1)K} = \frac{\sqrt{3}}{\sqrt{3}-1} \times \frac{(\sqrt{3}+1)}{\sqrt{3}+1} = \frac{\sqrt{3}(\sqrt{3}+1)}{2}$



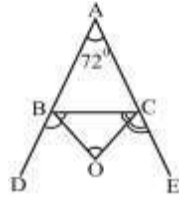
169. In $\triangle ABC$, $\angle A = 72^\circ$ the sides AB and AC is produced to point D and E respectively. If bisectors of $\angle CBD$ and $\angle BCE$ meet at point O , then $\angle BOC$ is equal to :

- (a) 106° (b) 32°
(c) 54° (d) 16°

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Ans. (c) :

$$\begin{aligned}\angle BOC &= 90^\circ - \frac{\angle A}{2} \\ &= 90^\circ - \frac{72^\circ}{2} \\ &= 90^\circ - 36^\circ \\ &= 54^\circ\end{aligned}$$

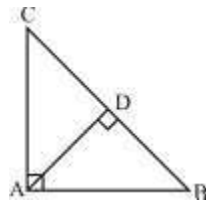


170. In $\triangle ABC$, a perpendicular AD is drawn on side BC . If $\angle BAC = 90^\circ$ then $AB^2 : AC^2$ equals to :
- (a) $BD^2 : CD^2$ (b) $CD^2 : BD^2$
 (c) $BD : CD$ (d) $CD : BD$

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Ans. (c) :

In $\triangle ADB$ and $\triangle CAB$,
 $\angle BDA = \angle BAC$
 $\angle ABD = \angle ABC$
 $\therefore \triangle ADB \sim \triangle CAB$
 $\therefore \frac{AD}{CA} = \frac{DB}{AB} = \frac{AB}{CB}$
 $AB^2 = BD \times BC$ (i)



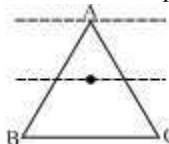
Similarly,
 In $\triangle ACD$ and $\triangle BCA$,
 $AC^2 = CD \times BC$ (ii)
 On dividing equation (i) by (ii),
 $\frac{AB^2}{AC^2} = \frac{BD \times BC}{CD \times BC}$
 $AB^2 : AC^2 = BD : CD$

171. Point A of $\triangle ABC$ moves parallel to side BC . Which of the following moves parallel to side BC ?

- (1) The circumcentre (2) The centroid
 (3) The incentre (4) The orthocentre
 (a) 3 (b) 4
 (c) 1 (d) 2

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Ans. (d) : \therefore Line drawn from point A , is parallel to line BC of a triangle ABC . According to question, Centroid is the point which moves parallel to line BC .

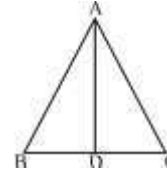


172. In $\triangle ABC$ a point D on BC is such that $BD : DC = 2 : 5$, then what is the value of ar ($\triangle ABD$) : ar ($\triangle ADC$) ?

- (a) 4 : 9 (b) 2 : 5
 (c) 2 : 3 (d) 1 : 2

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Ans. (c): Given that,



$$\begin{aligned}BD : DC &= 2 : 5 \\ BD : DC &= BD : (BC - BD) \\ &= 2 : (5 - 2) \\ &= 2 : 3\end{aligned}$$

area of $\triangle ABD$: area of $\triangle ADC$
 $=$

$$\begin{aligned}\left(\frac{1}{2} \times BD \times \text{height}\right) &: \left(\frac{1}{2} \times DC \times \text{height}\right) \\ &= BD : DC \\ &= 2 : 3\end{aligned}$$

173. $\triangle ABC \sim \triangle DEF$ and their perimeters are 64 cm and 48 cm respectively. If $DE = 9$ cm then the length of AB is :

- (a) 17.5 cm (b) 12 cm
 (c) 16 cm (d) 18 cm

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Ans. (b) : $\therefore \triangle ABC \sim \triangle DEF$

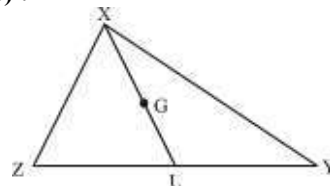
$$\begin{aligned}\therefore \frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle DEF} &= \frac{AB}{DE} \\ \Rightarrow \frac{64}{48} &= \frac{AB}{9} \\ AB &= 12 \text{ cm}\end{aligned}$$

174. In $\triangle XYZ$, if G is the centroid and XL is the median with length 18 cm, then the length of XG is:

- (a) 16 cm (b) 10 cm
 (c) 12 cm (d) 14 cm

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Ans. (c) :



Theorem :- Centroid (G) divides medians in 2 : 1 ratio.

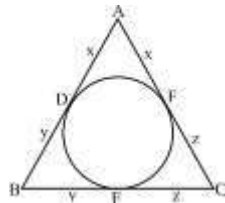
$$\begin{aligned}\therefore XG : GL &= 2 : 1 \\ \therefore XL &= 18 \\ XG &= 18 \times \frac{2}{3} \\ &= 12 \text{ cm}\end{aligned}$$

175. A circle inscribed in a triangle ABC touches its sides AB , BC and AC at the points D , E and F respectively. If $AB = 18$ cm, $BC = 15$ cm and $AC = 13$ cm, then the value of $AD + BE + CF$ is:

- (a) 25 cm (b) 33 cm
 (c) 23 cm (d) 20 cm

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Ans. (c)



$$2(x+y+z) = 18 + 15 + 13$$

$$2(x+y+z) = 46$$

$$x+y+z = 23$$

$$\therefore AD + BE + CF = 23 \text{ cm}$$

176. The exterior angle of a triangle is 115° and the corresponding interior opposite angles are in the ratio $2 : 3$. The measure of greatest angle of the triangle is:

- (a) 70° (b) 65°
(c) 69° (d) 79°

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Ans. (c) : Let the interior opposite angles are 2θ and 3θ

$$\therefore 2\theta + 3\theta = 115^\circ \text{ (From theorem)}$$

$$5\theta = 115^\circ \Rightarrow \theta = 23^\circ$$

$$\text{Value of the greatest angle } (3\theta) = 3 \times 23^\circ = 69^\circ$$

177. Three sides of a triangle measure 6 cm, 10 cm and x cm. The minimum integral value of x is:

- (a) 5 (b) 3
(c) 2 (d) 1

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Ans. (a) : \because Since, in a triangle third side is always greater than the difference of other two sides and smaller than sum of other two sides.

$$\therefore (10-6) < x < (10+6)$$

$$4 < x < 16$$

$$\therefore \text{The minimum integral value of } x = 5$$

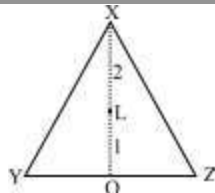
178. The centroid of an equilateral ΔXYZ is L. If $XY = 12$ cm, then the length of XL (in cm), is:

- (a) $4\sqrt{3}$ (b) $2\sqrt{3}$
(c) $5\sqrt{3}$ (d) $3\sqrt{3}$

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Ans. (a):

\because Centroid divides median in $2 : 1$ ratio.



\therefore We know that, $XL : LO = 2 : 1$

$$\therefore \text{Height of equilateral triangle} = XO = \frac{\sqrt{3}}{2} \times (\text{side})$$

$$= \frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3} \text{ cm}$$

$$\text{Length of XL} = 6\sqrt{3} \times \frac{2}{3}$$

$$= 4\sqrt{3} \text{ cm}$$

179. The side MN of ΔLMN is produced to X. If

$$\angle LNX = 117^\circ \text{ and } \angle M = \frac{1}{2} \angle L, \text{ then } \angle L \text{ is :}$$

- (a) 78° (b) 75°
(c) 76° (d) 77°

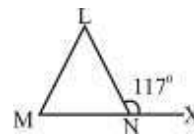
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Ans. (a) : By exterior angle theorem,

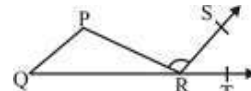
$$\angle L + \angle M = \angle LNX$$

$$\angle L + \angle L \times \frac{1}{2} = 117^\circ$$

$$\frac{3\angle L}{2} = 117^\circ \Rightarrow \angle L = 39^\circ \times 2 = 78^\circ$$



180. In the given figure, PQR is a triangle in which $\angle P : \angle Q : \angle R = 3:2:1$, and PR is perpendicular to RS. What will be the measure of angle TRS?



- (a) 30° (b) 60°
(c) 50° (d) 45°

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Ans. (b) : Let $\angle P$, $\angle Q$ and $\angle R$ be $3x$, $2x$ and x respectively.

\therefore In ΔPQR ,

$$\angle P + \angle Q + \angle R = 180^\circ$$

$$3x + 2x + x = 180^\circ$$

$$6x = 180^\circ$$

$$x = 30^\circ$$

$\therefore PR \perp RS$

$$\therefore \angle PRS = 90^\circ$$

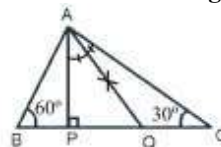
$$\therefore \angle QRP + \angle PRS + \angle TRS = 180^\circ$$

$$30^\circ + 90^\circ + \angle TRS = 180^\circ$$

$$\angle TRS = 180^\circ - 120^\circ$$

$$\angle TRS = 60^\circ$$

181. In the given figure, AP is perpendicular to BC, and AQ is the bisector of angle PAC. What will be the measure of angle PAQ?

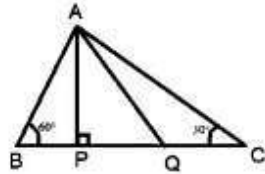


- (a) 30° (b) 50°
(c) 60° (d) 45°

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Ans. (a) :

$\therefore AP \perp BC$
 $\therefore \angle APC = 90^\circ$



\therefore In right angled triangle ΔAPC ,
 $\angle PAC + \angle APC + \angle PCA = 180^\circ$
 $\angle PAC + 90^\circ + 30^\circ = 180^\circ$
 $\angle PAC = 180^\circ - 120^\circ$
 $\angle PAC = 60^\circ$
 (AQ is the angle bisector of $\angle PAC$)
 $\therefore \angle PAC = \angle PAQ + \angle QAC$
 $= \angle PAQ + \angle PAQ$ [$\because \angle PAQ = \angle QAC$]
 $60^\circ = 2\angle PAQ$
 or $\angle PAQ = 30^\circ$

182. The ratio of three angles of a triangle is 1 : 3 : 5. Which is the measure of the greatest angle?

- (a) 80° (b) 120°
 (c) 60° (d) 100°

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Ans. (d) : \because Ratio of angles of triangles = 1:3:5

Let angles of triangles are x, 3x and 5x respectively.

$$\therefore x + 3x + 5x = 180^\circ$$

$$9x = 180^\circ$$

$$x = 20^\circ$$

Hence, measure of the largest angle = $5x = 5 \times 20 = 100^\circ$

183. The angles of a triangle are in the ratio of 3 : 4 : 8. The triangles is:

- (a) obtuse angled (b) acute angled
 (c) right angle (d) isosceles

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Ans. (a): \because Ratio of angles of the triangle = 3:4:8

Let angles of the triangle are 3x, 4x and 8x respectively. $\therefore 3x + 4x + 8x = 180^\circ$

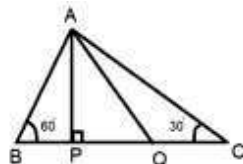
$$15x = 180^\circ$$

$$x = 12^\circ$$

Three angles = $36^\circ, 48^\circ, 96^\circ$

Hence, triangle is obtuse angled triangle.

184. In the given figure, AP is perpendicular to BC, and AQ is the bisector of angle A. What will be the measure of angle PQA?



- (a) 30° (b) 60°
 (c) 50° (d) 75°

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Ans. (d) : \because AQ is bisector of $\angle A$

$$\therefore \angle BAQ = \angle QAC = \frac{\angle A}{2}$$

\therefore In ΔABC ,

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\angle A + 60^\circ + 30^\circ = 180^\circ$$

$$\angle A = 180^\circ - 90^\circ$$

$$\angle A = 90^\circ$$

$\therefore \angle PQA = \angle QAC + \angle C$ [By exterior angle property]

$$= \frac{90}{2} + 30^\circ = 45^\circ + 30^\circ$$

$$\angle PQA = 75^\circ$$

185. In a ΔABC , $\angle ABC = 2\angle CAB$, If the side BC is extended to D and $\angle ACD = 126^\circ$, then $\angle CAB$ is:

- (a) 84° (b) 36°
 (c) 42° (d) 63°

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Ans. (c) :

Given, $\angle ABC = 2\angle CAB$

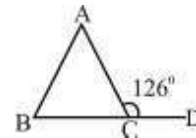
We know that,

$$\angle CAB + \angle ABC = \angle ACD$$

$$\angle CAB + 2\angle CAB = 126^\circ$$

$$3\angle CAB = 126^\circ$$

$$\angle CAB = 42^\circ$$

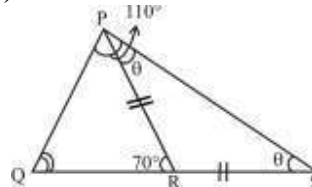


186. In ΔPQR , the side QR is extended to S such that $RS = PR$. If $\angle QPS = 110^\circ$ and $\angle PRQ = 70^\circ$, then the value of $\angle PQR$ is:

- (a) 35° (b) 40°
 (c) 45° (d) 50°

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Ans. (a) :



Let, $\angle RSP = \angle RPS = \theta$ ($\because RS = PR$)

$$\theta + \theta = 70^\circ \quad [\text{Exterior angle property}]$$

$$\theta = 35^\circ$$

$$\angle QPR = 110^\circ - \angle RPS$$

$$= 110^\circ - 35^\circ = 75^\circ$$

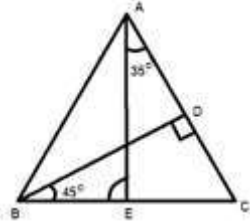
$$\therefore \angle PQR = 180^\circ - (\angle QPR + \angle PRQ)$$

$$= 180^\circ - (75^\circ + 70^\circ)$$

$$= 180^\circ - 145 = 35^\circ$$

Hence, $\angle PQR = 35^\circ$

187. In the given figure BD perpendicular to AC then what will be the measure of angle AEB?



- (a) 60° (b) 80°
(c) 100° (d) 45°

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Ans. (b) : $\because BD \perp AC$

$$\angle BDC = 90^{\circ}$$

$$\therefore \angle BCA = 180^{\circ} - (45^{\circ} + 90^{\circ})$$

$$= 180^{\circ} - 135^{\circ}$$

$$\angle BCA = 45^{\circ}$$

$$\therefore \angle AEB = \angle ECA + \angle EAC$$

[By exterior angle property]

$$\therefore \angle AEB = 45^{\circ} + 35^{\circ}$$

$$= 80^{\circ}$$

188. The areas of two similar triangles are 324 cm^2 and 225 cm^2 . If the altitude of the smaller triangle is 10 cm, then the altitude of the bigger triangle in centimetres, is:

- (a) 18 (b) 12
(c) 16 (d) 14

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Ans. (b): \because Ratio of areas of two similar triangles is equal to the ratio of squares of altitudes of triangles.

Let altitude of bigger triangle = h cm

$$\text{Ratio of areas of similar triangles} = \left(\frac{h}{10}\right)^2$$

$$\frac{324}{225} = \left(\frac{h}{10}\right)^2$$

$$\frac{18}{15} = \frac{h}{10}$$

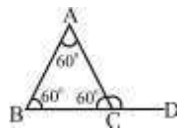
$$h = \frac{18 \times 10}{15} = 12 \text{ cm}$$

189. In an equilateral triangle, the value of each exterior angle is:

- (a) 100° (b) 140°
(c) 120° (d) 130°

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Ans. (c) :

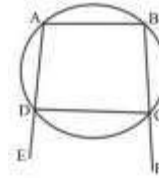


$$\angle ACD = 180^{\circ} - \angle ACB$$

$$= 180^{\circ} - 60^{\circ} = 120^{\circ}$$

190. In the given figure, chords AD and BC in the circle, are extended to E and F, respectively.

If $\angle CDE = 85^{\circ}$; $\angle DCF = 94^{\circ}$, then the value of $\angle ABF + \angle EAB$ is:



- (a) 194° (b) 179°
(c) 182° (d) 168°

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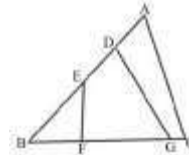
Ans. (b) : Exterior angle of a cyclic quadrilateral is equal to interior opposite angle.

$$\therefore \angle CDE = \angle ABF = 85^{\circ}$$

$$\angle DCF = \angle EAB = 94^{\circ}$$

$$\text{Hence, } \angle ABF + \angle EAB = 85^{\circ} + 94^{\circ} = 179^{\circ}$$

191. In the given figure, if $AD = 3$, $DE = 4$, $AB = 12$, $BF = 2$, $FG = 6$, $BC = 10$, then the value of $\frac{M}{N}$ is: (Assume: M is the area of the quadrilateral FGDE and N is the area of the triangle ABC.)



- (a) $\frac{25}{49}$ (b) $\frac{31}{60}$
(c) $\frac{1}{3}$ (d) $\frac{1}{2}$

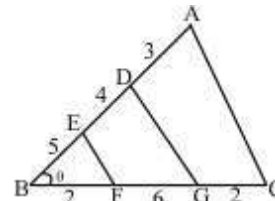
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Ans. (b) : Let $\angle ABC = \theta$

$$\text{Area of } \triangle ABC (N) = \frac{1}{2} AB \times BC \sin \theta$$

$$= \frac{1}{2} \times 12 \times 10 \times \sin \theta$$

$$= 60 \sin \theta$$



Area of quadrilateral FGDE (M) =
area of $\triangle BGD$ - area of $\triangle BEF$

$$= \frac{1}{2} \times 8 \times 9 \times \sin \theta - \frac{1}{2} \times 2 \times 5 \times \sin \theta = 31 \sin \theta$$

$$\therefore \frac{M}{N} = \frac{31 \sin \theta}{60 \sin \theta} = \frac{31}{60}$$

192. In a $\triangle ABC$, $2\angle ABC = 9\angle ACB$ and $2\angle BAC = 7\angle ACB$. If $AB = 8$ cm, $AC = 17$ cm, then the length of BC is:

- (a) 8 cm (b) 25 cm
(c) 15 cm (d) 9 cm

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Ans. (c) : Given,

$$\frac{\angle B}{\angle C} = \frac{9}{2}, \quad \frac{\angle A}{\angle C} = \frac{7}{2}$$

$$\angle A + \angle B + \angle C = 180^\circ$$

$$7x + 9x + 2x = 180^\circ$$

$$18x = 180^\circ$$

$$x = 10^\circ$$

$$\therefore \angle B = 90^\circ$$

In right angled $\triangle ABC$,

$$AC^2 = AB^2 + BC^2$$

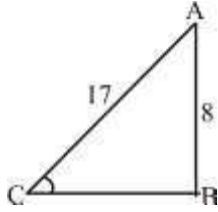
$$(17)^2 = (8)^2 + BC^2$$

$$289 = 64 + BC^2$$

$$289 - 64 = BC^2$$

$$\sqrt{225} = BC$$

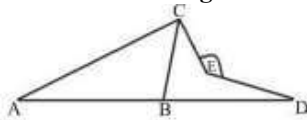
$$BC = 15 \text{ cm.}$$



193. If in the given figure,

$$\angle ACB + \angle BAC = 80^\circ; \quad \angle BDE = 35^\circ; \quad \angle BCE = 45^\circ$$

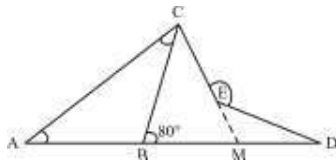
then the marked angle $\angle CED$ is:



- (a) 120° (b) 160°
(c) 150° (d) 135°

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Ans. (b) :



Given, $\angle ACB + \angle BAC = 80^\circ$

$\angle CBD$ [$\because \angle CBD$ is exterior angle]

CE is produced to M which meet BD at M .

$\angle BCE = 45^\circ$ (Given)

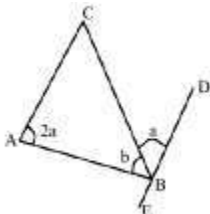
$\angle CMD = 80^\circ + 45^\circ = 125^\circ$ (Exterior angle)

$\angle CED = \angle CMD + \angle MDE$ (Exterior angle)

$\angle CED = 125^\circ + 35^\circ = 160^\circ$

194. In the given figure, if AC, DE are parallel and

$\angle CAB = 38^\circ$ then the value of $\angle ABC + 5\angle CBD$ is:



- (a) 960°
(c) 178°

- (b) 218°
(d) 158°

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Ans. (b) : Given, $\angle CAB = 38^\circ$

$$2a = 38^\circ$$

$$a = 19^\circ$$

$$\angle CAB = 2a$$

then $\angle ABE = 2a$ (Alternate angle)

Now, $2a + b + a = 180^\circ$

$$3a + b = 180^\circ$$

$$b = 180^\circ - 57^\circ$$

$$b = 123^\circ$$

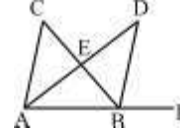
$$\angle ABC + 5\angle CBD$$

$$= b + 5a$$

$$= 123^\circ + 5 \times 19^\circ$$

$$= 218^\circ$$

195. In the given figure, AD is bisector of angle $\angle CAB$ and BD is bisector of angle $\angle CBF$. If the angle at C is 34° , the angle $\angle ADB$ is:



- (a) 17° (b) 34°
(c) 16° (d) 32°

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Ans. (a) : [By theorem]

Hence, $\angle ADB = \frac{\angle C}{2}$

$\therefore \angle C = 34^\circ$ (Given)

$$\angle ADB = \frac{34^\circ}{2}$$

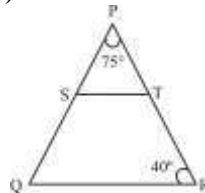
$$\angle ADB = 17^\circ$$

196. In $\triangle PQR$, S and T are mid-points of PQ and PR , respectively. If $\angle QPR = 75^\circ$ and $\angle PRQ = 40^\circ$, then $\angle TSQ$ is:

- (a) 120° (b) 115°
(c) 135° (d) 105°

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Ans. (b) :



\therefore Points S and T are the mid points of PQ and PR respectively.

\therefore [ST is parallel to QR]

$\therefore \angle PQR = \angle STP = 40^\circ$

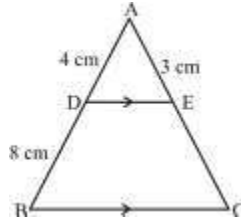
$\angle PRQ = \angle STP + \angle TPS$ [By exterior angle property]

$\angle TSQ = 75^\circ + 40^\circ = 115^\circ$

197. In a $\triangle ABC$, DE is parallel to BC where D and E are the points on AB and AC , respectively and $AD = 4$ cm, $DB = 8$ cm, $AE = 3$ cm. Length of EC is:
- (a) 7 cm (b) 5 cm
(c) 9 cm (d) 6 cm

SSC CHSL -13/10/2020 (Shift-III)

Ans. (d) : $\because BC \parallel DE$



By Thales theorem,

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{4}{8} = \frac{3}{EC}$$

$$EC = \frac{8 \times 3}{4} = 6 \text{ cm.}$$

198. M is the circumcentre of $\triangle ABC$ with circumradius 15 cm. Let $BC = 24$ cm and ML is perpendicular to BC . Then the length of ML is:

- (a) 10 cm (b) 9 cm
(c) 12 cm (d) 8 cm

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Ans. (b) :

In $\triangle MLB$,
By Pythagoras theorem

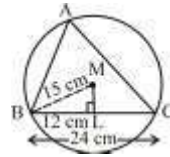
$$ML = \sqrt{(BM)^2 - (BL)^2}$$

$$= \sqrt{(15)^2 - (12)^2}$$

$$= \sqrt{225 - 144}$$

$$= \sqrt{81}$$

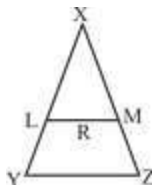
$$= 9 \text{ cm}$$



199. In $\triangle XYZ$, L and M are the middle points of the sides XY and XZ , respectively. R is a point on the segment LM , such that $LR : RM = 1 : 2$. If $LR = 3$ cm, then YZ is equal to:
- (a) 17 cm (b) 16 cm
(c) 18 cm (d) 19 cm

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Ans. (c) :



$\because LR : RM = 1 : 2$
But $LR = 3$ cm
 $\therefore RM = 6$ cm

$$\therefore LM = LR + RM$$

$$= 3 + 6$$

$$= 9 \text{ cm}$$

$$YZ = 2 LM$$

$$= 2 \times 9$$

$$= 18 \text{ cm}$$

200. If in any triangle, the angles are in the ratio of 1:2:1, then what will be the ratio of its sides?
- (a) $1 : \sqrt{2} : 1$ (b) 1 : 2 : 3
(c) 2 : 1 : 2 (d) 1 : 2 : 1

SSC CHSL -14/10/2020 (Shift-III)

Ans. (a) : Let the angles of triangle are x , $2x$ and x respectively.

$$x + 2x + x = 180^\circ$$

$$4x = 180^\circ$$

$$x = 45^\circ$$

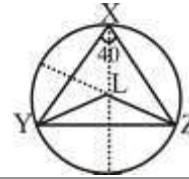
Ratio of sides = $\sin A : \sin B : \sin C$
 $= \sin 45^\circ : \sin 90^\circ : \sin 45^\circ$
 $= \frac{1}{\sqrt{2}} : 1 : \frac{1}{\sqrt{2}} = 1 : \sqrt{2} : 1$

201. If L is the circumcentre of $\triangle XYZ$ and angle X is 40° , then the value of $\angle YZL$ is:
- (a) 70° (b) 40°
(c) 50° (d) 60°

SSC CHSL -19/03/2020 (Shift-II)

Ans. (c) : $\because \angle YXZ = 40^\circ$

$$\therefore \angle YLZ = 2 \times 40 = 80^\circ$$



[Since, angle subtended by chord on the centre is double the angle subtended by same chord on the circumference of the circle]

$$\therefore \angle LYZ = \angle YZL$$

[YL and ZL are the radii of circle]

$$\therefore \angle YLZ + \angle LYZ + \angle YZL = 180^\circ$$

$$80^\circ + \angle YZL + \angle YZL = 180^\circ \quad (\because \angle LYZ = \angle YZL)$$

$$\text{or } 2 \angle YZL = 100^\circ$$

$$\text{or } \angle YZL = 50^\circ$$

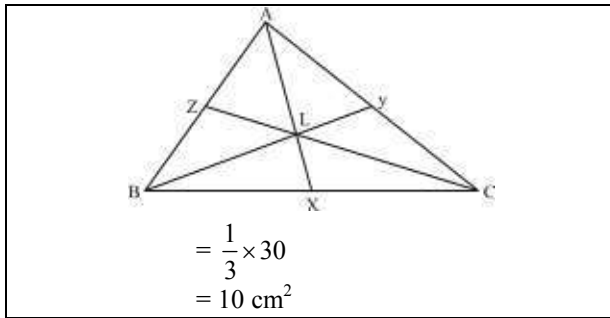
202. The three medians AX , BY and CZ of $\triangle ABC$ intersect at point L . If the area of $\triangle ABC$ is 30 cm^2 , then the area of the quadrilateral $BXLZ$ is,:

- (a) 14 cm^2 (b) 10 cm^2
(c) 16 cm^2 (d) 12 cm^2

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) : Area of quadrilateral $BXLZ$

$$= \frac{1}{3} (\text{area of } \triangle ABC)$$

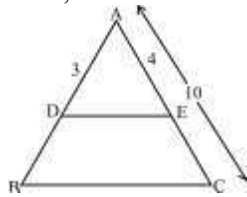


203. In a ΔABC , DE is parallel to BC , $AD = 3 \text{ cm}$, $AE = 4 \text{ cm}$ and $AC = 10 \text{ cm}$, then the value of BD in centimeters, is:

- (a) 5.5 (b) 3.5
(c) 7.5 (d) 4.5

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Ans. (d) : $AD = 3 \text{ cm}$, $AE = 4 \text{ cm}$



$AC = 10 \text{ cm}$

$\therefore EC = AC - AE$
 $= 10 - 4 \Rightarrow 6 \text{ cm}$

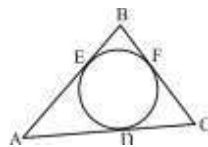
$\therefore \Delta ADE$ and ΔABC are similar By the rule of similarity.

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\therefore \frac{3}{DB} = \frac{4}{6}$$

or $DB = \frac{3 \times 6}{4}$ or $DB = 4.5 \text{ cm}$

204.

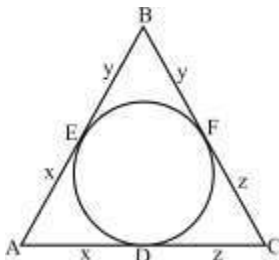


A circle is inscribed in the triangle ABC whose sides are given as $AB = 10$, $BC = 8$, $CA = 12$ units as shown in the figure. The value of $AD \times BF$ is:

- (a) 15 units (b) 18 units
(c) 21 units (d) 16 units

SSC CHSL -18/03/2020 (Shift-I)

Ans. (c) :



According to the question,

$$2(x + y + z) = 10 + 8 + 12$$

$$2(x + y + z) = 30$$

$$x + y + z = 15$$

$$\therefore y + z = 8$$

$$\therefore x = 15 - 8 = 7$$

$$\& x + z = 12$$

$$\therefore y = 15 - 12 = 3$$

then, $AD \times BF = x \times y$
 $= 7 \times 3 = 21 \text{ units}$

205. Two sides of a triangle are of length 3 cm and 8 cm. If the length of the third side is 'x' cm, then: Which of the following is correct ?

- (a) $0 < x < 11$ (b) $x > 11$
(c) $5 < x < 11$ (d) $5 < x$

SSC CHSL -17/03/2020 (Shift-I)

Ans. (c) : Since, for the construction of a triangle, sum of its two sides is always greater than the third side and difference of its two sides is always smaller than the third side.

Hence, $a + b > c$ or $a - b < c$

Hence, option (c) satisfy the above rule.

$$= (8 - 3) < x < (8 + 3)$$

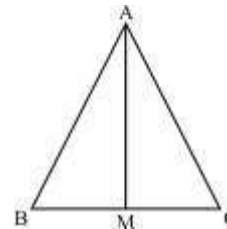
$$= 5 < x < 11$$

206. If M is the mid-point of the side BC of ΔABC , and the area of ΔABM is 18 cm^2 , then the area of ΔABC is:

- (a) 30 cm^2 (b) 36 cm^2
(c) 34 cm^2 (d) 32 cm^2

SSC CHSL -17/03/2020 (Shift-I)

Ans. (b):



Median divides the triangle in two equal parts ar. of (ΔABM) = ar. of (ΔACM)

$$\therefore \text{Area of } \Delta ABC = \text{area of } \Delta ABM + \text{area of } \Delta ACM$$

$$= 18 + 18 = 36 \text{ cm}^2$$

207. A triangle is NOT said to be a right-angled triangle if its sides measure:

- (a) 6 cm, 8 cm and 10 cm
(b) 3 cm, 4 cm and 5 cm
(c) 5 cm, 7 cm and 9 cm
(d) 5 cm, 12 cm and 13 cm

SSC CHSL -17/03/2020 (Shift-II)

Ans. (c) : Square of larger side is equal to the sum of squares of two smaller sides in a right angled triangle.

$$9^2 \neq 5^2 + 7^2$$

$$9^2 \neq 25 + 49$$

$$81 \neq 74$$

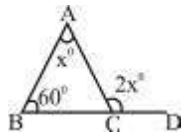
So these sides are not the sides of right angled triangle

208. The measure of one of the exterior angles of a triangle is twice one of the interior opposite angles and the measure of the other interior opposite angles is 60° . The triangle is a/an:

- (a) scalene triangle (b) right triangle
(c) equilateral triangle (d) isosceles triangle

SSC CHSL -19/03/2020 (Shift-III)

Ans. (c) : Let, $\angle BAC = x^\circ$
According to the question,
 $\angle ACD = 2\angle BAC = 2x^\circ$



\therefore In any triangle, exterior angle is always equal to sum of opposite two interior angles.

$$\therefore x^\circ + 60^\circ = 2x^\circ$$

$$\text{or } x^\circ = 60^\circ$$

$$\angle BAC + \angle ABC + \angle BCA = 180^\circ$$

$$\therefore x^\circ + 60^\circ + \angle BCA = 180^\circ$$

$$\text{or } 60^\circ + 60^\circ + \angle BCA = 180^\circ$$

$$\text{or } \angle BCA = 60^\circ$$

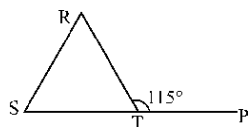
\therefore All angles of $\triangle ABC$ measure 60° , hence, it is an equilateral triangle

209. The side ST of $\triangle RST$ is produced to P. If $\angle RTP = 115^\circ$ and $\angle S = \frac{2}{3}\angle R$, then the measure of $\angle R$ is:

- (a) 66° (b) 68°
(c) 67° (d) 69°

SSC CHSL -20/10/2020 (Shift-III)

Ans: (d)



$$\therefore \angle R + \angle S = \angle RTP \quad \left(\angle S = \frac{2}{3}\angle R \right) \text{ (given)}$$

$$\angle R + \frac{2}{3}\angle R = 115^\circ$$

$$\frac{5\angle R}{3} = 115^\circ$$

$$\angle R = 23^\circ \times 3 = 69^\circ$$

$$\angle R = 69^\circ$$

210. ABC and BDE are two equilateral triangles such that D is the mid-point of BC. If the area of triangle ABC is 136 cm^2 , then the area of triangle BDE is equal to:

- (a) 36 cm^2 (b) 38 cm^2
(c) 24 cm^2 (d) 34 cm^2

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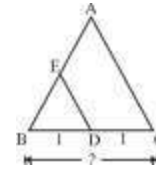
Ans : (d)

$$\therefore \triangle ABC \sim \triangle EBD$$

$$\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle BDE)} = \left(\frac{BC}{BD} \right)^2$$

$$\frac{136}{\text{ar}(\triangle BDE)} = \left(\frac{2}{1} \right)^2 = \frac{4}{1}$$

$$\text{ar}(\triangle BDE) = 34 \text{ cm}^2$$

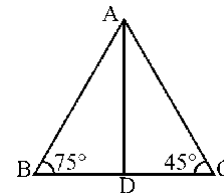


211. In $\triangle ABC$, D is a point on BC. If $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 75^\circ$ and $\angle C = 45^\circ$, then $\angle BAD$ is equal to:

- (a) 45° (b) 30°
(c) 60° (d) 50°

SSC CHSL -20/10/2020 (Shift-II)

Ans: (b)



$$\angle ABC + \angle BCA + \angle BAC = 180^\circ$$

$$\angle BAC = 180^\circ - (75^\circ + 45^\circ) = 180^\circ - 120^\circ$$

$$\angle BAC = 60^\circ$$

$$\text{If } \frac{AB}{AC} = \frac{BD}{DC}$$

\therefore AD is the angle bisector of $\angle BAC$.

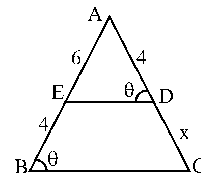
$$\therefore \angle BAD = \frac{\angle BAC}{2} = \frac{60^\circ}{2} = 30^\circ$$

212. In $\triangle ABC$, E and D are point on sides AB and AC, respectively, such that $\angle ABC = \angle ADE$. If $AE = 6 \text{ cm}$, $AD = 4 \text{ cm}$ and $EB = 4 \text{ cm}$, then the length of DC is:

- (a) 9.5 cm (b) 11 cm
(c) 10 cm (d) 8 cm

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b)



Given,

$$\angle ABC = \angle ADE$$

$$\frac{AB}{AC} = \frac{AD}{AE} \Rightarrow \frac{10}{4+x} = \frac{4}{6} = \frac{2}{3}$$

$$15 = 4 + x$$

$$x = 11 \text{ cm}$$

$$DC = 11 \text{ cm}$$

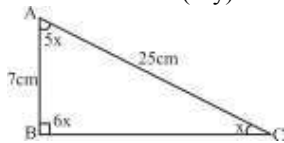
213. In $\triangle ABC$, $\angle ABC = 6\angle ACB$ and $\angle BAC = 5\angle ACB$. If $AB = 7 \text{ cm}$ and $AC = 25 \text{ cm}$, then length of BC is equal to:

- (a) 12cm (b) 24cm
(c) 26cm (d) 32cm

SSC CHSL -21/10/2020 (Shift-I)

Ans. (b) We know that
Sum of all angles of triangle is 180° .

$$\angle ACB = x \text{ (say)}$$



$$\begin{aligned} \therefore 6x + 5x + x &= 180^\circ \\ \Rightarrow 12x &= 180^\circ \\ \Rightarrow x &= 15^\circ \\ \therefore \angle ABC &= 6x = 6 \times 15 = 90^\circ \\ \angle ACB &= x = 15^\circ \\ \angle CAB &= 5x = 5 \times 15 = 75^\circ \end{aligned}$$

Hence triangle is a right angled triangle.

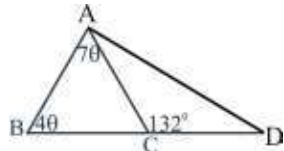
$$\begin{aligned} \therefore BC &= \sqrt{AC^2 - AB^2} \\ BC &= \sqrt{25^2 - 7^2} \\ BC &= \sqrt{625 - 49} \\ BC &= \sqrt{576} \\ BC &= 24\text{cm} \end{aligned}$$

214. The side BC of a triangle ABC is extended to the point D. If $\angle ACD = 132^\circ$ and $\angle B = 4/7\angle A$ then angle A equal to:

- (a) 80° (b) 60°
(c) 84° (d) 50°

SSC CHSL -21/10/2020 (Shift-II)

Ans. (c)



Given, $\angle ACD = 132^\circ$
 $\angle ACD$ is external angle of $\triangle ABC$.
 $4\theta + 7\theta = 132^\circ$
 $11\theta = 132^\circ$
 $\theta = 12^\circ$
 $\angle A = 84^\circ$

215. In $\triangle ABC$, $AB = AC$. If $\angle A$ is twice the sum of other two angles of the triangle, then the measure of $1/2\angle A$

- (a) 70° (b) 30°
(c) 60° (d) 80°

SSC CHSL -21/10/2020 (Shift-III)

Ans. (c) From question,

$$\begin{aligned} \angle A &= 2(\angle B + \angle C) \\ \frac{\angle A}{\angle B + \angle C} &= \frac{2}{1} \end{aligned}$$

$$\therefore \angle A + \angle B + \angle C = 180$$

$$\angle A = \frac{180}{3} \times 2$$

$$\angle A = 120^\circ$$

$$\frac{\angle A}{2} = \boxed{60^\circ}$$

216. In $\triangle ABC$, $AB = AC$, and $\angle BAC = 50^\circ$. Then $\angle ABC$ and $\angle BCA$ are, respectively:

- (a) 50° and 55° (b) 70° and 75°
(c) 55° and 55° (d) 65° and 65°

SSC CHSL -19/03/2020 (Shift-III)

Ans. (d): Given $\angle BAC = 50^\circ$

$$\therefore AB = AC$$

$$\therefore \angle ABC = \angle ACB$$

$$\therefore \angle ABC = \angle ACB = x^\circ \text{ (say)}$$

In $\triangle ABC$,

$$\angle BAC + \angle ABC + \angle ACB = 180^\circ$$

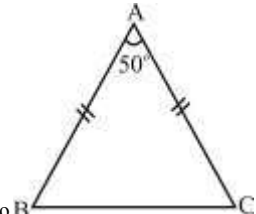
$$50^\circ + x^\circ + x^\circ = 180^\circ$$

$$\text{or } 2x^\circ = 180^\circ - 50^\circ$$

$$\text{or } 2x^\circ = 130^\circ$$

$$x^\circ = 65^\circ$$

Measure of $\angle ABC$ and $\angle BCA$ are 65° and 65° respectively.

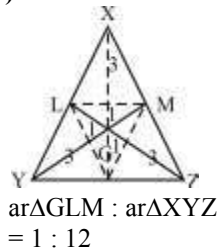


217. XYZ is a triangle. If the medians ZL and YM intersect each other at G, then (Area of $\triangle GLM$: Area of $\triangle XYZ$) is :

- (a) 1 : 11 (b) 1 : 12
(c) 1 : 10 (d) 1 : 14

SSC CHSL -12/10/2020 (Shift-II)

Ans. (b)



218. The lengths of the two sides forming the right angle of a right-angled triangle are 21 cm and 20 cm. What is the radius of the circle circumscribing the triangle?

- (a) 12 cm (b) 14.5 cm
(c) 15.5 cm (d) 14 cm

SSC CHSL -12/10/2020 (Shift-III)

Ans. (b) : In $\triangle ABC$,

$$AC = \sqrt{(AB)^2 + (BC)^2}$$



$$= \sqrt{(21)^2 + (20)^2}$$

$$= \sqrt{841}$$

$$= 29 \text{ cm}$$

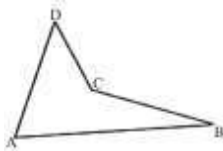
∴ In right angle $\triangle ABC$, circumradius of $\triangle ABC$ is equal to length of perpendicular BD drawn on hypotenuse AC from B .

$$\therefore BD = \frac{1}{2} AC$$

$$= \frac{29}{2}$$

$$\Rightarrow BD = 14.5 \text{ cm}$$

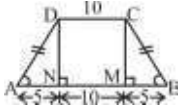
219. If in the following figure (not to scale), $\angle DAB + \angle CBA = 90^\circ$, $BC = AD$, $AB = 20 \text{ cm}$, $CD = 10 \text{ cm}$ then the area of the quadrilateral $ABCD$ is:



- (a) 100 cm^2 (b) 150 cm^2
(c) 120 cm^2 (d) 75 cm^2

SSC CHSL -13/10/2020 (Shift-II)

Ans. (d) :



∴ $\angle DAB + \angle CBA = 90^\circ$
∴ $\angle DAB = \angle CBA = 45^\circ$
∴ $ABCD$ is an isosceles trapezium
In $\triangle CMB$,
 $\angle MBC = \angle MCB = 45^\circ$
∴ $MB = CM = 5$

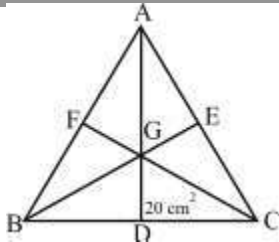
$$\text{Area of trapezium } ABCD = \frac{1}{2} \times (20 + 10) \times 5 = 75 \text{ cm}^2$$

220. In triangle ABC , AD , BE and CF are medians and G is the centroid of the triangle. If the area of the triangle DGC is 20 cm^2 , then the area of triangle AGF + the area of triangle BGF is equal to:

- (a) 40 cm^2 (b) 25 cm^2
(c) 20 cm^2 (d) 30 cm^2

SSC CHSL -19/10/2020 (Shift-I)

Ans. (a) : Since, 6 triangles made by medians are always equal to each other.



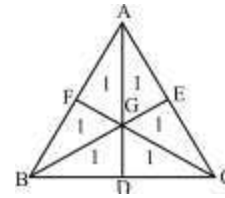
∴ Area of $\triangle DGC = \text{area of } \triangle AGF = \text{area of } \triangle BGF$
 $= 20 \text{ cm}^2$
∴ Area of $\triangle AGF + \text{area of } \triangle BGF = 20 + 20 = 40 \text{ cm}^2$

221. In an equilateral $\triangle ABC$, the medians AD , BE and CF intersect to each other at point G . If the area of quadrilateral $BDGF$ is $12\sqrt{3} \text{ cm}^2$, then the side of $\triangle ABC$ is:

- (a) $10\sqrt{3} \text{ cm}$ (b) 10 cm
(c) $12\sqrt{3} \text{ cm}$ (d) 12 cm

SSC CHSL -26/10/2020 (Shift-II)

Ans. (d) :



Given, area of quadrilateral $= 12\sqrt{3}$

$$\text{Area of equilateral } \triangle ABC = \frac{\sqrt{3}}{4} a^2$$

$$\frac{\sqrt{3}}{4} a^2 = 3 \times 12\sqrt{3}$$

$$a^2 = 36 \times 4$$

$$\Rightarrow a = 12 \text{ cm}$$

222. In $\triangle ABC$, D and E are on sides AC and AB such that $\angle ADE = \angle B$. If $AE = 8 \text{ cm}$, $CD = 3 \text{ cm}$, $DE = 6 \text{ cm}$ and $BC = 9 \text{ cm}$ then AD is equal to :

- (a) 9 cm (b) 7.5 cm
(c) 6 cm (d) 8 cm

SSC CHSL (Tier-I) 03/07/2019 (Shift-I)

Ans. (a)

Let, $AD = x \text{ cm}$

∴ $\angle ADE = \angle ABC$ (Given)

$\angle A = \angle A$ (common)

∴ $\triangle ADE \sim \triangle ABC$

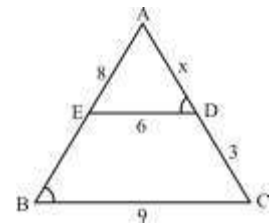
$$\therefore \frac{DE}{BC} = \frac{AE}{AC}$$

$$\frac{6}{9} = \frac{8}{x+3}$$

$$2x + 6 = 24$$

$$2x = 18$$

$$x = 9 \text{ cm}$$



223. In $\triangle ABC$, points D and E are on sides AC and AB such that $\angle ADE = \angle B$. If $AD = 7.6 \text{ cm}$, $AE = 7.2 \text{ cm}$, $BE = 4.2 \text{ cm}$ and $BC = 8.4 \text{ cm}$ then DE is equal to :

- (a) 7.4 cm (b) 5.6 cm
(c) 5.8 cm (d) 6.3 cm

SSC CHSL (Tier-I) 02/07/2019 (Shift-II)

Ans. (b) : Given,

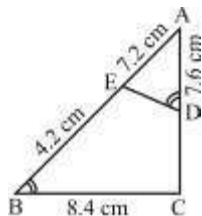
$$\angle ADE = \angle B$$

$$AD = 7.6 \text{ cm, } AE = 7.2 \text{ cm, } BE = 4.2 \text{ cm}$$

And, $BC = 8.4 \text{ cm}$

$\Rightarrow DE = ?$

According to the question,



$\triangle ADE$ and $\triangle ABC$,

$$\angle DAE = \angle CAB \quad (\text{Common})$$

$$\angle ADE = \angle ABC \quad (\text{Given})$$

$\therefore \triangle ADE \sim \triangle ABC$ (AA Similarity)

$$\frac{AD}{AB} = \frac{DE}{BC}$$

$$\frac{AD}{AE + BE} = \frac{DE}{BC}$$

$$\frac{7.6}{7.2 + 4.2} = \frac{DE}{8.4}$$

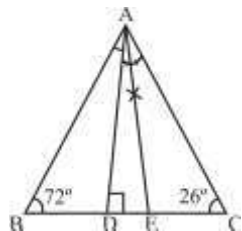
$$DE = \frac{63.84}{11.4} = 5.6 \text{ cm}$$

224. In $\triangle ABC$, $AD \perp BC$ and AE is the angle bisector of $\angle A$. If $\angle B = 72^\circ$ and $\angle C = 26^\circ$ then what is the measure of $\angle DAE$?

- (a) 37° (b) 25°
(c) 23° (d) 49°

SSC CHSL (Tier-I) 02/07/2019 (Shift-III)

Ans. (c) :



$$\angle DAE = \frac{\angle B + \angle C}{2}$$

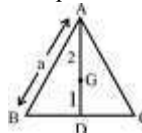
$$= \frac{72^\circ + 26^\circ}{2} = 49^\circ$$

225. G is the centroid of the equilateral triangle ABC . If $AB = 8\sqrt{3} \text{ cm}$, then the length of AG is equal to:

- (a) 4 cm (b) 6 cm
(c) 8 cm (d) 9 cm

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (c) : Let height of equilateral triangle = h



$$h = \frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 8\sqrt{3} = 12 \text{ cm}$$

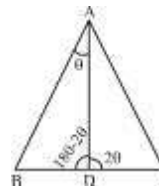
$$\therefore AG = 12 \times \frac{2}{3} = 8 \text{ cm}$$

226. In $\triangle ABC$, D is a point on BC such that $\angle BAD = \frac{1}{2} \angle ADC$, $\angle BAC = 84^\circ$ and $\angle C = 42^\circ$. What is the measure of $\angle ADB$?

- (a) 94° (b) 72°
(c) 102° (d) 68°

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (b) :



\therefore Let $\angle BAD = \theta$, then $\angle ADC = 2\theta$

$$\therefore \angle A + \angle B + \angle C = 180^\circ$$

$$\angle B = 180^\circ - (84^\circ + 42^\circ) = 180^\circ - 126^\circ = 54^\circ$$

Now In $\triangle ABD$,

$$\angle ABD + \angle ADB + \angle BAD = 180^\circ$$

$$54^\circ + 180^\circ - 2\theta + \theta = 180^\circ$$

$$\theta = 54^\circ$$

$$\therefore \angle ADB = 180^\circ - 2 \times 54^\circ = 180^\circ - 108^\circ = 72^\circ$$

227. $\triangle ABC \sim \triangle QRP$. If the ratio of the area of $\triangle ABC$ to the area of $\triangle PQR$ is $576 : 169$, $AB = 10 \text{ cm}$, $AC = 12 \text{ cm}$ and $BC = 13 \text{ cm}$ then the length of PR (in cm) is equal to :

- (a) $\frac{169}{10}$ (b) $\frac{169}{12}$
(c) $\frac{169}{11}$ (d) $\frac{169}{24}$

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : \therefore Given, $\triangle ABC \sim \triangle QRP$

$$\therefore \frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \left(\frac{BC}{PR}\right)^2$$

$$\frac{576}{169} = \left(\frac{BC}{PR}\right)^2$$

$$\left(\frac{24}{13}\right)^2 = \left(\frac{13}{PR}\right)^2$$

$$\Rightarrow \therefore PR = \frac{13 \times 13}{24} = \frac{169}{24} \text{ cm}$$

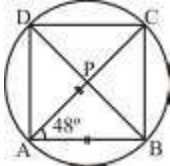
(III)**Problems based on Quadrilateral**

228. In a circle, ABCD is a cyclic quadrilateral. AC and BD intersect each other at P. If $AB = AC$ and $\angle BAC = 48^\circ$, then the measure of $\angle ADC$ is

- (a) 104° (b) 112°
(c) 132° (d) 114°

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(d) According to the question,



$\therefore AB = AC$ (Given)

$\therefore \Delta ACB$ is a isosceles triangle

$$\therefore \angle C = \angle B = x$$

$$48^\circ + x + x = 180^\circ \text{ [Sum of all angles of } \Delta = 180^\circ]$$

$$48^\circ + 2x = 180^\circ$$

$$2x = 132^\circ$$

$$\therefore x = 66^\circ$$

$\therefore ABCD$ is a cyclic quadrilateral

\therefore Sum of opposite angles $= 180^\circ$

$$\angle ADC + \angle ABC = 180^\circ$$

$$\angle ADC + 66^\circ = 180^\circ$$

$$\therefore \angle ADC = 180^\circ - 66^\circ = 114^\circ$$

229. ABCD is a cyclic quadrilateral. Sides AB and DC, when produced, meet at E and sides AD and BC when produced, meet at F. If $\angle ADC = 76^\circ$ and $\angle AED = 55^\circ$, then $\angle AFB$ is equal to:

- (a) 34° (b) 26°
(c) 29° (d) 27°

SSC CGL (Tier-II) 03/02/2022

Ans : (d)

$$\angle ADC + \angle ABC = 180^\circ$$

$$76^\circ + \angle ABC = 180^\circ$$

$$\angle ABC = 104^\circ$$

$$\angle ABC = \angle BEC + \angle ECB$$

$$104^\circ = 55^\circ + \angle ECB$$

$$\angle ECB = 49^\circ$$

$$\angle ECB = \angle DCF$$

$$\angle DCF = 49^\circ$$

$$\angle CDF = 180^\circ - 76^\circ$$

$$= 104^\circ$$

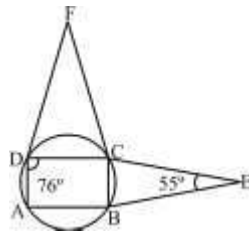
In ΔCDF ,

$$\angle DCF + \angle CFD + \angle CDF = 180^\circ$$

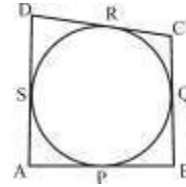
$$49^\circ + 104^\circ + \angle CFD = 180^\circ$$

$$\angle CFD = 27^\circ$$

$$\angle CFD = \angle AFB = 27^\circ$$



230. In the given figure, If $AB = 10$ cm, $CD = 7$ cm, $SD = 4$ cm and $AS = 5$ cm then $BC = ?$



- (a) 8 cm (b) 7.5 cm
(c) 9 cm (d) 6 cm

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) : $AB + DC = AD + BC$ (By theorem)

$$10 + 7 = 9 + BC$$

$$BC = 8 \text{ cm}$$

231. ABCD is a cyclic quadrilateral in which $AB = 15$ cm, $BC = 12$ cm and $CD = 10$ cm. If AC bisects BD, then what is the measure of AD?

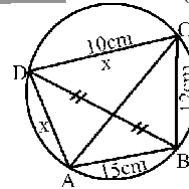
- (a) 13.5cm (b) 20cm
(c) 18cm (d) 15cm

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c)

$\therefore AC$ divides BD

$\therefore AD \times DC = AB \times BC$ (by using theorem)



$$x \times 10 = 15 \times 12$$

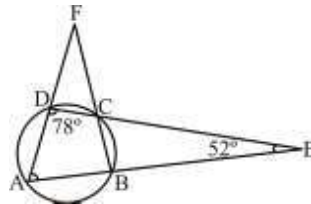
$$x = 18 \text{ cm}$$

232. Sides AB and DC of a cyclic quadrilateral ABCD are produced to meet at E and sides AD and BC are produced to meet at F. If $\angle ADC = 78^\circ$ and $\angle BEC = 52^\circ$, then the measure of $\angle AFB$ is :

- (a) 28° (b) 26°
(c) 32° (d) 30°

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

Ans. (a)



\therefore External angle of a cyclic quadrilateral is equal to its opposite angles.

$$\Rightarrow \angle CBE = 78^\circ$$

$$\therefore \angle BCE = 180^\circ - (78^\circ + 52^\circ) = 50^\circ$$

$$\therefore \angle DCF = \angle BCE = 50^\circ \text{ (Vertically opp. angle)}$$

$\therefore \angle ADC$ is an external angle of ΔDFC .

$$\angle ADC = \angle DFC + \angle DCF$$

$$78^\circ = \angle AFB + 50^\circ$$

$$\angle AFB = 28^\circ$$

233. PQRS is a cyclic quadrilateral. If $\angle P$ is 4 times $\angle R$, and $\angle S$ is 3 times $\angle Q$, then the average of $\angle Q$ and $\angle R$ is:

- (a) 45.7° (b) 81°
(c) 40.5° (d) 90°

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c)

\therefore Sum of opposite of angle cyclic quadrilateral is 180° .

$$\therefore 4x + x = 180^\circ$$

$$5x = 180^\circ$$

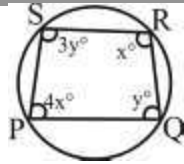
$$x = 36^\circ$$

$$\text{and } y + 3y = 180^\circ$$

$$4y = 180^\circ$$

$$y = 45^\circ$$

$$\text{Hence, } \frac{\angle Q + \angle R}{2} = \frac{45^\circ + 36^\circ}{2} = 40.5^\circ$$



234. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and $\angle ADC = 118^\circ$. What is the measure of $\angle BAC$?

- (a) 28° (b) 32°
(c) 30° (d) 45°

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a)

Sum of opposite angle of cyclic quadrilateral is 180° .

$$\Rightarrow \angle ADC + \angle ABC = 180^\circ$$

$$\Rightarrow 118^\circ + \angle ABC = 180^\circ$$

$$\Rightarrow \angle ABC = 62^\circ$$

$$\angle ACB = 90^\circ$$

[Angle formed in semicircle is right angle]

In $\triangle ABC$,

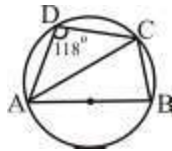
$$\angle BAC + \angle ACB + \angle ABC = 180^\circ$$

$$\angle BAC + 90^\circ + 62^\circ = 180^\circ$$

$$\angle BAC + 152^\circ = 180^\circ$$

$$\angle BAC = 180^\circ - 152^\circ$$

$$\angle BAC = 28^\circ$$

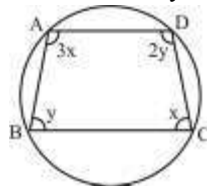


235. Vertices A, B, C and D of a quadrilateral ABCD lie on a circle. $\angle A$ is three times $\angle C$ and $\angle D$ is two times $\angle B$. What is the difference between the measures of $\angle D$ and $\angle C$?

- (a) 55° (b) 65°
(c) 75° (d) 45°

SSC CGL-(Tier-I) 2308/2021 (Shift I)

Ans. (c) : Let $\angle C = x^\circ$ and $\angle B = y^\circ$



\therefore Sum of opposite angles of a cyclic quadrilateral is 180° .

$$\therefore 3x + x = 180^\circ$$

$$x = 45^\circ$$

$$\text{And } y + 2y = 180^\circ$$

$$y = 60^\circ$$

$$\therefore \angle D - \angle C = 2y - x = 120 - 45^\circ = 75^\circ$$

236. ABCD is a cyclic quadrilateral such that when sides AB and DC are produced, they meet at E, and sides AD and BC meet at F, when produced. If $\angle ADE = 80^\circ$ and $\angle AED = 50^\circ$, then what is the measure of $\angle AFB$?

- (a) 40° (b) 20°
(c) 50° (d) 30°

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (d) : \therefore External angle of a cyclic quadrilateral is equal to its opposite angle.

$$\therefore \angle EBC = \angle ADC = 80^\circ$$

In $\triangle CBE$,

$$\angle BCE = 180^\circ - (50^\circ + 80^\circ) = 50^\circ$$

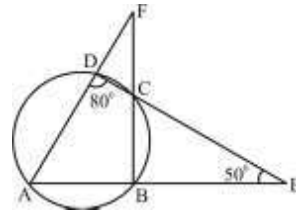
$$\therefore \angle DCF = \angle BCE = 50^\circ \text{ (Vertically opposite angle)}$$

$$\therefore \angle ADC \text{ is external angle of } \triangle FDC$$

$$\therefore \angle ADC = \angle DFC + \angle DCF$$

$$\text{or } 80^\circ = \angle AFB + 50^\circ$$

$$\angle AFB = 30^\circ$$

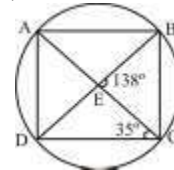


237. ABCD is a cyclic quadrilateral. Diagonals BD and AC intersect each other at E. If $\angle BEC = 138^\circ$ and $\angle ECD = 35^\circ$, then what is the measure of $\angle BAC$?

- (a) 133° (b) 123°
(c) 113° (d) 103°

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (d) : Given,



$$\angle BEC = 138^\circ \text{ and } \angle ECD = 35^\circ$$

$\angle BEC$ and $\angle CED$ are on the same straight line.

$$\therefore \angle BEC = 138^\circ$$

$$\therefore \angle CED = (180 - 138) = 42^\circ$$

In $\triangle CDE$,

$$\angle CED = 42^\circ \text{ and } \angle DCE = 35^\circ$$

$$\angle CDE = 180^\circ - (42^\circ + 35^\circ)$$

$$\angle CDE = 103^\circ$$

$\angle BAC$ and $\angle BDC$ are on the same arc. We know that in cyclic quadrilateral, angles on the same arc always same.

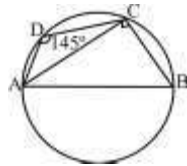
$$\Rightarrow \angle BAC = 103^\circ$$

238. ABCD is a cyclic quadrilateral such that AB is the diameter of the circle and $\angle ADC = 145^\circ$, then what is the measure of $\angle BAC$?

- (a) 65° (b) 45°
(c) 55° (d) 35°

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) :



In the figure drawn-

$$\angle ACB = 90^\circ \left[\begin{array}{l} \text{Angle formed in semicircle} \\ \text{is always equal to } 90^\circ \end{array} \right]$$

$$\& \angle ADC + \angle ABC = 180^\circ$$

$$145^\circ + \angle ABC = 180^\circ \quad \left[\begin{array}{l} \text{Opposite angles of a} \\ \text{quadrilateral in a circle} \end{array} \right]$$

$$\angle ABC = 180^\circ - 145^\circ$$

$$= 35^\circ$$

Again in ΔABC ,

$$\angle BAC + \angle ABC + \angle ACB = 180^\circ$$

$$\Rightarrow \angle BAC + 35^\circ + 90^\circ = 180^\circ$$

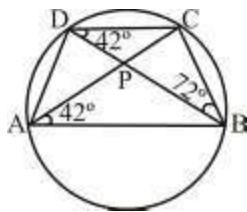
$$\Rightarrow \angle BAC = 55^\circ$$

239. ABCD is a cyclic quadrilateral whose diagonals intersect at P. If $\angle DBC = 72^\circ$ and $\angle BAC = 42^\circ$, then the measure of $\angle BCD$ (in degrees) is:

- (a) 66 (b) 65
(c) 60 (d) 57

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) :



[In cyclic quadrilateral, angles formed on the same arc are always same]

$$\angle BAC = \angle BDC = 42^\circ$$

So, In ΔBCD ,

$$\angle BCD = 180^\circ - (72^\circ + 42^\circ)$$

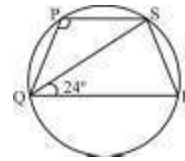
$$= 180^\circ - 114^\circ = 66^\circ$$

240. PQRS is a cyclic quadrilateral with QR as the diameter of the circle. If $\angle SQR = 24^\circ$, then what will be the measure of $\angle QPS$?

- (a) 126° (b) 104°
(c) 114° (d) 116°

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : Given -



$$\angle SQR = 24^\circ$$

In ΔQSR ,

$$\angle QRS = 180^\circ - (\angle SQR + \angle QRS)$$

$$= 180^\circ - (24^\circ + 90^\circ)$$

$$= 66^\circ$$

\therefore PQRS is a cyclic quadrilateral

$$\therefore \angle QPS + \angle QRS = 180^\circ$$

$$\Rightarrow \angle QPS + 66^\circ = 180^\circ$$

$$\Rightarrow \angle QPS = 180^\circ - 66^\circ$$

$$= 114^\circ$$

241. ABCD is a cyclic quadrilateral with AB as a diameter of the circle. If $\angle ADC = 118^\circ$, then the measure (in degrees) of $\angle BAC$ is:

- (a) 22 (b) 28
(c) 38 (d) 32

SSC CHSL 13/04/2021 (Shift-II)

Ans. (b) : Given-

$$\angle ADC + \angle ABC = 180^\circ$$

$$\Rightarrow \angle ABC = 180^\circ - 118^\circ = 62^\circ$$

In ΔACB ,

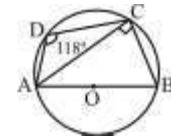
$$\angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow \angle A + 62^\circ + 90^\circ = 180^\circ$$

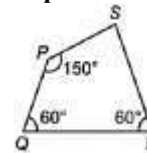
$$\Rightarrow \angle A = 180^\circ - 152^\circ$$

$$\Rightarrow \angle A = 28^\circ$$

$$\therefore \angle BAC = 28^\circ$$



242. In the given figure, PQRS is a quadrilateral. If $QR = 18$ cm and $PS = 9$ cm, then what is the area (in cm^2) of quadrilateral PQRS ?

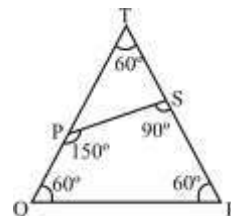


(a) $(64\sqrt{3})/3$ (b) $(177\sqrt{3})/2$

(c) $(135\sqrt{3})/2$ (d) $(98\sqrt{3})/3$

SSC CGL (Tier-II) 20-02-2018

Ans. (c):



\therefore Sum of internal angle of a quadrilateral = 360°

$$\angle P + \angle Q + \angle R + \angle S = 360^\circ$$

$$\angle S = 360^\circ - 270^\circ$$

$$\angle S = 90^\circ$$

QP and RS is produced which meet at point T.

\therefore In ΔTQR ,

$$\angle T = 60^\circ$$

ΔTQR is an equilateral triangle.

$$\therefore TQ = QR = TR = 18 \text{ (Given)}$$

$$\therefore \angle PST = 90^\circ$$

\therefore In right angled triangle ΔPST ,

$$\tan 60^\circ = \frac{PS}{TS}$$

$$\sqrt{3} = \frac{9}{TS}$$

$$TS = 3\sqrt{3} \text{ cm.}$$

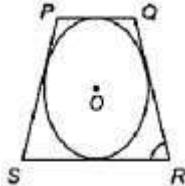
According to the question,

$$\text{Area of quadrilateral PQRS} = \text{area of } \Delta TQR - \text{area of } \Delta PST$$

$$= \frac{\sqrt{3}}{4} \times 18^2 - \frac{1}{2} \times 9 \times 3\sqrt{3}$$

$$= 81\sqrt{3} - \frac{27\sqrt{3}}{2} = \frac{135\sqrt{3}}{2} \text{ cm}^2$$

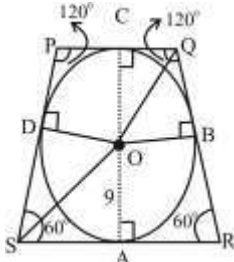
243. In the given figure, a circle touches the sides of the quadrilateral PQRS. The radius of the circle is 9 cm. $\angle RSP = \angle SRQ = 60^\circ$ and $\angle PQR = \angle QPS = 120^\circ$. What is the perimeter (in cm) of the quadrilateral?



- (a) $36\sqrt{3}$ (b) $24\sqrt{3}$
(c) $48\sqrt{3}$ (d) 32

SSC CGL (Tier-II) 18-02-2018

Ans. (c):



Radius (r) = 9 cm

$$\angle RSP = \angle SRQ = 60^\circ$$

$$\angle PQR = \angle QPS = 120^\circ$$

\therefore OS is bisector of $\angle RSP$

In ΔSOA ,

$$\tan 30^\circ = \frac{9}{AS}$$

$$\frac{1}{\sqrt{3}} = \frac{9}{AS}$$

$$AS = 9\sqrt{3} = SD$$

Similarly,

$$AR = RB = 9\sqrt{3}$$

\therefore OQ bisects $\angle BQC$

\therefore In ΔOBQ ,

$$\tan 60^\circ = \frac{OB}{OQ} = \frac{9}{BQ}$$

$$\sqrt{3} = \frac{9}{BQ} \therefore BQ = CQ$$

$$BQ = 3\sqrt{3}$$

$$CQ = 3\sqrt{3}$$

Similarly, $PC = PD = 3\sqrt{3}$

According to the question,

$$\text{Perimeter of quadrilateral PQRS} = PQ + QR + RS + SP$$

$$= 6\sqrt{3} + 12\sqrt{3} + 18\sqrt{3} + 12\sqrt{3}$$

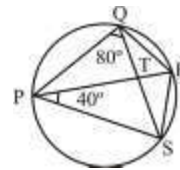
$$= 48\sqrt{3} \text{ cm}$$

244. PQRS is a cyclic quadrilateral. PR and QS intersect at T. If $\angle SPR = 40^\circ$ and $\angle PQS = 80^\circ$, then what is the value (in degrees) of $\angle PSR$?

- (a) 60 (b) 40
(c) 80 (d) 100

SSC CGL (Tier-II) 9-3-2018

Ans. (a):



\therefore Angles subtended by equal chords are equal.

$$\therefore \angle SPR = \angle SQR = 40^\circ$$

$$\therefore \angle PQR = 80^\circ + 40^\circ = 120^\circ$$

Sum of opposite angle of cyclic quadrilateral is 180° .

$$\angle PSR + \angle PQR = 180^\circ$$

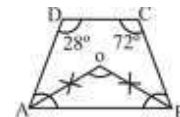
$$\angle PSR = 180^\circ - 120^\circ = 60^\circ$$

245. In quadrilateral ABCD, $\angle C = 72^\circ$ and $\angle D = 28^\circ$. The bisectors of $\angle A$ and $\angle B$ meet in O. What is the measure of $\angle AOB$?

- (a) 48° (b) 54°
(c) 36° (d) 50°

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

Ans. (d):



$$\angle A + \angle B = 360^\circ - (\angle C + \angle D)$$

$$= 360^\circ - (72^\circ + 28^\circ)$$

$$= 260^\circ$$

$$\frac{\angle A}{2} + \frac{\angle B}{2} = 130^\circ$$

$$\angle OAB + \angle OBA = 130^\circ$$

In $\triangle AOB$,

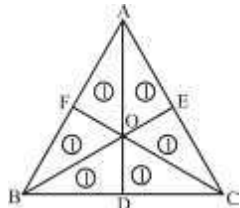
$$\angle AOB = 180^\circ - 130^\circ = 50^\circ$$

246. In $\triangle ABC$, the medians AD , BE and CF meet at O . What is the ratio of the area of $\triangle ABD$ to the area of $\triangle AOE$?

- (a) 3 : 2 (b) 5 : 2
(c) 2 : 1 (d) 3 : 1

SSC CGL (Tier-II) 12-09-2019

Ans. (d):



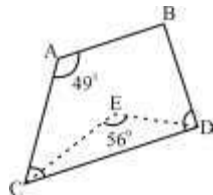
Let area of $\triangle ABC = 6$ units
 \therefore Area of $\triangle AOE = 1$ unit
Area of $\triangle ABD = (1+1+1) = 3$ units
 \therefore area of $\triangle ABD$: area of $\triangle AOE = 3 : 1$

247. In a quadrilateral $ABCD$, the bisectors of $\angle C$ and $\angle D$ meet at E . If $\angle CED = 56^\circ$ and $\angle A = 49^\circ$, then the measure of $\angle B$ is:

- (a) 71° (b) 67°
(c) 63° (d) 54°

SSC CGL (Tier-II) 12-09-2019

Ans. (c):



$$\angle A = 49^\circ$$

$$\angle CED = 56^\circ$$

$$\therefore \frac{\angle C}{2} + \frac{\angle D}{2} + \angle E = 180^\circ$$

$$\therefore \frac{\angle C}{2} + \frac{\angle D}{2} = 180^\circ - \angle E = 180^\circ - 56^\circ = 124^\circ$$

$$\angle C + \angle D = 248^\circ$$

$$\angle B = 360^\circ - (49^\circ + 248^\circ)$$

$$= 360^\circ - 297 = 63^\circ$$

or

By formula,

$$\angle CED = \frac{\angle A + \angle B}{2}$$

$$56^\circ = \frac{49^\circ + \angle B}{2}$$

$$\Rightarrow \angle B = 112^\circ - 49^\circ$$

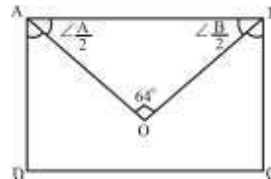
$$\angle B = 63^\circ$$

248. In quadrilateral $ABCD$, the bisectors of $\angle A$ and $\angle B$ meet at O and $\angle AOB = 64^\circ$. $\angle C + \angle D$ is equal to:

- (a) 116° (b) 128°
(c) 148° (d) 136°

SSC CGL (Tier-II) 11-9-2019

Ans. (b):



In $\triangle AOB$,

$$\frac{\angle A}{2} + \frac{\angle B}{2} = 180^\circ - 64^\circ = 116^\circ$$

$$\angle A + \angle B = 116^\circ \times 2 = 232^\circ$$

In quadrilateral $ABCD$,

$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$

$$232^\circ + \angle C + \angle D = 360^\circ$$

$$\angle C + \angle D = 360^\circ - 232^\circ = 128^\circ$$

(IV) Problems based on Square

249. $ABCD$ is square and CDE is an equilateral triangle outside the square. What is the value (in degrees) of $\angle BEC$?

- (a) 15 (b) 30
(c) 45 (d) 60

SSC CGL (Tier-II) 21-02-2018

Ans. (a):

In $\triangle BEC$,

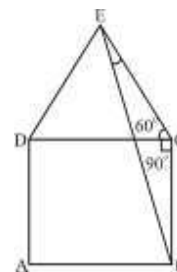
$BC = CE$

$\therefore \angle CBE = \angle CEB$

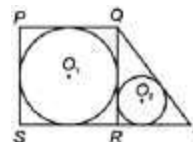
$$\therefore \angle BEC = \frac{180^\circ - (90^\circ + 60^\circ)}{2}$$

$$\therefore \angle BEC = \frac{30^\circ}{2}$$

$$\Rightarrow \angle BEC = 15^\circ$$



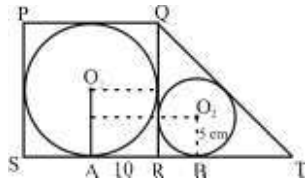
250. In the given figure, $PQRS$ is a square of side 20 cm and SR is extended to point T . If the length of QT is 25 cm, then what is the distance (in cm) between the centres O_1 and O_2 of the two circles?



- (a) $5\sqrt{10}$ (b) $4\sqrt{10}$
(c) $8\sqrt{5}$ (d) $16\sqrt{2}$

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :



Given,

$$\text{Side of square} = 20 \text{ cm}$$

$$\text{Radius of larger circle } (r_1) = \frac{20}{2} = 10 \text{ cm}$$

$$\therefore RT^2 = QT^2 - QR^2$$

$$RT^2 = (25)^2 - (20)^2$$

$$RT = 15 \text{ cm}$$

$$\therefore r = \frac{P+B-H}{2}$$

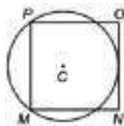
$$\Rightarrow r = \frac{15+20-25}{2}$$

$$r = 5 \text{ cm}$$

$$(O_1O_2)^2 = 15^2 + 5^2 = 250$$

$$\text{Distance between centres } O_1 \text{ and } O_2 = 5\sqrt{10}$$

251. In the given figure, MNOP is a square of side 6 cm. What is the value (in cm) of radius of circles ?



(a) 4.25

(b) 3.75

(c) 3.5

(d) 4.55

SSC CGL (Tier-II) 20-02-2018

Ans. (b) :

$$GN^2 = NX \times NM$$

$$9 = x \times 6$$

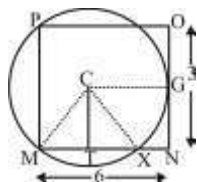
$$x = 1.5 \text{ cm}$$

$$MX = 6 - 1.5 = 4.5 \text{ cm}$$

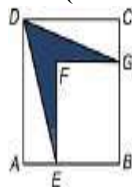
$$\therefore TX = MT = \frac{4.5}{2} = 2.25 \text{ cm}$$

$$TN = 6 - 2.25 = 3.75 \text{ cm}$$

$$\therefore \text{Radius} = 3.75 \text{ cm}$$



252. In the given figure, ABCD and BEFG are squares of sides 8 cm and 6 cm respectively. What is the area (in cm²) of the shaded region?



(a) 14

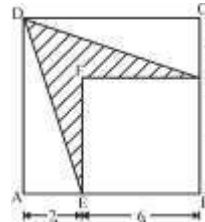
(b) 12

(c) 8

(d) 16

SSC CGL (Tier-II) 9-3-2018

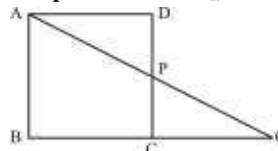
Ans. (b) :



$$\begin{aligned} \text{Area of shaded region} &= 8 \times 8 - 6 \times 6 - 2 \times \frac{1}{2} \times 2 \times 8 \\ &= 64 - 36 - 16 \\ &= 12 \text{ cm}^2 \end{aligned}$$

(V) Problems based on Rectangle

253. In the given figure, ABCD is a rectangle and P is point on DC such that BC = 24 cm, DP = 10 cm and CD = 15 cm. If AP produced intersects BC produced at Q, then find the length of AQ.



(a) 39 cm

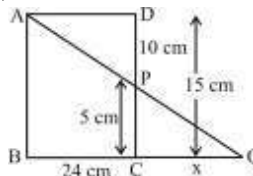
(b) 35 cm

(c) 26 cm

(d) 24 cm

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a):



Let CQ = x cm

$$\Delta PCQ \sim \Delta ABQ$$

$$\frac{x}{x+24} = \frac{5}{15} = \frac{1}{3}$$

$$3x = x + 24$$

$$x = 12 \text{ cm}$$

$$BQ = BC + CQ = 24 + 12 = 36 \text{ cm}$$

$$AB = 15 \text{ cm}, \quad AQ = ?$$

$$\therefore AQ^2 = AB^2 + BQ^2 = 15^2 + 36^2 = 1521$$

$$\therefore AQ = 39 \text{ cm}$$

254. PQRS is a rectangle in which side of PQ = 24 cm and QR = 16 cm. T is a point on RS. What is the area (in cm²) of the triangle PTQ ?

(a) 192

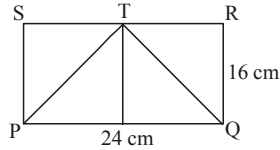
(b) 162

(c) 148

(d) Cannot be determined

SSC CGL (Tier-II) 9-3-2018 (Shift-I)

Ans. (a) :



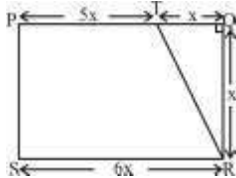
$$\begin{aligned} \text{Area of } \Delta PTQ &= \frac{1}{2} \times 24 \times 16 \\ &= 192 \text{ cm}^2 \end{aligned}$$

255. PQRS is a rectangle. T is a point on PQ such that RTQ is an isosceles triangle and $PT = 5$ QT. If the area of triangle RTQ is $12\sqrt{3}$ sq.cm then the area of the rectangle PQRS is:

- (a) $144\sqrt{3}\text{cm}^2$ (b) $142\sqrt{3}\text{cm}^2$
 (c) 142cm^2 (d) $134\sqrt{3}\text{cm}^2$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (a) Let, $QT = x$ cm



$$\text{Area of } \Delta RTQ = 12\sqrt{3}\text{cm}^2$$

$$\frac{1}{2} \times x \times x = 12\sqrt{3}$$

$$x^2 = 24\sqrt{3}\text{cm}^2$$

$$\begin{aligned} \text{Area of rectangle PQRS} &= QR \times SR = x \times 6x = 6x^2 \\ &= 6 \times 24\sqrt{3} \\ &= 144\sqrt{3}\text{cm}^2 \end{aligned}$$

(VI)

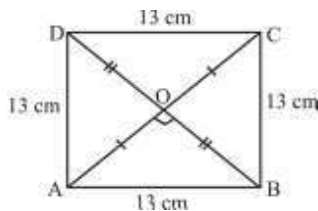
Problems based on Rhombus

256. Length of each side of a rhombus is 13 cm and one of the diagonal is 24 cm. What is the area (in cm^2) of the rhombus ?

- (a) 120 (b) 300
 (c) 60 (d) 240

SSC CGL–(Tier-I) 13/08/2021 (Shift I)

Ans. (a) : ∵ Diagonals of rhombus bisect each other at 90° .



$$OA = 12 \text{ cm}$$

In ΔAOB , (By Pythagoras Theorem)

$$AB^2 = OA^2 + OB^2$$

$$169 = 144 + OB^2$$

$$25 = OB^2$$

$$OB = 5$$

$$\therefore BD = 5 \times 2 = 10 \text{ cm}$$

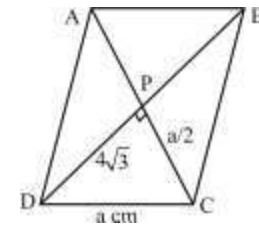
$$\begin{aligned} \text{Area of rhombus} &= \frac{1}{2} \times \text{product of diagonals} \\ &= \frac{1}{2} \times 24 \times 10 = 120 \text{ cm}^2 \end{aligned}$$

257. One diagonal of a rhombus is $8\sqrt{3}$ cm. If the other diagonal is equal to its side, then the area (in cm^2) of the rhombus is:

- (a) $12\sqrt{3}$ (b) $16\sqrt{3}$
 (c) $24\sqrt{3}$ (d) $32\sqrt{3}$

SSC CHSL 12/04/2021 (Shift-I)

Ans : (d)



Let the Length of side of rhombus = a cm

According to the question,

In ΔDPC ,

$$a^2 - \frac{a^2}{4} = 16 \times 3$$

$$\frac{3a^2}{4} = 48$$

$$a^2 = 16 \times 4 = 64$$

$$a = 8 \text{ cm}$$

As per question: – Length of side of rhombus = Length of other diagonal of given rhombus = 8 cm.

$$\text{Area of Rhombus} = \frac{1}{2} \times d_1 \times d_2$$

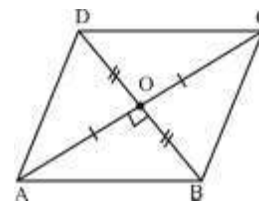
$$= \frac{1}{2} \times 8\sqrt{3} \times 8 = 32\sqrt{3} \text{ cm}^2$$

258. The perimeter of a rhombus is 148 cm, and one of its diagonals is 24 cm. The area (in cm^2) of the rhombus is:

- (a) 700 (b) 840
 (c) 770 (d) 875

SSC CHSL 13/04/2021 (Shift-I)

Ans. (b) :



Diagonals of rhombus bisect each other at 90°

$$\text{Side} = \frac{148}{4} = 37 \text{ cm}$$

$$\text{If } BD = 24 \text{ cm}$$

$$OB = \frac{24}{2} = 12 \text{ cm}$$

in ΔAOB ,

$$OA = \sqrt{37^2 - 12^2} = 35 \text{ cm}$$

$$\therefore AC = 70 \text{ cm}$$

Area of rhombus = $\frac{1}{2} \times$ product of diagonals

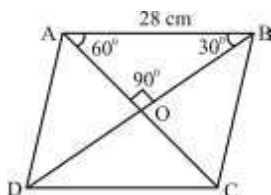
$$= \frac{1}{2} \times 24 \times 70 = 840 \text{ cm}^2$$

259. A rhombus of side 28 cm has one angle of 60° . What is the length of the larger diagonal?

- (a) 28 cm (b) $28\sqrt{2}$ cm
 (c) $28\sqrt{3}$ cm (d) $28(1+\sqrt{3})$ cm

SSC CHSL 04/08/2021 (Shift-II)

Ans. (c) :



In right angle triangle ΔAOB the side in front of 30° = Hypotenuse/2

$$\therefore AO = 14 \text{ cm.}$$

The side in front of $60^\circ = 14\sqrt{3}$

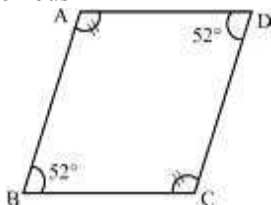
$$\text{Hence the length of diagonal} = BD = 2 \times 14\sqrt{3} = 28\sqrt{3} \text{ cm}$$

260. ABCD is a rhombus, in which $\angle ABC = 52^\circ$ then find the value of $\angle ACD$.

- (a) 26° (b) 64°
 (c) 54° (d) 48°

SSC CGL (Tier-II)-2019 – 18/11/2020 (Shift-I)

Ans. (b) : According to question, ABCD is a rhombus



\therefore Opposite angles of a rhombus are equal

$$\therefore \angle ABC = \angle ADC \text{ and } \angle BAD = \angle BCD$$

Diagonal bisects angles of a rhombus

$$\therefore \angle ABC + \angle ADC + \angle BAD + \angle BCD = 360^\circ$$

$$52^\circ + 52^\circ + \angle BAD + \angle BCD = 360^\circ$$

$$2\angle BCD = 360^\circ - 104^\circ$$

$$\angle BCD = 128^\circ$$

$$\therefore \angle ACD = \frac{\angle BCD}{2} = 64^\circ$$

261. The lengths of the diagonals of a rhombus are 16 cm and 12 cm. Its area is:

- (a) 96 cm^2 (b) 48 cm^2
 (c) 69 cm^2 (d) 28 cm^2

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) :

$$\text{Area of rhombus} = \frac{1}{2} \times \text{Product of diagonals}$$

$$= \frac{1}{2} \times 16 \times 12 = 96 \text{ cm}^2$$

262. One side of a rhombus is 13 cm and one of its diagonals is 24 cm. What is the area (in cm^2) of rhombus?

- (a) 120 (b) 60
 (c) 30 (d) 90

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a): Given,

Side of quadrilateral = 13cm

First diagonal of rhombus (d_1) = 24cm

\therefore Diagonals of rhombus bisect each other at right angle.

$$\text{Second diagonal of rhombus } (d_2) = 2\sqrt{(13)^2 - \left(\frac{d_1}{2}\right)^2}$$

$$= 2\sqrt{169 - 144}$$

$$= 10 \text{ cm}$$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 24 \times 10$$

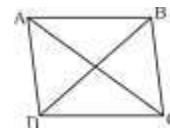
$$= 120 \text{ cm}^2$$

263. One side of a rhombus is 13 cm and one of its diagonals is 10 cm. What is the area of the rhombus (in cm^2) ?

- (a) 30 (b) 90
 (c) 120 (d) 60

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : Given,



One side of rhombus = 13 cm

Diagonal (d_1) = 10 cm

Area of rhombus = area of ΔABC + area of ΔADC
 (\therefore area of ΔABC = area of ΔADC)

($\Delta ABC \sim \Delta ADC$)

Area of rhombus = $2 \times$ area of ΔABC

From Heron's formula,

$$\text{area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{a+b+c}{2} = \frac{13+13+10}{2} = 18$$

$$\boxed{s = 18}$$

$$= \sqrt{18(18-13)(18-13)(18-10)}$$

$$= \sqrt{3600} = 60 \text{ cm}^2$$

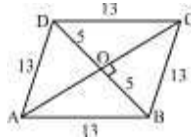
$$\text{Area of rhombus} = 2 \times 60 = 120 \text{ cm}^2$$

264. What is the area (in cm^2) of the rhombus whose side is 13 cm and its smaller diagonal is 10 cm ?

- (a) 120 (b) 192
(c) 96 (d) 50

SSC CHSL (Tier-I) 04/07/2019 (Shift-III)

Ans. (a):



\therefore Diagonals bisect each other at right angle of a rhombus.

$$OB = OD = 5 \text{ cm}$$

$$OA = OC$$

$$\angle BOC = 90^\circ$$

In $\triangle OBC$,

$$OC^2 = BC^2 - OB^2$$

$$OC^2 = 13^2 - 5^2$$

$$OC = 12 \text{ cm}$$

$$\therefore AC = AO + OC = 12 + 12 \quad (AO = OC)$$

$$AC = 24 \text{ cm}$$

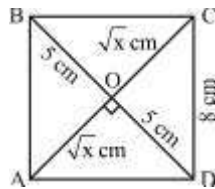
$$\text{Area of rhombus} = \frac{d_1 d_2}{2} = \frac{10 \times 24}{2} = 120 \text{ cm}^2$$

265. ABCD is a rhombus whose each side is 8 cm. If $BD = 10 \text{ cm}$, $AC = 2\sqrt{x} \text{ cm}$ then what is the value of $\sqrt{x+10}$?

- (a) 5 (b) 7
(c) $2\sqrt{3}$ (d) $3\sqrt{2}$

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (b) : $BD = 10 \text{ cm}$, $AC = 2\sqrt{x} \text{ cm}$



In $\triangle AOD$,

$$AD^2 = OA^2 + OD^2$$

$$8^2 = (\sqrt{x})^2 + 5^2$$

$$64 = x + 25$$

$$x = 39$$

$$\text{Hence, } \sqrt{x+10} = \sqrt{39+10}$$

$$= \sqrt{49}$$

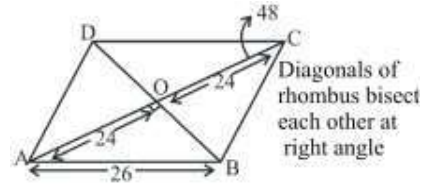
$$= 7 \text{ cm}$$

266. The length of one of the diagonals of a rhombus is 48 cm. If the side of the rhombus is 26 cm, then what is the area of the rhombus?

- (a) 540 cm^2 (b) 420 cm^2
(c) 360 cm^2 (d) 480 cm^2

SSC MTS 08/08/2019 (Shift-III)

Ans. (d) :



In $\triangle AOB$,

$$OB = \sqrt{AB^2 - OA^2}$$

$$OB = \sqrt{(26)^2 - (24)^2}$$

$$OB = \sqrt{676 - 576}$$

$$OB = \sqrt{100}$$

$$OB = 10 \text{ cm}$$

$$\therefore BD = 2 \times OB$$

$$BD = 2 \times 10$$

$$BD = 20 \text{ cm}$$

$$\therefore \text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times AC \times BD$$

$$= \frac{1}{2} \times 48 \times 20$$

$$= 480 \text{ cm}^2$$

267. If the lengths of the diagonals of a rhombus are 24 cm and 18 cm, then what is the area of the rhombus?

- (a) 196 cm^2 (b) 188 cm^2
(c) 204 cm^2 (d) 216 cm^2

SSC MTS 07/08/2019 (Shift-II)

$$\text{Ans. (d) } \therefore \text{Area of rhombus} = \frac{1}{2} \times d_1 d_2$$

Where, d_1 & d_2 are its diagonals.

$$\therefore \text{Area of rhombus} = \frac{1}{2} \times 24 \times 18$$

$$= 12 \times 18$$

$$= 216 \text{ cm}^2$$

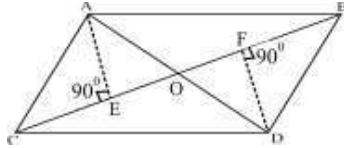
(VI) Problems based on Parallelogram

268. ABCD is a parallelogram in which diagonals AD and BC intersect at O. AE and DF are perpendiculars on BC at E and F, respectively. Which of the following is NOT true?

- (a) $\triangle AOE \cong \triangle DOF$ (b) $\triangle AEB \cong \triangle DFC$
(c) $\triangle ABC \cong \triangle DCB$ (d) $\triangle ADC \cong \triangle ABD$

SSC CGL (TIER-I)-2018 - 06.06.2019 (Shift-II)

Ans. (d)



From option,

(a) $\triangle AOE \cong \triangle DOF$

$\therefore AO = OD$ & $OE = OF$ & $\angle OEA = \angle OFD = 90^\circ$

Hence, $\triangle AOE \cong \triangle DOF$ (true)

(b) $\triangle AEB \cong \triangle DFC$

$\therefore CD = AB$ & $FC = EB$ & $\angle DFC = \angle AEB = 90^\circ$

Hence, $\triangle AEB \cong \triangle DFC$ (true)

(c) $\triangle ABC \cong \triangle DCB$

$\therefore AB = DC$ & $BD = CA$ & BC is common

Hence, $\triangle ABC \cong \triangle DCB$ (true)

(d) $\triangle ADC \cong \triangle ABD$

AD, AB & DC, BD is not parallel

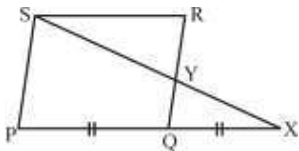
Option (d) is different from other options.

269. PQRS is a parallelogram and its area is 300 cm^2 . Side PQ is extended to X such that $PQ = QX$. If XS intersects QR at Y, then what is the area (in cm^2) of triangle SYR?

- (a) 75 (b) 50
(c) 120 (d) 100

SSC CGL (Tier-II) 9-3-2018

Ans. (a)



$\triangle SRY \sim \triangle XQY$

$\text{ar}(\triangle SRY) = \text{ar}(\triangle XQY)$

$\text{ar}(PQRS) = \text{ar}(PQYS) + \text{ar}(\triangle SRY)$

$= \text{ar}(PQYS) + \text{ar}(XQY)$

$= \text{ar}(\triangle XPS) = 300 \text{ cm}^2$

$\therefore \triangle XQY \sim \triangle XPS$

$$\frac{\text{ar}(\triangle XQY)}{\text{ar}(\triangle XPS)} = \left(\frac{QX}{PX}\right)^2 = \left(\frac{1}{2}\right)^2$$

$$\frac{\text{ar}(\triangle SRY)}{300} = \frac{1}{4}$$

$$\text{ar}(\triangle SYR) = 75 \text{ cm}^2$$

(VIII) Problems based on Trapezium

270. In a trapezium PQRS, PQ is parallel to RS and diagonals PR and QS intersect at O. If $PQ = 4 \text{ cm}$, $SR = 10 \text{ cm}$, then what is area ($\triangle POQ$) : area ($\triangle SOR$) ?

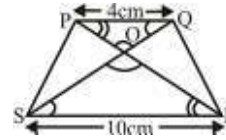
- (a) 2 : 3 (b) 2 : 5
(c) 4 : 25 (d) 4 : 9

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,

$PQ \parallel RS$

$PQ = 4 \text{ cm}$, $SR = 10 \text{ cm}$.



$\angle QPR = \angle PRS$

$\angle SQP = \angle QSR$

$\angle POQ = \angle SOR$

$\triangle POQ \sim \triangle ROS$

$$\frac{\text{area of } \triangle POQ}{\text{area of } \triangle ROS} = \left(\frac{PQ}{SR}\right)^2$$

$$= \left(\frac{4}{10}\right)^2$$

$$= \left(\frac{2}{5}\right)^2$$

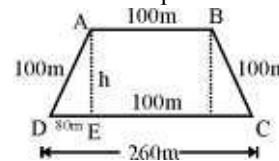
$$= \frac{4}{25}$$

271. A field is in the shape of a trapezium whose parallel sides are 260 m and 100 m, and non-parallel sides are each of length 100 m. What is the area (in m^2) of the field?

- (a) 11700 (b) 10800
(c) 9900 (d) 9000

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b) : Let ABCD is a trapezium.



$$AE = \sqrt{(AD)^2 - (DE)^2}$$

$$AE = \sqrt{(100)^2 - (80)^2}$$

$$AE = \sqrt{10000 - 6400}$$

$$AE = \sqrt{3600}$$

$$AE = 60 \text{ m}$$

Area of trapezium = $\frac{1}{2} \times \text{Sum of parallel sides} \times \text{Height}$

$$= \frac{1}{2} \times (100 + 260) \times 60$$

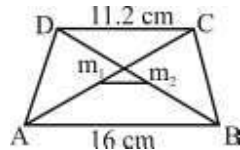
$$= \frac{1}{2} \times 360 \times 60 = 10800 \text{ m}^2$$

272. In a trapezium ABCD, $DC \parallel AB$, $AB = 16 \text{ cm}$ and $DC = 11.2 \text{ cm}$. What is the length (in cm) of the line segment joining the mid points of its diagonals?

- (a) 2.8 (b) 1.2
(c) 2.4 (d) 1.8

SSC CHSL 10/08/2021 (Shift-III)

Ans. (c) : Given –



In trapezium □ ABCD,

$$DC \parallel AB, AB = 16 \text{ cm}, DC = 11.2 \text{ cm}$$

∴ m_1 and m_2 are the midpoints at the diagonal AC and BD. respectively

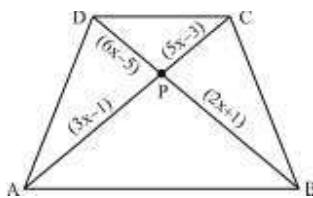
$$\begin{aligned} \therefore m_1 m_2 &= (AB - DC)/2 \\ &= (16 - 11.2)/2 \\ &= 4.8/2 \\ &= 2.4 \text{ cm.} \end{aligned}$$

273. ABCD is a trapezium in which $AB \parallel DC$ and its diagonals intersect at P. If $AP = (3x - 1)$ cm, $PC = (5x - 3)$ cm, $BP = (2x + 1)$ cm and $PD = (6x - 5)$ cm, then the length of DB is :

- (a) 16 cm (b) 10 cm
(c) 12 cm (d) 14 cm

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (c) ∴ $\Delta PAB \sim \Delta PCD$



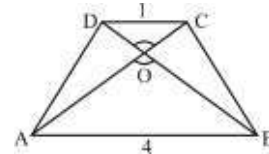
$$\begin{aligned} \therefore \frac{PA}{PC} &= \frac{PB}{PD} \\ \frac{3x-1}{5x-3} &= \frac{2x+1}{6x-5} \\ 18x^2 - 15x - 6x + 5 &= 10x^2 + 5x - 6x - 3 \\ 18x^2 - 21x + 5 &= 10x^2 - x - 3 \\ 8x^2 - 20x + 8 &= 0 \\ 2x^2 - 5x + 2 &= 0 \\ 2x^2 - 4x - x + 2 &= 0 \\ 2x(x-2) - 1(x-2) &= 0 \\ (x-2)(2x-1) &= 0 \\ \therefore x &= 2 \text{ and } x = \frac{1}{2} \text{ [Unacceptable]} \\ \therefore DB &= 6x - 5 + 2x + 1 = 8x - 4 = 16 - 4 = 12 \text{ cm} \end{aligned}$$

274. ABCD is a trapezium in which AB is parallel to CD and $AB = \frac{1}{4}$ (CD). The diagonals of the trapezium intersect at O. What is the ratio of area of triangle DCO to the area of the triangle ABO ?

- (a) 1 : 4 (b) 1 : 2
(c) 1 : 8 (d) 1 : 16

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :



In ΔDCO and ΔABO ,

$\angle DOC = \angle AOB$ [Vertically opposite angle]

$\angle OAB = \angle OCD$ [Alternate angle]

$\angle CDO = \angle ABO$ [Alternate angle]

∴ $\Delta DCO \sim \Delta ABO$

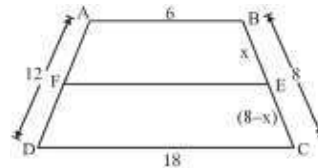
$$\begin{aligned} \therefore \frac{\text{area of } \Delta DCO}{\text{area of } \Delta ABO} &= \frac{DC^2}{AB^2} \\ &= \frac{1^2}{4^2} \\ &= \boxed{1:16} \end{aligned}$$

275. ABCD is trapezium. Sides AB and CD are parallel to each other. $AB = 6$ cm, $CD = 18$ cm, $BC = 8$ cm and $AD = 12$ cm. A line parallel to AB divides the trapezium in two parts of equal perimeter. This line cuts BC at E and AD at F. If $BE/EC = AF/FD$, then what is the value of BE/EC ?

- (a) 1/2 (b) 2
(c) 4 (d) 1/4

SSC CGL (Tier-II) 9-3-2018 (Shift-II)

Ans. (c):



$$\begin{aligned} \therefore \frac{BE}{EC} &= \frac{AF}{FD} \\ \text{or } \frac{EC}{BE} &= \frac{FD}{AF} \\ \frac{EC}{BE} + 1 &= \frac{FD}{AF} + 1 \\ \frac{8}{BE} &= \frac{12}{AF} \\ \text{or } \frac{8}{x} &= \frac{12}{AF} \\ AF &= \frac{3x}{2} \text{ \& } FD = 12 - \frac{3x}{2} \\ \therefore \text{Perimeter of } ABEF &= \text{Perimeter of } FDCE \\ AB + BE + FE + AF &= FE + EC + CD + FD \\ \text{or } 6 + x + \frac{3x}{2} &= 8 - x + 18 + 12 - \frac{3x}{2} \\ \text{or } 6 + x + 3x &= 38 - x \\ 5x &= 32 \\ x &= \frac{32}{5} \end{aligned}$$

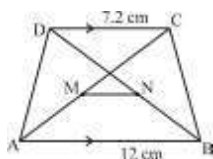
$$\begin{aligned} \therefore \frac{BE}{EC} &= \frac{\frac{32}{5}}{8 - \frac{32}{5}} \\ &= \frac{32}{8} = 4 \end{aligned}$$

276. In a trapezium ABCD, $DC \parallel AB$, $AB = 12$ cm and $DC = 7.2$ cm. What is the length of the line segment joining the midpoints of its diagonals?

- (a) 3.6 cm (b) 2.6 cm
(c) 4.8 cm (d) 2.4 cm

SSC CGL (Tier-II) 11-9-2019 (Shift-I)

Ans. (d) :



Let M and N are the mid points of diagonals AC and BD.

$$\text{then, } MN = \frac{AB - DC}{2} = \frac{12 - 7.2}{2} = 2.4 \text{ cm}$$

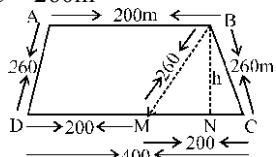
277. A field is in the shape of a trapezium whose parallel sides are 200m and 400m long, whereas each of other two sides is 260m long. What is the area (in m^2) of the field?

- (a) 52000 (b) 60000
(c) 48000 (d) 72000

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) In $\triangle BMC$,

$BM \parallel AD$ & $BN \perp MC$
 $a = AD = BM = 260\text{m}$
 $b = MC = 200\text{m}$
 $c = BC = 260\text{m}$



$$\text{Area of } \triangle BMC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{Where, } s = \frac{260 + 200 + 260}{2}$$

$$\text{Area of } \triangle BMC = \sqrt{360 \times 100 \times 160 \times 100}$$

$$\text{Area of } = \frac{1}{2} \times MC \times BN$$

$$24000 = \frac{1}{2} \times 200 \times h$$

$$\boxed{h = 240\text{m}}$$

\therefore Area of trapezium,

$$= \frac{1}{2} \times \text{sum of parallel sides} \times \text{Height}$$

$$= \frac{1}{2} \times 600 \times 240$$

$$= 72000 \text{ m}^2$$

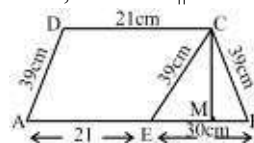
278. The lengths of the parallel sides of a trapezium are 51cm, and 21cm, and that of each of the other two sides is 39cm. What is the area (in cm^2) of the trapezium?

- (a) 1260 (b) 1296
(c) 1152 (d) 1206

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b)

Construction, Draw $CE \parallel DA$



\therefore AECD is a parallelogram

$\triangle CEB$ is an isosceles triangle

\therefore In an isosceles triangle, perpendicular drawn from the vertices of a triangle bisect the opposite side.

In $\triangle CMB$,

$$MB = 15 \text{ cm}$$

$$CM = \sqrt{39^2 - 15^2} = 36 \text{ cm}$$

$$\begin{aligned} \text{Area of trapezium} &= \frac{1}{2} \times (51 + 21) \times 36 \\ &= 1296 \text{ cm}^2 \end{aligned}$$

279. Parallel sides of a trapezium are 20 cm and 10 cm and its non-parallel sides are equal. If its area is 180 cm^2 , then what is the length of each non-parallel side?

- (a) 11 (b) 15
(c) 13 (d) 12

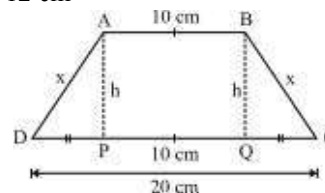
SSC CHSL (Tier-I) 04/07/2019 (Shift-I)

Ans. (c) : Let non parallel side = x cm

$$\text{Area} = \frac{1}{2} \times \text{Height} \times \text{Sum of parallel sides}$$

$$180 = \frac{1}{2} \times h \times 30$$

$$h = 12 \text{ cm}$$



then $AB = PQ = 10$ cm

$\therefore DP = QC$

$\therefore 2DP = DC - PQ,$

$$DP = \frac{20 - 10}{2} = 5 \text{ cm}$$

In $\triangle APD$,

$$AD^2 = AP^2 + DP^2$$

$$x^2 = h^2 + DP^2 \Rightarrow x = \sqrt{12^2 + 5^2}$$

$$x = 13 \text{ cm}$$

Non parallel side = 13 cm

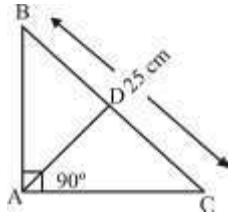
(IX) Problems based on Right angled Triangle

280. In a ΔABC , angle $BAC = 90^\circ$. If $BC = 25\text{cm}$, then what is the length of the median AD ?

- (a) 24cm (b) 14.5cm
(c) 12.5cm (d) 10cm

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c)



\therefore In any right angled triangle, circumcentre is the mid point of hypotenuse.

$$\therefore BD = CD = AD = \frac{25}{2}$$

$$AD = 12.5\text{cm}$$

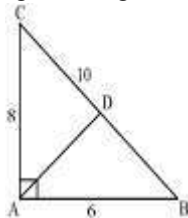
281. In ΔABC , D is the median from A to BC . $AB = 6$, $AC = 8$ cm, and $BC = 10$ cm. The length of median AD (in cm) is:

- (a) 3 (b) 5
(c) 4.5 (d) 4

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : \because 6, 8 and 10 are triplet

$\therefore \Delta ABC$ is right angled triangle



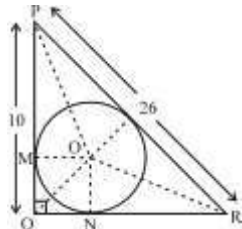
$$\therefore AD = \frac{BC}{2} = \frac{10}{2} = 5\text{cm}$$

282. In a triangle PQR , $\angle PQR = 90^\circ$, $PQ = 10$ cm and $PR = 26$ cm, then what is the value (in cm) of inradius of incircle ?

- (a) 9 (b) 4
(c) 8 (d) 6

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :



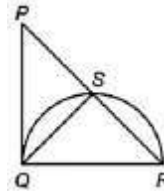
From figure,

$$QR = \sqrt{PR^2 - PQ^2} \Rightarrow \sqrt{26^2 - 10^2} = \sqrt{36 \times 16} = 24$$

$$\text{Inradius } (r) = \frac{\text{Area of } \Delta PQR}{\text{Semiperimeter of } \Delta PQR}$$

$$= \frac{\frac{1}{2} \times 24 \times 10}{\frac{1}{2} \times (24 + 26 + 10)} = \frac{120}{30} = 4$$

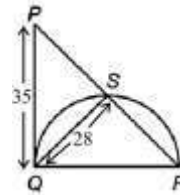
283. In the given figure, triangle PQR is a right angled triangle at Q . If $PQ = 35$ cm and $QS = 28$ cm, then what is the value (in cm) of SR ?



- (a) 35.33 (b) 37.33
(c) 41.33 (d) 43.33

SSC CGL (Tier-II) 20-02-2018 (Shift-I)

Ans. (b) :



$PQ = 35$ cm.

$QS = 28$ cm.

\therefore Angle drawn in semicircle is a right angle.

$\therefore \angle QSP = 90^\circ$

In ΔQSP ,

$$(PQ)^2 = (PS)^2 + (QS)^2$$

$$(35)^2 = PS^2 + 28^2$$

$$1225 = PS^2 + 784$$

$$PS^2 = 441$$

$$PS = 21\text{cm}$$

$\therefore QS^2 = PS \times SR$ (Theorem)

$$28 \times 28 = 21 \times SR$$

$$SR = \frac{28 \times 28}{21}$$

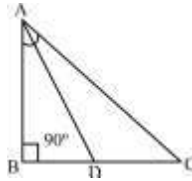
$$SR = 37.33 \text{ cm.}$$

284. In ΔABC , $\angle B = 90^\circ$, $AB = 8$ cm and $BC = 15$ cm. D is a point on BC such that AD bisects $\angle A$. The length (in cm) of BD is:

- (a) 4.5 (b) 4.8
(c) 4.2 (d) 3.6

SSC CHSL 13/04/2021 (Shift-II)

Ans. (b) : Given –



In ΔABC , $\angle B = 90^\circ$, $AB = 8$ cm
 $BC = 15$ cm

By Pythagoras Theorem –

$$AB^2 + BC^2 = AC^2$$

$$\Rightarrow (8)^2 + (15)^2 = AC^2$$

$$\Rightarrow AC = \sqrt{289}$$

$$\Rightarrow AC = 17 \text{ cm.}$$

$$\therefore \frac{BD}{DC} = \frac{AB}{AC} \quad \{\text{Angle Bisector theorem}\}$$

$$\Rightarrow \frac{BD}{DC} = \frac{8}{17}$$

$$\Rightarrow BD + DC = 8 + 17 = 25$$

$$\Rightarrow BD = 15 \times \frac{8}{25}$$

$$= 4.8 \text{ cm.}$$

285. In a triangle, ABC , $\angle BAC = 90^\circ$ and AD is perpendicular to BC . If $AD = 8.4$ cm and $BD = 4.8$ cm, then the length of BC is:

- (a) 19.5 cm (b) 15 cm
 (c) 18 cm (d) 18.5 cm

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) : Given,

$$\angle BAC = 90^\circ$$

$$AD \perp BC$$

$$AD = 8.4 \text{ cm.}$$

In ΔADB and ΔADC ,

$$\angle DAB = \angle DAC$$

$$\Delta ADB \sim \Delta ADC$$

$$AD^2 = BD \cdot CD$$

$$(8.4)^2 = 4.8 \times CD$$

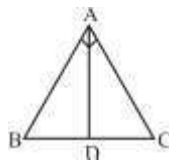
$$CD = \frac{8.4 \times 8.4}{4.8}$$

$$CD = 14.7$$

$$BC = BD + CD$$

$$= 4.8 + 14.7$$

$$BC = 19.5 \text{ cm.}$$

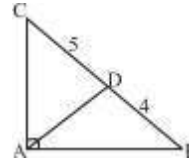


286. In a $\angle BAC = 90^\circ$ and AD is perpendicular to BC where D is a point on BC . If $BD = 4$ cm and $CD = 5$ cm, then the length of AD is equal to:

- (a) $2\sqrt{5}$ cm (b) 4.5 cm
 (c) $5\sqrt{2}$ cm (d) 6 cm

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a)



[By right angle triangle property]

$$AD^2 = BD \times CD$$

$$AD^2 = 5 \times 4$$

$$AD = \sqrt{5 \times 4}$$

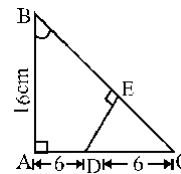
$$AD = 2\sqrt{5} \text{ cm}$$

287. In ΔABC , $\angle A = 90^\circ$, $AB = 16$ cm and $AC = 12$ cm. D is the midpoint of AC and $DE \perp CB$ at E . What is the area (in cm^2) of ΔCDE ?

- (a) 7.68 (b) 8.64
 (c) 6.25 (d) 5.76

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b)



$$\text{Area of angle } \Delta ABC = \frac{1}{2} \times 12 \times 16 = 96 \text{ cm}^2$$

$$BC^2 = AB^2 + AC^2$$

$$= (16)^2 + (12)^2$$

$$= 256 + 144$$

$$BC = \sqrt{400} = 20 \text{ cm}$$

$$\therefore \Delta ABC \sim \Delta EDC$$

$$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta EDC} = \left(\frac{BC}{DC}\right)^2$$

$$\frac{96}{\text{area of } \Delta EDC} = \left(\frac{20}{6}\right)^2$$

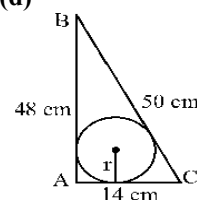
$$\text{area of } \Delta CDE = 96 \times \frac{9}{100} = 8.64 \text{ cm}^2$$

288. ABC is a right angled triangle, right angled at A . A circle is inscribed in it. The lengths of two sides containing the right angle are 48 cm and 14 cm. The radius of the inscribed circle is:

- (a) 5 cm (b) 8 cm
 (c) 4 cm (d) 6 cm

SSC CHSL –20/10/2020 (Shift-I)

Ans : (d)



$$BC^2 = AB^2 + AC^2 = (48)^2 + (14)^2$$

$$= 2304 + 196 = 2500$$

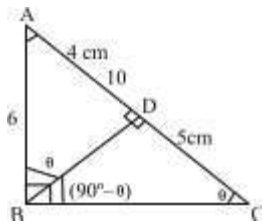
$$\begin{aligned} & \text{Inradius of right angle triangle} \\ &= \frac{\text{Perpendicular} + \text{Base} - \text{Hypotenuse}}{2} \\ &= \frac{48 + 14 - 50}{2} = \frac{62 - 50}{2} = \frac{12}{2} = 6\text{cm} \end{aligned}$$

289. In $\triangle ABC$, $\angle ABC = 90^\circ$ and $BD \perp AC$. If $AD = 4$ cm and $CD = 5$ cm then BD is equal to :

- (a) $3\sqrt{2}$ cm (b) $2\sqrt{5}$ cm
(c) $3\sqrt{5}$ (d) $4\sqrt{5}$

SSC CHSL (Tier-I) 11/07/2019 (Shift-III)

Ans. (b) :



$$\triangle ADB \sim \triangle BDC$$

\therefore

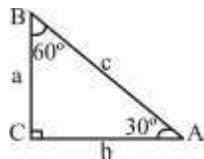
$$\begin{aligned} \frac{AD}{DB} &= \frac{BD}{DC} \\ BD^2 &= AD \times DC \\ BD &= \sqrt{4 \times 5} \\ &= 2\sqrt{5} \text{ cm} \end{aligned}$$

290. In any triangle, if the angles are in the ratio 1 : 2 : 3, then what will be the ratio of the sides opposite to them?

- (a) $1 : \sqrt{3} : 2$ (b) $2 : \sqrt{3} : 1$
(c) $1 : \sqrt{3} : 1$ (d) $2 : 2 : \sqrt{3}$

SSC CHSL 10/08/2021 (Shift-II)

Ans. (a) : Given,



The ratio of angles = 1:2:3
Let $A = x$, $B = 2x$ and $C = 3x$
 $\Rightarrow x + 2x + 3x = 180^\circ$
 $\Rightarrow 6x = 180^\circ \Rightarrow x = 30^\circ$
 $\Rightarrow \angle A = 30^\circ$, $\angle B = 60^\circ$ and $\angle C = 90^\circ$

We know that,

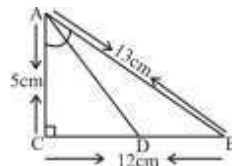
$$\begin{aligned} \frac{a}{\sin A} &= \frac{b}{\sin B} = \frac{c}{\sin C} \\ \Rightarrow \frac{a}{\sin 30^\circ} &= \frac{b}{\sin 60^\circ} = \frac{c}{\sin 90^\circ} \\ \Rightarrow \frac{a}{1/2} &= \frac{b}{\sqrt{3}/2} = \frac{c}{1} \\ \Rightarrow a:b:c &= 1 : \sqrt{3} : 2 \end{aligned}$$

291. In $\triangle ABC$. $\angle C = 90^\circ$ and D is a point on CB such that AD is the bisector of $\angle A$. If $AC = 5$ cm and $BC = 12$ cm. then what is the length of AD ?

- (a) $\frac{5\sqrt{13}}{3}$ cm (b) $\frac{5\sqrt{13}}{6}$ cm
(c) $\frac{20}{3}$ cm (d) $\frac{10}{3}$ cm

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a)



In right angled triangle ACB ,

$$AB = \sqrt{5^2 + 12^2} = 13\text{cm}$$

The bisector of an angle of a triangle divides its opposite side in the ratio of the remaining two sides.

$$\begin{aligned} \therefore \frac{DC}{DB} &= \frac{AC}{AB} \\ DC : DB &= 5 : 13 \end{aligned}$$

$$\therefore DC = \frac{5}{18} \times 12$$

$$DC = \frac{10}{3}$$

In right angle triangle ACD , By Pythagoras Theorem,

$$AD^2 = AC^2 + CD^2$$

$$AD^2 = 5^2 + \left(\frac{10}{3}\right)^2$$

$$AD^2 = 25 + \frac{100}{9}$$

$$AD = \sqrt{\frac{325}{9}}$$

$$AD = \frac{5\sqrt{13}}{3} \text{ cm}$$

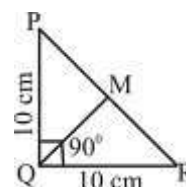
292. PQR is an isosceles triangle such that $PQ = QR = 10$ cm and $\angle PQR = 90^\circ$. What is the length of the perpendicular drawn from Q on PR ?

- (a) $5\sqrt{2}$ cm (b) $4\sqrt{2}$ cm
(c) $7\sqrt{2}$ cm (d) $6\sqrt{2}$ cm

SSC CHSL -12/10/2020 (Shift-II)

Ans. (a) :

$$\begin{aligned} PR &= \sqrt{(PQ)^2 + (QR)^2} \\ &= \sqrt{(10)^2 + (10)^2} \\ &= \sqrt{200} = 10\sqrt{2} \end{aligned}$$



By Theorem, $QM = \frac{1}{2}PR$

$$QM = \frac{10\sqrt{2}}{2}$$

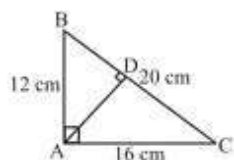
$$QM = 5\sqrt{2} \text{ cm}$$

293. In $\triangle ABC$, $\angle A = 90^\circ$, $AD \perp BC$ at D . If $AB = 12 \text{ cm}$ and $AC = 16 \text{ cm}$, then what is the length (in cm) of BD ?

- (a) 7.8 (b) 6.4
(c) 7.2 (d) 8.4

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (c) :



$$\therefore BD = \frac{AB^2}{BC} \text{ (by rule)}$$

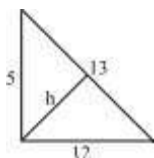
$$BD = \frac{12 \times 12}{20} = \frac{144}{20} = 7.2 \text{ cm}$$

294. What is the length (in cm) of the smallest altitude of the triangle whose sides are 5 cm, 12 cm and 13 cm? (correct to one decimal place)

- (a) 12.0 (b) 5.1
(c) 2.6 (d) 4.6

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (d) :



As we know that 5, 12 and 13 are triplets and form a right angle, the smallest altitude will be on hypotenuse.

Area of right angled triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

$$\frac{1}{2} \times 5 \times 12 = \frac{1}{2} \times h \times 13$$

$$\Rightarrow h = 4.6 \text{ cm}$$

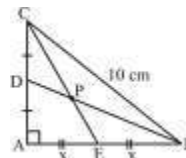
\therefore The length of the smallest altitude of the triangle is 4.6 cm.

295. BD and CE are the medians of $\triangle ABC$, right angled at A . If $CE = \frac{5\sqrt{13}}{2}$, $BC = 10 \text{ cm}$, then the length of BD is:

- (a) $3\sqrt{7} \text{ cm}$ (b) $3\sqrt{5} \text{ cm}$
(c) $\sqrt{13} \text{ cm}$ (d) $5/2 \sqrt{7} \text{ cm}$

SSC CHSL 04/08/2021 (Shift-III)

Ans. (d) :



Given,

$$CE = \frac{5\sqrt{13}}{2}$$

In $\triangle CAB$,

$$AC^2 + AB^2 = 100$$

$$AC^2 + (2x)^2 = 100$$

$$AC^2 + 4x^2 = 100 \dots (i)$$

In $\triangle CAE$,

$$AC^2 + x^2 = \left(\frac{5\sqrt{13}}{2}\right)^2$$

$$AC^2 + x^2 = \frac{325}{4} \dots (ii)$$

From equation (i) and (ii)

$$3x^2 = 100 - \frac{325}{4}$$

$$3x^2 = \frac{75}{4}$$

$$\Rightarrow x = \frac{5}{2}$$

$$AC = \sqrt{75} \text{ cm [From Pythagoras theorem]}$$

$\triangle DAB$,

$$(BD)^2 = (AB)^2 + (AD)^2$$

$$(BD)^2 = (5)^2 + \left(\frac{\sqrt{75}}{2}\right)^2$$

$$(BD)^2 = 25 + \frac{75}{4}$$

$$(BD)^2 = \frac{175}{4}$$

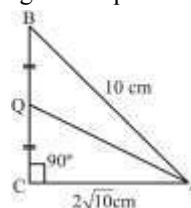
$$BD = \frac{5}{2}\sqrt{7} \text{ cm}$$

296. In $\triangle ABC$, $\angle C = 90^\circ$ and Q is the midpoint of BC . If $AB = 10 \text{ cm}$ and $AC = 2\sqrt{10} \text{ cm}$, then the length of AQ is :

- (a) $5\sqrt{2} \text{ cm}$ (b) $3\sqrt{5} \text{ cm}$
(c) $\sqrt{55} \text{ cm}$ (d) $5\sqrt{3} \text{ cm}$

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (c) : According to the question,



In $\triangle ABC$,

$$\angle C = 90^\circ \text{ and } CQ = BQ = \frac{1}{2} BC$$

By Pythagoras theorem,

$$AB^2 = AC^2 + BC^2$$

$$\Rightarrow 10^2 = (2\sqrt{10})^2 + BC^2$$

$$\Rightarrow 100 - 40 = BC^2$$

$$\therefore BC = \sqrt{60} = 2\sqrt{15}$$

$$\therefore CQ = \frac{1}{2} \times BC$$

$$\therefore \boxed{CQ = \sqrt{15}}$$

In $\triangle ACQ$,

Again by Pythagoras theorem,

$$AQ^2 = AC^2 + CQ^2$$

$$\Rightarrow AQ^2 = (2\sqrt{10})^2 + (\sqrt{15})^2$$

$$\Rightarrow AQ^2 = 40 + 15$$

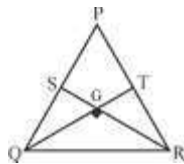
$$\therefore \boxed{AQ = \sqrt{55} \text{ cm}}$$

297. PQR is a triangle such that PQ = PR. RS and QT are the median to the sides PQ and PR respectively. If the medians RS and QT intersect at right angle, then what is the value of $(PQ/QR)^2$?

- (a) 3/2 (b) 5/2
(c) 2 (d) None of these

SSC CGL (Tier-II) 9-3-2018 (Shift-I)

Ans. (b):



$$\therefore \angle QGR = 90^\circ \quad (\text{By theorem})$$

In $\triangle PQR$,

$$\text{We know that, } PQ^2 + PR^2 = 5QR^2$$

$$2PQ^2 = 5QR^2 \quad (\because PQ = PR)$$

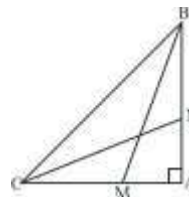
$$\left(\frac{PQ}{QR}\right)^2 = \frac{5}{2}$$

298. In a $\triangle ABC$, $\angle A = 90^\circ$, if BM and CN are two medians, $\frac{BM^2 + CN^2}{BC^2}$ is equal to:

- (a) 3/5 (b) 3/4
(c) 4/5 (d) 5/4

SSC CHSL -21/10/2020 (Shift-III)

Ans. (d)



BM is median

$$AM = CM = \frac{1}{2} AC \quad \dots(i)$$

CN is median

$$AN = NB = \frac{1}{2} AB \quad \dots(ii)$$

In $\triangle BAC$,

$$(BC)^2 = (AB)^2 + (AC)^2$$

In $\triangle BAM$,

$$(BM)^2 = (AB)^2 + \left(\frac{AC}{2}\right)^2$$

$$4BM^2 = 4AB^2 + (AC)^2$$

In $\triangle NAC$,

$$CN^2 = AN^2 + AC^2$$

$$(CN)^2 = \left(\frac{1}{2} AB\right)^2 + AC^2$$

$$4CN^2 = AB^2 + 4AC^2$$

$$BC^2 = AB^2 + AC^2 \quad \dots(i)$$

$$4BM^2 = 4AB^2 + AC^2 \quad \dots(ii)$$

$$4CN^2 = AB^2 + 4AC^2 \quad \dots(iii)$$

On adding eqⁿ (i) & (ii),

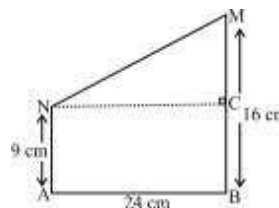
$$\frac{BM^2 + CN^2}{BC^2} = \frac{5}{4}$$

299. Asha and Suman's mud forts have heights 9 cm and 16 cm. They are 24 cm apart. How far (in cm) are the fort tops from each other?

- (a) 25 (b) 24
(c) 7 (d) 16

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) :



$$AB = NC = 24 \text{ cm}$$

$$CM = BM - AN = (16 - 9) = 7 \text{ cm}$$

In right angled triangle $\triangle NCM$,

$$NM^2 = NC^2 + CM^2$$

$$= (24)^2 + (7)^2$$

$$= 576 + 49$$

$$= 625$$

$$NM = \sqrt{625} = 25 \text{ cm}$$

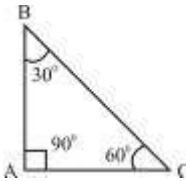
Hence, distance between the tops = 25 cm

300. ABC is a right angled triangle. $\angle BAC = 90^\circ$ and $\angle ACB = 60^\circ$. What is the ratio of the circumradius of the triangle to the side AB?

- (a) 1 : 2 (b) 1 : $\sqrt{3}$
 (c) 2 : $\sqrt{3}$ (d) 2 : 3

SSC CGL (Tier-II) 17-2-2018

Ans. (b):



Let $AC = x$

$$\tan 60^\circ = \frac{AB}{AC}$$

$$\Rightarrow \sqrt{3} = \frac{AB}{x}$$

$$AB = \sqrt{3}x$$

$$\therefore BC = \sqrt{(\sqrt{3}x)^2 + x^2}$$

$$= \sqrt{3x^2 + x^2} = \sqrt{4x^2}$$

$$= 2x$$

$$\therefore AB : AC : BC = \sqrt{3}x : x : 2x = \sqrt{3} : 1 : 2$$

$$\text{Circumradius (R)} = \frac{BC}{2} = x$$

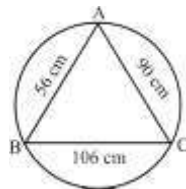
$$\therefore R : AB = x : \sqrt{3}x = 1 : \sqrt{3}$$

301. The sides of a triangle are 56 cm, 90 cm and 106 cm. The circumference of its circumcircle is :

- (a) 106π (b) 109π
 (c) 108π (d) 112π

SSC CGL (Tier-II) 12-09-2019 (Shift-II)

Ans. (a) :



$$\therefore \text{Circumradius (R)} = \frac{abc}{4\Delta}$$

$$\therefore 56^2 + 90^2 = 106^2$$

$$3136 + 8100 = 11236$$

$$11236 = 11236$$

Hence it is a right angled triangle

$$\text{Circumradius (R)} = \frac{\text{Hypotenuse}}{2}$$

$$= \frac{106}{2} = 53$$

$$\therefore \text{Circumference of circle} = 2\pi R$$

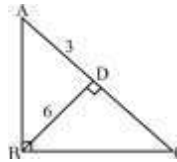
$$= 106\pi$$

302. $\triangle ABC$ is right-angled at B and D is a point on AC such that BD is perpendicular to AC. If $BD = 6\text{ cm}$ and $AD = 3\text{ cm}$, then what will be the length of AC?

- (a) 9 cm (b) 15 cm
 (c) 12 cm (d) 18 cm

SSC CHSL 16/04/2021 (Shift-III)

Ans.(b) : Given-



$$BD = 6\text{ cm}$$

$$AD = 3\text{ cm}$$

In $\triangle ABD$,

$$\therefore AB^2 = AD^2 + BD^2$$

$$\Rightarrow AB^2 = 3^2 + 6^2$$

$$\Rightarrow AB^2 = 45\text{ cm}$$

As per question,

$$\Rightarrow AD = \frac{AB^2}{AC}$$

$$\Rightarrow 3 = \frac{45}{AC}$$

$$\Rightarrow AC = \frac{45}{3}$$

$$\Rightarrow AC = 15\text{ cm.}$$

303. In $\triangle ABC$, $\angle C = 90^\circ$, $AC = 5\text{ cm}$ and $BC = 12\text{ cm}$. The bisector of $\angle A$ meets BC at D. What is the length of AD?

- (a) $\frac{2}{3}\sqrt{13}\text{ cm}$ (b) $2\sqrt{13}\text{ cm}$
 (c) $\frac{4}{3}\sqrt{13}\text{ cm}$ (d) $\frac{5\sqrt{13}}{3}\text{ cm}$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) :

In $\triangle ACB$,

$$AB = \sqrt{5^2 + 12^2} = 13\text{ cm}$$

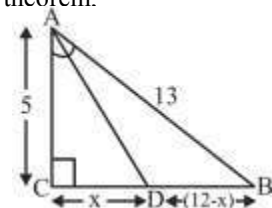
By internal angle bisector theorem.

$$\frac{AC}{CD} = \frac{AB}{BD}$$

$$\frac{5}{x} = \frac{13}{12-x}$$

$$60 - 5x = 13x$$

$$x = \frac{60}{18} = \frac{10}{3}\text{ cm}$$



In $\triangle ACD$,

$$AD^2 = 5^2 + \left(\frac{10}{3}\right)^2 = 25 + \frac{100}{9} = \frac{325}{9}$$

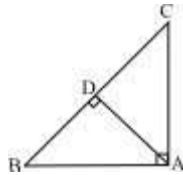
$$AD = \frac{5\sqrt{13}}{3}\text{ cm}$$

304. In a $\triangle ABC$, $\angle BAC = 90^\circ$, AD is drawn perpendicular from A on BC . Which among the following is the mean proportional between BD and BC ?

- (a) AD (b) AB
(c) CD (d) AC

SSC MTS 05/10/2021 (Shift-I)

Ans. (b) :



In $\triangle ABC \sim \triangle BAD$

$$\frac{BC}{AB} = \frac{AB}{BD}$$

$$AB^2 = BC \times BD$$

$$AB^2 = BC \times BD$$

Hence the mean proportional between BA and BC will be AB .

305. In a right angled triangle ABC , if $\angle ABC = 90^\circ$, $AB=6\text{cm}$, $BC=8\text{cm}$, and BD is perpendicular to AC , then $AD : DC$ is:

- (a) $9 : 16$ (b) $7 : 16$
(c) $9 : 14$ (d) $8 : 15$

SSC CHSL 19/04/2021 (Shift-III)

Ans. (a) : In $\triangle ABC$, from Pythagoras theorem,

$$AC^2 = (6)^2 + (8)^2 = 36 + 64 = 100$$

$$AC = \sqrt{100} = 10\text{cm}$$

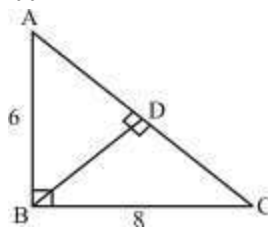
Now, From $AD = \frac{AB^2}{AC}$

$$AD = \frac{(6)^2}{10} = \frac{36}{10} = 3.6\text{cm}$$

$$\text{Then } DC = AC - AD = 10 - 3.6 = 6.4\text{ cm.}$$

$$\text{Hence, } AD : DC = 3.6 : 6.4$$

$$AD : DC = 9 : 16$$



306. In $\triangle ABC$, $\angle C = 90^\circ$ and CD is perpendicular to AB at D . If $AD/BD = \sqrt{k}$ then $AC/BC = ?$

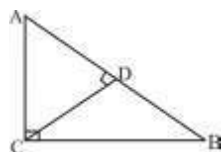
- (a) $\frac{1}{\sqrt{k}}$ (b) \sqrt{k}
(c) k (d) $\sqrt[4]{k}$

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (d) : $\left(\frac{AC}{BC}\right)^2 = \frac{AD}{BD}$ (from theorem)

$$\left(\frac{AC}{BC}\right)^2 = \sqrt{k}$$

$$\frac{AC}{BC} = \sqrt[4]{k}$$



307. In a triangle ABC , $AB = 6\sqrt{3}\text{ cm}$, $AC = 12\text{ cm}$ and $BC = 6\text{ cm}$. Then measure of $\angle B$ is equal to:

- (a) 45° (b) 60°
(c) 70° (d) 90°

SSC CGL (Tier-II)-2019 - 18/11/2020 (Shift-I)

Ans. (d) : $\triangle ABC$

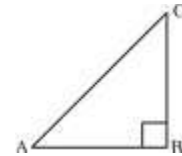
By Pythagoras theorem,

$$AB^2 + BC^2 = AC^2$$

$$108 + 36 = 144$$

$$\therefore AB^2 + BC^2 = AC^2$$

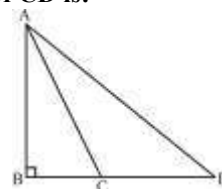
$\therefore ABC$ is a right angled triangle in which $\angle B = 90^\circ$



308. In the given figure, if $AB = 8\text{ cm}$, $AC = 10\text{ cm}$, $\angle ABD = 90^\circ$ and $AD = 17\text{ cm}$, then the measure of CD is:

- (a) 10 cm (b) 8 cm
(c) 9 cm (d) 11 cm

SSC CGL (Tier-I)-2019 - 06/03/2020 (Shift-II)



Ans. (c) : In $\triangle ABC$,

$$BC^2 = 10^2 - 8^2 = 36$$

$$BC = 6\text{ cm}$$

In $\triangle ABD$,

$$BD^2 = 17^2 - 8^2 = 225$$

$$BD = 15\text{ cm}$$

$$\therefore CD = 15 - 6 = 9\text{ cm}$$

309. In $\triangle ABC$, $\angle A = 90^\circ$, M is the midpoint of BC and D is a point on BC such that $AD \perp BC$. If $AB = 7\text{ cm}$ and $AC = 24\text{ cm}$, then $AD : AM$ is equal to:

- (a) $168 : 275$ (b) $336 : 625$
(c) $32 : 43$ (d) $24 : 25$

SSC CGL (Tier-I)-2019 - 04/03/2020 (Shift-I)

Ans. (b) :

$$BC^2 = 7^2 + 24^2 = 25^2$$

$$BC = 25\text{ cm}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times 7 \times 24$$

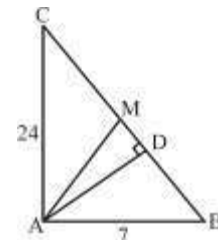
$$\frac{1}{2} \times BC \times AD = \frac{1}{2} \times 7 \times 24$$

$$AD = \frac{7 \times 24}{25}\text{ cm}$$

$\therefore M$ is the mid point of BC

$$AM = \frac{BC}{2} = \frac{25}{2} \text{ [From theorem]}$$

$$\therefore AD : AM = \frac{7 \times 24}{25} : \frac{25}{2} = 336 : 625$$

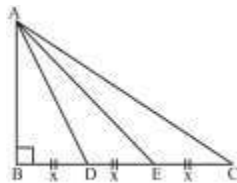


310. In $\triangle ABC$, $\angle B = 90^\circ$. If points D and E are on side BC such that $BD = DE = EC$, then which of the following is true?

- (a) $8AE^2 = 5AC^2 + 3AD^2$
 (b) $8AE^2 = 3AC^2 + 5AD^2$
 (c) $5AE^2 = 3AC^2 + 2AD^2$
 (d) $5AE^2 = 2AC^2 + 3AD^2$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (b):



Let, $BD = DE = EC = x$

In $\triangle ABD$,

$$AD^2 = AB^2 + x^2 \dots\dots\dots(i)$$

In $\triangle ABE$,

$$AE^2 = AB^2 + 4x^2 \dots\dots\dots(ii)$$

In $\triangle ABC$,

$$AC^2 = AB^2 + 9x^2 \dots\dots\dots(iii)$$

From eqⁿ (i) $\times 5$ + eqⁿ (iii) $\times 3$

$$\begin{aligned} 5AD^2 + 3AC^2 &= 5AB^2 + 5x^2 + 3AB^2 + 27x^2 \\ &= 8AB^2 + 32x^2 \\ &= 8(AB^2 + 4x^2) \end{aligned}$$

$$5AD^2 + 3AC^2 = 8AE^2 \quad [\text{From eq}^n \text{ (ii)}]$$

$$\text{or } 8AE^2 = 3AC^2 + 5AD^2$$

311. In $\triangle ABC$, $\angle C = 90^\circ$. M and N are the mid-points of sides AB and AC, respectively. CM and BN intersect each other at D and $\angle BDC = 90^\circ$. If $BC = 8\text{cm}$, then the length of BN is:

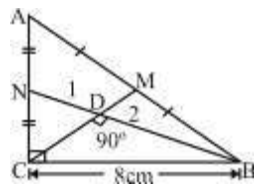
- (a) $4\sqrt{6}\text{cm}$ (b) $6\sqrt{3}\text{cm}$
 (c) $8\sqrt{3}\text{cm}$ (d) $6\sqrt{6}\text{cm}$

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a)

\therefore D is centroid of $\triangle ABC$

$$\therefore \frac{BD}{DN} = \frac{2}{1}$$



But, $\frac{NC^2}{BC^2} = \frac{ND}{DB}$ [From theorem]

$$\frac{NC}{BC} = \frac{1}{\sqrt{2}}$$

if $NC = x$, $BC = \sqrt{2}x$

$$BN = \sqrt{x^2 + 2x^2} = \sqrt{3}x$$

but, $\sqrt{2}x = 8$
 $x = 4\sqrt{2}$

$$\therefore BN = \sqrt{3} \times 4\sqrt{2} = 4\sqrt{6}\text{ cm}$$

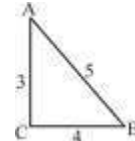
312. There are twelve sticks, each length is 1 unit, a right triangle is formed by using them. Area of triangle will be :

- (a) 10 unit^2 (b) 4 unit^2
 (c) 8 unit^2 (d) 6 unit^2

SSC CHSL (Tier-I) 10/07/2019 (Shift-II)

Ans. (d): Let number of all sticks is 12 which form right angled triangle.

\therefore We know that,



$$\begin{aligned} (\text{Hypotenuse})^2 &= (\text{Perpendicular})^2 + (\text{Base})^2 \\ 5^2 &= 3^2 + 4^2 \end{aligned}$$

$25 = 25$ (which shows it is a right angled triangle)

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} \times \text{Base} \times \text{height} = \frac{1}{2} \times 3 \times 4 \\ &= 6\text{ unit}^2 \end{aligned}$$

313. 70 sticks each of unit length are combined to form a right angled triangle without breaking any stick. what is the area (in square units) of the triangle?

- (a) 210 (b) 180
 (c) 240 (d) 350

SSC MTS 05/08/2019 (Shift-I)

Ans. (a) : Sides of right angled triangle are 20 units, 21 units and 29 units respectively.

$$\therefore 20 + 21 + 29 = 70\text{ units}$$

and $(20)^2 + (21)^2 = (29)^2$ (Right angled triangle property)

$$\text{Area of triangle} = \frac{1}{2} \times 20 \times 21 = 210\text{ units}^2$$

314. The hypotenuse of a right angled triangle is 39 cm and the difference of other two sides is 21 cm, then the area of triangle is :

- (a) 360 cm^2 (b) 270 cm^2
 (c) 280 cm^2 (d) 540 cm^2

SSC MTS 09/08/2019 (Shift-III)

Ans. (b) : If $a > b$

$$AC^2 = AB^2 + BC^2$$

$$a^2 + b^2 = 1521$$

$$a - b = 21$$

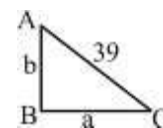
$$(a-b)^2 = a^2 + b^2 - 2ab$$

$$441 = 1521 - 2ab$$

$$2ab = 1080$$

$$ab = 540$$

$$\text{area} = \frac{1}{2} \times a \times b = \frac{1}{2} \times 540 = 270\text{ cm}^2$$



(X)

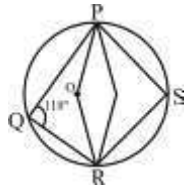
Problems based on Circle

315. In a circle with centre O, PQ and QR are two chords such that $\angle PQR = 118^\circ$. What is the measure of $\angle OPR$?

- (a) 36°
- (b) 26°
- (c) 31°
- (d) 28°

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (d) Given,
 $\angle PQR = 118^\circ$



ABCD is a cyclic quadrilateral then sum of opposite angle is 180°

$$\angle PQR + \angle PSR = 180^\circ$$

$$\angle PSR = 180^\circ - 118^\circ$$

$$\angle PSR = 62^\circ$$

$$\angle POR = \frac{\angle PQR + \angle PSR}{2}$$

$$= \frac{118^\circ + 62^\circ}{2}$$

$$= \frac{180}{2}$$

$$= 90^\circ$$

316. AB is the diameter of a circle with centre O. C and D are two points on the circle on either side of AB such that $\angle CAB = 52^\circ$ and $\angle ABD = 47^\circ$. What is the difference (in degrees) between then measures of $\angle CAD$ and $\angle CBD$?

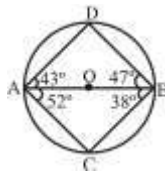
- (a) 10
- (b) 15
- (c) 25
- (d) 20

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (a) Given,

$$\angle CAB = 52^\circ, \angle ABD = 47^\circ$$

$$\angle CAD - \angle CBD = ?$$



\therefore Angle subtended by a diameter on any point of circle is 90° .

$$\begin{aligned} \text{In } \triangle DAB &= [180^\circ - (90^\circ + 47^\circ)] \\ &= (180^\circ - 137^\circ) \\ &= 43^\circ \end{aligned}$$

$$\begin{aligned} \text{In } \triangle ACB, \angle ABC &= [180^\circ - (90^\circ + 52^\circ)] \\ &= [180^\circ - 142^\circ] \\ \angle ABC &= 38^\circ \end{aligned}$$

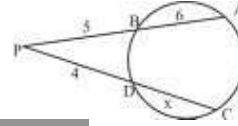
$$\text{Difference between } (\angle CAD - \angle CBD) = (43 - 38)^\circ = 5^\circ$$

317. Two chords AB and CD of a circle when produced, meet at a point P outside the circle. If $AB = 6$ cm, $PB = 5$ cm, $PD = 4$ cm, then CD is equal to:

- (a) 7.75 cm
- (b) 8.25 cm
- (c) 9.75 cm
- (d) 7.5 cm

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (c) : Given, $AB = 6$ cm, $PB = 5$ cm, $PD = 4$ cm,
Let $CD = x$ cm



$$\therefore PA \times PB = PC \times PD$$

$$(6 + 5) \times 5 = (4 + x) \times 4$$

$$\frac{55}{4} = 4 + x$$

$$x = \frac{55 - 16}{4} = \frac{39}{4} = 9.75 \text{ cm}$$

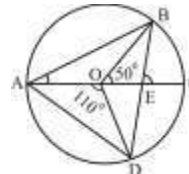
$$\therefore CD = 9.75 \text{ cm}$$

318. Let O be the centre of a circle and AC be its diameter. BD is a chord intersecting AC at E. Point A is joined to B and D. If $\angle BOC = 50^\circ$ and $\angle AOD = 110^\circ$, then $\angle BEC = ?$

- (a) 80°
- (b) 55°
- (c) 70°
- (d) 90°

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (a) :



\therefore Angle subtended by a chord on the centre is double the angle subtended by the same chord at circumference of the circle.

$$\angle BAC = \frac{\angle BOC}{2} = 25^\circ$$

$$\angle ABD = \frac{\angle AOD}{2} = 55^\circ$$

But $\angle BEC$, is the exterior angle of $\triangle ABE$.

$$\therefore \angle BEC = 25^\circ + 55^\circ = 80^\circ$$

319. In a circle of radius 10 cm and centre O, PQ and PR are two equal chords, each of length 12cm. What is the length (in cm) of chord QR?

- (a) 20.4
- (b) 18.4
- (c) 19.2
- (d) 18.6

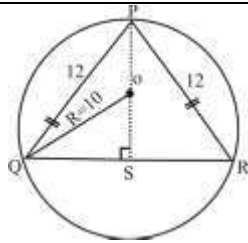
SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (c) : \therefore O is the circum centre.

$$\therefore \text{Circum radius } (R) = \frac{abc}{4\Delta}$$

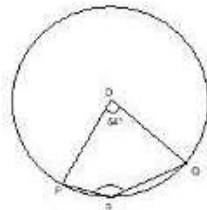
$$10 = \frac{QR \times 12 \times 12}{4 \times \frac{1}{2} \times QR \times PS}$$

$$PS = 7.2 \text{ cm}$$



In ΔPSQ ,
 $QS^2 = QP^2 - PS^2$
 $144 - 51.84 = 92.16$
 $QS = 9.6 \text{ cm}$
 $QR = 2 \times QS = 2 \times 9.6 = 19.2 \text{ cm}$

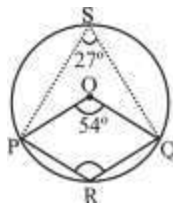
320. In the given figure, O is the centre of the circle. $\angle POQ = 54^\circ$. What is the measure (in degree) of $\angle PRQ$?



- (a) 235 (b) 137
 (c) 207 (d) 153

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (d)



\therefore Angle subtended the center O of circle is half of the angle made on its circumference.

$$\therefore \angle PSQ = \frac{\angle POQ}{2}$$

$$= \frac{54^\circ}{2}$$

$$= 27^\circ$$

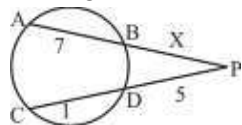
Now, In quadrilateral PSQR,
 Since, \square PSQR is a cyclic quadrilateral
 $\Rightarrow \angle PSR + \angle PRQ = 180^\circ$
 $\Rightarrow 27^\circ + \angle PRQ = 180^\circ$
 $\Rightarrow \angle PRQ = 153^\circ$

321. Chords AB and CD of a circle intersect externally at P. If AB = 7 cm, CD = 1 cm and PD = 5 cm, then the length of PB (in cm) is:

- (a) 3 (b) 10
 (c) 8 (d) 5

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (a) $PA \times PB = PC \times PD$



Put, $(x + 7) \times x = 6 \times 5$
 $x = 3$
 Then both side satisfy
 Hence x is 3 cm.

322. In a circle with centre O and of radius 13 cm, two parallel chords are drawn on different sides of the centre. If the length of a chord is 10 cm and the distance between the two chords is 17 cm, then find the difference in lengths of the two chords (in cm).

- (a) 10 (b) 14
 (c) 24 (d) 12

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b) Given, AB = 10, PQ = 17

Triplet- 5, 12, 13
 $CQ = 12$
 $CD = 24$



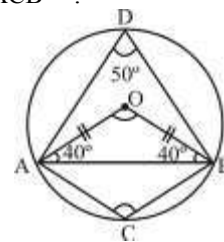
Difference in length of the two chords = $CD - AB$
 $= 24 - 10$
 $= 14$

323. AB is a chord of circle with centre O. C is a point on the circumference of the circle in the minor sector. If $\angle ABO = 40^\circ$, What is the measure (in degree) of $\angle ACB$?

- (a) 110° (b) 130°
 (c) 100° (d) 120°

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b) Given,
 $\angle ABO = 40^\circ$ $\angle ACB = ?$



$\angle AOB = 180^\circ - (40^\circ + 40^\circ)$
 $\angle AOB = 100^\circ$

$$\angle ADB = \frac{\angle AOB}{2}$$

$$\angle ADB = 50^\circ$$

ABCD is a quadrilateral. Then opposite angle sum is 180°

$$\angle ACB + \angle ADB = 180^\circ$$

$$\angle ACB = 180^\circ - 50^\circ$$

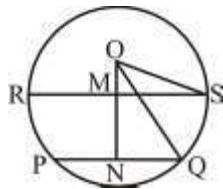
$$\angle ACB = 130^\circ$$

324. PQ and RS are two parallel chords of a circle of length 14 cm and 48 cm, respectively, and lie on the same side of the centre O. If the distance between the chords is 17 cm, what is the radius (in cm) of the circle?

- (a) 28 (b) 24
 (c) 25 (d) 20

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (c) Given, $PQ = 14$ cm, $NQ = 7$ cm
 $RS = 48$ cm, $MS = 24$ cm
 $MN = 17$ cm
 Let $OM = x$ cm
 and $OS = r$ cm



In $\triangle OMS$,
 $OS^2 = OM^2 + MS^2$
 $r^2 = x^2 + (24)^2$ _____ (i)

In $\triangle ONQ$
 $OQ^2 = ON^2 + NQ^2$
 $r^2 = (17 + x)^2 + (7)^2$ _____ (ii) $\{\because OS = OQ = r\}$

From equations (i) and (ii)
 $x^2 + (24)^2 = (17 + x)^2 + (7)^2$
 $\Rightarrow x^2 + 576 = 289 + x^2 + 34x + 49$
 $\Rightarrow 576 - 338 = 34x$
 $\Rightarrow 34x = 238$
 $\Rightarrow x = 7$

On putting the value of x in eqⁿ (i)
 $r^2 = (7)^2 + (24)^2$
 $r^2 = 49 + 576$
 $r = \sqrt{625}$
 $r = 25$ cm

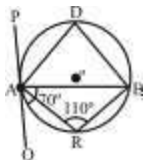
Hence the radius of the circle is 25 cm.

325. AB is a chord of a circle with centre **O**, while **PAQ** is the tangent at **A**, **R** is a point on the minor arc **AB**. If $\angle BAQ = 70^\circ$, then find the measure of $\angle ARB$.

- (a) 110° (b) 125°
 (c) 70° (d) 145°

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (a)



By the alternate segment theorem
 $\angle BAQ = \angle ADB = 70^\circ$
 $\therefore \angle ADB + \angle ARB = 180^\circ \Rightarrow \angle ARB = 180 - 70^\circ$
 $\therefore \angle ARB = 110^\circ$

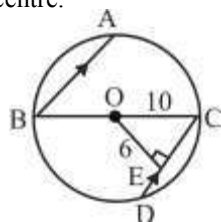
326. In a circle of diameter 20 cm, chords **AB** and **CD** are parallel to each other. **BC** is diameter. If **AB** is 6 cm from the centre of the circle, what is length (in cm) of the chord **CD**?

- (a) 8 (b) 12
 (c) 20 (d) 16

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (d) Since both chords are parallel to each other they are equidistant from the centre.

$AB = CD$
 In $\triangle ODC$
 $OC^2 = OD^2 + CE^2$
 $10^2 = 6^2 + CE^2$
 $CE^2 = 64$
 $CE = 8$
 $CD = 2CE = 2 \times 8 = 16$

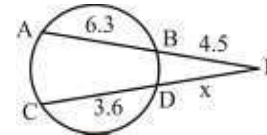


327. Chords AB and CD of a circle, when produced, meet at the point **P**. If **AB = 6.3** cm, **BP = 4.5** cm, and **CD = 3.6** cm, then the length (in cm) of **PD** is:

- (a) 4.8 cm (b) 3.5 cm
 (c) 3.1 cm (d) 5.4 cm

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (d)



$= (3.6 + x) \times x$
 $(6.3 + 4.5) \times 4.5$

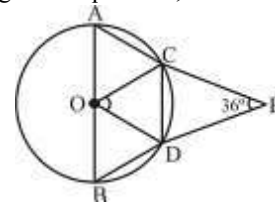
On putting the value of $x = 5.4$
 Then both sides satisfy
 Hence, length of **PD** is 5.4 cm.

328. In a circle with centre **O**, **AC** and **BD** are two chords. **AC** and **BD** meet at **E**, when produced. If **AB** is a diameter and $\angle AEB = 36^\circ$, then the measure of $\angle DOC$ is :

- (a) 112° (b) 124°
 (c) 136° (d) 108°

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans. (d) According to the question,



As we know that,
 $\angle DOC = 180^\circ - 2 \angle AEB$

$$= 180^\circ - 2 \times 36^\circ \quad [\because \angle AEB = 36^\circ \text{ (Given)}]$$

$$= 180^\circ - 72^\circ$$

$$= 108^\circ$$

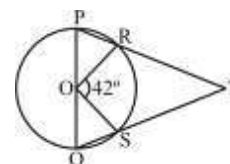
$\therefore \angle DOC = 108^\circ$

329. In a circle with centre **O**, chords **PR** and **QS** meet at the point **T**, When produced, and **PQ** is a diameter. If $\angle ROS = 42^\circ$, then the measure of $\angle PTQ$ is:

- (a) 59° (b) 58°
 (c) 48° (d) 69°

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (d) Given, $\angle ROS = 42^\circ$



$$\angle PTQ = 90^\circ - \frac{\angle ROS}{2}$$

$$= 90^\circ - \frac{42^\circ}{2}$$

$$= 90^\circ - 21^\circ$$

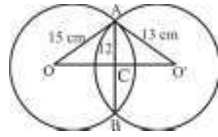
$$= 69^\circ$$

330. Two circles of radius 13 cm and 15 cm intersect each other at points A and B. If the length of the common chord is 24cm, then what is the distance between their centres?

- (a) 12 cm (b) 16 cm
(c) 14 cm (d) 18 cm

SSC CGL (Tier-II) 03/02/2022

Ans : (c)



$$OC = \sqrt{15^2 - 12^2} \quad O'C = \sqrt{13^2 - 12^2}$$

$$OC = \sqrt{81} \text{cm} \quad O'C = \sqrt{25} \text{cm}$$

$$OC = 9 \text{cm} \quad O'C = 5 \text{cm}$$

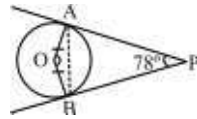
Distance between their centres (OO') = 9 + 5 = 14 cm

331. If PA and PB are tangents down to a circle with centre O at A and B from external point P such that $\angle APB = 78^\circ$, then $\angle OAB$ is equal to:

- (a) 12° (b) 39°
(c) 29° (d) 36°

SSC CHSL 05/08/2021 (Shift-II)

Ans. (b) : Given –



$$\angle APB = 78^\circ$$

$$\therefore \angle OAB + \angle OBA + \angle AOB + \angle APB = 360^\circ$$

$$\therefore \text{AP and BP are tangent to the circle}$$

$$\angle OAP = \angle OBP = 90^\circ$$

$$\Rightarrow 90^\circ + 90^\circ + \angle AOB + 78^\circ = 360^\circ$$

$$\Rightarrow \angle AOB = 360^\circ - 90^\circ - 90^\circ - 78^\circ$$

$$\Rightarrow \angle AOB = 102^\circ$$

$$\therefore \angle AOB + \angle OAB + \angle OBA = 180^\circ$$

$$\Rightarrow 102^\circ + 2\angle OAB = 180^\circ \{ \because \angle OBA = \angle OAB \}$$

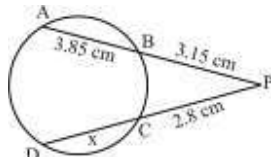
$$\Rightarrow \angle OAB = \frac{78^\circ}{2} \quad \Rightarrow \angle OAB = 39^\circ$$

332. In a circle, AB and DC are two chords. When AB and DC are produced, they meet at P. If PC = 2.8 cm, PB = 3.15 cm and AB = 3.85 cm, then CD = ?

- (a) 5.075 cm (b) 4.175 cm
(c) 6.975 cm (d) 7.875 cm

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) :



$$(3.85 + 3.15) \times 3.15 = 2.8 \times (2.8 + x)$$

$$7 \times 3.15 = 2.8(2.8 + x)$$

$$2.8 + x = 7.875$$

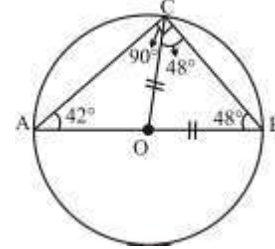
$$x = 5.075$$

333. AB is a diameter of a circle with centre O. If C is any point on the circle such that $\angle BAC = 42^\circ$, then find the measure of $\angle BOC$.

- (a) 42° (b) 84°
(c) 63° (d) 60°

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) :



According to the question,

AB = Diameter

$$\angle BAC = 42^\circ$$

$$\angle ACB = 90^\circ$$

(Angle subtended by a diameter on any point of circle is 90°)

\therefore In $\triangle ABC$

$$\angle CBA = 180^\circ - (90^\circ + 42^\circ) = 48^\circ$$

Line OC = OB (Radius of circle)

$$\therefore \angle OBC = \angle BCO = 48^\circ$$

$$\angle BOC = 180^\circ - 2 \times 48^\circ$$

$$= 180^\circ - 96^\circ = 84^\circ$$

334. The radii of two concentric circles are 12 cm and 13 cm. AB is a diameter of the bigger circle. BD is a tangent to a smaller circle touching it at D. Find the length (in cm) of AD? (Correct to one decimal place) :

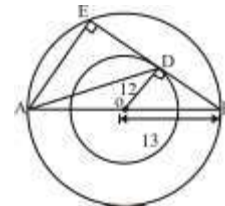
- (a) 23.5 (b) 25.5
(c) 24.5 (d) 17.6

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (c) : Given that–

Radius of bigger circle = 13 cm

Radius of smaller circle = 12 cm



By Pythagoras theorem,

In $\triangle ODB$

$$OB^2 = OD^2 + DB^2$$

$$\Rightarrow 13^2 = 12^2 + DB^2$$

$$\therefore DB = 5 \text{ cm}$$

$$\therefore DB = DE$$

$$\therefore DB = DE = \frac{1}{2} \times BE \quad \left[\begin{array}{l} \text{Perpendicular drawn from the centre on} \\ \text{a chord bisects it in two equal parts} \end{array} \right]$$

$$\therefore DE = 5 \text{ cm.}$$

$$BE = 10 \text{ cm.}$$

In $\triangle ABE$,

$\angle AEB = 90^\circ$ [\because Angle made in semicircle]

$$\therefore AB^2 = AE^2 + BE^2$$

$$\Rightarrow 26^2 = AE^2 + 10^2$$

$$\Rightarrow AE^2 = 676 - 100$$

$$AE = 24 \text{ cm.}$$

In $\triangle ADE$,

$$AD^2 = ED^2 + AE^2$$

$$\Rightarrow AD^2 = 5^2 + 24^2$$

$$\Rightarrow AD = \sqrt{601}$$

$$\therefore \boxed{AD = 24.51 \text{ cm}}$$

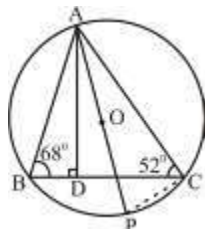
Hence, option (c) is correct answer.

335. The vertices of a $\triangle ABC$ lie on a circle with centre O . AO is produced to meet the circle at the point P . D is a point on BC such that $AD \perp BC$. If $\angle B = 68^\circ$ and $\angle C = 52^\circ$, then the measure of $\angle DAP$ is :

- (a) 18° (b) 16°
(c) 12° (d) 28°

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) :



In $\triangle ABD$,

$$\begin{aligned} \angle BAD &= 180^\circ - (90^\circ + 68^\circ) \\ &= 180^\circ - 158^\circ = 22^\circ \end{aligned}$$

Angle subtended by a diameter on any point of circle is 90°

$$\angle ACP = 90^\circ$$

$$\therefore \angle BCP = 90^\circ - 52^\circ = 38^\circ$$

Angles subtended by same arc are equal.

$$\angle BAP = \angle BCP = 38^\circ$$

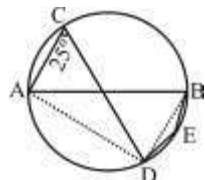
$$\therefore \angle DAP = 38^\circ - 22^\circ = 16^\circ$$

336. AB is a diameter of a circle. C and D are points on the opposite sides of the diameter AB , such that $\angle ACD = 25^\circ$. E is a point on the minor arc BD . Find the measure of $\angle BED$ (in degrees).

- (a) 105 (b) 125
(c) 130 (d) 115

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (d) :



Angles formed on same arc are equal.

$$\angle ACD = \angle ABD = 25^\circ$$

$\triangle ADB$ is a right angled triangle as $\angle ADB = 90^\circ$

(Angle in semicircle)

In $\triangle ADB$,

$$\angle ABD + \angle ADB + \angle BAD = 180^\circ$$

$$\angle BAD = 180^\circ - 25^\circ - 90^\circ = 65^\circ$$

Then,

$ABED$ is a cyclic quadrilateral.

$$\angle BAD + \angle BED = 180^\circ$$

$$\angle BED = 180^\circ - 65^\circ$$

$$\therefore \boxed{\angle BED = 115^\circ}$$

337. A chord AB of circle C_1 of radius 17 cm touches circle C_2 which is concentric to C_1 . The radius of C_2 is 8 cm. What is the length (in cm) of AB ?

- (a) 25 (b) 20
(c) 30 (d) 24

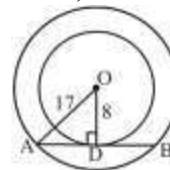
SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,

Radius (C_1) = 17cm

Radius (C_2) = 8cm

According to the question,



$$AD = \sqrt{(17)^2 - (8)^2}$$

$$AD = 15 \text{ cm}$$

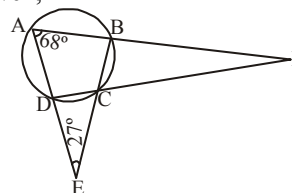
$$\text{Length of chord (AB)} = 2 \times 15 = 30 \text{ cm.}$$

338. $ABCD$ is a cyclic quadrilateral. AB and DC meet at F , when produced. AD and BC meet at E , when produced. If $\angle BAD = 68^\circ$ and $\angle AEB = 27^\circ$, then what is the measure of $\angle BFC$?

- (a) 27° (b) 22°
(c) 17° (d) 15°

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (c) : Given,



In $\triangle BFC$

$$95^\circ + 68^\circ + \angle BFC = 180^\circ$$

$$\angle BFC = 180^\circ - 163^\circ$$

$$\angle BFC = 17^\circ$$

339. In a circle with centre O , AB and CD are parallel chords on the opposite of a diameter. If $AB = 12$ cm, $CD = 18$ cm and the distance between the chords AB and CD is 15 cm, then find the radius of the circle (in cm) :

- (a) $9\sqrt{13}$ (b) 9
(c) $3\sqrt{13}$ (d) 12

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (c) : Given –



AB = 12 cm
CD = 18 cm
MN = 15 cm

In $\triangle AMO$,

$$AM^2 + OM^2 = OA^2 \Rightarrow 6^2 + x^2 = r^2 \text{ ——(i)}$$

In $\triangle OCN$,

$$ON^2 + CN^2 = OC^2 \Rightarrow (15-x)^2 + (9)^2 = r^2 \text{ ——(ii)}$$

From equations (i) and (ii)–

$$\begin{aligned} 6^2 + x^2 &= (15-x)^2 + (9)^2 \\ 36 + x^2 &= 225 + x^2 - 30x + 81 \\ \Rightarrow 30x &= 270 \Rightarrow x = 9 \end{aligned}$$

Now putting the value of x in eqⁿ (i)

$$\begin{aligned} 6^2 + 9^2 &= r^2 \Rightarrow r^2 = 36 + 81 \\ \Rightarrow r^2 &= 117 \\ \Rightarrow r &= \sqrt{117} \\ \Rightarrow r &= 3\sqrt{13} \end{aligned}$$

340. Points A and B are on a circle with centre O. Point C is on the major arc AB. If $\angle OAC = 35^\circ$ and $\angle OBC = 45^\circ$, then what is the measure (in degrees) of the angle subtended by the minor arc AB at the centre ?

- (a) 70 (b) 160
(c) 80 (d) 100

SSC CGL–(Tier-I) 18/08/2021 (Shift III)

Ans. (b) : Given –

$$\begin{aligned} \angle OAC &= 35^\circ \\ \angle OBC &= 45^\circ \end{aligned}$$

In $\triangle OAC$,

$$\begin{aligned} OA &= OC \text{ (Radius of circle)} \\ \angle OAC &= \angle OCA = 35^\circ \\ \therefore \angle AOC &= 180^\circ - (35^\circ + 35^\circ) = 110^\circ \end{aligned}$$

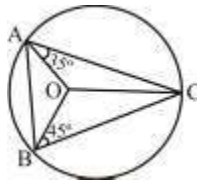
In $\triangle OBC$,

$$\begin{aligned} OB &= OC \text{ (Radius of circle)} \\ \therefore \angle OBC &= \angle OCB = 45^\circ \\ \therefore \angle BOC &= 180^\circ - (45^\circ + 45^\circ) = 90^\circ \end{aligned}$$

Now

$$\begin{aligned} \angle AOB + \angle AOC + \angle BOC &= 360^\circ \\ \Rightarrow \angle AOB + 110^\circ + 90^\circ &= 360^\circ \\ \Rightarrow \angle AOB &= 360^\circ - 200^\circ \\ \Rightarrow \angle AOB &= 160^\circ \end{aligned}$$

The angle subtended by the minor arc AB at the centre is 160° .



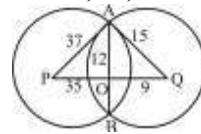
341. Two circles of radius 15 cm and 37 cm intersect each other at the points A and B. If the length of common chord is 24 cm, what is the distance (in cm) between the centres of the circles?

- (a) 44 (b) 45
(c) 42 (d) 40

SSC CGL–(Tier-I) 20/08/2021 (Shift III)

Ans. (a) : Given,

AB = 24
AO = OB = 12
Triplet = 12, 35, 37 and 9, 12, 15



Hence distance between the centres of the circles = PO + OQ
= 35 + 9
= 44 cm.

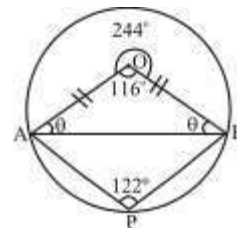
342. AB is a chord of a circle with centre O and P is any point on the circle. If $\angle APB = 122^\circ$, then what is the measure of $\angle OAB$?

- (a) 32° (b) 15°
(c) 22° (d) 28°

SSC CGL–(Tier-I) 20/08/2021 (Shift III)

Ans. (a) : Given,

$\angle APB = 122^\circ$
 $\angle OAB = ?$



The angle subtended by an arc at the centre is twice the angle subtended of the circumference.

$$\begin{aligned} \angle AOB &= 360^\circ - 244^\circ \\ \angle AOB &= 116^\circ \end{aligned}$$

In $\triangle AOB$,

$$\begin{aligned} \text{Let,} \\ \angle OAB &= \angle OBA = \theta \\ \angle AOB + \angle OAB + \angle OBA &= 180^\circ \\ 116^\circ + \theta + \theta &= 180 \\ 2\theta &= 180^\circ - 116^\circ \\ 2\theta &= 64^\circ \\ \theta &= 32^\circ \end{aligned}$$

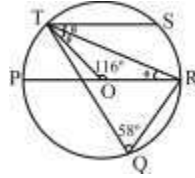
Hence, $\angle OAB = \theta = 32^\circ$

343. Points P, Q, R, S and T lie in this order on a circle with centre O. If chord TS is parallel to diameter PR and $\angle RQT = 58^\circ$, then find the measure (in degrees) of $\angle RTS$.

- (a) 29 (b) 32
(c) 45 (d) 58

SSC CGL–(Tier-I) 17/08/2021 (Shift II)

Ans. (b)



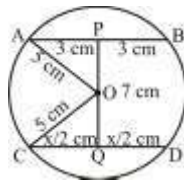
Given that: $PR \parallel TS$
 & $\angle RQT = 58^\circ$
 & PR is a diameter.
 Let O is the centre of the circle and draw OT as radius
 & $\angle RTS = \theta$
 $\therefore \angle OTR = \angle ORT$ [$\because \Delta OTR$ is an Isosceles triangle]
 $\therefore PR \parallel TS$
 $\therefore \angle RTS = \angle TRO = \theta$
 Now, $\angle TOR = 2 \angle RQT$
 The angle subtended by an arc of the centre is twice the angle subtended of the circumference .
 $= 2 \times 58^\circ = 116^\circ$
 And in ΔTOR
 $\angle OTR + \angle ORT + \angle TOR = 180^\circ$
 $\theta + \theta + 116^\circ = 180^\circ$
 $2\theta = 64^\circ$
 $\theta = 32^\circ$

344. In a circle with center O and radius 5 cm. AB and CD are two parallel chords of lengths 6 cm and x cm, respectively and the chords are on the opposite side of the centre O . The distance between the chords is 7 cm. What is the value of x ?

- (a) 9 (b) 12
 (c) 8 (d) 10

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (c)



In ΔOPA ,
 $\therefore OA^2 = OP^2 + AP^2$
 $25 = OP^2 + 9$
 $OP = 4$ cm

In ΔOQC ,
 $\therefore QC^2 = OC^2 - OQ^2$
 $= 25 - (7 - 4)^2 = 25 - 9$
 $= 16$
 $QC = 4$
 $\Rightarrow \frac{x}{2} = 4$ cm
 $\therefore x = 8$ cm

345. ΔPQR is inscribed in a circle. The bisector of $\angle P$ cuts QR at S and the circle at T . If $PR = 5$ cm, $PS = 6$ cm and $ST = 4$ cm, then the length (in cm) of PQ is:

- (a) 13 (b) 12
 (c) 10 (d) 15

SSC CHSL 19/04/2021 (Shift-I)

Ans. (b)



Given-

$PR = 5$ cm
 $ST = 4$ cm
 $PS = 6$ cm

According to the question,

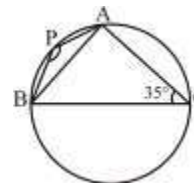
$PS^2 = PQ \times PR - PS \times ST$
 $(6)^2 = PQ \times 5 - 6 \times 4$
 $36 = 5PQ - 24$
 $5PQ = 60$
 $PQ = 12$ cm.

346. ABC is a triangle inscribed in a circle and $\angle ACB$ is equal to 35° . P is a point on the circle on the side AB , opposite to C . What is the value of $\angle APB$ in degrees?

- (a) 72.5 (b) 145
 (c) 175 (d) 70

SSC CHSL 10/08/2021 (Shift-I)

Ans. (b)



$\therefore APBC$ is a cyclic quadrilateral.
 $\therefore \angle APB + \angle ACB = 180^\circ$
 $\angle APB = 180^\circ - 35^\circ = 145^\circ$

347. Let O be the center of a circle and AC be the diameter. BD is a chord intersecting AC at E . AD and AB are joined. if $\angle BOC = 40^\circ$ and $\angle AOD = 120^\circ$, then $\angle BEC$ is equal to:

- (a) 55° (b) 80°
 (c) 90° (d) 70°

SSC CHSL 10/08/2021 (Shift-I)

Ans. (b) :



$\angle EOD = 180^\circ - 120^\circ = 60^\circ$ (straight line)
 $\angle OBD = \angle ODB$

In ΔBOD , $\angle BOD + \angle OBD + \angle ODB = 180^\circ$
 $2\angle OBD = 180^\circ - 40^\circ - 60^\circ = 80^\circ$
 $\angle OBD = 40^\circ$

External angle,

$\angle OBD + \angle BOC = \angle BEC$
 $\angle BEC = 40^\circ + 40^\circ = 80^\circ$

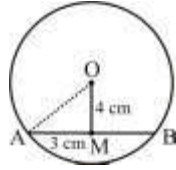
348. In a circle with centre O, a 6 cm long chord is at a distance 4 cm from the centre. Find the length of the diameter.

- (a) 14 cm (b) 5 cm
(c) 7 cm (d) 10 cm

SSC CHSL 12/04/2021 (Shift-I)

Ans : (d)

From Pythagoras theorem
 $OA = 5$ cm
 Diameter = $2 \times 5 = 10$ cm

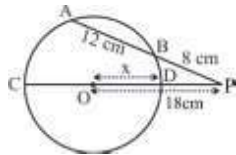


349. Chord AB and diameter CD of a circle meet at the point P, outside the circle when produced. If PB = 8 cm, AB = 12 cm and the distance of P from the centre of the circle is 18 cm, the radius (in cm) of the circle is closest to:

- (a) 13 (b) 12
(c) 12.4 (d) 12.8

SSC CHSL 12/04/2021 (Shift-I)

Ans : (d)



Let radius of the circle = x cm

According to the question,

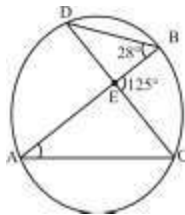
$$\begin{aligned} PA \times PB &= PC \times PD \\ 20 \times 8 &= (2x+18-x)(18-x) \\ 20 \times 8 &= (x+18)(18-x) \\ 20 \times 8 &= (18)^2 - x^2 \\ 160 &= 324 - x^2 \\ x^2 &= 324 - 160 \\ x &= \sqrt{164} = 12.8 \text{ cm} \end{aligned}$$

350. AB and CD are two chords of a circle which intersect at E inside the circle. If $\angle BEC = 125^\circ$ and $\angle EBD = 28^\circ$, then what is the measure of $\angle BAC$?

- (a) 87° (b) 56°
(c) 97° (d) 55°

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) :



$$\begin{aligned} \text{Exterior angle } \angle BEC &= \angle BDE + \angle EBD \\ 125^\circ &= \angle BDE + 28^\circ \\ \angle BDE &= 97^\circ \end{aligned}$$

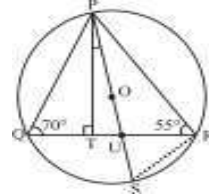
$\therefore \angle BAC = \angle BDC = 97^\circ$ (Angles in same segment)

351. $\triangle PQR$ is inscribed in a circle with center O. PO is produced to meet QR at U and the circle at S, and $PT \perp QR$, where T lies between Q and U. If $\angle Q = 70^\circ$ and $\angle R = 55^\circ$, then what is the measure (in degrees) of $\angle TPS$?

- (a) 25 (b) 20
(c) 15 (d) 30

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) :



In $\triangle QPT$,

$$\angle QPT = 180^\circ - (90^\circ + 70^\circ) = 20^\circ$$

Since angle made in a semicircle is a right angle.

$$\therefore \angle PRS = 90^\circ$$

$$\angle QRS = 90^\circ - 55^\circ = 35^\circ$$

\therefore Angles subtended in same segment of a circle are equal.

$$\angle QPS = \angle QRS = 35^\circ$$

$$\therefore \angle TPS = 35^\circ - 20^\circ = 15^\circ$$

OR

By shortcut method,

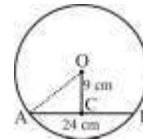
$$(\angle TPS = \angle Q - \angle R = 70^\circ - 55^\circ = 15^\circ)$$

352. A 9m long perpendicular is drawn from the center of circle to a chord of length 24 cm. The radius of the circle is:

- (a) 20 cm (b) 15 cm
(c) 12 cm (d) 18 cm

SSC CHSL 11/08/2021 (Shift-I)

Ans. (b) :



\therefore The perpendicular line drawn to the chord from the centre of circle bisects the chord.

\therefore In, $\triangle AOC$ [By Pythagoras theorem]

$$OA^2 = OC^2 + AC^2 \quad (\because AC = BC = 12 \text{ cm})$$

$$OA^2 = (9)^2 + (12)^2$$

$$OA^2 = 81 + 144$$

$$OA^2 = 225$$

$$OA = 15 \text{ cm}$$

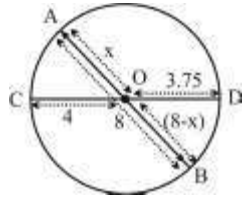
\therefore Radius of circle = 15 cm

353. Two chords AB and CD of a circle intersect at O. If $CO = 4$ cm, $OD = 3.75$ cm and $AB = 8$ cm, then what is the length (in cm) of the smaller among AO and OB?

- (a) 2.75 (b) 3
(c) 5 (d) 5.25

SSC CHSL 04/08/2021 (Shift-II)

Ans. (b)



Let $AO = x$ cm
then, $BO = (8-x)$ cm.

From formula,

$$\therefore AO \times BO = CO \times DO$$

$$x \times (8-x) = 4 \times 3.75$$

$$x \times (8-x) = 15$$

$x = 3$, will satisfy the above equation.

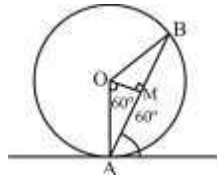
Hence the length of smaller among AO and OB is $OA = 3$ cm

354. If the length of a chord of a circle, that makes an angle of 60° with the tangent drawn at one end point of the chord, is $8\sqrt{3}$ cm, then the radius of the circle will be:

- (a) 6 cm (b) 8 cm
(c) 5 cm (d) 7 cm

SSC CHSL 10/082021 (Shift-II)

Ans. (b) : Given –



The length at chord of a circle (AB) = $8\sqrt{3}$ cm

The length of $AM = AB/2$

$$= 8\sqrt{3}/2 = 4\sqrt{3}$$

In $\triangle AOM$,

$$\angle AOM = 60^\circ$$

$$\therefore \sin 60^\circ = \frac{AM}{OA}$$

$$\sqrt{3}/2 = 4\sqrt{3}/OA$$

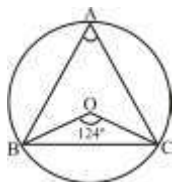
$$\Rightarrow OA = 2 \times 4 = 8 \text{ cm. } \{OA = \text{Radius}\}$$

355. A, B and C are three points on a circle whose centre is O. If angle BOC is equal to 124° , then what is the value (in degrees) of angle BAC?

- (a) 62 (b) 72
(c) 34 (d) 66

SSC CHSL 11/082021 (Shift-II)

Ans. (a) : Given –



$$\angle BOC = 124^\circ$$

$$\therefore \angle BAC = \frac{1}{2} \angle BOC$$

$$= \frac{1}{2} \times 124^\circ$$

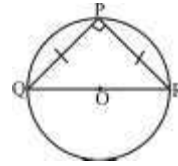
$$= 62^\circ$$

356. P, Q and R are three points on the circumference of a circle such that QR is a diameter and $PQ = PR$. If the radius of the circle is 7 cm, then the length of PQ is:

- (a) $7\sqrt{3}$ cm (b) $14\sqrt{2}$ cm
(c) 7 cm (d) $7\sqrt{2}$ cm

SSC CHSL 13/04/2021 (Shift-III)

Ans.(d) : Given –



In $\triangle QPR$,

$$\angle QPR = 90^\circ$$

$$\therefore PQ = PR$$

$$\therefore PQ = \frac{QR}{\sqrt{2}}$$

$$\Rightarrow PQ = \frac{14}{\sqrt{2}} \text{ cm}$$

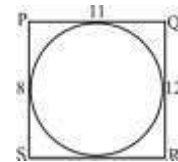
$$\Rightarrow PQ = 7\sqrt{2} \text{ cm}$$

357. A circle touches all four sides of a quadrilateral PQRS. If $PQ = 11$ cm, $QR = 12$ cm and $PS = 8$ cm, then what is the length of RS?

- (a) 7 cm (b) 15 cm
(c) 7.3 cm (d) 9 cm

SSC CHSL 13/04/2021 (Shift-III)

Ans.(d) : Given –



If a circle touches all four sides of a quadrilateral PQRS then,

$$PQ + RS = SP + RQ$$

$$\Rightarrow 11 + RS = 8 + 12$$

$$\Rightarrow RS = 20 - 11$$

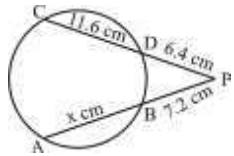
$$\Rightarrow RS = 9 \text{ cm.}$$

358. Chords AB and CD of a circle intersect externally at P. If $CD = 11.6$ cm, $PD = 6.4$ cm and $PB = 7.2$ cm, then AB (in cm) is equal to:

- (a) 12 (b) 16
(c) 8.8 (d) 4.8

SSC CHSL 04/08/2021 (Shift-III)

Ans. (c)



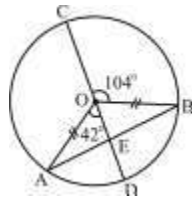
From theorem,
 $PC \times PD = PA \times PB$
 $18 \times 6.4 = (x+7.2) 7.2$
 $16 = x + 7.2$
 $x = 16 - 7.2$
 $x = 8.8 \text{ cm}$

359. In a circle with center O, chord AB and diameter CD intersect each other at point E, inside the circle, if $\angle AOD = 42^\circ$ and $\angle BOC = 104^\circ$, then what is the measure (in degree) of $\angle AED$?

- (a) 73 (b) 62
 (c) 58 (d) 84

SSC CHSL 04/08/2021 (Shift-III)

Ans. (a) : Given,
 $\angle AOD = 42^\circ$
 $\angle BOC = 104^\circ$
 $\angle BOC + \angle BOE = 180^\circ$
 $104^\circ + \angle BOE = 180^\circ$
 $\angle BOE = 180^\circ - 104^\circ$
 $= 76^\circ$



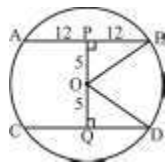
In $\triangle AOB$,
 $\angle OAB = \angle OBA (\because AO = OB)$
 $\angle OAB = \frac{180^\circ - \angle AOB}{2} = \frac{180^\circ - 118^\circ}{2} = 31^\circ$
 $\angle AED = \angle AOD + \angle OAE$
 $= 42^\circ + 31^\circ$
 $= 73^\circ$

360. The distance between two equal parallel chords of a circle is 10 cm. If the chords are 24 cm long, then what is the length of the radius?

- (a) $2\sqrt{61}$ (b) 17 cm
 (c) 26 cm (d) 13 cm

SSC CHSL 05/08/2021 (Shift-III)

Ans. (d) : Given-



Length of each chords = 24 cm
 Distance between chords = 10 cm

In $\triangle BPO$,
 $OB^2 = PB^2 + OP^2$
 $OB^2 = (12)^2 + (5)^2$
 $OB^2 = 169$

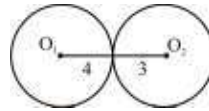
$\Rightarrow OB = \sqrt{169}$
 $\Rightarrow OB = 13 \text{ cm. (Radius)}$

361. Two circles of radii 4 cm and 3 cm respectively, touch each other externally. What is the distance (in cm) between their centres?

- (a) 5 (b) 16
 (c) 7 (d) 9

SSC CHSL 05/08/2021 (Shift-III)

Ans. (c) : Given -



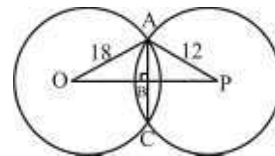
Radius of first circle is 4 cm.
 Radius of second circle is 3 cm
 \therefore The distance between their centers $(O_1 O_2) = 4 + 3 = 7 \text{ cm.}$

362. Two circles of radii 18 cm and 12 cm intersect each other and the length of their common chord is 16 cm. What is the distance (in cm) between their centres?

- (a) $2\sqrt{5}(-2 + \sqrt{13})$ (b) $2\sqrt{5}(2 + \sqrt{13})$
 (c) $2\sqrt{5}(4 - \sqrt{13})$ (d) $2\sqrt{5}(4 + \sqrt{13})$

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) : Given -



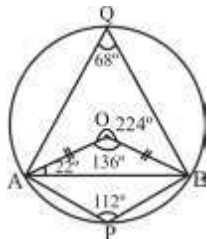
Length of $AB = \frac{AC}{2}$
 $= 16/2 = 8 \text{ cm}$
 $OB^2 = OA^2 - AB^2$
 $= 18^2 - 8^2 = 260$
 $\Rightarrow OB = \sqrt{260} = 2\sqrt{65}$
 And $BP^2 = 12^2 - 8^2 = 80$
 $\Rightarrow BP = \sqrt{80} = 4\sqrt{5}$
 $\therefore OP = OB + BP$
 $= 2\sqrt{65} + 4\sqrt{5}$
 $= 2\sqrt{5}(2 + \sqrt{13})$

363. AB is a chord of a circle with centre O and P is any point on the circle, if $\angle APB = 112^\circ$, then what is the measure of $\angle OAB$?

- (a) 44° (b) 32°
 (c) 22° (d) 30°

SSC CHSL 16/04/2021 (Shift-III)

Ans.(c) : Given –



We know that, if a chord makes x° on the major arc at the circle then it will make $2x^\circ$ on the centre.

$$\therefore \angle AOB = 224^\circ$$

But angle cannot be greater than 180°

$$\text{So angle is} = 360^\circ - 224^\circ$$

$$= 136^\circ$$

$$\because AO = BO = (\text{radius})$$

$$2\angle OAB = 180^\circ - 136^\circ$$

$$\Rightarrow \angle OAB = 44^\circ/2$$

$$= 22^\circ$$

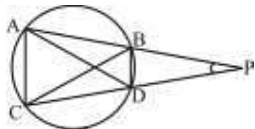
364. Chords AB and CD of a circle are produced to meet at the point P, outside the circle, and AD is the diameter of the circle, If $\angle DAP = 36^\circ$ and $\angle APC = 30^\circ$, then what will be the measure of $\angle CBD$?

- (a) 24° (b) 34°
(c) 16° (d) 26°

SSC CHSL 19/08/2021 (Shift-II)

Ans. (a) : Given-

$$\angle DAP = 36^\circ$$



$$\angle APC = 30^\circ$$

According to the question-

$$\angle ADC = \angle DAP + \angle APC$$

$$\left[\begin{array}{l} \text{External angle} = \text{sum of} \\ \text{opposite internal angles} \end{array} \right]$$

$$= 36^\circ + 30^\circ = 66^\circ$$

$$\therefore \angle ABC = 66^\circ \text{ (Angle subtended in the same segment)}$$

Since AD is a diameter

$$\therefore \angle ABD = 90^\circ$$

$$\Rightarrow \angle ABC + \angle CBD = 90^\circ$$

$$\Rightarrow 66^\circ + \angle CBD = 90^\circ$$

$$\Rightarrow \angle CBD = 90^\circ - 66^\circ$$

$$\angle CBD = 24^\circ$$

365. In a circle, two chords UV and WX intersect each other at a point Z within the circle. If $UV = 18$ cm, $ZV = 6$ cm and $WZ = 9$ cm, then the length of ZX is:

- (a) 6 cm (b) 8 cm
(c) 4 cm (d) 10 cm

SSC CHSL 09/08/2021 (Shift-III)

Ans. (b) : Given –



$$UV = 18 \text{ cm}, ZV = 6 \text{ cm}$$

$$WZ = 9 \text{ cm}$$

$$\therefore UZ = UV - ZV$$

$$\Rightarrow UZ = UV - ZV$$

$$= 18 - 6 = 12 \text{ cm}$$

We know that –

$$UZ \times ZV = XZ \times WZ$$

$$\therefore 12 \times 6 = XZ \times 9$$

$$\Rightarrow XZ = 8 \text{ cm.}$$

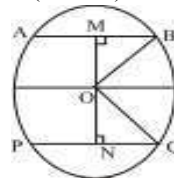
366. Two parallel chords are drawn in a circle of diameter 50 cm on the opposite sides of its centre. The length of one chord is 40 cm and the distance between the two chords is 22 cm. The length of the other chord is:

- (a) 50 cm (b) 44 cm
(c) 48 cm (d) 46 cm

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) :

$$\because OB = OQ = 25 \text{ cm (Radius)}$$



$$AB = 40 \text{ cm}, MN = 22 \text{ cm}$$

$$MB = 40/2 = 20 \text{ cm}$$

In $\triangle MOB$,

$$(OB)^2 = (OM)^2 + (MB)^2$$

$$\Rightarrow (OM)^2 = 225$$

$$\Rightarrow OM = 15 \text{ cm}$$

$$\therefore ON = 22 - OM$$

$$= 22 - 15 = 7 \text{ cm}$$

In $\triangle ONQ$,

$$(OQ)^2 = (ON)^2 + (NQ)^2$$

$$(25)^2 = (7)^2 + (NQ)^2$$

$$\Rightarrow NQ = 24 \text{ cm}$$

$$\therefore PQ = 2NQ$$

$$= 2 \times 24$$

$$= 48 \text{ cm.}$$

367. Chords AB and CD of a circle intersect externally at P. If $AB = 8.8$ cm, $PB = 7.2$ cm, $PD = 6.4$ cm, then CD is equal to:

- (a) 10.8 cm (b) 10.6 cm
(c) 11.4 cm (d) 11.6 cm

SSC CHSL 09/08/2021 (Shift-III)

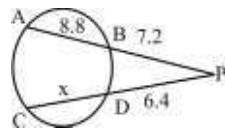
Ans. (d) : $\therefore PA \times PB = PC \times PD$

$\therefore 16 \times 7.2 = PC \times 6.4$

$\Rightarrow PC = 18 \text{ cm}$

$\therefore \text{Length of } CD = 18 - 6.4$

$= 11.6 \text{ cm}$

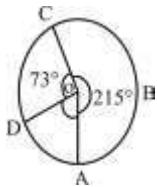


368. Points A, B, C and D are concyclic points of a circle with centre O, such that $\angle DOC = 73^\circ$. The measure of $\angle ABC$ is 215° . What is the measure of $\angle AOD$?

- (a) 145° (b) 273°
(c) 87° (d) 72°

SSC CHSL 06/082021 (Shift-II)

Ans. (d) : $\angle DOC = 73^\circ$



and $\angle AOC = 215^\circ$

$\therefore \angle AOD = 360^\circ - (215^\circ + 73^\circ)$

$= 360^\circ - 288^\circ$

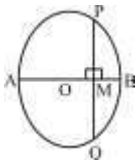
$= 72^\circ$

369. AB is the diameter of a circle of radius 9 cm. PQ is a chord (not a diameter) that intersects AB at M perpendicularly. If $AM : BM = 5 : 4$, then the length of chord PQ will be:

- (a) $5\sqrt{5} \text{ cm}$ (b) $6\sqrt{5} \text{ cm}$
(c) $6\sqrt{3} \text{ cm}$ (d) $8\sqrt{5} \text{ cm}$

SSC CHSL 09/082021 (Shift-II)

Ans. (d) : Let the ratio of AM and BM are $5x$ and $4x$ respectively.



Then-

AB is the diameter of a circle of radius 9 cm $= 9 \times 2$ cm $= 18$ cm

$\Rightarrow (5x + 4x) = 18$

$\Rightarrow x = 2$

$\therefore AM = 5x = 5 \times 2 = 10$ cm

$BM = 4x = 4 \times 2 = 8$ cm

As we know,

$PM \times MQ = AM \times BM$

$\Rightarrow PM \times PM = 10 \times 8$

$\Rightarrow PM^2 = 80$

$\Rightarrow PM = 4\sqrt{5} \text{ cm}$

$\therefore PQ = 2PM$

$= 2 \times 4\sqrt{5}$

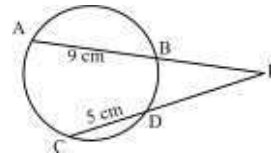
$= 8\sqrt{5} \text{ cm}$

370. Chords AB and CD of a circle meet at point P (outside the circle), when produced. If $AB = 9$ cm, $PB = \frac{1}{3} AB$ and $CD = 5$ cm, then the length of PD (in cm) is:

- (a) 4 (b) 5
(c) 6 (d) 7

SSC CHSL 12/08/2021 (Shift-I)

Ans. (a) :



$\therefore PA \times PB = PC \times PD$

$(AB + PB) PB = (CD + PD) \times PD$

$(9 + PB) PB = (5 + PD) \times PD$

$\therefore PB = \frac{1}{3} AB = 3 \text{ cm}$

$\therefore (9 + 3) \times 3 = (5 + PD) \times PD$

$(5 + PD) \times PD = 36$

$(5 + 4) \times 4 = 36$

$(PD = 4 \text{ satisfies the equation})$

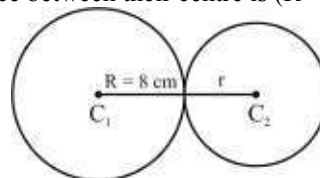
$PD = 4 \text{ cm}$

371. Two circles touch each other externally. The distance between their centers is 14 cm. If the radius of one circle is 8 cm, then the radius of the other circle is:

- (a) 7 cm (b) 6 cm
(c) 5 cm (d) 8 cm

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) : When two circles touch each other externally then, distance between their centers is $(R + r)$



So, $R + r = 14 \text{ cm}$

$8 + r = 14 \text{ cm}$ ($\because R = 8 \text{ cm}$ given)

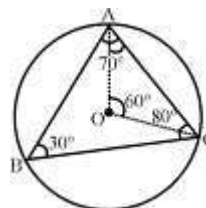
$r = 6 \text{ cm}$

372. The circumcentre of a triangle ABC is O. If $\angle BAC = 70^\circ$ and $\angle BCA = 80^\circ$, then the measure of $\angle OAC$ is equal to:

- (a) 60° (b) 70°
(c) 40° (d) 30°

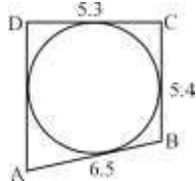
SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (a) :



Given, $\angle BAC = 70^\circ$, $\angle BCA = 80^\circ$
 In ΔABC ,
 $\angle ABC = 180^\circ - (70^\circ + 80^\circ)$
 $= 30^\circ$
 $\angle AOC = 2\angle ABC$
 Angle subtended by chord on centre is double the angle subtended by same chord on circumference.
 $\angle AOC = 2 \times 30^\circ$
 $= 60^\circ$
 $\angle OAC = \angle OCA = \frac{180^\circ - 60^\circ}{2} = 60^\circ$ ($\because AO = OC$)

373. In the figure, a circle touches all the sides of a quadrilateral ABCD whose sides AB = 6.5cm, BC = 5.4cm and CD = 5.3cm. The length of AD is:



- (a) 6.2cm (b) 4.6cm
 (c) 5.8cm (d) 6.4cm

SSC CHSL -21/10/2020 (Shift-II)

Ans. (d)
 Theorem $AB + CD = BC + AD$
 $\Rightarrow 6.5 + 5.3 = 5.4 + AD$
 $AD = 11.8 - 5.4$
 $AD = 6.4 \text{ cm}$

374. Quadrilateral ABCD is inscribed in a circle whose centre is O. If $\angle BOC = 92^\circ$ and $\angle ADC = 112^\circ$ then $\angle ABO$ is equal to:

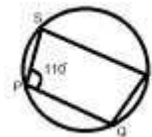
- (a) 24° (b) 26°
 (c) 22° (d) 28°

SSC CHSL 11/07/2019 (Shift-III)

Ans. (a):

In ΔOBC ,
 $OB = OC$ (Radius)
 $\therefore \angle OCB = \angle OBC$
 $\angle OBC + \angle OCB + \angle BOC = 180^\circ$
 (Sum of angles of triangle)
 $2\angle OBC + 92^\circ = 180^\circ$ ($\angle OBC = \angle OCB$)
 $\angle OBC = 44^\circ$
 $\therefore \angle ADC + \angle ABC = 180^\circ$
 (Sum of opposite angles of a cyclic quadrilateral is 180°)
 $112^\circ + (44^\circ + \angle ABO) = 180^\circ$
 $(\angle ABC = \angle ABO + \angle OBC)$
 $\angle ABO = 24^\circ$

375. In the given figure, PQRS is a cyclic quadrilateral. What is the measure of the angle PQR if PQ is parallel to SR?



- (a) 80° (b) 100°
 (c) 70° (d) 110°

SSC CHSL -16/10/2020 (Shift-II)

Ans. (d) : $\angle SPQ + \angle QRS = 180^\circ$
 The sum of opposite angles of a cyclic quadrilateral = 180°
 $\therefore 110^\circ + \angle QRS = 180^\circ$
 $\angle QRS = 70^\circ$
 $\therefore SR \parallel PQ$
 $\angle QRS + \angle PQR = 180^\circ$ (interior angle)
 $70^\circ + \angle PQR = 180^\circ$
 $\angle PQR = 110^\circ$

376. ABDC is a cyclic quadrilateral inside a circle with a centre O in which AB is a diameter. AC and BD is produced which meet at E. If $\angle CED = 70^\circ$ then $\angle COD$ is equal to :

- (a) 60° (b) 45°
 (c) 40° (d) 30°

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c): Join A to D
 In ΔADB ,
 $\angle ADB = 90^\circ$
 (Angle made in semi circle)
 $\therefore \angle ADE = 180^\circ - 90^\circ$
 $\angle ADE = 90^\circ$
 In ΔADE ,
 $\angle EAD = 180^\circ - (90^\circ + 70^\circ)$
 or, $\angle CAD = 20^\circ$

Angle subtended by chord on centre is double the angle subtended by same chord on circumference.
 $\angle COD = 2 \times \angle CAD = 2 \times 20^\circ = 40^\circ$

377. PQRS is a cyclic quadrilateral. If $\angle P$ is four times the $\angle R$ and $\angle S$ is three times the $\angle Q$. Then the sum of $\angle Q$ and $\angle R$ is :

- (a) 81° (b) 73°
 (c) 86° (d) 77°

SSC CHSL 03/07/2019 (Shift-I)

Ans. (a)

The sum of opposite angles in a cyclic quadrilateral is 180°

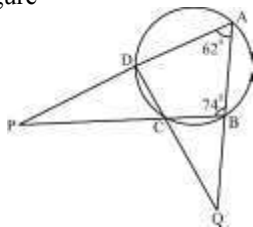
$$\begin{aligned} \angle P + \angle R &= 180^\circ, & \angle Q + \angle S &= 180^\circ \\ 4x + x &= 180^\circ & y + 3y &= 180^\circ \\ 5x &= 180^\circ & 4y &= 180^\circ \\ \boxed{x = 36^\circ} & & \boxed{y = 45^\circ} & \\ \angle Q + \angle R &= x + y = 36^\circ + 45^\circ \\ \boxed{\angle Q + \angle R = 81^\circ} \end{aligned}$$

378. ABCD is a cyclic quadrilateral whose sides AD and BC meet at point P by producing them and AB and DC meet at point Q by producing them. If $\angle A = 62^\circ$ and $\angle ABC = 74^\circ$, then difference of $\angle P$ and $\angle Q$ is :

- (a) 44° (b) 32°
(c) 23° (d) 38°

SSC CHSL 04/07/2019 (Shift-I)

Ans. (b) : In figure



ABCD is a cyclic quadrilateral
 $\angle ABC + \angle ADC = 180^\circ$
 $\angle ADC = 180^\circ - 74^\circ = 106^\circ$

In $\triangle ABP$,
 $\angle APB + \angle PAB + \angle PBA = 180^\circ$
 $\angle APB = 180^\circ - (62^\circ + 74^\circ)$
 $= 44^\circ$

In $\triangle ADQ$,
 $\angle DAQ + \angle ADQ + \angle AQD = 180^\circ$
 $\angle AQD = 180^\circ - (62^\circ + 106^\circ)$
 $= 12^\circ$
 $\angle P - \angle Q = 44^\circ - 12^\circ$
 $= 32^\circ$

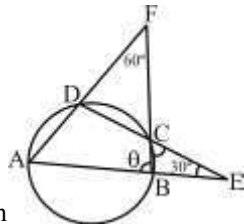
379. ABCD is cyclic quadrilateral. Sides AB and DC, when produced, meet at E, and sides BC and AD, when produced, meet at F. If $\angle BFA = 60^\circ$ and $\angle AED = 30^\circ$, then the measure of $\angle ABC$ is:

- (a) 75° (b) 70°
(c) 80° (d) 65°

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a)

Let, $\angle ABC = \theta$
 $\angle BCE = x^\circ$



\therefore From exterior angle theorem
 $\theta = x + 30^\circ \dots\dots(1)$
 $\therefore \angle FCD = x$ (Vertically Opposite angle)
 $\therefore \angle FDC = x + 30^\circ$
 Exterior angle of cyclic quadrilateral
 \therefore In $\triangle FDC$,
 $x + x + 30^\circ + 60^\circ = 180^\circ$

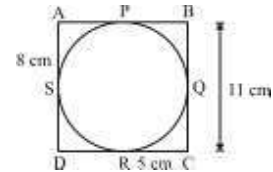
$$\begin{aligned} 2x &= 90 \\ x &= 45^\circ \\ \text{From equation (1)} \\ \theta &= 45^\circ + 30^\circ \\ &= 75^\circ \end{aligned}$$

380. A circle is drawn inside the quadrilateral ABCD which touches AB, BC, CD and DA at P, Q, R and S respectively. If $AS = 8$ cm, $BC = 11$ cm and $CR = 5$ cm then the length of AB is equal to:

- (a) 16 cm (b) 13 cm
(c) 14 cm (d) 12 cm

SSC CHSL -02/07/2019 (Shift-III)

Ans. (c)



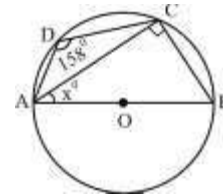
$CQ = CR = 5$ cm (Tangent line)
 $\therefore BC = BQ + CQ$
 $\therefore BQ = 11 - 5 = 6$ cm
 $\therefore BP = BQ = 6$ cm (Tangent line)
 $AP = AS = 8$ cm (Tangent line)
 $AB = AP + BP = 8 + 6$
 $= 14$ cm

381. ABCD is a cyclic quadrilateral in which AB is the diameter of the circle on it and $\angle ADC = 158^\circ$ then $\angle BAC$ is equal to :

- (a) 50° (b) 38°
(c) 40° (d) 68°

SSC CHSL -02/07/2019 (Shift-II)

Ans. (d)



Given,
 ABCD is a cyclic quadrilateral and AB is the diameter of circle.

$$\begin{aligned} \angle ADC &= 158^\circ \\ \angle ADC + \angle ABC &= 180^\circ \quad (\text{Theorem}) \\ 158^\circ + \angle ABC &= 180^\circ \\ \angle ABC &= 180^\circ - 158^\circ \\ \angle ABC &= 22^\circ \end{aligned}$$

We know that, angle made in semi circle is 90°
 $\angle ACB = 90^\circ$

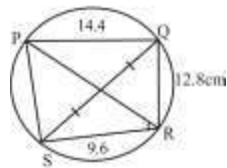
In Right angled triangle $\triangle ABC$
 $\angle BAC + \angle ACB + \angle ABC = 180^\circ$
 $\angle BAC + 90^\circ + 22^\circ = 180^\circ$
 $\angle BAC = 180^\circ - 112^\circ$
 $\angle BAC = 68^\circ$

382. PQRS is a cyclic quadrilateral in which $PQ = 14.4$ cm, $QR = 12.8$ cm and $SR = 9.6$ cm. If PR bisects QS, what is the length of PS ?

- (a) 15.6 cm (b) 15.8 cm
(c) 16.4 cm (d) 19.2 cm

SSC CGL (Tier-II) 11-9-2019

Ans. (d)



∴ PR bisects QS

$PS \times SR = PQ \times QR$ (From Theorem)

$$PS \times 9.6 = 14.4 \times 12.8$$

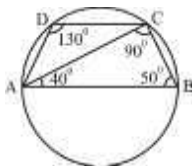
$$PS = \frac{14.4 \times 12.8}{9.6} = 19.2 \text{ cm}$$

383. ABCD is a quadrilateral whose side AB is the diameter of a circle through A, B, C and D. If $\angle ADC = 130^\circ$ then the measure of $\angle BAC$ is:

- (a) 50° (b) 35°
(c) 45° (d) 40°

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (d): Given,



$$\angle ADC = 130^\circ$$

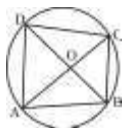
$$\angle ABC = 180^\circ - 130^\circ = 50^\circ$$

(Opposite angle of cyclic quadrilateral)

$$\angle ACB = 90^\circ \quad (\text{Angle of semi circle})$$

$$\therefore \angle BAC = 180^\circ - (90^\circ + 50^\circ) = 180^\circ - 140^\circ = 40^\circ$$

384. A cyclic quadrilateral ABCD is such that $AB = BC$, $AD = DC$ and AC and BD intersect at O. If $\angle CAD = 46^\circ$, then the measure of $\angle AOB$ is equal to :



- (a) 80° (b) 86° (c) 84° (d) 90°

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : ABCD is a cyclic quadrilateral

$$\therefore AD = DC$$

$$\Rightarrow \angle CAD = \angle DCA = 46^\circ$$

$$\therefore \angle ADC = 88^\circ$$

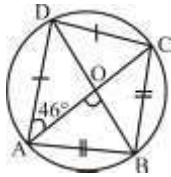
$$\therefore AB = BC$$

$$\Rightarrow \angle CBD = \angle ABD = 46^\circ$$

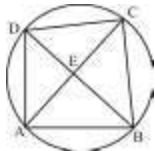
$$\therefore \angle ABC = 92^\circ$$

$$\angle AOB = \angle OAB + \angle ABO = 44^\circ + 46^\circ$$

$$\angle AOB = 90^\circ$$



385. In the given figure, $\angle DBC = 65^\circ$, $\angle BAC = 35^\circ$ and $AB = BC$, then the measure of $\angle ECD$ is equal to :



- (a) 55° (b) 45°
(c) 50° (d) 65°

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Figure $\therefore AB = BC$

$$\therefore \angle BAC = 35^\circ = \angle ACB$$

In $\triangle ABC$,

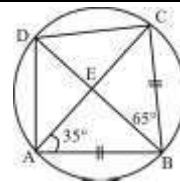
$$\angle ABC = 180^\circ - (35^\circ + 35^\circ) = 110^\circ$$

$$\angle ABD = 110^\circ - 65^\circ = 45^\circ$$

∴ Angle subtended by same chord is equal

$$\therefore \angle ABD = \angle ACD$$

Hence, $\angle ECD = 45^\circ$



386. In a circle with centre O, AB is the diameter and CD is a chord such that ABCD is a trapezium. If $\angle BAC = 24^\circ$, then $\angle CAD$ is equal to:

- (a) 48° (b) 42°
(c) 24° (d) 36°

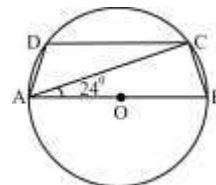
SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (b) :

$$\angle BAC = 24^\circ \text{ (Given,)}$$

$$\angle ACB = 90^\circ$$

(Angle formed in semicircle is right angle)



$$\begin{aligned} \angle ABC &= 180^\circ - (90 + 24) \\ &= 180^\circ - 114^\circ \\ &= 66^\circ \end{aligned}$$

Sum of opposite angles of a cyclic quadrilateral is 180°

$$\begin{aligned} \angle ADC &= (180^\circ - 66^\circ) \\ &= 114^\circ \end{aligned}$$

$$\angle ACD = 24^\circ \text{ (} \because AB \parallel DC \text{)}$$

$$\angle CAD = 180 - (114^\circ + 24^\circ)$$

$$= 180^\circ - 138^\circ$$

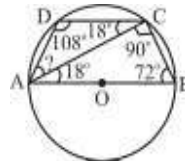
$$\angle CAD = 42^\circ$$

387. In a circle with centre O, AB is the diameter and CD is a chord such that ABCD is a trapezium. If $\angle BAC = 18^\circ$, then $\angle CAD$ is equal to:

- (a) 18° (b) 36°
(c) 72° (d) 54°

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) :



$$\therefore \angle BAC = \angle ACD = 18^\circ \text{ [Alternate angle]}$$

∴ Angle formed in semicircle is right angle]

$$\therefore \angle ACB = 90^\circ$$

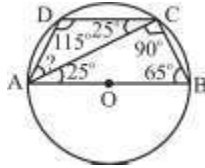
$$\therefore \angle ABC + \angle ACB + \angle BAC = 180^\circ$$

$$\angle ABC = 180^\circ - (18^\circ + 90^\circ) = 180^\circ - 108 = 72^\circ$$

∴ Sum of opposite angles of trapezium is 180°
 ∴ $\angle B + \angle D = 180^\circ$
 $\angle D = 180^\circ - 72^\circ = 108^\circ$
 In $\triangle ACD$,
 $\angle CAD + \angle ADC + \angle DCA = 180^\circ$
 $\angle CAD = 180^\circ - (108^\circ + 18^\circ) = 180^\circ - 126^\circ = 54^\circ$

388. In a circle with centre O . AB is the diameter and CD is a chord such that $ABCD$ is a trapezium. If $\angle BAC = 25^\circ$, then $\angle CAD$ is equal to:
 (a) 65° (b) 45°
 (c) 25° (d) 40°
 SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

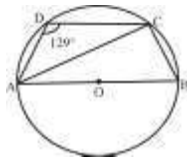
Ans. (d) :



∴ $\angle BAC = \angle ACD = 25^\circ$ [Alternate angle]
 ∴ $\angle BAC + \angle ACB + \angle ABC = 180^\circ$
 $\angle ABC = 180^\circ - (25^\circ + 90^\circ) = 180^\circ - 115^\circ = 65^\circ$
 ∴ [Sum of opposite angle of a cyclic quadrilateral 180°]
 ∴ $\angle B + \angle D = 180^\circ$
 $65^\circ + \angle D = 180^\circ$
 $\angle D = 115^\circ$
 ∴ $\angle CAD = 180^\circ - (\angle ADC + \angle ACD)$
 $= 180^\circ - (115^\circ + 25^\circ)$
 $= 180^\circ - 140^\circ = 40^\circ$

389. $ABCD$ is a cyclic quadrilateral such that AB is the diameter of the circle circumscribing it and $\angle ADC = 129^\circ$. Then $\angle BAC$ is equal to:
 (a) 51° (b) 49°
 (c) 61° (d) 39°
 SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

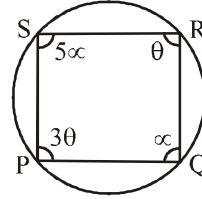
Ans. (d) : ∴ Sum of opposite angles of cyclic quadrilateral is 180°



$\angle ADC + \angle ABC = 180^\circ$
 $\angle ABC = 180^\circ - 129^\circ = 51^\circ$
 ∴ Angle formed in semicircle is right angle
 ∴ $\angle ACB = 90^\circ$
 In $\triangle ABC$,
 $\angle BAC = 180^\circ - (90^\circ + 51^\circ) = 39^\circ$

390. $PQRS$ is a cyclic quadrilateral. If angle P is three times the angle R and angle S is five times the angle Q , then the sum of the angle Q and R is:
 (a) 72° (b) 65°
 (c) 75° (d) 70°
 SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (c):



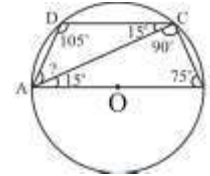
∴ Sum of opposite angles of cyclic quadrilateral is 180°

∴ $\angle P + \angle R = 180^\circ$
 $3\theta + \theta = 180^\circ$
 $\theta = 45^\circ$
 And, $\angle Q + \angle S = 180^\circ$
 $\alpha + 5\alpha = 180^\circ$
 $\alpha = 30^\circ$

Hence, $\angle Q + \angle R = \alpha + \theta = 30^\circ + 45^\circ = 75^\circ$

391. In a circle with centre O , AB is a diameter and CD is a chord such that $ABCD$ is a trapezium. If $\angle BAC = 15^\circ$, then $\angle CAD$ is equal to:
 (a) 30° (b) 75°
 (c) 45° (d) 60°
 SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (d) :

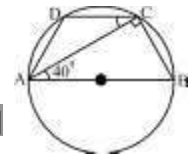


Given,
 $\angle BAC = 15^\circ$
 $\angle CAD = ?$
 ∴ Angle formed in semicircle is right angle
 ∴ $\angle ACB = 90^\circ$
 ∴ Sum of opposite angles of a trapezium is 180°
 ∴ $\angle B + \angle D = 180^\circ \Rightarrow \angle D = 180^\circ - 75^\circ = 105^\circ$
 In $\triangle ADC$,
 $\angle CAD + \angle ACD + \angle CDA = 180^\circ$
 $\angle CAD + 15^\circ + 105^\circ = 180^\circ$
 $\Rightarrow \angle CAD = 180^\circ - 120^\circ$
 $= 60^\circ$

392. In a circle with centre O , AB is the diameter and CD is a chord such that $ABCD$ is a trapezium. If $\angle BAC = 40^\circ$, then $\angle CAD$ is equal to:
 (a) 50° (b) 15°
 (c) 20° (d) 10°
 SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (d) : Given,

$\angle BAC = 40^\circ$
 ∴ $\angle ACB = 90^\circ$
 [Angle subtended in semicircle is 90°]
 In $\triangle ACB$,
 ∴ $\angle BAC + \angle ACB + \angle ABC = 180^\circ$
 $\Rightarrow 40^\circ + 90^\circ + \angle ABC = 180^\circ$
 $\Rightarrow \angle ABC = 50^\circ$



∴ Since, vertices of trapezium lies on the circumference of circle, hence, it is a cyclic quadrilateral.

∴ In cyclic quadrilateral ABCD

$$\angle ABC + \angle ADC = 180^\circ$$

$$\Rightarrow 50^\circ + \angle ADC = 180^\circ$$

$$\Rightarrow \angle ADC = 130^\circ$$

$$\therefore \angle BAC = \angle ACD = 40^\circ \quad (\text{Alternate angle})$$

In $\triangle ADC$,

$$\angle ADC + \angle ACD + \angle CAD = 180^\circ$$

$$\Rightarrow 130^\circ + 40^\circ + \angle CAD = 180^\circ$$

$$\Rightarrow \angle CAD = 180^\circ - (130^\circ + 40^\circ)$$

$$\Rightarrow \angle CAD = 180^\circ - 170^\circ$$

$$\Rightarrow \angle CAD = 10^\circ$$

393. A triangle ABC is inscribed in a circle with centre O. AO is produced to meet the circle K and $AD \perp BC$. If $\angle B = 80^\circ$ and $\angle C = 64^\circ$, then the measure of $\angle DAK$ is:

- (a) 10° (b) 12°
(c) 20° (d) 16°

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (d) : Given,

$$AD \perp BC$$

$$\angle B = 80^\circ$$

$$\& \quad \angle C = 64^\circ$$

In $\triangle ADC$,

$$\angle DAC + \angle ACD + \angle CDA = 180^\circ$$

$$\Rightarrow \angle DAC + 64^\circ + 90^\circ = 180^\circ$$

$$\Rightarrow \angle DAC = 180^\circ - 154^\circ = 26^\circ$$

Again, in $\triangle AOC$,

$$\angle COA = 80^\circ \times 2 = 160^\circ$$

[from circle property]

$$\& \quad \angle COA + \angle OCA + \angle CAO = 180^\circ$$

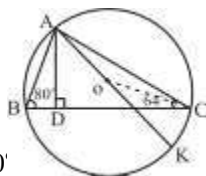
$$\Rightarrow \angle OCA + \angle CAO = 180 - 160 = 20^\circ$$

$$\therefore \angle OCA = \angle CAO = \frac{20}{2} = 10^\circ \quad [\because OC = OA]$$

$$\text{Hence, } \angle DAK = \angle DAC - \angle CAO$$

$$\angle DAK = 26^\circ - 10^\circ$$

$$\boxed{\angle DAK = 16^\circ}$$



394. In a circle of radius 10 cm, with centre O, PQ and PR are two chords each of length 12 cm. PO intersects chord QR at the points S. The length of OS is:

- (a) 3.2 cm (b) 2.5 cm
(c) 3 cm (d) 2.8 cm

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d) :

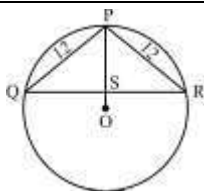
We know that,

$$\text{Circumradius}(R) = \frac{abc}{4\Delta}$$

Given,

$$OP = R = 10 \text{ cm}$$

$$PQ = a = 12 \text{ cm}$$



$$PR = b = 12 \text{ cm}$$

$$c = QR$$

$$10 = \frac{12 \times 12 \times QR}{4 \times \frac{1}{2} \times PS \times QR}$$

$$PS = \frac{12 \times 12}{2 \times 10}, \quad \boxed{PS = 7.2}$$

$$OS = OP - PS$$

$$= 10 - 7.2, \quad \boxed{OS = 2.8 \text{ cm}}$$

395. In a circle with centre O, an arc ABC subtends an angle of 140° at the centre of the circle. The chord AB is produced to point P. Then $\angle CBP$ is equal to:

- (a) 80° (b) 40°
(c) 50° (d) 70°

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (d) : According to the question,

$$\angle AOC = 140^\circ \dots (\text{Given})$$

$$\angle ADC = \frac{\angle AOC}{2} = 70^\circ$$

∴ ABCD is a cyclic quadrilateral

$$\text{Hence, } \angle ADC + \angle ABC = 180^\circ$$

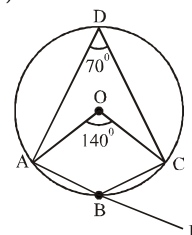
$$\angle ABC = 180^\circ - 70^\circ$$

$$\angle ABC = 110^\circ$$

$$\& \quad \angle ABC + \angle CBP = 180^\circ$$

$$\angle CBP = 180^\circ - 110^\circ$$

$$\angle CBP = 70^\circ$$



396. In a circle of radius 13 cm, a chord is at a distance of 5 cm from its centre, What is the length of the chord?

- (a) 20 cm (b) 24 cm
(c) 12 cm (d) 18 cm

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (b) : According to the question,

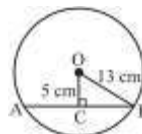
$$OB = 13 \text{ cm (Radius)}$$

$$OC = 5 \text{ cm}$$

$$\therefore OC \perp AB$$

[Perpendicular drawn on chord from centre of circle, divides the chord in two equal parts]

$$\therefore AB = 2 CB$$



In $\triangle OCB$, By using Pythagoras theorem

$$CB^2 = OB^2 - OC^2$$

$$CB^2 = 13^2 - 5^2$$

$$CB^2 = 169 - 25$$

$$CB^2 = 144$$

$$CB = 12 \text{ cm}$$

$$\therefore \text{Length of chord} = 2CB = 24 \text{ cm}$$

397. Chords AB and CD of a circle intersect at a point P inside the circle. If AB = 10 cm, AP = 4 cm and PC = 5 cm then CD is equal to
 (a) 6.8 cm (b) 9.8 cm
 (c) 4.8 cm (d) 7.8 cm
 SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (b)

$$\begin{aligned} AB &= 10 \text{ cm} \\ \therefore PB &= AB - PA \\ &= 10 - 4 \\ &= 6 \text{ cm} \end{aligned}$$

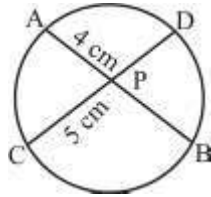
\therefore By using theorem,

$$PA \cdot PB = PC \cdot PD$$

$$\Rightarrow 4 \times 6 = 5 \times PD$$

$$\Rightarrow PD = \frac{24}{5}$$

$$\therefore \text{Chord } CD = \frac{24}{5} + 5 = \frac{24 + 25}{5} = \frac{49}{5} = 9.8 \text{ cm}$$



398. In a circle with centre O, an arc ABC subtends an angle of 110° at the centre of the circle. The chord AB is produced to a point P. Then $\angle CBP$ is equal to:

- (a) 65° (b) 70°
 (c) 60° (d) 55°

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (d) : According to the question,

$$\angle AOC = 110^\circ$$

$$\begin{aligned} \therefore \angle ADC &= \frac{\angle AOC}{2} \\ &= \frac{110^\circ}{2} = 55^\circ \end{aligned}$$

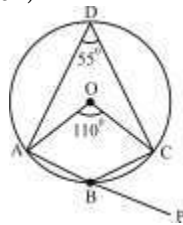
\therefore ABCD is a cyclic quadrilateral

$$\therefore \angle ADC + \angle ABC = 180^\circ$$

$$\begin{aligned} \angle ABC &= 180^\circ - \angle ADC \\ &= 180^\circ - 55^\circ = 125^\circ \end{aligned}$$

& $\angle ABC + \angle CBP = 180^\circ$ [Linear pair]

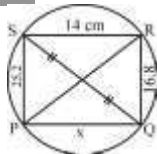
$$\begin{aligned} \angle CBP &= 180^\circ - \angle ABC \\ &= 180^\circ - 125^\circ = 55^\circ \end{aligned}$$



399. PQRS is a cyclic quadrilateral in which PQ = x cm, QR = 16.8 cm, RS = 14 cm, PS = 25.2 cm, and PR bisects QS. What is the value of x?
 (a) 18 (b) 21
 (c) 24 (d) 28
 SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b) :

$$\therefore PS \times SR = PQ \times QR \text{ (From theorem)}$$



$$25.2 \times 14 = x \times 16.8$$

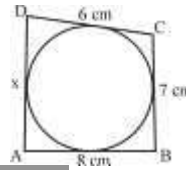
$$x = \frac{25.2 \times 14}{16.8} = 21 \text{ cm}$$

400. Quadrilateral ABCD circumscribes a circle. If AB = 8 cm, BC = 7 cm and CD = 6 cm, then the length of AD is:

- (a) 6.8 cm (b) 7 cm
 (c) 7.5 cm (d) 6 cm

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b) :



$$\therefore AB + DC = AD + BC \text{ (from theorem)}$$

$$(8+6) = AD + 7$$

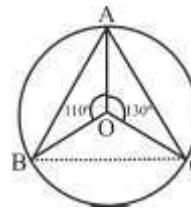
$$AD = 7 \text{ cm}$$

401. A, B, and C are three points on a circle such that the angles subtended by the chord AB and AC at the centre O are 110° and 130° , respectively. Then the value of $\angle BAC$ is:

- (a) 75° (b) 70°
 (c) 60° (d) 65°

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (c) :



$$\text{Angle } \angle BOC = 360^\circ - 240^\circ = 120^\circ$$

\therefore Angle subtended by chord on centre is double the angle subtended by same chord on circumference

$$\angle BOC = 2\angle BAC$$

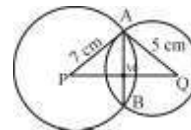
$$\therefore \angle BAC = \frac{120^\circ}{2} = 60^\circ$$

402. Two circles of radii 7 cm and 5 cm intersect each other at A and B, and the distance between their centres is 10 cm. The length (in cm) of the common chord AB is.

- (a) $\frac{3\sqrt{74}}{5}$ (b) $\frac{2\sqrt{74}}{5}$
 (c) $\frac{3\sqrt{66}}{5}$ (d) $\frac{4\sqrt{66}}{5}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d):



In $\triangle APQ$,

$$a = 7 \text{ cm}$$

$$b = 5 \text{ cm}$$

$$c = 10 \text{ cm}$$

$$s = \frac{a + b + c}{2} = 11 \text{ cm}$$

$$\text{Area of } \triangle APQ = \sqrt{11 \times 4 \times 6 \times 1}$$

$$\frac{1}{2} \times PQ \times AM = \sqrt{11 \times 4 \times 6}$$

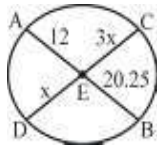
$$\frac{1}{2} \times 10 \times AM = \sqrt{11 \times 4 \times 6}$$

$$AM = \sqrt{\frac{11 \times 4 \times 6}{25}} = \frac{2\sqrt{66}}{5}$$

$$\therefore AB = \frac{4\sqrt{66}}{5} \text{ cm}$$

403. The chords AB and CD of a circle intersect at E. If AE = 12 cm, BE = 20.25 cm and CE = 3 DE, then the length (in cm) of CE is:
 (a) 25.5 (b) 28.5
 (c) 27 (d) 18
 SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

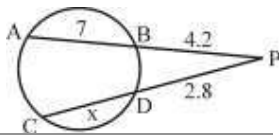
Ans. (c):



$\therefore AE \times EB = CE \times ED$ (From theorem)
 $12 \times 20.25 = 3x \times x$
 $x^2 = 81$
 $x = 9 \text{ cm}$
 $\therefore CE = 27 \text{ cm}$

404. Two chords AB and CD of a circle are produced to intersect each other at a point P outside the circle. If AB = 7 cm, BP = 4.2 cm and PD = 2.8 cm, then the length of CD is:
 (a) 12 cm (b) 14.6 cm
 (c) 14 cm (d) 15.8 cm
 SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

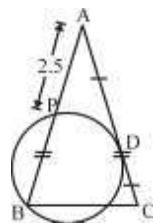
Ans. (c):



$\therefore PA \times PB = PC \times PD$ (From theorem)
 $11.2 \times 4.2 = (2.8+x) \times 2.8$
 $5.6 \times 3 = 2.8 + x$
 $16.8 = 2.8 + x$
 $x = 14 \text{ cm}$

405. In $\triangle ABC$, $AB = AC$. A circle drawn through B touches AC at D and intersect AB at P. If D is the mid point of AC and $AP = 2.5 \text{ cm}$, then AB is equal to:
 (a) 12.5 cm (b) 9 cm
 (c) 10 cm (d) 7.5 cm
 SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (c)



$\therefore AD^2 = AP \times AB$ (By using formula)

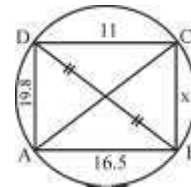
$$\left(\frac{AC}{2}\right)^2 = AP \times AB$$

$$\frac{AB^2}{4} = 2.5 \times AB \quad (\because AB = AC)$$

$$AB = 10 \text{ cm}$$

406. ABCD is a cyclic quadrilateral in which AB = 16.5 cm, BC = x cm, CD = 11 cm, AD = 19.8 cm, and BD is bisected by AC at O. What is the value of x?
 (a) 12.8 cm (b) 13.2 cm
 (c) 12.4 cm (d) 13.8 cm
 SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

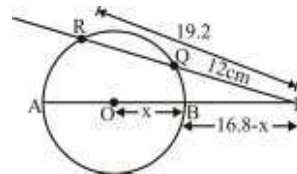
Ans. (b):



$\therefore AD \times DC = AB \times BC$ (by using theorem)
 $19.8 \times 11 = 16.5 \times x$
 $x = \frac{19.8 \times 11}{16.5} = 13.2 \text{ cm}$

407. Diameter AB of a circle with centre O is produced to point P such that $PO = 16.8 \text{ cm}$. PQR is a secant which intersects the circle at Q and R such that $PQ = 12 \text{ cm}$ and $PR = 19.2 \text{ cm}$. The length of AB (in cm) is:
 (a) 15.8 (b) 14.4
 (c) 15.2 (d) 14.2
 SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

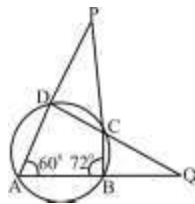
Ans. (b):



$\therefore PQ \times PR = PB \times PA$ (by using theorem)
 $12 \times 19.2 = (16.8-x)(16.8+x)$
 $230.4 = 282.24 - x^2$
 $x^2 = 51.84$
 $x = 7.2 \text{ cm}$
 $\therefore AB = 2x = 14.4 \text{ cm}$

408. ABCD is a cyclic quadrilateral in which sides AD and BC are produced to meet at P, and sides DC and AB meet at Q when produced. If $\angle A = 60^\circ$ and $\angle ABC = 72^\circ$, then $\angle DPC - \angle BQC =$
 (a) 40° (b) 36°
 (c) 24° (d) 30°
 SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (b)



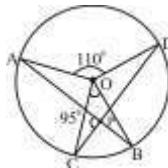
In $\triangle PAB$,
 $\angle DPC = 180^\circ - (60^\circ + 72^\circ) = 48^\circ$
 \therefore Sum of opposite angles of a cyclic quadrilateral is 180°
 $\angle ADC = 180^\circ - 72^\circ = 108^\circ$
 In $\triangle DAQ$,
 $\angle BQC = 180^\circ - (60^\circ + 108^\circ) = 12^\circ$
 $\therefore \angle DPC - \angle BQC = 48^\circ - 12^\circ = 36^\circ$

409. Two chords AB and CD of a circle with centre O intersect each other at P. If $\angle APC = 95^\circ$ and $\angle AOD = 110^\circ$, then $\angle BOC$ is:

- (a) 70° (b) 60°
 (c) 65° (d) 55°

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (b)



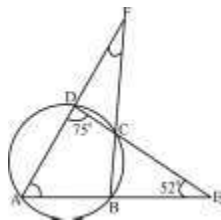
$\angle CPB = 180^\circ - 95^\circ = 85^\circ$ (linear pair)
 $\therefore \angle CPB = \frac{\angle AOD + \angle BOC}{2}$ (by using theorem)
 $85^\circ = \frac{110^\circ + \angle BOC}{2}$
 $\angle BOC = 170^\circ - 110^\circ = 60^\circ$

410. Sides AB and DC of a cyclic quadrilateral AB and CD are produced to meet at E, and sides AD and BC are produced to meet at F. If $\angle ADC = 75^\circ$, and $\angle BEC = 52^\circ$, then the difference between $\angle BAD$ and $\angle AFB$ is:

- (a) 23° (b) 22°
 (c) 21° (d) 31°

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) :



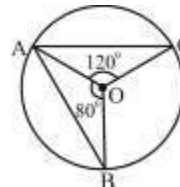
In $\triangle ADE$,
 $\angle BAD = 180^\circ - (75^\circ + 52^\circ) = 53^\circ$
 \therefore Sum of opposite angles of a cyclic quadrilateral is 180°
 $\therefore \angle ABC = 180^\circ - 75^\circ = 105^\circ$
 In $\triangle AFB$,
 $\angle AFB = 180^\circ - (53^\circ + 105^\circ) = 22^\circ$
 Difference = $53^\circ - 22^\circ = 31^\circ$

411. A, B, and C are three points on a circle such that the angles subtended by the chords AB and AC at the centre O are 80° and 120° , respectively. The value of $\angle BAC$ is:

- (a) 70° (b) 85°
 (c) 80° (d) 75°

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

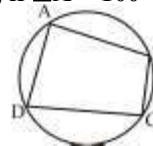
Ans. (c)



$\angle BOC = 360^\circ - (120^\circ + 80^\circ) = 160^\circ$
 \therefore Angle subtended by chord on centre is double the angle subtended by same chord on circumference.

$$\therefore \angle BAC = \frac{\angle BOC}{2} = \frac{160^\circ}{2} = 80^\circ$$

412. In the figure, if $\angle A = 100^\circ$ then $\angle C = ?$



- (a) 50° (b) 90°
 (c) 80° (d) 100°

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (c) \therefore Sum of opposite angle of a cyclic quadrilateral = 180°

$$\therefore \angle A + \angle C = 180^\circ$$

$$\angle C = 180^\circ - 100^\circ = 80^\circ$$

413. In a circle, AB is a the diameter and CD is a chord. AB and CD produced to meet at a point P, outside the circle. If PD = 15.3 cm, CD = 11.9 cm and AP = 30.6 cm, then the radius of the circle is:

- (a) 7.5 cm (b) 8.5 cm
 (c) 9 cm (d) 8 cm

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (b) :

$$\therefore PD \times PC = PB \times PA \text{ (by theorem)}$$

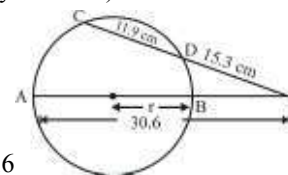
$$15.3 \times 27.2 = PB \times 30.6$$

$$PB = \frac{15.3 \times 27.2}{30.6}$$

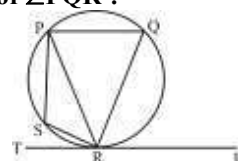
$$= 13.6 \text{ cm}$$

$$\therefore AB = 30.6 - 13.6$$

$$\therefore \text{radius } (r) = \frac{17}{2} = 8.5 \text{ cm}$$



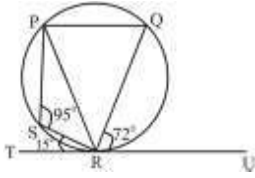
414. In the given figure, $\angle QRU = 72^\circ$, $\angle TRS = 15^\circ$ and $\angle PSR = 95^\circ$, then what is the value (in degrees) of $\angle PQR$?



- (a) 85 (b) 95
(c) 75 (d) 90

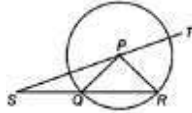
SSC CGL (Tier-II) 21-02-2018

Ans. (a) :



\therefore PQRS is a cyclic quadrilateral
 $\therefore \angle PSR + \angle PQR = 180^\circ$
 $95^\circ + \angle PQR = 180^\circ$
 $\Rightarrow \angle PQR = 180^\circ - 95^\circ$
 $\Rightarrow \angle QPR = 85^\circ$

415. In the given figure, P is the centre of the circle. If QS = PR, then what is the ratio of $\angle RSP$ to the $\angle TPR$?

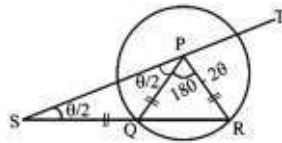


- (a) 1 : 4 (b) 2 : 5
(c) 1 : 3 (d) 2 : 7

SSC CGL (Tier-II) 20-02-2018

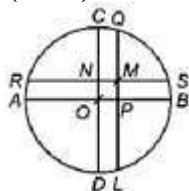
Ans. (c)

Let, $\angle PSQ = \frac{\theta}{2}$
 $\therefore PQ = PR = QS$
 $\therefore \angle SPQ = \frac{\theta}{2}$



By exterior angle property,
 $\angle PQR = \theta$
 $\therefore \angle QPR = 180^\circ - 2\theta$
 $\angle TPR = \frac{3\theta}{2}$
 $\frac{\angle RSP}{\angle TPR} = \frac{\frac{\theta}{2}}{\frac{3\theta}{2}} = 1:3$

416. In the given figure, CD and AB are diameters of circles and AB and CD are perpendicular to each other. LQ and SR are perpendiculars to AB and CD respectively. Radius of circle is 5 cm, PB : PA = 2 : 3 and CN : ND = 2 : 3. What is the length (in cm) of SM ?



- (a) $[(5\sqrt{3}) - 3]$ (b) $[(4\sqrt{3}) - 2]$
(c) $[(2\sqrt{5}) - 1]$ (d) $[(2\sqrt{6}) - 1]$

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let, PB = 2x & PA = 3x

PA + PB = AB = 10 cm.

5x = 10cm

x = 2cm

\therefore PB = 2 \times 2 = 4 cm

PA = 2 \times 3 = 6cm

Similarly,

CN = 4 cm

ND = 6cm

ON = OC - NC

ON = 5 - 4 = 1 cm

Similarly,

PO = 6 - 5 = 1 cm.

\therefore NOPM is a square

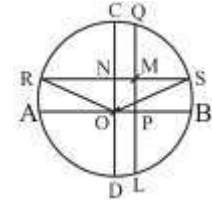
In $\triangle ONS$,

$SN^2 = 5^2 - 1^2$

SN = $2\sqrt{6}$

SM = SN - MN

= $2\sqrt{6} - 1$ cm

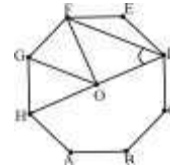


417. There are 8 equidistant points A, B, C, D, E, F, G and H (in same order) on a circle. What is the value of $\angle FDH$ (in degree)?

- (a) 22.5 (b) 45
(c) 30 (d) 42.5

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :



$\angle GOH = \frac{360^\circ}{8} = 45^\circ$

$\angle FOH = 45^\circ + 45^\circ = 90^\circ$

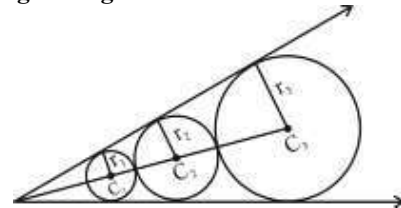
Angle subtended by chord on centre is double the angle subtended by same chord on circumference

$\therefore \angle FOH = 2\angle FDH$

$90^\circ = 2\angle FDH$

$\angle FDH = 45^\circ$

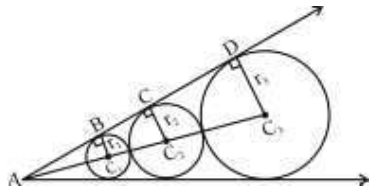
418. Three circle C_1 , C_2 and C_3 with radii r_1 , r_2 and r_3 (where $r_1 < r_2 < r_3$) are placed as shown in the given figure. What is the value of r_2 ?



- (a) $\sqrt{(r_1 r_3)}$ (b) $(r_1 + r_3)/2$
(c) $(2r_1 r_2)/(r_1 + r_2)$ (d) $\sqrt{(r_1 + r_3)}$

SSC CGL (Tier-II) 19-02-2018

Ans. (a)



Radius of circle is perpendicular to tangent.

$$\therefore \angle ABC_1 = \angle ACC_2 = \angle ADC_3 = 90^\circ$$

$$\therefore BC_1 \parallel CC_2 \parallel DC_3$$

$$\therefore \frac{AB}{AC} = \frac{AC}{AD} \dots\dots(i)$$

But $\triangle ABC_1 \sim \triangle ACC_2$

$$\frac{AB}{AC} = \frac{BC_1}{CC_2} = \frac{r_1}{r_2} \dots\dots(ii)$$

Similarly, $\triangle ACC_2 \sim \triangle ADC_3$

$$\frac{AC}{AD} = \frac{CC_2}{DC_3} = \frac{r_2}{r_3} \dots\dots(iii)$$

From equation (i), (ii) & (iii)

$$\therefore \frac{r_1}{r_2} = \frac{r_2}{r_3}$$

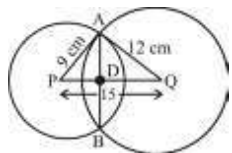
$$r_2 = \sqrt{r_1 r_3}$$

419. Two circle are having radii 9 cm and 12 cm. The distance between their centers is 15cm. What is the length (in cm) of their common chord?

- (a) 6.8 (b) 13.6
(c) 7.2 (d) 14.4

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Ans. (d) :



9, 12 & 15 cm are the sides of right angled triangle.

$$\text{Area of } \triangle APQ = \frac{1}{2} \times 9 \times 12$$

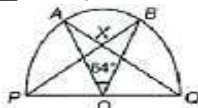
$$\Rightarrow \frac{1}{2} \times PQ \times AD = \frac{1}{2} \times 9 \times 12$$

$$\frac{1}{2} \times 15 \times AD = \frac{1}{2} \times 9 \times 12$$

$$AD = \frac{36}{5} \text{ cm}$$

$$\text{Common chord } AB = \frac{2 \times 36}{5} = \frac{72}{5} = 14.4 \text{ cm.}$$

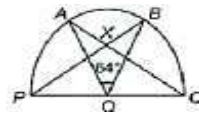
420. In the given figure, PQ is a diameter of the semicircle PABQ and O is its center. $\angle AOB = 64^\circ$. BP cuts AQ at X. What is the value (in degrees) of $\angle AXP$?



- (a) 36 (b) 32
(c) 58 (d) 54

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Ans. (c) :



PQ is diameter

If line AP is joined

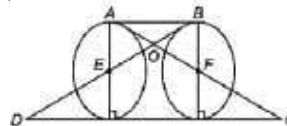
$$\angle APB \Rightarrow \frac{1}{2} \angle AOB = 32^\circ$$

Angle formed on centre is double the angle formed on circumference by same chord in same segment.

$\angle PAQ = 90^\circ$ (Angle formed in semicircle is right angle)

$$\angle AXP = 180^\circ - (\angle APB + \angle PAQ) = 180^\circ - (90^\circ + 32^\circ) = 58^\circ$$

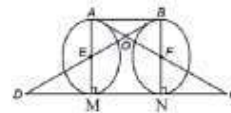
421. In the given figure, E and F are the centers of two identical circles. What is the ratio of area of triangle AOB to the area of triangle DOC ?



- (a) 1 : 3 (b) 1 : 9
(c) 1 : 8 (d) 1 : 4

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Ans. (b) :



$$\angle AEB = \angle MED$$

$$\angle AFB = \angle CFN$$

$$AB = DM = CN \text{ \& } AB = MN$$

$$\frac{AB}{DM + MN + NC} = \frac{AB}{DC} = \frac{1}{3}$$

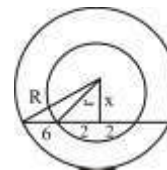
$$\frac{\text{Area } \triangle ADB}{\text{Area } \triangle DOC} = \frac{AB^2}{DC^2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9} \text{ or } 1 : 9$$

422. A line cuts two concentric circles. The lengths of chords formed by that line on the two circles are 4 cm and 16 cm. What is the difference (in cm^2) in squares of radii of two circles?

- (a) 240 (b) 120
(c) 60 (d) 90

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Ans. (c) :



Let 'R' be the radius of larger circle and 'r' is the radius of smaller circle.

Distance from centre to chord is x .

$$R^2 = 8^2 + x^2$$

$$x^2 = R^2 - 8^2 \text{ -----(i)}$$

$$x^2 = r^2 - 2^2 \text{ -----(ii)}$$

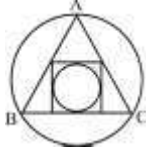
From equation (i) & (ii)

$$R^2 - 8^2 = r^2 - 2^2$$

$$R^2 - r^2 = 8^2 - 2^2$$

$$R^2 - r^2 = 60 \text{ cm}^2$$

423. An equilateral triangle ABC is inscribed in a circle as shown in figure. A square of the largest possible area is made inside this triangle as shown. Another circle made inscribing the square. What is the ratio of larger circle and the smaller circle ?



- (a) $(15 - 12\sqrt{3}) : 1$ (b) $4 : (63 - 36\sqrt{3})$
 (c) $(7 - 4\sqrt{3}) : 8$ (d) $(18 - \sqrt{3}) : 2$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : If side of an equilateral triangle is 'a' then side of square of maximum area drawn inside triangle

$$x = a\sqrt{3}(2 - \sqrt{3})$$

$$\therefore \text{Radius of smaller circle} = \frac{a\sqrt{3}(2 - \sqrt{3})}{2}$$

$$\text{Radius of larger circle} = \frac{a}{\sqrt{3}}$$

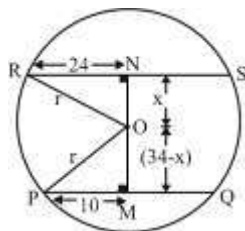
$$\begin{aligned} \text{Ratio of areas} &= \left(\frac{a}{\sqrt{3}}\right)^2 : \left[\frac{a\sqrt{3}(2 - \sqrt{3})}{2}\right]^2 \\ &= \frac{a^2}{3} : \frac{3a^2(7 - 4\sqrt{3})}{4} \\ &= 4 : (63 - 36\sqrt{3}) \end{aligned}$$

424. PQ and RS are two chords of a circle. PQ = 20 cm, RS = 48 cm and PQ is parallel to RS. If the distance between PQ and RS is 34 cm, then what is the area (in cm^2) of the circle ?

- (a) 729π (b) 900π
 (c) 676π (d) 784π

SSC CGL (Tier-II) 9-3-2018

Ans. (c)



By using Pythagoras theorem,
 $(34-x)^2 + (10)^2 = x^2 + 24^2$

$$(34-x)^2 - x^2 = 476$$

$$(34-x+x)(34-x-x) = 476$$

$$34 - 2x = \frac{476}{34}$$

$$34 - 2x = 14$$

$$x = 10 \text{ cm}$$

$$\therefore r^2 = 100 + 576$$

$$r^2 = 676$$

$$r = 26$$

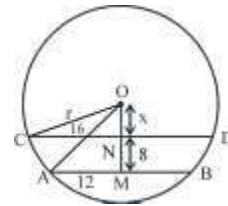
$$\text{Area of circle} = \pi r^2 = 676\pi \text{ cm}^2$$

425. Two parallel chords are the one side of the centre of a circle. The length of the two chords is 24 cm and 32 cm. If the distance between the two chords is 8 cm, then what is the area (in cm^2) of the circle ?

- (a) 724.14 (b) 832.86
 (c) 924.12 (d) 988.32

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :



$$OA = OC = r$$

$$\text{In } \triangle ONC, r^2 = x^2 + 16^2 \text{ (i)}$$

$$\text{In } \triangle OMA,$$

$$r^2 = (x+8)^2 + 12^2$$

$$x^2 + 16^2 = (x+8)^2 + 12^2 \quad [\text{From equation (i)}]$$

$$x^2 + 256 = x^2 + 64 + 16x + 144$$

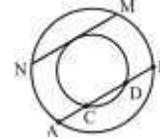
$$16x = 256 - 208 = 48$$

$$x = 3$$

$$\therefore r^2 = 9 + 256 = 265$$

$$\therefore \text{Area of circle} = \pi r^2 = \frac{22}{7} \times 265 = 832.86 \text{ cm}^2$$

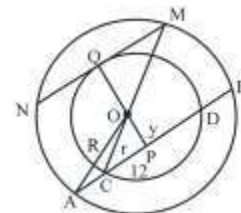
426. In the given figure, AB = 30 cm and CD = 24 cm. What is the value (in cm) of MN?



- (a) 18 (b) 9
 (c) 12 (d) 15

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :



$$R^2 = 15^2 + y^2 \quad \text{----- (i)}$$

$$r^2 = 12^2 + y^2 \quad \text{----- (ii)}$$

On subtracting eqⁿ (i) and (ii)

$$R^2 - r^2 = 15^2 + y^2 - (12^2 + y^2)$$

$$R^2 - r^2 = 225 - 144$$

$$R^2 - r^2 = 81$$

$$QM = \sqrt{R^2 - r^2} = 9\text{cm}$$

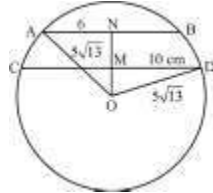
$$MN = 2 \times 9 = 18\text{ cm}$$

427. Two parallel chords on the same side of the centre of a circle are 12 cm and 20 cm long and the radius of the circle is $5\sqrt{13}$ cm. What is the distance (in cm) between the chords?

- (a) 2.5 (b) 1.5
(c) 2 (d) 3

SSC CGL (Tier-II) 13-09-2019

Ans. (c)



OA = OD = $5\sqrt{13}$ (Radius of circle)
In ΔMOD ,
 $OM^2 = OD^2 - MD^2 = 25 \times 13 - 100 = 325 - 100$
 $OM = 15\text{ cm}$
In ΔONA ,
 $ON^2 = 325 - 36 = 289$
 $ON = 17\text{ cm}$
 \therefore Distance between chords (MN) = $ON - OM = 17 - 15 = 2\text{ cm}$

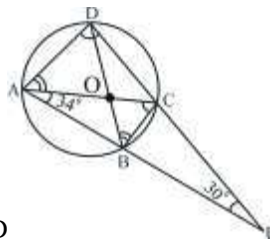
428. In a circle with centre O, ABCD is a cyclic quadrilateral and AC is the diameter. Chords AB and DC are produced to meet at E. If $\angle CAE = 34^\circ$ and $\angle E = 30^\circ$, then $\angle CBD$ is equal to :

- (a) 24° (b) 36°
(c) 26° (d) 34°

SSC CGL (Tier-II) 13-09-2019

Ans. (c)

In ΔAEC ,
 $\angle ACE = 180^\circ - (34^\circ + 30^\circ)$
 $= 180^\circ - 64^\circ = 116^\circ$
 \therefore AC is diameter
 $\therefore \angle ADC = 90^\circ$
[angle in semicircle]
 $\angle ACE$, exterior angle of ΔADC
 $\angle ACE = \angle ADC + \angle DAC$
 $116^\circ = 90^\circ + \angle DAC$
 $\angle DAC = 26^\circ$
[The angle subtended by the same chord in same segment are equal]
 $\angle DBC = 26^\circ$

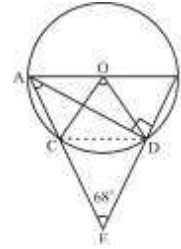


429. In a circle with centre O, AC and BD are two chords. AC and BD meet at E when produced. If AB is the diameter and $\angle AEB = 68^\circ$, then the measure of $\angle DOC$ is :

- (a) 32° (b) 30°
(c) 44° (d) 22°

SSC CGL (Tier-II) 12-09-2019

Ans. (c)



In ΔABD ,
 $\angle ADB = 90^\circ$ [Angle in semicircle]
 $\therefore \angle ADE = 180 - 90^\circ = 90^\circ$ [Linear pair]
In ΔAED ,
 $\angle EAD = 180^\circ - (90^\circ + 68^\circ) = 22^\circ$
 $\therefore \angle DOC = 2 \times \angle CAD$ (By using theorem)
 $= 2 \times \angle EAD$ ($\because \angle EAD = \angle CAD$)
 $= 2 \times 22 = 44^\circ$

430. In a circle, AB and DC are two chords. When AB and DC are produced, they meet at P. If PC = 5.6 cm, PB = 6.3 cm and AB = 7.7 cm, then the length of CD is :

- (a) 10.15 cm (b) 9.25 cm
(c) 8.35 cm (d) 9 cm

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : $PA \times PB = PD \times PC$

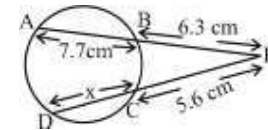
$$14 \times 6.3 = PD \times 5.6$$

$$PD = \frac{14 \times 63}{56} = 15.75$$

$$CD = PD - PC$$

$$= 15.75 - 5.6$$

$$x = CD = 10.15\text{ cm}$$



431. Chord AB of a circle is produced to a point P, and C is a point on the circle such that PC is a tangent to the circle. If PC = 18 cm, and BP = 15 cm, then AB is equal to :

- (a) 8.5 cm (b) 6.2 cm
(c) 5.8 cm (d) 6.6 cm

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Ans. (d)

Let, AB = x cm

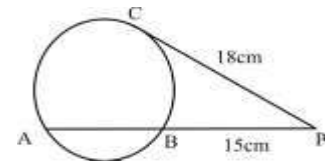
$$PC^2 = AP \times BP$$

$$18 \times 18 = (x + 15) \times 15$$

$$x + 15 = \frac{18 \times 6}{5}$$

$$x = \frac{108}{5} - 15 = \frac{108 - 75}{5} = \frac{33}{5}$$

$$x = 6.6\text{ cm}$$



432. P is a point outside a circle with centre O, and it is 14cm away from the centre. A secant PAB drawn from P intersects the circle at the points A and B such that PA = 10 cm and PB = 16cm. The diameter of the circle, is:

- (a) 10 cm (b) 11 cm
(c) 13 cm (d) 12 cm

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) Let radius of circle = x cm

$$\text{Diameter} = 2x$$

$$PD \times PC = PB \times PA$$

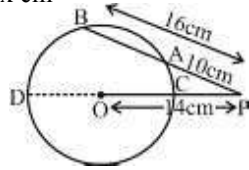
$$(14 + x) \times (14 - x) = 16 \times 10$$

$$14^2 - x^2 = 160$$

$$x^2 = 196 - 160 = 36$$

$$x = 6$$

$$\text{Diameter} = 2x = 2 \times 6 = 12 \text{ cm}$$



433. Two circles of radii 5 cm and 3 cm intersect each other at A and B, and the distance between their centres is 6 cm. The length (in cm) of the common chord AB is:

(a) $\frac{4\sqrt{14}}{3}$

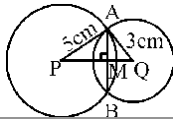
(b) $\frac{2\sqrt{13}}{3}$

(c) $\frac{2\sqrt{14}}{3}$

(d) $\frac{4\sqrt{13}}{3}$

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (a)



Line PQ is perpendicular and bisector of AB.

$$AM = BM$$

$$\text{Semiperimeter } (s) = \frac{5+3+6}{2} = 7 \text{ cm}$$

$$\text{Area of } \triangle APQ = \sqrt{7 \times 2 \times 4 \times 1}$$

$$\frac{1}{2} \times 6 \times AM = 2\sqrt{14}$$

$$AM = \frac{2\sqrt{14}}{3}$$

$$AB = \frac{4\sqrt{14}}{3}$$

434. From a point P which is at a distance of 10 cm from the centre O of a circle of radius 6 cm, a pair of tangents PQ and PR to the circle at point Q and R respectively, are drawn. Then the area of the quadrilateral PQOR is equal to:

(a) 24 sq.cm

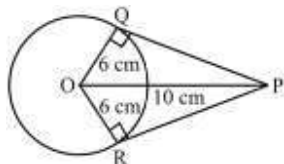
(b) 40 sq.cm

(c) 48 sq.cm

(d) 30 sq.cm

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c)



In $\triangle OQP$,

$$QP^2 = OP^2 - OQ^2 = 10^2 - 6^2$$

$$QP = 8 \text{ cm}$$

$$QP = RP$$

$$= 8 \text{ cm (Tangent lines)}$$

$$\text{Area of } \square PQOR = \text{Area of } \triangle OQP + \text{Area of } \triangle ORP$$

$$= \frac{1}{2} \times 6 \times 8 + \frac{1}{2} \times 6 \times 8$$

$$= 48 \text{ sq. cm}$$

435. The tangent at a point A on a circle with centre O intersects the diameter PQ of the circle, when extended, at point B. If $\angle BAQ = 105^\circ$, then $\angle APQ$ is equal to:

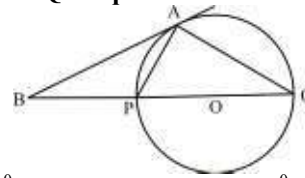
(a) 65°

(b) 60°

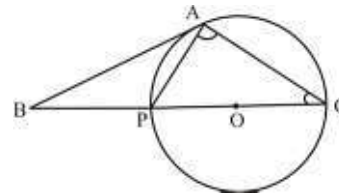
(c) 55°

(d) 75°

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Ans. (d)



$\therefore \angle PAQ = 90^\circ$ [Angle in semicircle]

$$\angle BAQ = \angle BAP + \angle PAQ$$

$$105^\circ = \angle BAP + 90^\circ$$

$$\angle BAP = 15^\circ$$

$$\angle AQP = \angle BAP$$

$$= 15^\circ$$

In $\triangle PAQ$,

$$\angle APQ + \angle PAQ + \angle AQP = 180^\circ$$

$$\angle APQ = 180^\circ - 90^\circ - 15^\circ$$

$$= 75^\circ$$

436. P is a point outside a circle and is 26 cm away from its centre. A secant PAB drawn from P intersect the circle at points A and B such that $PB = 32$ cm and $PA = 18$ cm. The radius of the circle (in cm) is:

(a) 8

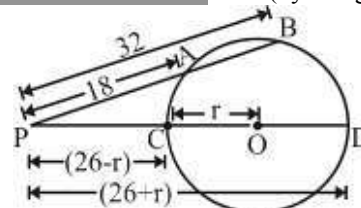
(b) 10

(c) 12

(d) 13

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b) $PA \times PB = PC \times PD$ (by using theorem)



$$18 \times 32 = (26 - r)(26 + r)$$

$$576 = 676 - r^2$$

$$r^2 = 100$$

$$r = 10 \text{ cm}$$

437. In a circle with centre O, AD is a diameter and AC is a chord. Point B is on AC such that $OB = 7$ cm and $\angle OBA = 60^\circ$. If $\angle DOC = 60^\circ$, then what is the length of BC?

(a) 3.5 cm

(b) $3\sqrt{7}$ cm

(c) 7 cm

(d) $5\sqrt{7}$ cm

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Given, $OB = 7$ cm.

$\angle OBA = 60^\circ$, $\angle DOC = 60^\circ$

On joining DC

$\angle DOC = 60^\circ$

(Angle formed on centre)

In $\triangle DAC$,

$$\angle DAC = \frac{\angle DOC}{2} = \frac{60^\circ}{2} = 30^\circ$$

$$\begin{aligned} \angle AOB &= 180^\circ - (\angle OAB + \angle OBA) \\ &= 180^\circ - (30^\circ + 60^\circ) = 90^\circ \end{aligned}$$

In $\triangle OBC$,

$$\begin{aligned} \angle OBC &= 180^\circ - \angle OBA \\ &= 180^\circ - 60^\circ = 120^\circ \end{aligned}$$

$$\begin{aligned} \angle BOC &= 180^\circ - (\angle AOB + \angle DOC) \\ &= 180^\circ - (90^\circ + 60^\circ) = 30^\circ \end{aligned}$$

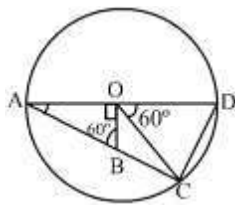
$$\begin{aligned} \angle BCO &= 180^\circ - (\angle OBC + \angle BOC) \\ &= 180^\circ - (120^\circ + 30^\circ) = 30^\circ \end{aligned}$$

\therefore Again In $\triangle OBC$,

$\angle BOC = \angle OCB$ [Corresponding angles are equal to corresponding sides]

$\therefore OB = BC$

$\Rightarrow BC = 7$ cm. ($\because OB = 7$ cm)

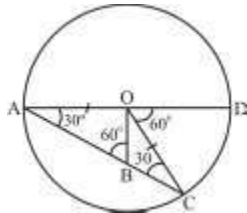


438. In a circle of centre O , AD is a diameter and AC is a chord. B is a point on AC such that $OB = 5$ cm and $\angle OBA = 60^\circ$. If $\angle DOC = 60^\circ$ then the length of BC is :

- (a) 4 cm (b) $3\sqrt{5}$ cm
(c) $5\sqrt{3}$ cm (d) 5 cm

SSC CHSL 01/07/2019 (Shift-III)

Ans. (d) :



$$\begin{aligned} \angle AOC + \angle DOC &= 180^\circ \quad (\text{Linear pair}) \\ \angle AOC + 60^\circ &= 180^\circ \\ \angle AOC &= 120^\circ \end{aligned}$$

In triangle AOC ,

$AO = OC$ (Radius)

$\therefore \angle ACO = \angle OAC$ (corresponding angles of equal corresponding sides)

$$\begin{aligned} \angle OAC + \angle ACO + \angle AOC &= 180^\circ \\ 2\angle ACO + 120^\circ &= 180^\circ \end{aligned}$$

$$\angle ACO = \frac{60^\circ}{2}$$

$\angle ACO = 30^\circ$

$\therefore \angle OAC = 30^\circ$

$\angle ABO + \angle CBO = 180^\circ$

$60^\circ + \angle CBO = 180^\circ$

$\angle CBO = 120^\circ$

In $\triangle OBC$,

$\angle CBO + \angle BOC + \angle OCB = 180^\circ$

$120^\circ + \angle BOC + 30^\circ = 180^\circ$

$\angle BOC = 30^\circ$

$\angle BOC = \angle BCO = 30^\circ$

$\therefore BC = OB$

$\therefore BC = 5$ cm

439. Diameters AB and chord CD intersect each other at a point E in a circle of centre O . A is joined with C and D . If $\angle BOC = 48^\circ$ and $\angle AOD = 100^\circ$ then what is the measure of $\angle CEB$?

- (a) 78° (b) 74°
(c) 72° (d) 82°

SSC CHSL 03/07/2019 (Shift-III)

Ans. (b) :

$$\angle ACD = \frac{\angle AOD}{2} = \frac{100^\circ}{2} = 50^\circ$$

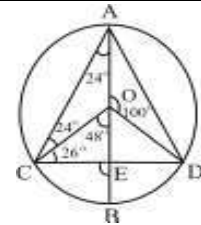
$$\angle BAC = \frac{\angle BOC}{2} = \frac{48^\circ}{2} = 24^\circ$$

$\angle ACO = \angle OAC = 24^\circ$
($AO = CO = \text{radius}$)

$\angle ACE = \angle ACO + \angle OCE$

$\angle OCE = 50^\circ - 24^\circ = 26^\circ$

In $\triangle OCE$, $\angle CEB = \angle OCE + \angle EOC$ (Exterior angle)
 $= 26^\circ + 48^\circ = 74^\circ$

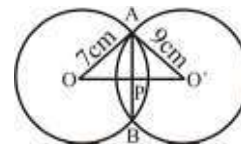


440. Two circles of radii 7 cm and 9 cm intersect each other at points A and B . If $AB = 10$ cm and distance between the centres of the circle is x cm then the value of x is :

- (a) $2(\sqrt{6} + \sqrt{7})$ (b) $2(\sqrt{6} + \sqrt{14})$
(c) $(\sqrt{6} + \sqrt{14})$ (d) $(\sqrt{6} + 7)$

SSC CHSL 05/07/2019 (Shift-I)

Ans. (b) :



According to the question,

$OA = 7$ cm & $O'A = 9$ cm

and $AB = 10$ cm

$\therefore PA = 5$ cm

In $\triangle OPA$,

$OA^2 = OP^2 + PA^2$

$7^2 = OP^2 + 5^2$

$OP^2 = 49 - 25$

$OP^2 = 24$

$OP = 2\sqrt{6}$ cm

and In $\triangle APO'$,

$O'A^2 = AP^2 + PO'^2$

$9^2 = 5^2 + PO'^2$

$PO'^2 = 81 - 25$

$PO'^2 = 56$

$PO' = 2\sqrt{14}$ cm

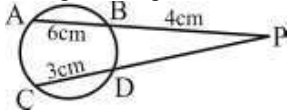
Hence $OO' = OP + PO'$
 $= 2\sqrt{6} + 2\sqrt{14}$
 $= 2(\sqrt{6} + \sqrt{14})$

441. The chords AB and CD of a circle intersect each other at point P externally. If AB = 6 cm, CD = 3 cm and PB = 4 cm, then the length of PD is:

- (a) 5 (b) 2
 (c) 6 (d) 7

SSC CHSL 08/07/2019 (Shift-II)

Ans. (a) : According to the question,



Chords AB & CD are meet at point P.
 then, $AP \times BP = CP \times DP$

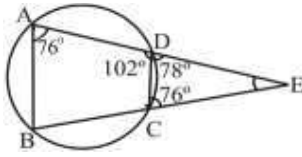
$(6 + 4) \times 4 = (3 + DP) \times DP$
 $40 = 3DP + DP^2$
 $\Rightarrow DP^2 + 3DP - 40 = 0$
 $\Rightarrow DP^2 + 8DP - 5DP - 40 = 0$
 $\Rightarrow DP(DP + 8) - 5(DP + 8) = 0$
 $\Rightarrow (DP + 8)(DP - 5) = 0$
 $DP = 5$ cm

442. In a circle, AD and BC intersect each other at point E externally. If $\angle BAE = 76^\circ$ and $\angle ADC = 102^\circ$, then $\angle AEC = ?$

- (a) 28° (b) 24°
 (c) 26° (d) 25°

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) :



$\angle ADC + \angle CDE = 180^\circ$
 $102^\circ + \angle CDE = 180^\circ$
 $\angle CDE = 78^\circ$
 $\angle DCE = \angle BAD$ (by theorem)
 $= 76^\circ$

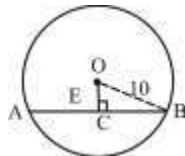
In $\triangle CDE$,
 $\angle CDE + \angle DEC + \angle ECD = 180^\circ$
 $78^\circ + \angle DEC + 76^\circ = 180^\circ$
 $\angle DEC = 26^\circ$ or $\angle AEC = 26^\circ$

443. In a circle centred at O, AB is a chord and C is any point on AB such that OC is perpendicular to AB. If the radius of the circle is 10 cm and OC = 6 cm, then the length of the chord is

- (a) 8 cm (b) 12 cm
 (c) 4 cm (d) 16 cm

SSC CHSL -26/10/2020 (Shift-II)

Ans. (d)



Perpendicular drawn from centre on chord divides it into two equal parts

$AB = 2CB$

In $\triangle OCB$,

$OB^2 = CB^2 + OC^2$

$CB^2 = OB^2 - OC^2$

$CB^2 = 10^2 - 6^2$

$CB = \sqrt{100 - 36}$

$CB = \sqrt{64}$

$CB = 8$

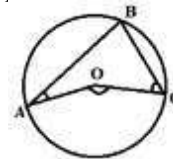
$AB = 2CB$

$AB = 2 \times 8$

$AB = 16$ cm

444. In the given figure, O is the centre of the circle. If $\angle BAO = 30^\circ$ and $\angle BCO = 50^\circ$, then $\angle AOC$ is equal to:

- (a) 80° (b) 60°
 (c) 160° (d) 40°



SSC CHSL -19/10/2020 (Shift-III)

Ans. (c)

Construction: Join OB

In $\triangle OAB$,

$OA = OB$

$\angle OAB = \angle OBA = 30^\circ$

In $\triangle OBC$,

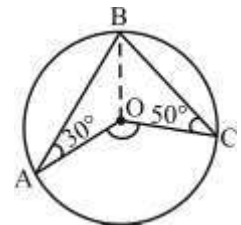
$OB = OC$

$\angle OCB = \angle OBC = 50^\circ$

$\therefore \angle ABC = \angle OBA + \angle OBC = 30^\circ + 50^\circ = 80^\circ$

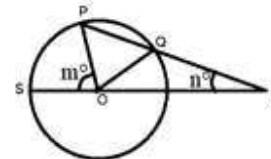
\therefore The angle subtended by an arc at the centre is double the angle subtended by it at circumference of the circle.

$\angle AOC = 2\angle ABC = 2 \times 80^\circ = 160^\circ$



445. In the given figure, if $OQ = QR$, then the value of m is:

- (a) $3n^\circ$ (b) n°
 (c) $4n^\circ$ (d) $2n^\circ$



SSC CHSL -16/10/2020 (Shift-I)

Ans. (a) $\because OQ = QR$

$\therefore \angle ORQ = n^\circ$

(Corresponding equal sides have equal angles)

$\therefore \angle PQO = \angle QOR + \angle QRO$ (by exterior angle property)
 $= n^\circ + n^\circ$

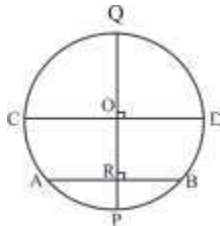
$\therefore \angle PQO = 2n^\circ$

$\therefore \angle OPQ = 2n^0$ ($\because OP = OQ$) [Radius is of circle]
 $\therefore \angle SOP + \angle POQ + \angle QOR = 180^0$
 $\therefore m^0 + \angle POQ + n^0 = 180^0$ _____ (i)
 Again in ΔPOQ ,
 $\angle POQ + \angle OQP + \angle OPQ = 180^0$
 $\angle POQ + 2n^0 + 2n^0 = 180^0$
 or $4n^0 + \angle POQ = 180^0$ _____ (ii)
 From eqⁿ (i) & (ii)
 $m^0 + n^0 + \angle POQ = 4n^0 + \angle POQ$
 or $m^0 = 3n^0$

446. If the diameter of a circle bisects each of the two chords of the circle, then both the chords:
- intersect at 30^0
 - intersect at 60^0
 - intersect at 90^0
 - are parallel to each other

SSC CHSL -16/10/2020 (Shift-I)

Ans. (d)



PQ is diameter of circle and, AB and CD are the two chords.
 \therefore PQ bisects both chords.

(The bisector of chords which passes through center of circle is perpendicular on the chord.)

$\therefore PQ \perp AB, PQ \perp CD$

$\therefore \angle QOD = \angle ORB = 90^0$

But these are alternate angles.

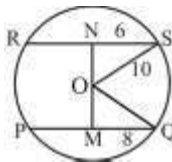
AB \parallel CD

- 447 In a circle of radius 10 cm, PQ and RS are two parallel chords of lengths 16 cm and 12 cm, respectively. What is the distance between the chords if they are on opposite sides of the centre?

- 8 cm
- 14 cm
- 2 cm
- 6 cm

SSC CHSL -16/10/2020 (Shift-II)

Ans. (b) :



\therefore Radius of circle = OS = OQ = 10cm

\therefore Chord (PQ) = 16cm

$\therefore PM = MQ = \frac{16}{2} = 8$ cm

\therefore Chord (RS) = 12cm

$\therefore RN = NS = \frac{12}{2} = 6$ cm

\therefore In ΔSNO ,
 $OS^2 = ON^2 + NS^2$
 $10^2 = ON^2 + 6^2$
 $ON^2 = 100 - 36$
 $ON = \sqrt{64}$
 $ON = 8$ cm

Again in ΔOMQ ,
 $OQ^2 = OM^2 + MQ^2$
 $10^2 = OM^2 + 8^2$
 $OM^2 = 100 - 64$
 $OM = \sqrt{36}$
 $OM = 6$

$\therefore MN = OM + ON = 6 + 8 = 14$ cm

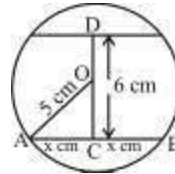
Distance between both chords = 14 cm

448. In a circle, two equal and parallel chords are 6 cm apart and they lie on the opposite sides of the centre of the circle, whose radius is 5 cm. The length of each chord (in cm), is:

- 12
- 8
- 6
- 10

SSC CHSL -15/10/2020 (Shift-I)

Ans. (b)



$\therefore CD = OC + OD = 6$ cm

\therefore Into two equal parts.

$OA^2 = OC^2 + AC^2$

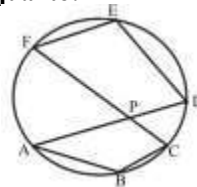
$(5)^2 = (3)^2 + (x)^2$

$x^2 = 25 - 9 = 16 = 4^2$

$x = 4$ cm

$\therefore AB = AC + BC = 4 + 4 = 8$ cm

449. In the following figure, if angles $\angle ABC = 95^0$ $\angle FED = 115^0$ (not to scale). Then the angle $\angle APC$ is equal to:



- 135^0
- 155^0
- 150^0
- 120^0

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) Given, $\angle ABC = 95^0$

$\angle FED = 115^0$



On joining point F to point A, a cyclic quadrilateral ABCF is formed

Hence, $\angle AFC = 85^\circ$

Now, In cyclic quadrilateral ADEF

$$\angle FAD = 180^\circ - 115^\circ = 65^\circ$$

but $\angle FPD$, $\angle FAP$ & $\angle AFP$ are exterior angles

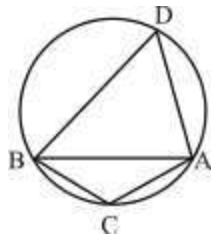
Hence $\angle FPD = 65^\circ + 85^\circ$

$$\angle FPD = 150^\circ$$

$$\angle FPD = \angle APC$$

$$\angle APC = 150^\circ$$

450. If in the following figure (no to the scale), $\angle ACB = 135^\circ$ and the radius of the circle is $2\sqrt{2}$ cm, then the length of the chord AB is:



- (a) $4\sqrt{2}$ cm (b) 6 cm
(c) 4 cm (d) $3\sqrt{2}$

SSC CHSL -13/10/2020 (Shift-II)

Ans. (c) : \because DBCA is a cyclic quadrilateral

$$\therefore \angle BCA + \angle BDA = 180^\circ$$

$$\therefore \angle BDA = 180^\circ - 135^\circ = 45^\circ$$

$$\therefore \angle BOA = 2 \times \angle BDA = 2 \times 45^\circ = 90^\circ$$

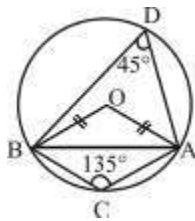
(\because $\triangle BOA$ is a right angled triangle)

$$OB = OA = 2\sqrt{2}$$

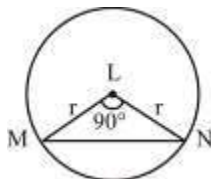
$$\therefore (BA)^2 = (2\sqrt{2})^2 + (2\sqrt{2})^2 = 16$$

$$\Rightarrow BA = 4 \text{ cm}$$

$$\therefore \text{Length of chord (AB)} = 4 \text{ cm}$$



451. In the figure, L is the centre of the circle and ML is the perpendicular to LN. If the area of the triangle MLN is 36, then the area of the circle is:



- (a) 70π (b) 72π
(c) 68π (d) 66π

SSC CHSL -12/10/2020 (Shift-II)

Ans. (b) : \because $\triangle MLN$ is a right angled triangle

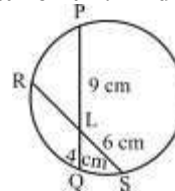
$$\therefore \text{Area} = \frac{1}{2} \text{Base} \times \text{Height}$$

$$\Rightarrow \frac{1}{2} r \times r = 36$$

$$\Rightarrow r^2 = 72$$

$$\text{Area of circle} = \pi r^2 = 72\pi$$

452. In the given figure, chord PQ and RS intersect each other at Point L. Find the length of RL.



- (a) 3 cm (b) 6 cm
(c) 8 cm (d) 2 cm

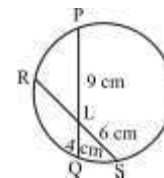
SSC CHSL -12/10/2020 (Shift-I)

Ans. (b) :

Let length of RL = x cm

$$9 \times 4 = 6 \times x$$

$$x = 6 \text{ cm}$$

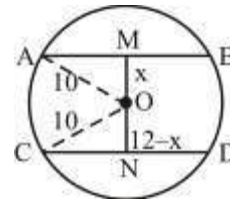


453. Two parallel chords are drawn in a circle of diameter 20 cm. The length of one chord is 16 cm and the distance between the two chords is 12 cm. The length of the other chord is:

- (a) 18 cm (b) 12 cm
(c) 16 cm (d) 20 cm

SSC CHSL -14/10/2020 (Shift-III)

Ans. (c) :



Let $OM = x$ cm

$$ON = (12 - x) \text{ cm}$$

\because Perpendicular drawn from centre to chord, bisects chord.

In $\triangle OMA$,

$$x^2 = 100 - 64$$

$$x = 6 \text{ cm}$$

$\therefore ON = 6$ cm

In $\triangle ONC$

$$CN^2 = OC^2 - ON^2 = 10^2 - 6^2 = 64$$

$CN = 8$ cm

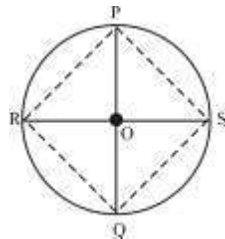
$\therefore CD = 16$ cm

454. In a circle, PQ and RS are two diameters that are perpendicular to each other. Find the length of the chord PR.

- (a) $\frac{PQ}{2}$ (b) $\sqrt{2} PQ$
(c) $\frac{PQ}{\sqrt{2}}$ (d) $2 PQ$

SSC CHSL -14/10/2020 (Shift-III)

Ans. (c)



∴ PQ and RS are perpendicular bisector.
 $\angle PRQ = \angle PSQ = 90^\circ$ [Angle in semicircle]
 ∴ Square of PSQR
 Side of square = $\frac{PQ}{\sqrt{2}}$

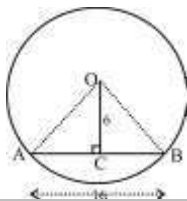
455. In a circle centred at O, AB is a chord and C is any point on AB, such that OC is perpendicular to AB. If the length of the chord is 16 cm and OC = 6 cm, the radius of circle is:

- (a) 10 cm (b) 6 cm
 (c) 12 cm (d) 8 cm

SSC CHSL -19/03/2020 (Shift-III)

Ans. (a) : ∴ Chord AB = 16cm

$$\therefore AC = CB = \frac{16}{2} = 8 \text{ cm}$$



Perpendicular drawn from centre to chord, bisects chord.

∴ Right angle $\triangle ACO$

$$(AO)^2 = (AC)^2 + (OC)^2$$

$$(AO)^2 = 8^2 + 6^2 = 64 + 36$$

$$(AO)^2 = \sqrt{100} = 10 \text{ cm}$$

Radius of circle = 10cm

456. A, B and C are three points on the circle. If $AB = AC = 7\sqrt{2}$ cm and $\angle BAC = 90^\circ$, then the radius is equal to:

- (a) 7 cm (b) 6 cm
 (c) 14 cm (d) $7\sqrt{2}$ cm

SSC CHSL -20/10/2020 (Shift-II)

Ans : (a)

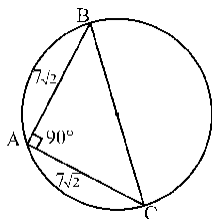
$$BC^2 = AB^2 + AC^2$$

$$BC^2 = 49 \times 2 + 49 \times 2$$

$$BC^2 = 49 \times 2 \times 2$$

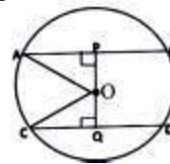
$$BC = 7 \times 2$$

$$BC = 14 \text{ cm}$$



$$\therefore \text{Radius of circle} = \frac{BC}{2} = \frac{14}{2} = 7 \text{ cm}$$

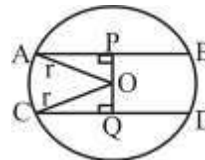
457. In the figure, O is the centre of a circle of radius 29cm, $OP \perp AB$, $OQ \perp CD$ and AB is parallel CD. If $AB = 40$ cm and $CD = 42$ cm, then the length of PQ is:



- (a) 20cm (b) 32cm
 (c) 21cm (d) 41cm

SSC CHSL -21/10/2020 (Shift-III)

Ans. (d)



Given, radius (r) = 29cm

$$AB = 40 \text{ cm}$$

$$CD = 42 \text{ cm}$$

$$PQ = ?$$

$$AP = PB$$

$$CQ = QD$$

According to the question,

$$AP = \frac{AB}{2} = \frac{40}{2} = 20 \text{ cm}$$

$$CQ = \frac{CD}{2} = \frac{42}{2} = 21 \text{ cm}$$

In $\triangle AOP$,

$$(AO)^2 = (AP)^2 + (PO)^2$$

$$(29)^2 = (20)^2 + (PO)^2$$

$$(PO)^2 = 841 - 400$$

$$PO = 21 \text{ cm}$$

In $\triangle COQ$,

$$(CO)^2 = (CQ)^2 + (QO)^2$$

$$(29)^2 = (21)^2 + (QO)^2$$

$$(QO)^2 = 841 - 441$$

$$QO = 20 \text{ cm}$$

$$PQ = PO + QO$$

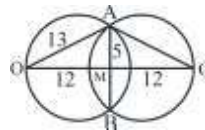
$$PQ = 21 + 20 = 41 \text{ cm}$$

458. The circles of same radius 13cm intersect each other point at A and B. If $AB = 10$ cm then the distance between their centres is:

- (a) 24cm (b) 12cm
 (c) 26cm (d) 18cm

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a)



$$AM = \frac{AB}{2} = \frac{10}{2} = 5$$

In $\triangle AOM$,

$$OA^2 = OM^2 + AM^2$$

$$(13)^2 = OM^2 + (5)^2$$

$$169 - 25 = OM^2$$

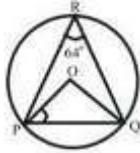
$$144 = OM^2$$

$$OM = 12$$

$$\text{Distance between centres} = 2 \times OM$$

$$= 2 \times 12 = 24\text{cm}$$

459. In the given figure O is the centre of the circle. If angle PRQ = 64°, then what is the measure of angle OPQ?



- (a) 32° (b) 26°
(c) 60° (d) 64°

SSC CHSL -15/10/2020 (Shift-II)

Ans. (b) : Given, $\angle PRQ = 64^\circ$

{ \because Angle subtended by chord on centre is double the angle subtended by same chord on circumference }

$$\therefore \angle POQ = 2\angle PRQ = 2 \times 64^\circ = 128^\circ$$

$$\therefore \angle OPQ = \angle OQP \quad (\because PO = OQ = \text{Radius of circle})$$

\therefore In ΔPQO ,

$$\angle POQ + \angle OPQ + \angle OQP = 180^\circ$$

$$128^\circ + \angle OPQ + \angle OPQ = 180^\circ \quad [\angle OPQ = \angle OQP]$$

$$2\angle OPQ = 180^\circ - 128^\circ$$

$$2\angle OPQ = 52^\circ$$

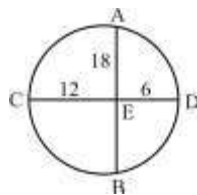
$$\angle OPQ = 26^\circ$$

460. In a circle, chords AB and CD intersect each other at point E. If CD = 18 cm, DE = 6 cm and AE = 18 cm then BE = ?

- (a) 3 cm (b) 6 cm
(c) 8 cm (d) 4 cm

SSC CHSL -02/07/2019 (Shift-III)

Ans. (d) : Given,



$$CD = 18 \text{ cm}$$

$$DE = 6 \text{ cm}$$

$$AE = 18 \text{ cm}$$

$$BE = ?$$

$$AE \times BE = CE \times ED$$

$$18 \times BE = 12 \times 6$$

$$BE = 4 \text{ cm}$$

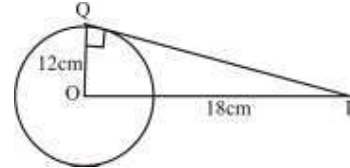
(XI) Problems based on Tangent to Circle

461. The length of the tangent drawn to a circle of radius 12 cm from a point 18 cm away from the centre of the circle is:

- (a) $3\sqrt{5}$ cm (b) $6\sqrt{5}$ cm
(c) $9\sqrt{5}$ cm (d) $2\sqrt{5}$ cm

SSC CHSL 01/06/2022 (Shift- III)

Ans. (b)

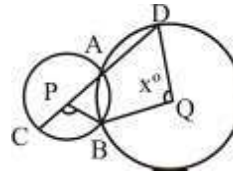


$$PQ^2 = 18^2 - 12^2 = (18 - 12)(18 + 12) = 6 \times 30$$

$$PQ = 6\sqrt{5} \text{ cm}$$

Hence, the length of tangent = $6\sqrt{5}$ cm

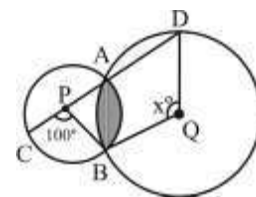
462. two circles. The circles are intersecting at point A and B. PA produced on both the sides meets the circles at C and D. If $\angle CPB = 100^\circ$, then find the value of x.



- (a) 115 (b) 120
(c) 110 (d) 100

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (d) \because Given, $\angle CPB = 100^\circ$



Given, $\angle CPB = 100^\circ$, $\angle BQD = x^\circ$

Then, $\angle DPB = 180^\circ - 100^\circ = 80^\circ$

\therefore In quadrilateral, sum of two opposite angles are is 180° .

So, $\angle DPB + \angle DQB = 180^\circ$

$$80^\circ + x^\circ = 180^\circ$$

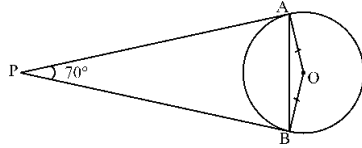
$$\angle x^\circ = 100^\circ$$

463. If PA and PB are tangents drawn from an external point P to a circle with centre O such that $\angle APB = 70^\circ$, then $\angle OAB$ is equal to:

- (a) 30° (b) 35°
(c) 40° (d) 25°

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b)



$\angle APB = 70^\circ$ (Given)
 $\angle APB = 180^\circ - \angle AOB$
 $\angle AOB = 180^\circ - 70^\circ = 110^\circ$
 In $\triangle AOB$,
 $\angle AOB + \angle OAB + \angle OBA = 180^\circ$
 $\angle OBA + \angle OAB = 180^\circ - 110^\circ$ ($\because \angle OBA = \angle OAB$)
 $\therefore 2\angle OAB = 70^\circ$
 $\angle OAB = 35^\circ$

464. AB is the diameter of a circle. C is the Point on tangent drawn on A. If AB = 24cm and AC is 7cm then the length of BC is?

- (a) 15cm (b) 50cm
(c) 26cm (d) 25cm

SSC CHSL -21/10/2020 (Shift-I)

Ans. (d) According to the question,

AB = 24cm
AC = 7cm



Tangent line is perpendicular to line passing through centre

$$\therefore \angle CAB = 90^\circ$$

then, $\triangle CAB$ is a right angled triangle

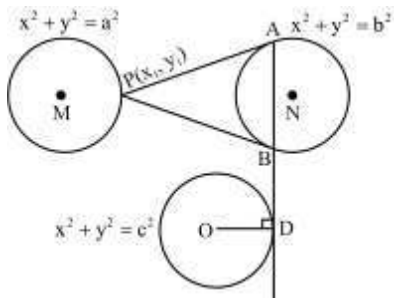
$$\begin{aligned} \therefore BC &= \sqrt{(AB)^2 + (AC)^2} \\ &= \sqrt{(24)^2 + (7)^2} \\ &= \sqrt{576 + 49} = \sqrt{625} \\ &= 25\text{cm} \end{aligned}$$

465. A chord of contact of tangents drawn from a point of circle $x^2 + y^2 = a^2$ to the circle $x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = c^2$ such that $b^p = a^m c^n$, where $m, n, p \in \mathbb{N}$ and m, n, p are relatively prime then find the value of $2m + n + 2p - 3$:

- (a) 4 (b) 2
(c) 6 (d) 5

SSC CHSL -08/07/2019 (Shift-I)

Ans. (a)



If $P(x_1, y_1)$ is situated on circle $x^2 + y^2 = a^2$ then $x_1^2 + y_1^2 = a^2$

equation of chord drawn from tangent on circle from point $x^2 + y^2 = b^2$ from point (x_1, y_1) $xx_1 + yy_1 = b^2$
Length of perpendicular (c) drawn from circle $x^2 + y^2 = c^2$ of centre $(0, 0)$ on line $xx_1 + yy_1 = b^2$

$$\frac{b^2}{\sqrt{x_1^2 + y_1^2}} = c$$

$$\frac{b^2}{\sqrt{a^2}} = c$$

$$b^2 = ac$$

but $b^p = a^m \cdot c^n$

$$\therefore p = 2, \quad m = 1, \quad n = 1$$

Hence, $2m + n + 2p - 3$

$$= 2 + 1 + 4 - 3$$

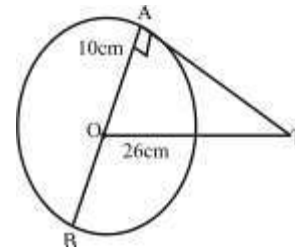
$$= 4$$

466. O is the centre of a circle with diameter 20 cm. T is a point outside the circle and TA is a tangent to a circle. If OT is = 26 cm, what is the length (in cm) of the tangent TA?

- (a) 20 (b) 26
(c) 24 (d) 18

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (c)



In Right angled triangle $\angle AOT$

$$AT^2 = 26^2 - 10^2$$

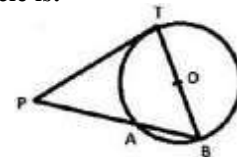
$$AT^2 = 676 - 100$$

$$AT^2 = 576$$

$$AT = 24\text{cm}$$

467. In the given figure, TB is a chord which passes through the center of the circle. PT is a tangent to the circle at the point T on the circle. If PT = 10cm, PA = 5cm and AB = xcm, then the radius of the circle is:

- (a) $6\sqrt{5}$ cm (b) $3\sqrt{5}$ cm
(c) $10\sqrt{3}$ cm (d) $5\sqrt{3}$ cm



SSC CHSL -21/10/2020 (Shift-I)

Ans. (d) By using theorem,

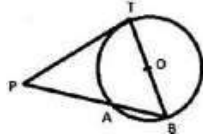
$$PT^2 = PA \times PB$$

$$(10)^2 = 5 \times (x + 5)$$

$$100 = 5x + 25$$

$$x = \frac{75}{5} = 15\text{cm}$$

Now, in right angled triangle PTB,
 $PT = 10, PB = 5 + 15 = 20\text{cm}$

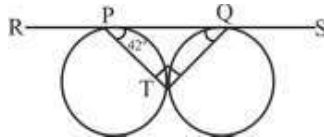


$$\begin{aligned} \therefore TB &= \sqrt{PB^2 - PT^2} \\ TB &= \sqrt{(20)^2 - (10)^2} \\ TB &= \sqrt{400 - 100} \\ TB &= \sqrt{300} = 10\sqrt{3} \\ \text{Radius} &= \frac{TB}{2} = \frac{10\sqrt{3}}{2} \\ &= 5\sqrt{3}\text{ cm} \end{aligned}$$

468. Two circles touch each other externally at T. RS is a direct common tangent to the two circles touching the circles at P and Q. $\angle TPQ = 42^\circ$. $\angle PQT$ (in degrees) is:
- (a) 48 (b) 45
 (c) 42 (d) 60

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (a)



$$\begin{aligned} \text{In } \Delta PTQ, \\ \angle PTQ &= 90^\circ \\ \angle TPQ &= 42^\circ \\ \Rightarrow \angle PTQ + \angle TPQ + \angle TQP &= 180^\circ \\ 90^\circ + 42^\circ + \angle TQP &= 180^\circ \\ \angle TQP &= 180^\circ - 132^\circ \\ \angle TQP &= 48^\circ \end{aligned}$$

469. O is the centre of a circle of radius 9 cm. M is a point outside the circle and MN is a tangent to the circle. What is the length (in cm) of OM if the length MN is 12 cm?

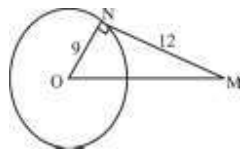
- (a) 15 (b) 21
 (c) 17 (d) 12

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : $\angle ONM = 90^\circ$

$$\begin{aligned} \text{In } \Delta ONM \\ (OM)^2 &= (ON)^2 + (NM)^2 \\ (OM)^2 &= (9)^2 + (12)^2 \end{aligned}$$

$$\begin{aligned} OM &= \sqrt{81 + 144} \\ \sqrt{225} &= 15\text{ cm.} \end{aligned}$$



470. AB is 12 cm long chord of a circle with center O and radius 10cm. The tangents at A and B intersect at P. What is the length of OP?

- (a) 12.5 cm (b) 12 cm
 (c) 10 cm (d) $2\sqrt{61}$ cm

SSC CHSL 09/08/2021 (Shift-II)

Ans. (a) : AB is the Chord of the circle with centre

Now $OP \perp AB$ So OP bisects AB

$$AL = BL = 12/2 = 6\text{cm}$$

$$OL = \sqrt{(OA)^2 - (AL)^2}$$

$$OL = \sqrt{(10)^2 - (6)^2}$$

$$\Rightarrow OL = 8\text{cm}$$

In ΔOAP and ΔOLA ,

$\angle OAP = \angle OLA$

$OP = OA$

$OA = OA$ (common)

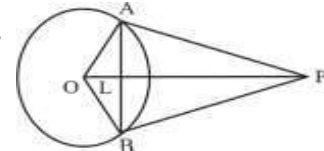
$\therefore \Delta OAP \sim \Delta OLA$

$$\Rightarrow \frac{OP}{OA} = \frac{OA}{OL}$$

$$\Rightarrow \frac{OP}{10} = \frac{10}{8}$$

$$\Rightarrow OP = 100/8$$

$$= 12.5\text{ cm.}$$

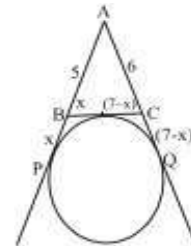


471. A ΔABC has sides 5 cm, 6 cm and 7 cm. AB extended touches a circle at P and AC extended touches the same circle at Q. Find the length (in cm) of AQ.

- (a) 13 (b) 9
 (c) 11 (d) 12

SSC CGL (Tier-I) 17/08/2021 (Shift I)

Ans. (b) :



$$\therefore AP = AQ$$

$$5 + x = 6 + 7 - x$$

$$2x = 8$$

$$x = 4$$

$$\therefore AQ = 6 + 7 - x$$

$$= 6 + 7 - 4$$

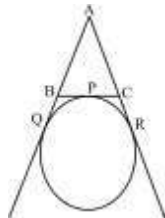
$$= 9\text{ cm}$$

472. A circle touches the side BC of ΔABC at P and also touches AB and AC produced at Q and R, respectively. If the perimeter of $\Delta ABC = 14.1$ cm, then the length (in cm) of AQ will be:

- (a) 10.3 (b) 7.05
 (c) 6.25 (d) 9.15

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b)



\therefore Length of tangents drawn from an external point to a circle are equal.

$$AQ = AR, BQ = BP, CP = CR$$

$$\begin{aligned} \therefore \text{Perimeter of } \triangle ABC &= AB + BC + CA \\ &= (AQ - BQ) + (BP + CP) + (AR - CR) \\ &= AQ - BP + BP + CR + AR - CR \\ &= AQ + AR \\ &= 2AQ \quad (\because AQ = AR) \end{aligned}$$

$$\begin{aligned} \text{So, } 2AQ &= 14.1 \text{ cm} \\ AQ &= 7.05 \text{ cm} \end{aligned}$$

Method 2

By theorem, we know that

$$AQ = AR = \frac{1}{2} \times \text{Perimeter of triangle}$$

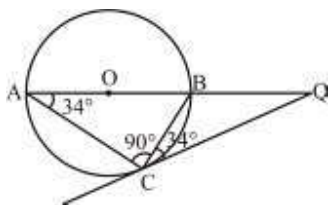
$$\begin{aligned} \text{So, } AQ &= \frac{1}{2} \times 14.1 \text{ cm} \\ &= 7.05 \text{ cm} \end{aligned}$$

473. AB is a diameter of the circle with centre O. The tangent at the point C on the circle meets AB produced at Q. If $\angle BAC = 34^\circ$, then the measure of $\angle CQA$ (in degrees) will be:

- (a) 24 (b) 36
(c) 22 (d) 26

SSC CHSL 15/04/2021 (Shift-I)

Ans. (c) :



Given,

$$\begin{aligned} \angle BAC &= 34^\circ \\ \angle ACB &= 90^\circ \end{aligned}$$

(Angle subtended by a diameter on any point of circle is 90°)

$$\angle BAC = \angle QCB = 34^\circ \text{ (Alternate segment theorem)}$$

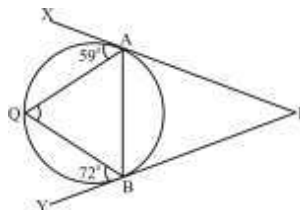
$$\begin{aligned} \angle CQA &= 180^\circ - (34^\circ + 90^\circ + 34^\circ) \\ &= 180^\circ - 158^\circ = 22^\circ \end{aligned}$$

474. In a circle with centre O, PAX and PBY are the tangents to the circle at points A and B, from an external point P. Q is any point on the circle such that $\angle QAX = 59^\circ$ and $\angle QBY = 72^\circ$. What is the measure of $\angle AQB$?

- (a) 31° (b) 72°
(c) 49° (d) 59°

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (c) :



For any circle, the angle formed by tangent and chord through the point of contact of the tangent is equal to the angle formed by the chord in the alternate segment.

$$\angle QAX = \angle ABQ = 59^\circ$$

$$\angle QBY = \angle QAB = 72^\circ$$

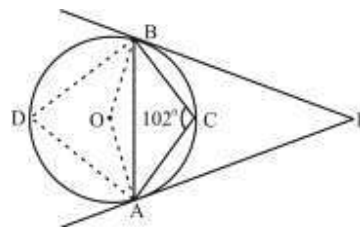
$$\begin{aligned} \angle AQB &= 180^\circ - (72^\circ + 59^\circ) \\ &= 180^\circ - 131^\circ \\ &= 49^\circ \end{aligned}$$

475. AB is a chord of a circle in minor segment with center O. C is a point on the minor arc between the points A and B. The tangents to the circle at A and B meet at the point P. If $\angle ACB = 102^\circ$, then what is the measure of $\angle APB$?

- (a) 29° (b) 27°
(c) 23° (d) 24°

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (d) :



Sum of opposite angles of a cyclic quadrilateral is 180° .

$$\angle ADB = 180^\circ - 102^\circ = 78^\circ$$

Angle subtended on centre of a circle by an arc is double the angle subtended on circumference of the circle.

$$\angle AOB = 2 \angle ADB = 2 \times 78^\circ = 156^\circ$$

$$\angle AOB + \angle APB = 180^\circ \text{ (By theorem)}$$

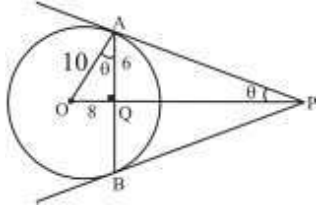
$$\angle APB = 180^\circ - 156^\circ = 24^\circ$$

476. Chord AB of a circle of radius 10 cm is at a distance 8 cm from the centre O. If tangents drawn at A and B intersect at P, then the length of the tangent AP (in cm) is :

- (a) 7.5 (b) 4
(c) 3.75 (d) 15

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (a) :



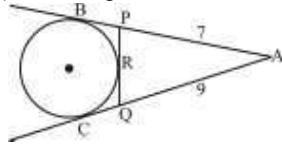
In ΔOQA ,
 $AQ = \sqrt{10^2 - 8^2} = 6\text{ cm}$
 $\therefore \angle APQ = \angle OAQ$ (By theorem)
 $\therefore \Delta OAQ \sim \Delta APQ$
 $\frac{OQ}{AQ} = \frac{AO}{AP}$
 $\frac{8}{6} = \frac{10}{AP}$
 $AP = 7.5\text{ cm}$

477. From an external point A, two tangents AB and AC have been drawn to a circle touching the circle at B and C respectively. P and Q are points on AB and AC respectively such that PQ touches the circle at R. If AB = 11 cm, AP = 7 cm and AQ = 9 cm, then find the length of PQ (in cm).

- (a) 7 (b) 5
 (c) 8 (d) 6

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (d) : From question,



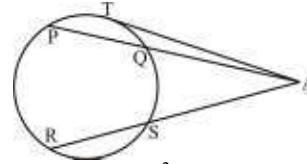
\therefore The tangents drawn from same external point are equal in lengths.
 $\therefore AB = AC, BP = PR$ and $CQ = QR$
 So, $AC = 11\text{ cm}$ [$\because AB = 11$ is given]
 $\therefore BP = AB - AP = 11 - 7 = 4\text{ cm}$
 $CQ = AC - AQ = 11 - 9 = 2\text{ cm}$
 $\therefore PR = 4\text{ cm}$ [$\because BP = PR$]
 and $QR = 2\text{ cm}$ [$\because CQ = QR$]
 $\therefore PQ = PR + QR$
 $= 4 + 2$
 $= 6\text{ cm}$.
 Hence, option (d) is correct answer.

478. Two chords PQ and RS of a circle meet at A when produced. AT is a tangent to the circle meeting it at T. The ratio PA : SA is equal to which of the following?

- (a) RQ : QT (b) AQ : AT
 (c) AQ : QR (d) RA : AQ

SSC CHSL 06/08/2021 (Shift-I)

Ans. (d) :



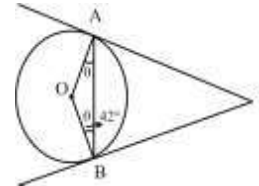
$PA \times AQ = RA \times SA = AT^2$
 $\frac{PA}{SA} = \frac{RA}{AQ}$
 $PA : SA = RA : AQ$

479. PA and PB are tangents drawn to a circle with center O from an external point P. If A and B are points on the circle and $\angle OBA = 42^\circ$, then $\angle APB$ is:

- (a) 78° (b) 84°
 (c) 76° (d) 86°

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) :



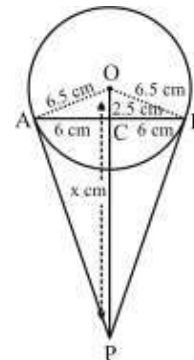
$\therefore \angle OBA = \angle OAB = \theta = 42^\circ$
 $\therefore \angle AOB = 180^\circ - (42^\circ + 42^\circ) = 180^\circ - 84^\circ = 96^\circ$
 From $\angle AOB + \angle APB = 180^\circ$
 $180^\circ - \angle AOB = \angle APB$
 $\angle APB = 180^\circ - 96^\circ = 84^\circ$

480. In a circle with centre O and radius 6.5 cm, a chord AB is at a distance 2.5 cm from the centre. If tangents at A and B intersect at P, then find the distance of P from the centre.

- (a) 17 cm (b) 15 cm
 (c) 16.9 cm (d) 18 cm

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) :



In ΔOAP ,
 $AP^2 + OA^2 = OP^2$
 $\therefore AP^2 = AC^2 + PC^2$
 So, $AC^2 + PC^2 + OA^2 = OP^2$
 $6^2 + x^2 + (6.5)^2 = (2.5 + x)^2$

$$36 + 36 = 5x$$

$$x = \frac{72}{5} = 14.4 \text{ cm}$$

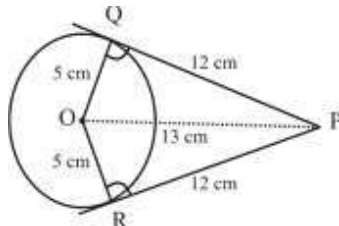
Hence, distance of P from the centre (OP) = OC + PC
= 2.5 + 14.4 = 16.9 cm

481. From a point P, which is at a distance of 13 cm from the center O of a circle, a pair of tangents PQ and PR of length 12 cm are drawn to the circle. The area of the quadrilateral PQOR (in cm^2) is:

- (a) 50 (b) 76
(c) 80 (d) 60

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d)



{Where, PQ = RP = 12 cm, OQ = OR}

In, ΔPOR ,

$$OR^2 + PR^2 = PO^2$$

$$OR^2 = 169 - 144 = 25$$

$$\therefore OR = 5 \text{ cm}$$

So,

The Area of quadrilateral PQOR = Area of ΔPOR + Area of ΔPOQ

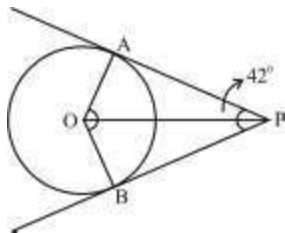
$$= \frac{1}{2} \times 5 \times 12 + \frac{1}{2} \times 12 \times 5 = 30 + 30 = 60 \text{ cm}^2$$

482. In a circle with center O, PA and PB are the tangents at A and B, respectively, from an external point P. If $\angle APB = 42^\circ$ then what will be the measure of $\angle AOB$?

- (a) 138° (b) 142°
(c) 121° (d) 159°

SSC CHSL 04/08/2021 (Shift-II)

Ans. (a) :



In quadrilateral AOBP

$$\therefore \angle AOB + \angle APB = 180^\circ$$

$$\therefore \angle AOB = 180^\circ - 42^\circ$$

$$\angle AOB = 138^\circ$$

483. In a circle with center O, PA and PB are tangents to the circle at A and B, respectively, from an external point P. If $\angle AOB = 116^\circ$ then what is the measure of $\angle OPB$?

- (a) 30°
(c) 90°

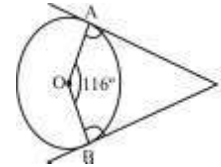
- (b) 32°
(d) 58°

SSC CHSL 10/08/2021 (Shift-II)

Ans. (b) : Give:

$$\angle AOB = 116^\circ$$

$$\therefore \angle AOB + \angle APB = 180^\circ$$



$$\Rightarrow 116^\circ + \angle APB = 180^\circ$$

$$\Rightarrow \angle APB = 64^\circ$$

Now,

$$\angle OPB = \frac{\angle APB}{2}$$

$$= \frac{64^\circ}{2}$$

$$= 32^\circ$$

484. From a point P that is at a distance of 15 cm from centre O of a circle of radius 9 cm, in the same plane, a pair of tangents PQ and PR is drawn to the circle. The area of quadrilateral PQOR is:

- (a) 108 cm^2 (b) 118 cm^2
(c) 114 cm^2 (d) 106 cm^2

SSC CHSL 19/04/2021 (Shift-III)

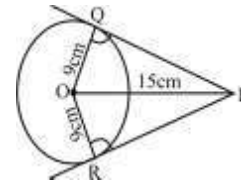
Ans. (a) : In ΔPQO ,

$$(PQ)^2 + (OQ)^2 = (OP)^2$$

$$\Rightarrow (PQ)^2 + (9)^2 = (15)^2$$

$$\Rightarrow (PQ)^2 = 225 - 81$$

$$\Rightarrow PQ = \sqrt{144} = 12 \text{ cm.}$$



$\therefore PQ = PR = 12 \text{ cm}$ (Tangent through an external point to a circle is equal)

Area of $\square PQOR$ = Area of ΔPQO + Area of ΔPRO

$$= \left(\frac{1}{2} \times OQ \times PQ \right) + \left(\frac{1}{2} \times OR \times PR \right)$$

$$= \left(\frac{1}{2} \times 9 \times 12 \right) + \left(\frac{1}{2} \times 9 \times 12 \right)$$

$$= 54 + 54$$

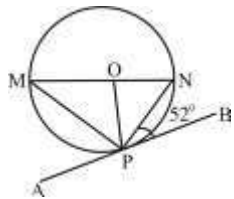
$$= 108 \text{ cm}^2$$

485. In a circle with center O, APB is a tangent at P. If MN is a diameter such that $\angle BPN = 52^\circ$, then what is the measure of $\angle PNM$?

- (a) 38° (b) 48°
(c) 52° (d) 90°

SSC CHSL 06/08/2021 (Shift-II)

Ans. (a)



We know that the radius of a circle is perpendicular on tangent.

$$\angle OPB = 90^\circ$$

$$\angle OPN = 90^\circ - 52^\circ = 38^\circ$$

In $\triangle OPN$

$$OP = ON \quad (\text{Radius of circle})$$

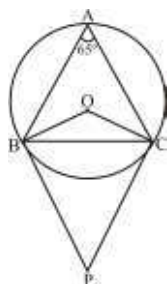
$$\angle PNM = \angle OPN = 38^\circ$$

486. $\triangle ABC$ is drawn in a circle such that $AC = BC$ and $\angle BAC = 65^\circ$. From points B and C two tangents are drawn which intersect at point P . What is the measure of $\angle BPC$?

- (a) 32.5° (b) 55°
 (c) 52.5° (d) 50°

SSC CHSL 12/08/2021 (Shift-II)

Ans. (d) : Given –



$$\therefore \angle BOC = 2 \times \angle BAC$$

$$= 2 \times 65^\circ$$

$$= 130^\circ$$

And $\angle OBP = \angle OCP = 90^\circ$

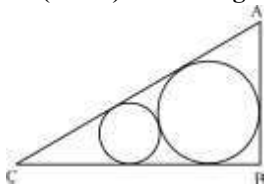
$$\therefore \angle BOC + \angle BPC + \angle OBP + \angle OCP = 360^\circ$$

$$\Rightarrow \angle BPC = 360^\circ - (130^\circ + 90^\circ + 90^\circ)$$

$$= 360^\circ - 310^\circ$$

$$= 50^\circ$$

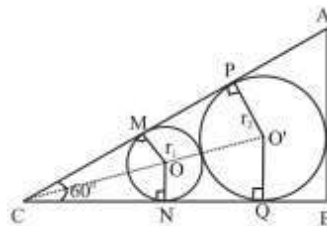
487. In the given figure, ABC is a right angled triangle. $\angle ABC = 90^\circ$ and $\angle ACB = 60^\circ$. If the radius of the smaller circle is 2 cm, then what is the radius (in cm) of the larger circle?



- (a) 4 (b) 6
 (c) 4.5 (d) 7.5

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :



$$\therefore \angle MCO = \angle PCO$$

$$= \frac{\angle ACB}{2} = 30^\circ$$

In $\triangle CMO$,

$$\sin 30^\circ = \frac{MO}{OC}$$

$$\frac{1}{2} = \frac{2}{OC} \Rightarrow OC = 4\text{cm}$$

From $\triangle PCO'$,

$$\sin 30^\circ = \frac{PO'}{O'C}$$

$$\frac{1}{2} = \frac{r_2}{6 + r_2}$$

$$6 + r_2 = 2r_2$$

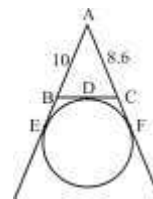
$$r_2 = 6 \text{ cm}$$

488. A circle touches the side BC of $\triangle ABC$ at D and AB and AC are produced to E and F , respectively. If $AB = 10$ cm, $AC = 8.6$ cm and $BC = 6.4$ cm, then $BE = ?$

- (a) 2.2 cm (b) 3.2 cm
 (c) 3.5 cm (d) 2.5 cm

SSC CGL (Tier-II) 13-09-2019

Ans. (d) :



$$\therefore BD = BE \text{ and } CD = CF \text{ and } AE = AF$$

$$\therefore AE = AF$$

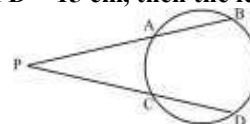
$$AB + BE = AC + CF \quad (\because BD = BE)$$

$$\text{or } AB + BE + BE = AC + CF + BD$$

$$AB + 2BE = AC + CD + BD$$

$$BE = \frac{AC + BC - AB}{2} = \frac{8.6 + 6.4 - 10}{2} = 2.5\text{cm}$$

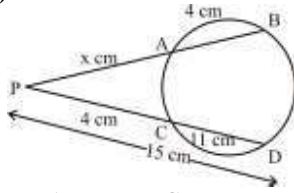
489. In the figure, chords AB and CD of a circle intersect externally at P . If $AB = 4$ cm, $CD = 11$ cm and $PD = 15$ cm, then the length of PB is.



- (a) 8 cm (b) 12 cm
 (c) 10 cm (d) 14 cm

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c)



$$\begin{aligned} \therefore PA \cdot PB &= PC \cdot PD \\ x(x+4) &= 4 \times 15 \\ x(x+4) &= 2 \times 5 \times 3 \times 2 \\ x(x+4) &= 6(6+4) \\ PB &= PA + AB \\ PB &= x + 4 = 6 + 4 = 10 \end{aligned}$$

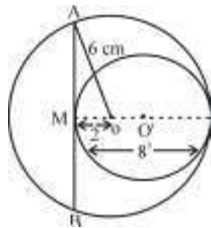
$$\boxed{PB = 10 \text{ cm}}$$

490. Two circles of radius 4 cm and 6 cm touch each other internally. What is the length (in cm) of the longest chord of the outer circle, which is also a tangent to inner circle?

- (a) $12\sqrt{2}$ (b) $8\sqrt{2}$
 (c) $6\sqrt{2}$ (d) $4\sqrt{2}$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :



Let centre of larger circle is O and smaller circle is O'. Radius of circle is perpendicular to tangent.

In ΔAMO ,

$$AM^2 = OA^2 - OM^2 = 36 - 4$$

$$AM = 4\sqrt{2} \text{ cm}$$

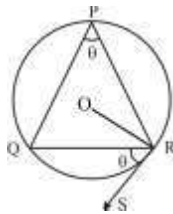
$$\text{Largest chord } AB = 2 \times 4\sqrt{2} = 8\sqrt{2} \text{ cm}$$

491. The vertices of a ΔPQR lie on a circle with centre O. SR is a tangent to the circle at the point R. If QR bisects the $\angle ORS$, then what is the measure of $\angle RPQ$?

- (a) 45° (b) 60°
 (c) 40° (d) 30°

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) :



Radius of circle is perpendicular to its tangent.

$$\therefore \angle ORS = 90^\circ$$

$$\angle QRS = \frac{\angle ORS}{2} = 45^\circ$$

[Alternate segment theorem]

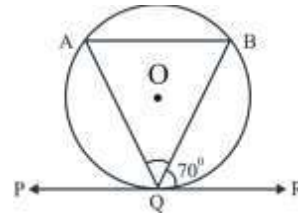
$$\angle RPQ = \angle QRS = 45^\circ$$

492. In a circle with centre O, PQR is a tangent at the point Q on it. AB is a chord in the circle parallel to the tangent such that $\angle BQR = 70^\circ$. What is the measure of $\angle AQB$?

- (a) 60° (b) 55°
 (c) 35° (d) 40°

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (d) :



[Alternate segment theorem]

$$\therefore \angle BQR = \angle BAQ = 70^\circ$$

$$\text{And } \angle BQR = \angle ABQ = 70^\circ$$

\therefore In ΔABQ ,

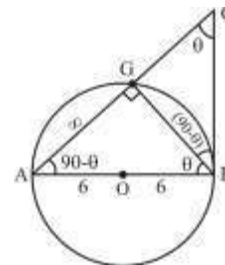
$$\angle AQB = 180^\circ - (70^\circ + 70^\circ) = 40^\circ$$

493. AB is a diameter of a circle with centre O. CB is a tangent to the circle at B. AC intersects the circle at G. If the radius of the circle is 6 cm and $AG = 8$ cm, then the length of BC is:

- (a) $6\sqrt{5}$ cm (b) $6\sqrt{6}$ cm
 (c) $2\sqrt{6}$ cm (d) $2\sqrt{5}$ cm

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (a) :



$$\angle AGB = 90^\circ \quad (\text{Angle in semicircle})$$

$$\therefore \Delta AGB \text{ is a right angle triangle}$$

By using Pythagoras theorem,

$$(GB)^2 = (AB)^2 - (AG)^2$$

$$(GB)^2 = (12)^2 - (8)^2$$

$$(GB) = \sqrt{80}$$

$$\boxed{GB = 4\sqrt{5}}$$

$$\therefore \Delta BGA \sim \Delta CGB$$

$$\text{Hence } \frac{AB}{BC} = \frac{GA}{GB}$$

$$\Rightarrow \frac{12}{BC} = \frac{8}{4\sqrt{5}}$$

$$\Rightarrow BC = \frac{12 \times 4\sqrt{5}}{8}$$

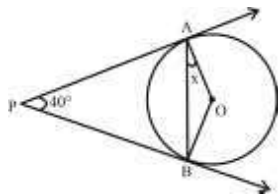
$$\Rightarrow \boxed{BC = 6\sqrt{5}}$$

494. PA and PB are tangent to a circle with centre O, from a point P outside the circle and A and B are points on the circle. If $\angle APB = 40^\circ$, then $\angle OAB$ is equal to:

- (a) 50° (b) 20°
 (c) 25° (d) 40°

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (b) : $\because \angle APB + \angle AOB = 180^\circ$



\because Angle formed by tangent lines are supplementary to angle formed by radius on centre of circle.

$$\angle AOB = 180^\circ - 40^\circ = 140^\circ$$

In $\triangle AOB$,

$$OA = OB$$

$$\angle OAB = \angle OBA = x^\circ$$

$$x + x + \angle AOB = 180^\circ$$

$$2x = 180^\circ - 140^\circ$$

$$2x = 40^\circ$$

$$x = 20^\circ$$

495. PA and PB are tangent lines from a point P outside a circle with centre O. A and B are two points on the circle. If $\angle APB = 30^\circ$, then $\angle OAB$ is equal to-

- (a) 25° (b) 50°
 (c) 15° (d) 40°

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (c) :

Angle formed by tangent lines are supplementary to angle formed by radius on centre of circle.

$$\angle APB + \angle AOB = 180^\circ$$

$$30^\circ + \angle AOB = 180^\circ$$

$$\angle AOB = 150^\circ$$

In $\triangle AOB$,

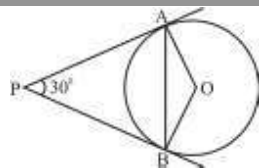
$$OA = OB$$

$$\angle OAB = \angle OBA = x$$

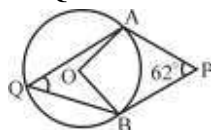
$$x + x + \angle AOB = 180^\circ$$

$$2x + 150^\circ = 180^\circ$$

$$x = 15^\circ$$



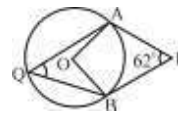
496. In the given figure, AP and BP are tangents to a circle with centre O. If $\angle APB = 62^\circ$ then the measure of $\angle AQB$ is:



- (a) 59° (b) 31°
 (c) 28° (d) 118°

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (a) :



\because Radius of a circle is perpendicular on tangent

$$\therefore \angle OBP = \angle OAP = 90^\circ$$

In quadrilateral OAPB,

$$\angle AOB = 360^\circ - (90^\circ + 90^\circ + 62^\circ) = 118^\circ$$

\because The angle subtended by an arc at the centre is double the angle subtended by it at circumference of the circle.

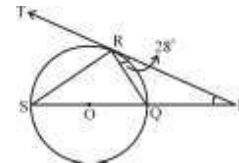
$$\therefore \angle AQB = \frac{\angle AOB}{2} = 59^\circ$$

497. PRT is a tangent to a circle with centre O, at the point R on it. Diameter SQ of the circle is produced to meet the tangent at P and QR is joined. If $\angle QRP = 28^\circ$, then the measure of $\angle SPR$ is:

- (a) 32° (b) 29°
 (c) 62° (d) 34°

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) :



\because (Angle formed in semicircle is right angle)

$$\therefore \angle SRQ = 90^\circ$$

\because Angle formed by a chord of a circle with tangent line is equal to the angle formed by same chord in alternate segments

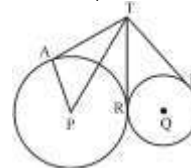
$$\angle QRP = \angle QSR = 28^\circ$$

$$\text{In } \triangle SRQ, \angle SQR = 180^\circ - (90^\circ + 28^\circ) = 62^\circ$$

by exterior angle property, $\angle SQR = \angle QRP + \angle SPR$

$$\therefore \angle SPR = 62^\circ - 28^\circ = 34^\circ$$

498. In the figure, Two circles with centres P and Q touch externally at R. Tangents AT and BT meet the common tangent TR at T. If AP = 6 cm and PT = 10 cm, then BT = ?



- (a) 8 cm (b) 12 cm
 (c) 10 cm (d) 6 cm

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (a)

\because Radius of a circle is perpendicular to its tangent.

$$\therefore \angle PAT = 90^\circ$$

$$\therefore AT = \sqrt{10^2 - 6^2} = 8\text{cm}$$

\because Tangents drawn from external point are equal

$$\therefore AT = RT = 8\text{ cm}$$

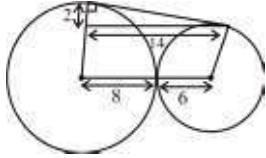
Similarly $RT = BT = 8\text{ cm}$

499. Two circles of radii 8 cm and 6 cm touch each other externally. The length of the direct common tangent is:

- (a) 20 (b) 13.86
(c) 24 (d) 10.12

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

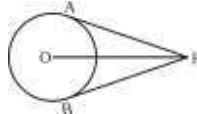
Ans. (b) :



$$d = 8 + 6 = 14\text{cm}, R = 8\text{cm}, r = 6\text{cm}$$

$$\begin{aligned} \text{Length of direct common tangent} &= \sqrt{d^2 - (R - r)^2} \\ &= \sqrt{14^2 - 2^2} \\ &= \sqrt{192} = 13.86\text{cm} \end{aligned}$$

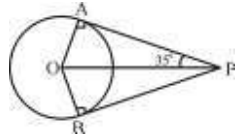
500. In the given figure, if $\angle APO = 35^\circ$, then which of the following options is correct?



- (a) $\angle BPO = 35^\circ$ (b) $\angle APB = 80^\circ$
(c) $\angle APB = 60^\circ$ (d) $\angle BPO = 55^\circ$

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a):



$$\therefore \triangle AOP \cong \triangle BOP$$

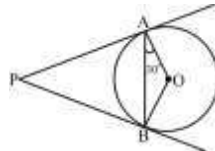
$$\therefore \angle APO = \angle BPO = 35^\circ$$

501. Two tangents PA and PB are drawn to a circle with centre O from an external point P. If $\angle OAB = 30^\circ$, then $\angle APB$ is:

- (a) 120° (b) 30°
(c) 60° (d) 15°

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (c) :



$$\therefore OA = OB \quad (\text{radii of circle})$$

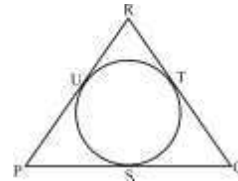
$$\therefore \angle OAB = \angle OBA = 30^\circ$$

$$\begin{aligned} \therefore \angle AOB &= 180^\circ - (30^\circ + 30^\circ) \\ &= 120^\circ \end{aligned}$$

$$\therefore \angle APB + \angle AOB = 180^\circ$$

$$\angle APB = 180^\circ - 120^\circ = 60^\circ$$

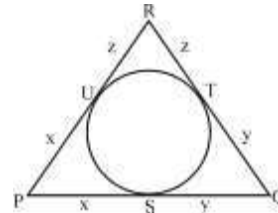
502. In the given figure, a circle inscribed in $\triangle PQR$ touches its sides PQ, QR and RP at points S, T and U, respectively. If PQ = 15 cm, QR = 10 cm, and RP = 12 cm, then find the lengths of PS, QT and RU ?



- (a) PS = 8.5 cm, QT = 3.5 cm and RU = 6.5 cm
(b) PS = 6.5 cm, QT = 8.5 cm and RU = 3.5 cm
(c) PS = 3.5 cm, QT = 6.5 cm and RU = 8.5 cm
(d) PS = 8.5 cm, QT = 6.5 cm and RU = 3.5 cm

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) :



\therefore Tangents lines drawn from exterior point of a circle are equals

$$x + y = 15 \dots\dots (1)$$

$$y + z = 10 \text{ cm} \dots\dots (2)$$

$$z + x = 12 \text{ cm} \dots\dots (3)$$

On adding eqⁿ (i), (ii), (iii) we have

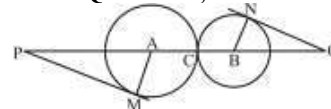
$$2(x + y + z) = 37$$

$$x + y + z = 18.5 \text{ cm}$$

$$\therefore x = 8.5, y = 6.5, z = 3.5 \text{ cm}$$

$$\text{Hence } PS = 8.5\text{cm}, QT = 6.5\text{cm and } RU = 3.5 \text{ cm}$$

503. In the given figure, MP is tangent to a circle with centre A and NQ is a tangent to a circle with centre B. If MP = 15 cm, NQ = 8 cm, PA = 17 cm and BQ = 10 cm, then AB is:



- (a) 28 cm (b) 14 cm
(c) 13.5 cm (d) 23 cm

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (b) :

\therefore Radius of a circle is perpendicular to its tangent.

$$\therefore \angle AMP = \angle BNQ = 90^\circ,$$

In $\triangle AMP$,

$$AM = \sqrt{AP^2 - MP^2} = \sqrt{17^2 - 15^2} = 8\text{cm (radius)}$$

In $\triangle BNQ$,

$$BN = \sqrt{10^2 - 8^2} = 6\text{cm (radius)}$$

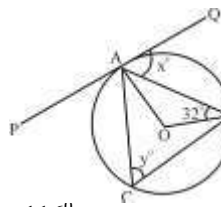
$$\therefore AB = 8 + 6 = 14 \text{ cm}$$

504. PAQ is a tangent to a circle with centre O, at a point A on it. AB is a chord such that $\angle BAQ = x^\circ$ ($x < 90^\circ$). C is a point on the major arc AB such that $\angle ACB = y^\circ$. If $\angle ABO = 32^\circ$, then the value of $x + y$ is:

- (a) 112 (b) 98
(c) 110 (d) 116

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Ans. (d)
 In $\triangle AOB$,
 $\therefore OA = OB$



$$\therefore \angle OAB = \angle OBA = 32^\circ$$

$$\therefore \angle AOB = 180^\circ - (32^\circ + 32^\circ) = 116^\circ$$

\therefore Angle formed by a chord on the centre is double the angle formed by same chord on the circumference.

$$\therefore \angle ACB = y^\circ = \frac{116^\circ}{2} = 58^\circ$$

\therefore Angle formed by chord of a circle with its tangent is equal to angle formed by same chord at alternate segment.

$$\therefore \angle BAQ = \angle ACB$$

$$x^\circ = y^\circ = 58^\circ$$

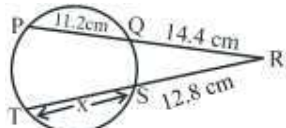
$$\therefore x + y = 116^\circ$$

505. In a circle, chords PQ and TS are produced to meet at R. If RQ = 14.4 cm, PQ = 11.2 cm, and SR = 12.8 cm, then the length of chord TS is

- (a) 18 cm (b) 14.2 cm
 (c) 12.4 cm (d) 16 cm

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (d) :



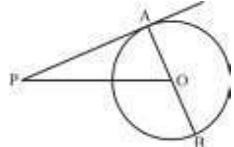
$$\therefore RQ \times RP = RS \times RT$$

$$14.4 \times 25.6 = 12.8 \times (12.8 + x)$$

$$12.8 + x = 28.8$$

$$x = 16 \text{ cm}$$

506. In the figure, PA is a tangent from an external point P to the circle with centre O. If $\angle POB = 110^\circ$, then the measure of $\angle APO$ is:



- (a) 30° (b) 25°
 (c) 20° (d) 40°

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (c) : Radius of a circle is perpendicular to its tangent.

$$\therefore \angle PAO = 90^\circ$$

$\therefore \angle APO + \angle PAO = \angle POB$ (by exterior angle property)

$$\angle APO = 110^\circ - 90^\circ = 20^\circ$$

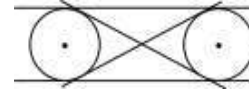
507. What can be the maximum number of common tangent which can be drawn to two non-intersecting circles?

- (a) 2
 (c) 3

- (b) 4
 (d) 6

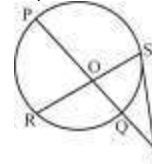
SSC CGL (Tier-II) 21-02-2018

Ans. (b) :



It is clear that maximum four common tangent can be drawn from two non-intersecting circles.

508. In the given figure, SX is tangent. $SX = OX = OR$. If QX = 3 cm and PQ = 9 cm, then what is the value (in cm) of OS?



- (a) 6
 (c) 4

- (b) 5
 (d) 3

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :

\therefore SX is a tangent.

$$\therefore (SX)^2 = (XQ) \times (XP)$$

$$\Rightarrow (SX)^2 = 3 \times 12$$

$$\Rightarrow SX = \sqrt{36} = 6 \text{ cm}$$

$$\therefore SX = OR = OX = 6 \text{ cm}$$

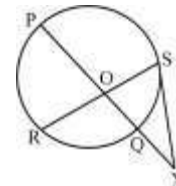
$$OQ = 6 - 3 = 3 \text{ cm}$$

$$PO = 9 - 3 = 6 \text{ cm}$$

$$\therefore PO \times OQ = OR \times OS$$

$$\Rightarrow 6 \times 3 = 6 \times OS$$

$$\Rightarrow \boxed{OS = 3 \text{ cm}}$$

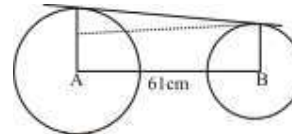


509. The distance between the centres of two circles is 61 cm and their radii are 35 cm and 24 cm. What is the length (in cm) of the direct common tangent to the circles?

- (a) 60 (b) 54
 (c) 48 (d) 72

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Ans. (a) :

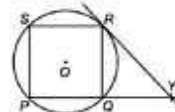


$$\text{Length of direct common tangent} = \sqrt{D^2 - (R_1 - R_2)^2}$$

$$= \sqrt{(61)^2 - (35 - 24)^2}$$

$$= \sqrt{3721 - 121} = \sqrt{3600} = 60 \text{ cm.}$$

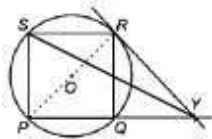
510. In the given figure, PQRS is a square inscribed in a circle of radius 4 cm. PQ is produced till point Y. From Y a tangent is drawn to the circle at point R. What is the length (in cm) of SY?



- (a) $4\sqrt{10}$ (b) $2\sqrt{10}$
 (c) $6\sqrt{10}$ (d) $3\sqrt{5}$

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :



$$\text{Side} = \frac{\text{diagonal}}{\sqrt{2}} = 4\sqrt{2}$$

Line joining the centre and tangent point is perpendicular to tangent.

$$\therefore \angle PRY = 90^\circ$$

$$\angle SRP = \angle QRP = 45^\circ$$

$$\angle QRY = \angle PRY - \angle PRQ = 45^\circ$$

Hence ΔRQY is isosceles triangle

$$\therefore QR = QY = 4\sqrt{2} \text{ (Side of square)}$$

According to the question,

$$PY = 4\sqrt{2} + 4\sqrt{2}$$

$$= 8\sqrt{2}$$

In ΔSPY ,

$$SY^2 = PY^2 + PS^2$$

$$SY^2 = (8\sqrt{2})^2 + (4\sqrt{2})^2$$

$$SY^2 = 160 \text{ cm}$$

$$SY = 4\sqrt{10} \text{ cm}$$

511. Two circles touch each other at point X. Two common tangents of the circle meet at point P and none of the tangents passes through X. These tangents touch the larger circle at points B and C. If the radius of the larger circle is 15 cm and $CP = 20$ cm, then what is the radius (in cm) of the smaller circle

- (a) 3.5 (b) 3.75
 (c) 4.25 (d) 4.45

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

Radius of a circle is perpendicular to its tangent.

$$\therefore \angle OCP = \angle O'EP = 90^\circ$$

$$\Delta POC \sim \Delta PO'E$$

In ΔOCP ,

$$OP^2 = 15^2 + 20^2$$

$$OP = 25 \text{ cm}$$

$$O'P = (10 - r) \text{ cm}$$

By similarity theorem,

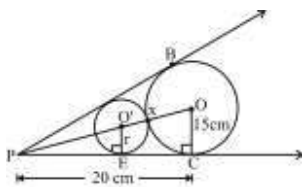
$$\frac{O'P}{OP} = \frac{r}{15}$$

$$\frac{10 - r}{25} = \frac{r}{15}$$

$$5r = 30 - 3r$$

$$8r = 30$$

$$r = 3.75 \text{ cm.}$$

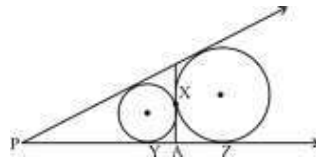


512. Two circles touch each other at point X. A common tangent touch them at two distinct points Y and Z. If another tangent passing through X cut YZ at A and $XA = 16$ cm, then what is the value (in cm) of YZ?

- (a) 18 (b) 24
 (c) 16 (d) 32

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :



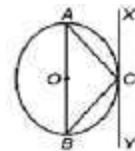
Tangents drawn from exterior point of a circle are equal.

$$XA = YA = 16 \text{ cm}$$

$$XA = ZA = 16 \text{ cm}$$

$$YZ = 16 + 16 = 32 \text{ cm}$$

513. In the given figure, AB is a diameter of the circle with centre O and XY is the tangent at a point C. If $\angle ACX = 35^\circ$, then what is the value (in degrees) of $\angle CAB$?



- (a) 45 (b) 35
 (c) 55 (d) 65

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Ans. (c) :

\therefore Angle formed in a semicircle is right angle.

$$\angle ACB = 90^\circ$$

$$\angle ACX = 35^\circ$$

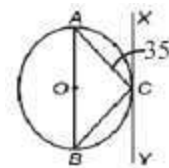
$$\angle ACX = \angle ABC = 35^\circ$$

In ΔACB ,

$$\angle CAB + \angle ACB + \angle ABC = 180^\circ$$

$$\angle CAB + 90^\circ + 35^\circ = 180^\circ$$

$$\angle CAB = 55^\circ$$

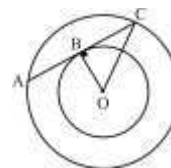


514. Centre of two concentric circles is O. The area of two circles is 616 cm^2 and 154 cm^2 respectively. A tangent is drawn through point A on the larger circle to the smaller circle. This tangent touches smaller circle at B and intersects larger circle at C. What is the length (in cm) of AC?

- (a) $12\sqrt{3}$ (b) $14\sqrt{3}$
 (c) $10\sqrt{6}$ (d) $18\sqrt{2}$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :



$$\text{Area of larger circle} = 616 \text{ cm}^2$$

$$\frac{22}{7}r^2 = 616$$

$$r = 14 \text{ cm}$$

$$OA = OC = 14 \text{ cm}$$

$$\text{Area of smaller circle} = 154 \text{ cm}^2$$

$$\frac{22}{7}r_1^2 = 154$$

$$r_1 = 7 \text{ cm}$$

$$OB = 7 \text{ cm}$$

∴ Radius of a circle is perpendicular to tangent.

In $\triangle OBC$,

$$\therefore BC^2 = OC^2 - OB^2 = 196 - 49$$

$$BC^2 = 147$$

$$BC = 7\sqrt{3} \text{ cm}$$

∴ Perpendicular drawn from centre of a circle to its chord bisects the chord.

$$AC = 14\sqrt{3} \text{ cm}$$

515. PA and PB are two tangents drawn to two circles of radius 3 cm and 5 cm respectively. PA touches the smaller and larger circles at points X and Y respectively. PB touches the smaller and larger circle at point U and V respectively. The centres of the smaller and larger circles O and N respectively. If ON = 12 cm, then what is the value (in cm) of PY ?

(a) $5\sqrt{35}$

(b) $7\sqrt{15}$

(c) $9\sqrt{15}$

(d) $12\sqrt{5}$

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Ans. (a):

Let $PO = x$ cm

∴ $\triangle POX \sim \triangle PNY$

$$\therefore \frac{PO}{PN} = \frac{OX}{NY}$$

$$\frac{x}{x+12} = \frac{3}{5}$$

$$5x - 3x = 36$$

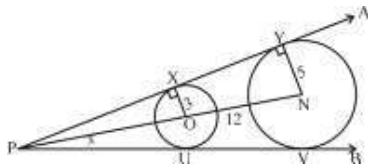
$$x = 18 \text{ cm}$$

$$\therefore PN = 18 + 12 = 30 \text{ cm}$$

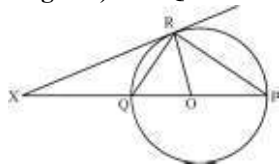
In $\triangle PYN$,

$$PY^2 = PN^2 - NY^2 = 900 - 25 = 875$$

$$PY = 5\sqrt{35} \text{ cm}$$



516. XR is a tangent to the circle. O is the centre of the circle. If $\angle XRP = 120^\circ$, then what is the value (in degrees) of $\angle QOR$?



(a) 80

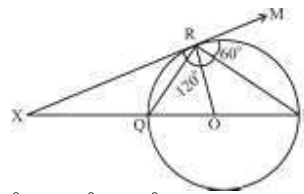
(b) 70

(c) 60

(d) 40

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :



$$\angle MRP = 180^\circ - 120^\circ = 60^\circ$$

Angle formed by chord of a circle with a tangent is equal to the angle formed by same chord in the alternate segment of the circle.

$$\angle RQP = 60^\circ$$

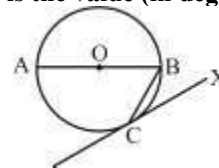
In $\triangle OQR$,

$$OQ = OR$$

$$\angle ORQ = \angle RQO = 60^\circ$$

$$\therefore \angle QOR = 60^\circ$$

517. O is the centre of the circle. A tangent is drawn which touches the circle at C. If $\angle AOC = 80^\circ$, then what is the value (in degrees) of $\angle BCX$?



(a) 80

(b) 30

(c) 40

(d) 50

SSC CGL (Tier-II) 9-3-2018

Ans. (d) In $\triangle AOC$,

$$OA = OC \text{ (radius)}$$

$$\text{Let, } \angle OAC = \angle OCA = x$$

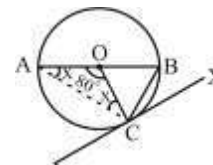
$$x + x + 80^\circ = 180^\circ$$

$$x = 50^\circ$$

$$\therefore \angle BAC = 50^\circ$$

∴ Angle formed by chord of a circle to its tangent equal to the angle formed by same chord in alternate segment of the circle.

$$\therefore \angle BCX = \angle BAC = 50^\circ$$



518. The distance between the centres of two circles is 24 cm. If the radius of the two circles are 4 cm and 8 cm, then what is the sum of the lengths (in cm) of the direct common tangent and the transverse common tangent ?

(a) $4(3\sqrt{3} + \sqrt{35})$

(b) $4(4\sqrt{35} + 3\sqrt{3})$

(c) $4(\sqrt{35} + 3\sqrt{3})$

(d) $4\sqrt{3}(\sqrt{35} + 3\sqrt{3})$

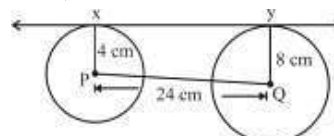
SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Length of direct common tangent

$$= \sqrt{d^2 - (R - r)^2}$$

$$= \sqrt{576 - (8 - 4)^2}$$

$$= \sqrt{576 - 16} = 4\sqrt{35} \text{ cm}$$

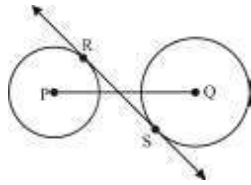


Length of transverse common tangent

$$= \sqrt{d^2 - (R+r)^2}$$

$$= \sqrt{24^2 - 12^2}$$

$$= 12\sqrt{3} \text{ cm}$$



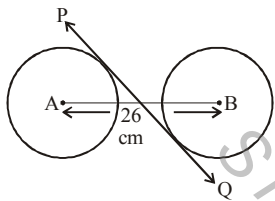
$$\text{Required Sum} = 4\sqrt{35} + 12\sqrt{3} = 4(\sqrt{35} + 3\sqrt{3}) \text{ cm}$$

519. There are two identical circles of radius 10 cm each. If the length of the direct common tangent is 26 cm, then what is the length (in cm) of the transverse common tangent

- (a) $2\sqrt{69}$ (b) $4\sqrt{23}$
 (c) $4\sqrt{46}$ (d) $3\sqrt{46}$

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Ans. (a) :

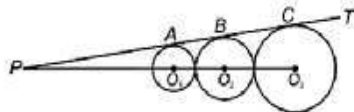


Since, circles are identical
 Hence, length of direct common tangent is equal to distance between their centres.
 Length of transverse common tangent

$$(PQ) = \sqrt{d^2 - (r_1 + r_2)^2}$$

$$= \sqrt{26^2 - 20^2} = \sqrt{276} = 2\sqrt{69} \text{ cm}$$

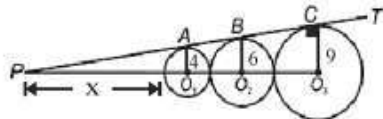
520. In the given figure, PT is a common tangent to three circles at points, A, B and C respectively. The radius of the small, medium and large circles is 4 cm, 6 cm and 9 cm. O_1 , O_2 and O_3 are the centre of the three circles. What is the value (in cm) of PC ?



- (a) $18\sqrt{6}$ (b) $9\sqrt{6}$
 (c) $24\sqrt{6}$ (d) $15\sqrt{6}$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :



$$\Delta PO_1A \sim \Delta PO_2B$$

$$\frac{PO_1}{PO_2} = \frac{O_1A}{O_2B}$$

$$\frac{x+4}{x+14} = \frac{4}{6}$$

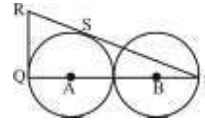
$$3x + 12 = 2x + 28$$

$$x = 16 \text{ cm}$$

$$PO_3 = 16 + 8 + 12 + 9 = 45 \text{ cm}$$

In ΔPO_3C ,
 $(45)^2 = 9^2 + PC^2$
 $PC^2 = 9^2 (25-1)$
 $PC = 9\sqrt{24} = 18\sqrt{6} \text{ cm}$

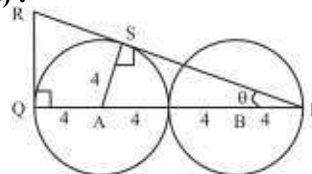
521. In the given figure, two identical circles of radius 4 cm touch each other. A and B are the centres of the two circles. If RQ is a tangent to the circle, then what is the length (in cm) of RQ?



- (a) $3\sqrt{3}$ (b) $2\sqrt{6}$
 (c) $4\sqrt{2}$ (d) $6\sqrt{2}$

SSC CGL (Tier-II) 17-2-2018

Ans. (c) :



$$\therefore \Delta RQP \sim \Delta ASP$$

$$\frac{RQ}{AS} = \frac{QP}{SP}$$

$$\frac{RQ}{4} = \frac{16}{\sqrt{12^2 - 4^2}}$$

$$RQ = \frac{4 \times 16}{8\sqrt{2}}$$

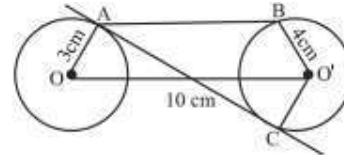
$$= 4\sqrt{2} \text{ cm}$$

522. The radius of two circles are 3 cm and 4 cm. The distance between the centres of the circles is 10 cm. What is the ratio of the length of direct common tangent to the length of the transverse common tangent?

- (a) $\sqrt{51} : \sqrt{68}$ (b) $\sqrt{33} : \sqrt{17}$
 (c) $\sqrt{66} : \sqrt{51}$ (d) $\sqrt{28} : \sqrt{17}$

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :



Length of direct common tangent

$$(AB) = \sqrt{10^2 - (4-3)^2}$$

$$= \sqrt{100-1}$$

$$= \sqrt{99}$$

Length of transverse common tangent

$$= \sqrt{10^2 - (4+3)^2}$$

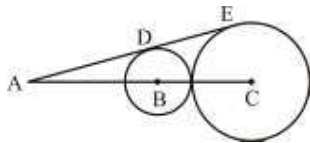
$$= \sqrt{100-49}$$

$$= \sqrt{51}$$

$$\text{Ratio} = \sqrt{99} : \sqrt{51}$$

$$= \sqrt{33} : \sqrt{17}$$

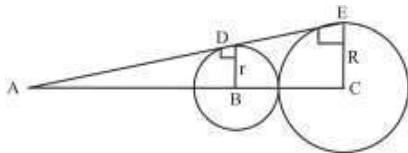
523. In the given figure, B and C are the centres of the two circles. ADE is the common tangent to the two circles. If the ratio of the radius of both the circles is 3 : 5 and AC = 40, then what is the value of DE?



- (a) $3\sqrt{15}$ (b) $5\sqrt{15}$
(c) $6\sqrt{15}$ (d) $4\sqrt{15}$

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

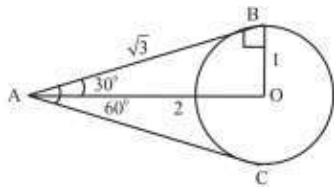


$$\begin{aligned} r : R &= 3 : 5 \\ \therefore \triangle ABD &\sim \triangle ACE \\ \frac{AB}{AC} &= \frac{BD}{CE} = \frac{3}{5} \\ 5k &= 40 \\ k &= 8 \\ \therefore BC &= AC - AB = 5k - 3k = 2k = 16\text{cm} \\ r + R &= 16\text{cm} \\ 3x + 5x &= 16 \\ x &= 2 \\ \therefore r &= 6, R = 10\text{cm} \\ DE &= \sqrt{BC^2 - (R - r)^2} \\ &= \sqrt{16^2 - (10 - 6)^2} \\ &= \sqrt{256 - 16} = \sqrt{240} = 4\sqrt{15} \end{aligned}$$

524. AB and AC are the two tangents to a circle whose radius is 6 cm. If $\angle BAC = 60^\circ$, then what is the value (in cm) of $\sqrt{AB^2 + AC^2}$?
- (a) $6\sqrt{6}$ (b) $4\sqrt{6}$
(c) $9\sqrt{3}$ (d) $8\sqrt{3}$

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :



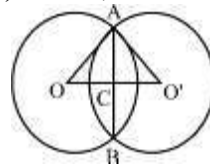
$$\begin{aligned} AB &= AC \text{ (Tangent lines)} \\ \therefore \text{ Since, angles of right angled triangle } \triangle AOB &\text{ are } 30^\circ, 60^\circ \text{ \& } 90^\circ \text{ hence ratio of their sides are } 1 : \sqrt{3} : 2 \\ \text{According to the question,} \\ 1 &\rightarrow 6 \\ AB &= \sqrt{3} \rightarrow 6\sqrt{3} \\ \therefore \sqrt{AB^2 + AC^2} &= AB\sqrt{2} = 6\sqrt{3} \times \sqrt{2} = 6\sqrt{6} \text{ cm} \end{aligned}$$

525. Two circles of radii 15 cm and 10 cm intersect each other and the length of their common chord is 16 cm. What is the distance (in cm) between their centres?

- (a) $15 + 2\sqrt{161}$ (b) $6 + \sqrt{161}$
(c) $10 + \sqrt{161}$ (d) $12 + 3\sqrt{7}$

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : Given,



Radius of circle with centre O (OA) = 15cm
Radius of circle with centre O' (O'A) = 10cm
Chord of circle (AB) = 16cm

$$\Rightarrow AC = 16/2 = 8\text{cm}$$

In $\triangle ACO$,

$$OC = \sqrt{(OA)^2 - (AC)^2}$$

$$OC = \sqrt{(15)^2 - (8)^2} = \sqrt{161} \text{ cm}$$

In $\triangle ACO'$

$$O'C = \sqrt{(AO')^2 - (CA)^2}$$

$$OC = \sqrt{(10)^2 - (8)^2} = 6 \text{ cm}$$

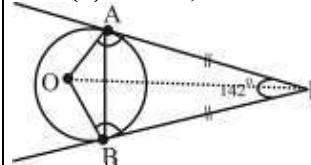
$$\begin{aligned} \text{Hence distance between centre O and O'} &= (OC + O'C) \\ &= (\sqrt{161} + 6) \text{ cm} \end{aligned}$$

526. PA and PB are two tangents from a point P outside the circle with centre O. If A and B are points on the circle such that $\angle APB = 142^\circ$, then $\angle OAB$ is equal to:

- (a) 58° (b) 31°
(c) 64° (d) 71°

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : Given,



$$\angle APB = 142^\circ$$

$$\therefore \angle OAP = 90^\circ$$

$$\angle OBP = 90^\circ$$

\therefore In $\square OAPB$,

$$\angle OAP + \angle APB + \angle PBO + \angle AOB = 360^\circ$$

$$\Rightarrow 90^\circ + 142^\circ + 90^\circ + \angle AOB = 360^\circ$$

$$\Rightarrow \angle AOB = 360^\circ - 322^\circ$$

$$\Rightarrow \angle AOB = 38^\circ$$

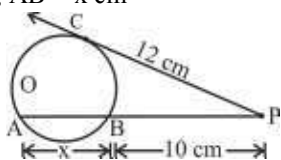
In $\triangle OAB$,
 $OA = OB = \text{Radius of circle}$
 $\Rightarrow \angle OAB = \angle OBA$
 $\therefore \angle AOB + \angle OAB + \angle OBA = 180^\circ$
 $\Rightarrow 38^\circ + 2 \times \angle OAB = 180^\circ \quad \{\because \angle OAB = \angle OBA\}$
 $\Rightarrow \angle OAB = 71^\circ$

527. Chord AB of a circle is produced to a point P, and C is a point on the circle such that PC is a tangent to the circle. If PC = 12 cm, and BP = 10 cm, then the length of AB (in cm) is:

- (a) 5 (b) 5.4
 (c) 6 (d) 4.4

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Let, $AB = x$ cm



$\therefore PC^2 = PA \times PB$ (by theorem)

$$144 = (10+x) \times 10$$

$$14.4 = 10 + x$$

$$x = 4.4$$

$\therefore AB = 4.4$ cm

528. PA and PB are two tangents from a point P outside the circle with centre O at the points A and B on it. If $\angle APB = 130^\circ$, then $\angle OAB$ is equal to:

- (a) 50° (b) 35°
 (c) 65° (d) 45°

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Given, $\angle APB = 130^\circ$

$$\angle APB + \angle BAP + \angle ABP = 180^\circ$$

$$130^\circ + \angle BAP + \angle ABP = 180^\circ$$

$$\angle BAP + \angle ABP = 50^\circ$$

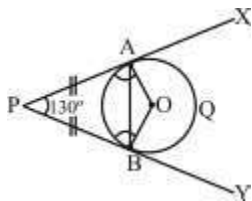
$$\angle BAP = 25^\circ = \angle ABP$$

$$\therefore \angle OAP = 90^\circ$$

$$\therefore \angle OAB = 90^\circ - \angle BAP$$

$$= 90^\circ - 25^\circ$$

$$\angle AOB = 65^\circ$$



529. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and $\angle ADC = 148^\circ$. What is the measure of the $\angle BAC$?

- (a) 32° (b) 45°
 (c) 58° (d) 60°

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : \because Angle formed in semicircle is right angle

$$\therefore \angle BCA = 90^\circ$$

$$\angle ADC + \angle ABC = 180^\circ$$

$$\angle ABC = 180^\circ - 148^\circ$$

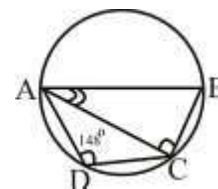
$$\angle ABC = 32^\circ$$

In $\triangle ACB$,

$$\angle BAC = 180^\circ - (\angle ABC + \angle BCA)$$

$$= 180^\circ - (32^\circ + 90^\circ)$$

$$= 180^\circ - 122^\circ = 58^\circ$$

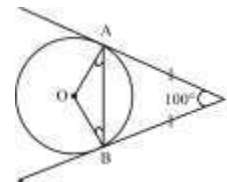


530. PA and PB are two tangents from a point P outside the circle with centre O. If A and B are points on the circle such that $\angle APB = 100^\circ$, then $\angle OAB$ is equal to:

- (a) 45° (b) 35°
 (c) 70° (d) 50°

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) :



$$\therefore \angle AOB + \angle APB = 180^\circ$$

$$\angle AOB = 180^\circ - 100^\circ = 80^\circ$$

$$\therefore OA = OB \text{ (radius)}$$

$$\therefore \angle OAB = \angle OBA$$

$$\text{then, } \angle OAB = \frac{1}{2}(180^\circ - \angle AOB)$$

$$\angle OAB = \frac{1}{2}(180^\circ - 80^\circ)$$

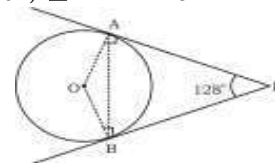
$$\angle OAB = 50^\circ$$

531. PA and PB are two tangents from a point P outside the circle with centre O. If A and B are points on the circle such that $\angle APB = 128^\circ$, then $\angle OAB$ is equal to :

- (a) 38° (b) 72°
 (c) 64° (d) 52°

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : Given, $\angle APB = 128^\circ$



In $\triangle ABP$,

$$\therefore \angle APB + \angle BAP + \angle ABP = 180^\circ$$

$$128^\circ + \angle BAP + \angle ABP = 180^\circ$$

$$\angle BAP + \angle ABP = 180^\circ - 128^\circ = 52^\circ$$

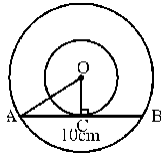
$\Rightarrow \angle BAP = 26^\circ = \angle ABP$
 $\therefore \angle OAP = 90^\circ$
 Hence,
 $\angle OAB = \angle OAP - \angle BAP$
 $= 90^\circ - 26^\circ$
 $\therefore \angle OAB = 64^\circ$

532. A chord of the larger among two concentric circles is of length 10cm and it is tangent to the smaller circle. What is the area (in cm^2) of the annular portion between the two circles?

- (a) 5π (b) $\frac{5\pi}{2}$
 (c) 25π (d) 10π

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c)



$\therefore AB$ is a tangent on smaller circle

$OC \perp AB$

$\therefore AC = BC = 5\text{cm}$

Let, $OC = x\text{cm}$

In ΔAOC ,

$$AC^2 = AO^2 - OC^2$$

$$5^2 = AO^2 - OC^2$$

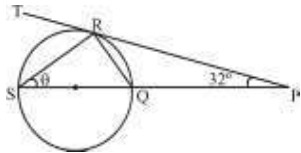
$$\text{Area of annular portion,} = \pi(AO)^2 - \pi(OC)^2 = 25\pi$$

533. PT is a tangent at the point R on a circle with centre O. SQ is a diameter, which when produced meets the tangent PT at P. If $\angle SPT = 32^\circ$, then what will be the measure of $\angle QRP$?

- (a) 58° (b) 32°
 (c) 30° (d) 29°

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d)



\therefore By alternate segment theorem,

$$\therefore \angle QRP = \angle QSR = \theta$$

$$\angle SRQ = 90^\circ \quad (\text{Angle in semicircle})$$

In ΔSRP ,

$$\theta + 90^\circ + \theta + 32^\circ = 180^\circ$$

$$2\theta = 180^\circ - 122^\circ$$

$$\theta = 29^\circ$$

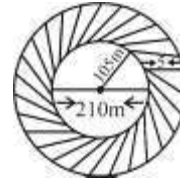
534. A circular park whose diameter is 210m has a 5m wide path running around it (on the outside). What is the area (in m^2) of the path?

- (a) 1075π (b) 1100π
 (c) 1020π (d) 1050π

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a) $r_1 = 105\text{m}$

$$r_2 = 105 + 5 = 110\text{m}$$



$$\begin{aligned} \therefore \text{Area of path} &= \pi r_2^2 - \pi r_1^2 \\ &= \pi(r_2^2 - r_1^2) \\ &= \pi(110^2 - 105^2) \\ &= \pi \times 215 \times 5 \end{aligned}$$

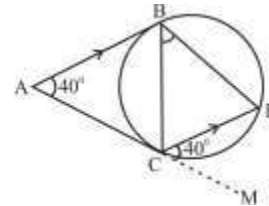
$$\text{Area of path} = 1075\pi$$

535. Two tangents AB and AC are drawn from a point A to the circle such that $\angle BAC = 40^\circ$. A chord CP is drawn parallel to BA. The measure of $\angle CBP$ is :

- (a) 55° (b) 45°
 (c) 35° (d) 40°

SSC CHSL 01/07/2019 (Shift-III)

Ans. (d) :



$$\angle BAC = \angle PCM = 40^\circ \quad (\text{Corresponding angle})$$

\therefore By alternate segment theorem

$$\angle PCM = \angle CBP \quad (\text{theorem})$$

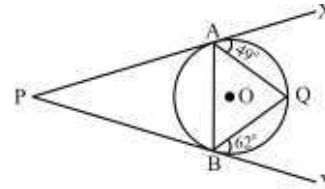
$$\angle CBP = 40^\circ$$

536. The centre of a circle is O. PAX and PBY are tangents at point A and B from point P. Q is a point on the circle, where $\angle QAX = 49^\circ$ and $\angle QBY = 62^\circ$. What is the measure of $\angle AQB$?

- (a) 63° (b) 69°
 (c) 59° (d) 67°

SSC CHSL 03/07/2019 (Shift-I)

Ans. (b) :



Angle formed by chord of a circle with tangent is equal to the angle formed by same chord in the alternate segment

$$\angle QBY = \angle BAQ = 62^\circ$$

$$\angle QAX = \angle ABQ = 49^\circ$$

In ΔABQ ,

$$\angle AQB = 180^\circ - (\angle BAQ + \angle ABQ)$$

$$= 180^\circ - (62^\circ + 49^\circ)$$

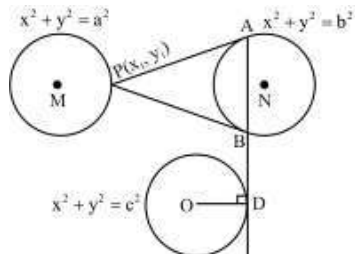
$$= 69^\circ$$

537. The chord of contact of tangents drawn from a point of circle $x^2 + y^2 = a^2$ to the circle $x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = c^2$ such that $b^m = a^n c^p$ and $m, n, p \in \mathbb{N}$ and m, n, p are prime to each other, then the value of $m + n + p - 3$ is :

- (a) 1 (b) 2
(c) -1 (d) 0

SSC CHSL 05/07/2019 (Shift-II)

Ans. (a)



If $P(x_1, y_1)$ is situated on circle $x^2 + y^2 = a^2$

$$\therefore x_1^2 + y_1^2 = a^2$$

The equation of the chord of the contact of tangents drawn from the point (x_1, y_1) to the circle $x^2 + y^2 = b^2$ will be.

$$xx_1 + yy_1 = b^2$$

Perpendicular distance of this tangent from the centre of the circle $x^2 + y^2 = c^2$ will be equal to the radius of the circle.

$$\frac{|-b^2|}{\sqrt{x_1^2 + y_1^2}} = c$$

$$\frac{b^2}{\sqrt{a^2}} = c$$

$$b^2 = ac \quad \dots\dots\dots(i)$$

Given, $b^m = a^n \cdot c^p \quad \dots\dots\dots(ii)$

By comparing the equation (i) and (ii)

$$m = 2, \quad n = 1, \quad p = 1$$

Hence, $m + n + p - 3 = 2 + 1 + 1 - 3 = 1$

538. The distance between the centres of two circles of radii 3 cm and 2 cm is 13 cm. Find the length (in cm) of transverse common tangent.

- (a) 12 (b) 6
(c) 8 (d) 10

SSC CHSL 08/07/2019 (Shift-III)

Ans. (a) : Given $r_1 = 3\text{cm}, r_2 = 2\text{cm}$
Distance between centres (d) = 13cm

Length of transverse common tangent

$$= \sqrt{d^2 - (r_1 + r_2)^2}$$

$$= \sqrt{(13)^2 - (3 + 2)^2}$$

$$= \sqrt{169 - 25}$$

$$= \sqrt{144} = 12\text{cm}$$

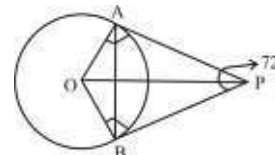
539. PA and PB are tangents from a point P outside the circle with centre O. A and B are points on the circle. If $\angle APB = 72^\circ$, then $\angle OAB$ is equal to :

- (a) 36° (b) 24°
(c) 18° (d) 72°

SSC CHSL 08/07/2019 (Shift-III)

Ans. (a) : Given,

$$\angle APB = 72^\circ$$



$$\therefore \angle OAP = \angle OBP = 90^\circ$$

In $\square APBO$ -

$$\angle OAP + \angle APB + \angle OBP + \angle AOB = 360^\circ$$

$$\Rightarrow 90^\circ + 72^\circ + 90^\circ + \angle AOB = 360^\circ$$

$$\Rightarrow \angle AOB = 360^\circ - 252^\circ$$

$$\Rightarrow \angle AOB = 108^\circ$$

In $\triangle AOB$ -

$$OA = OB = (\text{radius})$$

$$\therefore \angle OAB = \angle OBA \quad \dots\dots\dots(i)$$

$$\therefore \angle OAB + \angle OBA + \angle AOB = 180^\circ$$

$$\Rightarrow \angle OAB + \angle OAB + \angle AOB = 180^\circ$$

$$\therefore 2\angle OAB + 108^\circ = 180^\circ \quad [\text{from equation (i)}]$$

$$\therefore 2\angle OAB = 180^\circ - 108^\circ$$

$$\Rightarrow 2\angle OAB = 72^\circ$$

$$\Rightarrow 2\angle OAB = 72^\circ/2$$

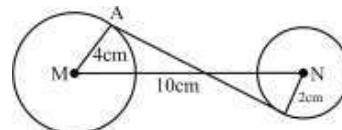
$$\Rightarrow \angle OAB = 36^\circ$$

540. The distance between the centres of two circles of radii 4 cm and 2 cm is 10 cm. Find the length of transverse common tangent.

- (a) 8 (b) 10
(c) 6 (d) 4

SSC CHSL 08/07/2019 (Shift-II)

Ans. (a) :



Length of transverse common tangent

$$= \sqrt{(\text{Distance between centers})^2 - (\text{Sum of radii})^2}$$

$$= \sqrt{10^2 - (4 + 2)^2}$$

$$= \sqrt{100 - 36} = \sqrt{64} = 8\text{cm}$$

541. The distance between the centres of the two circles of radius 6 cm is 13 cm. Find the length (in cm) of transverse common tangent.

- (a) 5 (b) 10
(c) 6 (d) 12

SSC CHSL 09/07/2019 (Shift-II)

Ans. (a) :

Length of transverse common tangent

$$= \sqrt{(\text{Distance between centers})^2 - (\text{Sum of radii})^2}$$

$$= \sqrt{13^2 - (6 + 6)^2}$$

$$= \sqrt{169 - 144}$$

$$= \sqrt{25}$$

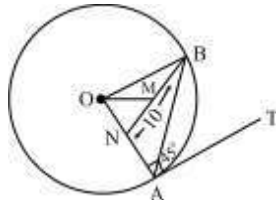
$$= 5\text{cm}$$

542. A and B are two points on a circle with centre O. AT is the tangents such that $\angle BAT = 45^\circ$. N is the point on OA such that $BN = 10$ cm. What is the length of median OM of $\triangle NOB$?

- (a) $10\sqrt{2}$ cm (b) 5 cm
(c) $5\sqrt{3}$ cm (d) $5\sqrt{2}$ cm

SSC CHSL 10/07/2019 (Shift-III)

Ans. (b) :



Median drawn from the vertex of a triangle bisects the opposite side.

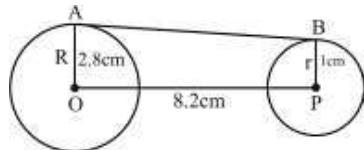
- $\angle OAT = 90^\circ$, $\angle BAT = 45^\circ$
 $\therefore \angle OAB = 90^\circ - 45^\circ = 45^\circ$
 $\triangle AOB$, $OA = OB$
 $\therefore \angle OAB = \angle OBA = 45^\circ$
 $\angle NOB = 180^\circ - 45^\circ - 45^\circ = 180^\circ - 90^\circ = 90^\circ$
 $\therefore \triangle BON$ is a right angled triangle
 $\therefore OM \perp BN$
 $\therefore OM$ divides BN in two equal parts
 $BM = OM = 5$ cm
 $\therefore OM = 5$ cm

543. The distance between the centres of the two circles of diameters 2 cm and 5.6 cm is 8.2 cm. What will be the length of a common tangent of circles that does not intersect the line joining the two circles ?

- (a) 6.4 cm (b) 7.2 cm
(c) 8 cm (d) 8.4 cm

SSC CHSL 10/07/2019 (Shift-II)

Ans. (c) :



- \therefore Length of direct common tangent $(AB) = \sqrt{OP^2 - (R - r)^2}$
 $= \sqrt{(8.2)^2 - (2.8 - 1)^2}$
 $= \sqrt{(8.2)^2 - (1.8)^2}$
 $= \sqrt{(8.2 + 1.8)(8.2 - 1.8)}$
 $= \sqrt{(10.0)(6.4)}$
 $= \sqrt{64} = 8$ cm

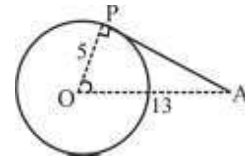
544. In a circle centred at O, a tangent AP is drawn from an external point A. If $OA = 13$ cm and $OP = 5$ cm, then the length of tangent AP is:

- (a) 10 cm (b) 8 cm
(c) 18 cm (d) 12 cm

SSC CHSL -26/10/2020 (Shift-II)

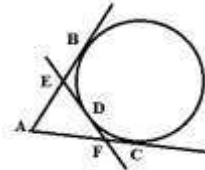
Ans. (d):

Given, $OA = 13$ cm
 $OP = 5$ cm



$\angle OPA = 90^\circ$
 $(OA)^2 = (OP)^2 + (AP)^2$
 $(13)^2 = (5)^2 + (AP)^2$
 $169 - 25 = (AP)^2$
 $144 = (AP)^2$
 $AP = 12$ cm

545. In the given figure, AB, AC and EF are tangents to a circle. If $AC = 15$ cm and $DE = 3$ cm, then the length of AE is:



- (a) 9 cm (b) 24 cm
(c) 18 cm (d) 12 cm

SSC CHSL -19/10/2020 (Shift-III)

Ans. (d) : \therefore Given,

$AC = 15$ cm, $DE = 3$ cm

\therefore Tangents drawn from exterior points of circle are equal.

$DE = BE = 3$ cm,
 $AB = AC = 15$ cm
 $AE + BE = AB = 15$
 $AE + 3 = 15$
 $AE = 12$ cm

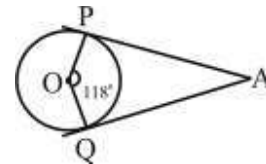
546. A circle is centred at O. Two tangents AP and AQ are drawn from an external point A. If

$\angle POQ = 118^\circ$, then $\angle PAQ$ is equal to:

- (a) 112° (b) 98°
(c) 62° (d) 72°

SSC CHSL -15/10/2020 (Shift-I)

Ans. (c) :



$\angle POQ + \angle PAQ = 180^\circ$ (By theorem)
 $\Rightarrow \angle PAQ = 180^\circ - 118^\circ = 62^\circ$

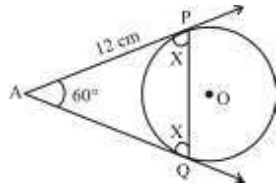
547. Two tangents AP and AQ are drawn to a circle with centre O from an external point A, where P and Q are points on the circle. If $AP = 12$ cm and

$\angle PAQ = 60^\circ$, then the length of chord PQ is:

- (a) 24 cm (b) 10 cm
(c) 12 cm (d) 16 cm

SSC CHSL -14/10/2020 (Shift-I)

Ans. (c):



$\therefore AP = AQ$ (tangent line)

$\angle APQ = \angle AQP = x^\circ$

In $\triangle APQ$,

$$x + x + 60^\circ = 180^\circ$$

$$2x = 120^\circ$$

$$x = 60^\circ$$

$\therefore \triangle APQ$ is an equilateral triangle.

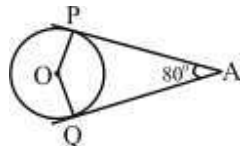
$\therefore PQ = 12$ cm

548. To a circle with centre at O, two tangents AP and AQ are drawn from an external point A. If the $\angle PAQ = 80^\circ$, then the $\angle POQ$ is:

- (a) 80° (b) 90°
(c) 70° (d) 100°

SSC CHSL -13/10/2020 (Shift-III)

Ans. (d) : \therefore

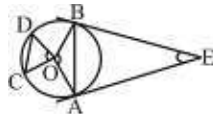


$$\angle POQ + \angle PAQ = 180^\circ$$

$$\angle POQ = 180^\circ - 80^\circ$$

$$\angle POQ = 100^\circ$$

549. In the following figure (not to scale), at the centre O, if the chord AB subtends double the angle that is subtended by chord CD and the angle $\angle AEB = 2\angle AOB$, then $\angle COD$ is equal to:



- (a) 45° (b) 60°
(c) 75° (d) 30°

SSC CHSL -13/10/2020 (Shift-II)

Ans. (d) : \therefore Given,

$$\angle AOB = 2 \times \angle COD$$

$$\angle AEB = 2\angle AOB$$

(by theorem)

$$\angle AOB + \angle AEB = 180^\circ$$

$$\Rightarrow 3\angle AOB = 180^\circ$$

$$\angle AOB = 60^\circ$$

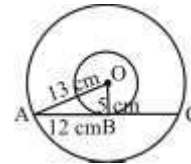
$$\therefore \angle COD = \frac{60}{2} = 30^\circ$$

550. Two concentric circles are of radii 13 cm and 5 cm. The length of the chord of the larger circle which touches the smaller circle is:

- (a) 24 cm (b) 10 cm
(c) 15 cm (d) 13 cm

SSC CHSL -12/10/2020 (Shift-III)

Ans. (a)



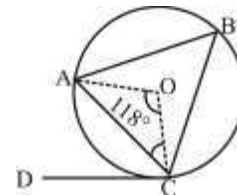
Radius of larger circle (AO) = 13 cm

Radius of smaller circle (OB) = 5 cm

By Pythagoras theorem (AB) = 12 cm

Length of chord = AC = 2AB = 24 cm

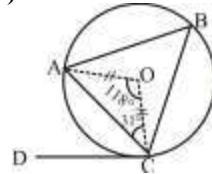
551. In the given figure, BC is a chord and CD is a tangent through the point C. If $\angle AOC = 118^\circ$, then find the $\angle ACD$.



- (a) 65° (b) 59°
(c) 56° (d) 63°

SSC CHSL -12/10/2020 (Shift-I)

Ans. (b) :



In $\triangle AOC$,

AO = OC (radius)

$$\angle OAC = \angle OCA = \left(\frac{180^\circ - 118^\circ}{2} \right) = \frac{62^\circ}{2} = 31^\circ$$

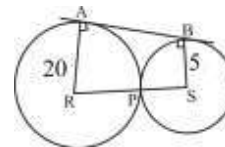
$$\angle ACD = 90^\circ - 31^\circ = 59^\circ$$

552. Two circles of radii 20 cm and 5 cm, respectively, touch each other externally at the point P, AB is the direct common tangent of those two circles of centres R and S, respectively. The length of AB is equal to:

- (a) 10 cm (b) 20 cm
(c) 5 cm (d) 15 cm

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) :



\therefore Radius (RA) = 20 cm

Radius (BS) = 5 cm

\therefore Distance between centres (RS) = 20 + 5 = 25 cm

\therefore Length of direct common tangent (AB)

$$\begin{aligned}
 &= \sqrt{(RS)^2 - (RA - BS)^2} \\
 &= \sqrt{(25)^2 - (20 - 5)^2} \\
 &= \sqrt{(25)^2 - (15)^2} \\
 &= \sqrt{625 - 225} = \sqrt{400} = 20 \text{ cm}
 \end{aligned}$$

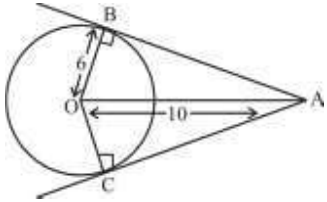
553. A pair of tangents AB and AC are drawn from a point which is at a distance of 10 cm from the centre O of a circle of radius 6 cm, then the area (in cm²) of quadrilateral ABOC, is:

- (a) 52 (b) 72
(c) 48 (d) 60

SSC CHSL -19/03/2020 (Shift-I)

Ans. (c) : Length of tangents AB and AC

$$\begin{aligned}
 AB = AC &= \sqrt{(10)^2 - (6)^2} \\
 &= \sqrt{100 - 36} \\
 &= \sqrt{64} = 8 \text{ cm}
 \end{aligned}$$



∴ area of □ABOC = area of ΔABO + area of ΔACO

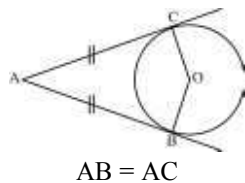
$$\begin{aligned}
 &= \frac{1}{2} \times AB \times OB + \frac{1}{2} \times AC \times OC \\
 &= \frac{1}{2} \times 8 \times 6 + \frac{1}{2} \times 8 \times 6 \\
 &= 24 + 24 \\
 &= 48 \text{ cm}^2
 \end{aligned}$$

554. The length of tangents drawn from an external point to the circle are:

- (a) not equal (b) perpendicular
(c) parallel (d) equal

SSC CHSL -19/03/2020 (Shift-I)

Ans. (d) : ∴ Tangents drawn from exterior point of a circle are equal

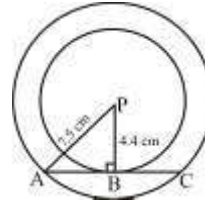


555. Two circles with the same centre P have radii 7.5 cm and 4.4 cm. Through a point A of the larger circle, a tangent is drawn to the smaller circle touching it at B. Find AC (Approximate in cm).

- (a) 13 cm (b) 14.27 cm
(c) 12.14 cm (d) 14 cm

SSC CHSL -18/03/2020 (Shift-III)

Ans. (c) :



In ΔABP,

$$(AB)^2 = (AP)^2 - (PB)^2$$

$$(AB)^2 = (7.5)^2 - (4.4)^2$$

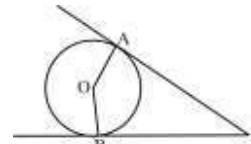
$$(AB)^2 = 56.25 - 19.36$$

$$AB = \sqrt{36.89}$$

$$AB = 6.07$$

$$AC = 2AB = 2 \times 6.07 = 12.14 \text{ cm}$$

556.



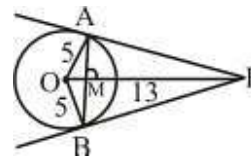
PA and PB are tangents to the circle and O is the centre of the circle. The radius is 5 cm and PO is 13 cm. If the area of the triangle PAB is

M, then the value of $\sqrt{\frac{M}{15}}$ is:

- (a) $\sqrt{\frac{12}{13}}$ (b) $\sqrt{\frac{24}{13}}$
(c) $\frac{12}{13}$ (d) $\frac{24}{13}$

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d) :



$$\begin{aligned}
 AP &= \sqrt{13^2 - 5^2} \\
 &= 12
 \end{aligned}$$

$$\text{Length of AM} = \frac{\text{Perpendicular} \times \text{Base}}{\text{Hypotenuse}}$$

$$= \frac{5 \times 12}{13} = \frac{60}{13}$$

$$\therefore AB = 2 \times \frac{60}{13} = \frac{120}{13}$$

$$(AO)^2 = (OM)^2 + (AM)^2$$

$$25 = (OM)^2 + \frac{3600}{169}$$

$$(OM)^2 = 25 - \frac{3600}{169}$$

$$= \frac{4225 - 3600}{169} = \frac{625}{169}$$

$$OM = \frac{25}{13}$$

$$\therefore MP = 13 - \frac{25}{13} = \frac{144}{13}$$

then, area of $\Delta PAB = \frac{1}{2} \times \frac{120}{13} \times \frac{144}{13} = \frac{60 \times 144}{169}$

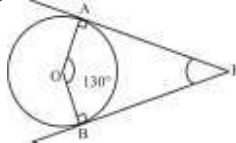
$$\therefore \sqrt{\frac{M}{15}} = \sqrt{\frac{60 \times 144}{169 \times 15}} = \sqrt{\frac{576}{169}} = \frac{24}{13}$$

$$\therefore \sqrt{\frac{M}{15}} = \frac{24}{13}$$

557. If the angle between two radii of a circle is 130° , then the angle between the tangents at the end of these radii (in degrees) is:
- (a) 90° (b) 40°
 (c) 50° (d) 70°

SSC CHSL -19/03/2020 (Shift-III)

Ans. (c) :



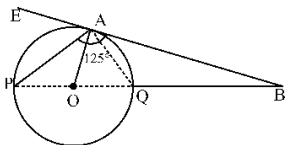
\therefore PAOB is a quadrilateral
 and $\angle PAO = \angle PBO = 90^\circ$
 $\therefore \angle AOB + \angle APB = 180^\circ$
 $\angle APB = 180^\circ - \angle AOB$
 $\angle APB = 180^\circ - 130^\circ = 50^\circ$

558. The tangent at a point A of a circle with centre O intersects the diameter PQ of the circle (when extended) at the point B. If $\angle BAP = 125^\circ$, then $\angle AQP$ is equal to:

- (a) 55° (b) 45°
 (c) 50° (d) 60°

SSC CHSL -20/10/2020 (Shift-III)

Ans : (a)



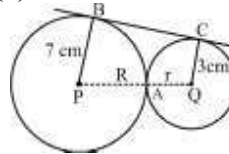
BA is produced to point E
 $\therefore \angle BAP = 125^\circ$
 $\therefore \angle EAP = 180^\circ - \angle BAP = 180^\circ - 125^\circ$
 $\angle EAP = 55^\circ$
 $\therefore \angle EAP = \angle AQP$ (alternate segment theorem)
 $\angle AQP = 55^\circ$

559. Two circles with centres P and Q of radii 7 cm and 3 cm, respectively, touch each other externally at a point A. BC is a direct common tangent to these two circles where B and C are the points on the circles respectively. The length of BC is:

- (a) $3\sqrt{21}$ cm (b) $2\sqrt{21}$ cm
 (c) $\sqrt{21}$ cm (d) $4\sqrt{21}$ cm

SSC CHSL -20/10/2020 (Shift-III)

Ans : (b)



Length of direct common tangent =

$$\sqrt{(\text{Distance between centers})^2 - (R - r)^2}$$

$$= \sqrt{(R + r)^2 - (R - r)^2}$$

$$= \sqrt{4Rr} = 2\sqrt{7 \times 3} = 2\sqrt{21} \text{ cm}$$

(XII) Problems based on Equilateral Polygon

560. A_1 and A_2 are two regular polygons. The sum of all the interior angles of A_1 is 1080° . Each interior angle of A_2 exceeds its exterior angle by 132° . The sum of the number of sides A_1 and A_2 is:

- (a) 21 (b) 22
 (c) 23 (d) 24

SSC CGL (Tier-II) 03/02/2022

Ans : (c) The sum of all the interior angles of $A_1 = 1080^\circ$

$$\Rightarrow (n - 2) \times 180^\circ = 1080^\circ$$

$$n - 2 = 6$$

$$n = 8$$

$$A_1 = 8$$

Let I is interior angle and E is the exterior angle of the polygon.

$$I - E = 132^\circ \text{ (i) [given]}$$

$$I + E = 180^\circ \text{ (ii) [Linear pair]}$$

From eqⁿ (i) + (ii),

$$2I = 180^\circ + 132^\circ$$

$$I = 156^\circ$$

On putting $I = 156^\circ$ in eqⁿ (i),

$$156^\circ - E = 132^\circ$$

$$156^\circ - 132^\circ = E$$

$$E = 24^\circ$$

$$\text{Number of sides of polygon} = 360^\circ / 24^\circ = 15$$

$$\text{The sum of the number of side } A_1 \text{ and } A_2 = (8 + 15) = 23$$

561. The sum of the interior angles of a regular polygon A is 1260 degrees and each interior angle of a regular polygon B is $128\frac{4}{7}$ degrees.

The sum of the number of sides of polygons A and B is:

- (a) 17 (b) 16
 (c) 19 (d) 18

SSC CGL (Tier-II) 29/01/2022

Ans : (b) We know that,

Each interior angle of a regular polygon

$$= \frac{(n - 2)}{n} \times 180^\circ$$

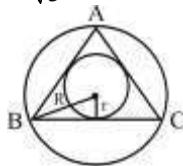
(where, n = number of sides)
 and, Sum of all interior angles of a regular polygon
 $= (n-2) 180^\circ$
 In polygon A,
 $(n-2) 180^\circ = 1260^\circ$
 $(n-2) = 7$
 $\Rightarrow n = 9$
 In polygon B,
 $\frac{(n-2)}{n} \times 180^\circ = 128\frac{4}{7}$
 $\frac{(n-2)}{n} \times 180^\circ = \frac{900^\circ}{7}$
 $\frac{(n-2)}{n} = \frac{5}{7}$
 $\Rightarrow 7n - 14 = 5n$
 $2n = 14$
 $\Rightarrow n = 7$
 Now, sum of sides of polygons A and B
 $= 9 + 7$
 $= 16$

562. If the radius of the circumcircle of an equilateral triangle is 8 cm, then the measure of radius of its incircle is:
 (a) 8 cm (b) 12 cm
 (c) 16 cm (d) 4 cm

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (d) : $\because \triangle ABC$ is equilateral

$$\text{Circumradius (R)} = \frac{a}{\sqrt{3}}$$



$$\text{Inradius (r)} = \frac{a}{2\sqrt{3}}$$

$$\therefore R = 2r$$

$$8 = 2r$$

$$r = 4 \text{ cm}$$

563. PQRST is a regular pentagon. If PR and QT intersect each other at X, then what is the value (in degrees) of $\angle TXR$?

- (a) 98 (b) 90
 (c) 72 (d) 108

SSC CGL (Tier-II) 9-3-2018

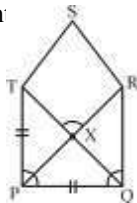
Ans. (d) : Interior angle of a regular pen

$$= \frac{(n-2) \times 180^\circ}{n} = \frac{3 \times 180^\circ}{5} = 108^\circ$$

$$\angle TPQ = \angle RQP = 108^\circ$$

In $\triangle TPQ$,

$$\angle XPQ = \frac{180^\circ - 108^\circ}{2} = 36^\circ$$



Similarly, $\angle XPQ = 36^\circ$

In $\triangle XPQ$, $\angle PXQ = 180^\circ - (36^\circ + 36^\circ) = 108^\circ$

$\angle TXR = \angle PXQ = 108^\circ$ (Vertically opposite angle)

564. If the measure of each exterior angle of a regular polygon is $\left(51\frac{3}{7}\right)^\circ$, then the ratio of the number of its diagonals to the number of its sides is :

- (a) 5 : 2 (b) 3 : 1
 (c) 2 : 1 (d) 13 : 6

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Number of sides of regular

$$\text{polygon} = \frac{360^\circ}{\frac{360^\circ}{7}} = 7$$

Ratio between number of diagonals and number of sides

$$= \frac{n(n-3)}{2} : n = (n-3) : 2$$

$$= 4 : 2$$

$$= 2 : 1$$

565. The sum of the interior angles of a regular polygon is 1260° . What is the difference between an exterior angle and an interior angle of the polygon ?

- (a) 120° (b) 105°
 (c) 100° (d) 90°

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Interior angle of a regular polygon = $180^\circ \times (n-2)$

$$\therefore 180^\circ \times (n-2) = 1260^\circ$$

$$n-2 = 7$$

$$n = 9$$

$$\therefore \text{Interior angle } (\theta_i) + \text{Exterior angle } (\theta_e) = 180^\circ$$

$$\therefore \theta_e = \frac{360^\circ}{n} = \frac{360^\circ}{9} = 40^\circ$$

$$\therefore \theta_i = 180^\circ - 40^\circ = 140^\circ$$

$$\text{Difference between interior and exterior angle} = \theta_e - \theta_i$$

$$= 140^\circ - 40^\circ = 100^\circ$$

566. If each interior angle of a regular polygon is

$\left(128\frac{4}{7}\right)^\circ$ then what is the sum of the number of its diagonals and the number of its sides ?

- (a) 21 (b) 17
 (c) 15 (d) 19

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : Let number of sides = x

$$\text{Each interior angle} = 128\frac{4}{7}$$

$$\frac{(x-2)180^\circ}{x} = \frac{900^\circ}{7}$$

$$7x-14 = 5x$$

$$x = 7$$

$$\text{Number of diagonals of polygon of side } x = \frac{x(x-3)}{2}$$

Number of diagonals of polygon of side 7

$$= \frac{7(7-3)}{2} = 14$$

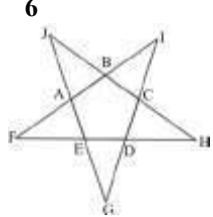
 Required Sum = 7 + 14 = 21

567. O, G, I and H are circumcentre, centroid, incentre and orthocentre respectively in an equilateral triangle. Which of the points are equal?
 (a) Only O, G and H (b) O, G, I and H
 (c) Only O and I (d) Only O and G

SSC CHSL (Tier-I) 11/07/2019 (Shift-I)

Ans. (b) :
 In equilateral triangle, circumcentre, centroid, incentre and orthocentre lie on the same point

568. ABCDE is a regular pentagon. Its sides are extended as shown in the figure. The value of $\frac{\angle ABC + 2\angle EGD + 3\angle BAJ}{6}$ is:



- (a) 45° (b) 66°
 (c) 75° (d) 30°

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : Each exterior angle of a regular pentagon = $\frac{360^\circ}{5} = 72^\circ$
 Each interior angle = $180^\circ - 72^\circ = 108^\circ$
 $\therefore \angle ABC = 108^\circ$
 $\angle BAJ = 72^\circ$
 $\angle EGD = 180^\circ - (72^\circ + 72^\circ) = 36^\circ$
 Hence,

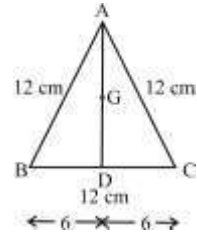
$$\frac{\angle ABC + 2\angle EGD + 3\angle BAJ}{6} = \frac{108^\circ + 72^\circ + 216^\circ}{6} = \frac{396^\circ}{6} = 66^\circ$$

(XIII) Miscellaneous

569. ABC is an equilateral triangle with side 12 cm and AD is the median. Find the length of GD if G is the centroid of ΔABC .
 (a) $3\sqrt{3}$ cm (b) $6\sqrt{3}$ cm
 (c) $4\sqrt{3}$ cm (d) $2\sqrt{3}$ cm

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d): In ΔADB ,
 $AB^2 = AD^2 + BD^2$
 $12^2 = AD^2 + 6^2$
 $AD^2 = 144 - 36$
 $AD = \sqrt{108}$
 $AD = 6\sqrt{3}$ cm
 Hence, $GD = \frac{1}{3} \times AD = \frac{1}{3} \times 6\sqrt{3} = 2\sqrt{3}$ cm



570. A circle is inscribed in a quadrilateral ABCD touching AB, BC, CD and AD at the points P, Q, R and S, respectively, and $\angle B = 90^\circ$. If AD = 24 cm, AB = 27 cm and DR = 6 cm, then what is the circumference of the circle?
 (a) 18π (b) 12π
 (c) 20π (d) 15π

SSC CGL (Tier-II) 12-09-2019

Ans. (a) :

 \therefore Tangents drawn from exterior point of a circle are equal.
 $AP = AS, BP = BQ, CQ = CR, DR = DS$
 $\therefore DR = DS = 6$ cm
 $AS = 24 - 6 = 18$ cm
 $\therefore AS = AP = 18$ cm
 $BP = 27 - 18 = 9$ cm
 $\therefore BQ = 9$ cm
 $\therefore r = 9$ cm
 Circumference of circle = $2\pi r = 18\pi$ cm

571. A circle is inscribed in an equilateral triangle of side 24 cm. What is the area (in cm^2) of a square inscribed in the circle?
 (a) 96 (b) 72
 (c) 48 (d) 54

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a) ΔABC is equilateral triangle.

$$\text{Inradius} = \frac{\text{Side}}{2\sqrt{3}} = \frac{24}{2\sqrt{3}}$$

$$= \frac{12}{\sqrt{3}} \text{ cm}$$

$$\therefore \text{Diameter} = 2 \times \frac{12}{\sqrt{3}}$$

$$\therefore \text{Diagonal of square} = \text{diameter of incircle}$$

$$\text{diagonal of square} = \frac{24}{\sqrt{3}}$$

$$\therefore \text{area of square} = \frac{(\text{diagonal})^2}{2} = \frac{\left(\frac{24}{\sqrt{3}}\right)^2}{2}$$

$$= \frac{24 \times 24}{\sqrt{3} \times \sqrt{3}} \times \frac{1}{2}$$

$$\text{area of square} = 96 \text{ cm}^2$$

572. The sides of ΔABC are 10cm, 10.5 cm and 14.5 cm. What is the radius of its circumcircle?

- (a) 7.5cm
- (b) 5cm
- (c) 7.25cm
- (d) 5.25cm

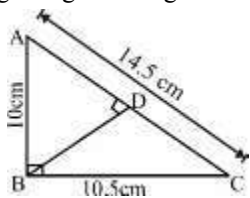
SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c)

$a : b : c = 10 : 10.5 : 14.5$
 $= 2 : 2.1 : 2.9$

$\therefore c^2 = a^2 + b^2$
 $(2.9)^2 = (2)^2 + (2.1)^2$
 $8.41 = 4 + 4.41$
 $8.41 = 8.41$

$\Rightarrow \Delta ABC$ is a right angled triangle.



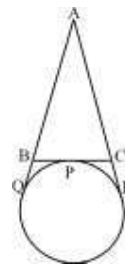
Length of radius of circumcircle (BD) = $\frac{AC}{2} = \frac{14.5}{2} = 7.25 \text{ cm}$

573. A circle touches the side BC of a ΔABC at P and also touches AB and AC produced at Q and R, respectively. If the perimeter of $\Delta ABC = 26.4 \text{ cm}$, then the length of AQ is:

- (a) 17.6cm
- (b) 13.2cm
- (c) 8.8cm
- (d) 15.4cm

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b)



Perimeter of $\Delta ABC = 26.4 \text{ cm}$
 $AB + BC + CA = 26.4$
 $AB + BP + PC + CA = 26.4$
 $AB + BQ + CR + CA = 26.4$ (BQ = BP, CR = CP)
 Tangent lines drawn from exterior of a circle are equal.
 $AQ + AR = 26.4$
 $2AQ = 26.4$ (AQ = AR)
 $AQ = 13.2 \text{ cm}$

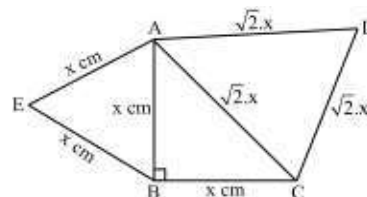
574. Two equilateral triangles are formed on the hypotenuse of an isosceles right angled triangle and on one of its perpendicular sides. Their

areas are H and A respectively. $\frac{A}{H}$ is equal to:

- (a) $\frac{1}{4}$
- (b) $\frac{1}{2}$
- (c) $\frac{1}{\sqrt{2}}$
- (d) $\frac{1}{\sqrt[3]{2}}$

SSC CHSL (Tier-I) 10/07/2019 (Shift-II)

Ans. (b):



Let, the equal sides of an isosceles right angled triangle are x cm.

$\therefore \text{hypotenuse} = \sqrt{x^2 + x^2} = \sqrt{2}.x$
 Area of equilateral triangle made on hypotenuse (H)
 $= \frac{\sqrt{3}}{4} \times (\sqrt{2}.x)^2$

Area of equilateral triangle made on altitude side

$(A) = \frac{\sqrt{3}}{4} \times (x)^2$
 $\therefore \frac{A}{H} = \frac{\frac{\sqrt{3}}{4} \times (x)^2}{\frac{\sqrt{3}}{4} \times (\sqrt{2}.x)^2}$
 $\therefore \frac{A}{H} = \frac{1}{2}$

05.

Co-ordinate Geometry

1. The graph of the equations $5x - 2y + 1 = 0$ and $4y - 3x + 5 = 0$, intersect at the point P (α, β). What is the value of $(2\alpha - 3\beta)$?
- (a) 4 (b) -4
(c) 6 (d) -3

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : On solving the given equation,
 $5x - 2y = -1$ (1)
 $-3x + 4y = -5$ (2)
 $10x - 4y = -2$ Multiply by 2 in equation (1)-eqⁿ (2)
 $\underline{-3x + 4y = -5}$
 $7x = -7$
 $x = -1$
 Putting the value of x in equation (1)
 $-2y = -1 + 5$
 $y = -2$
 \therefore Given equation intersect at point P (α, β)
 Hence,
 $\therefore \alpha = -1, \beta = -2$
 $(2\alpha - 3\beta) = -2 + 6 = 4$

2. What is the reflection of the point (5, -3) in the line $y = 3$?
- (a) (5, -6) (b) (-5, 3)
(c) (5, 3) (d) (5, 9)

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d) :

Hence the reflection of the point (5, -3) will be (5, 9) with respect to $y = 3$

3. The graphs of the linear equations $4x - 2y = 10$ and $4x + ky = 2$ intersect at a point (a, 4). The value of k is equal to :
- (a) -3 (b) 4
(c) 3 (d) -4

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Ans. (d) : According to the question,
 \therefore Given linear equations intersects each other at point (a, 4)
 \therefore Point (a, 4) will satisfying the both given equations.
 $4x - 2y = 10$ ----- (Given)
 $4 \times a - 2 \times 4 = 10,$
 $4a - 8 = 10$
 $a = \frac{9}{2}$

And $4x + ky = 2$
 $4 \times a + k \times 4 = 2$
 $4a + 4k = 2$
 Putting the value of $a = \frac{9}{2}$
 $k = -4$

4. What is the area (in square units) of the triangular region enclosed by the graphs of the equations $x + y = 3$, $2x + 5y = 12$ and the x-axis?
- (a) 6 (b) 4
(c) 3 (d) 2

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : $x + y = 3$ (1)
 $2x + 5y = 12$ (2)
 Intersects the x-axis then,
 $y = 0$ (3)
 On solving equation (1) and (2),
 $x = 1, y = 2 \Rightarrow (1, 2)$
 On solving equation (2) and (3),
 $x = 6, y = 0 \Rightarrow (6, 0)$
 On solving equation (3) and (1),
 $x = 3, y = 0 \Rightarrow (3, 0)$
 \therefore Area of triangular region

$$= \frac{1}{2} \{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\}$$

$$= \frac{1}{2} \{1(0 - 0) + 6(0 - 2) + 3(2 - 0)\}$$

$$= \frac{1}{2} \{-12 + 6\} = -3 = 3 \text{ unit square}$$

5. The point of intersection of the graphs of the equations $3x - 5y = 19$ and $3y - 7x + 1 = 0$ is P(α, β). What is the value of $(3\alpha - \beta)$?
- (a) 0 (b) 1
(c) -1 (d) -2

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : $3x - 5y = 19$ (i)
 $3y - 7x = -1$ (ii)
 The point of intersection of equation (i) and (ii) is (α, β).
 $\therefore 3\alpha - 5\beta = 19$ (iii)
 and $3\beta - 7\alpha = -1$ (iv)
 On solving equation (iii) and (iv).
 $\alpha = -2, \beta = -5$
 $3\alpha - \beta = -6 + 5 = -1$

6. The graphs of the equations $2x + 3y = 11$ and $x - 2y + 12 = 0$ intersects at P(x_1, y_1) and the graph of the equation $x - 2y + 12 = 0$ intersects the x-axis at Q (x_2, y_2). What is the value of $(x_1 - x_2 + y_1 + y_2)$?

- (a) 15 (b) 13
(c) -11 (d) -9

SSC CGL (Tier-II) 12-09-2019

Ans. (a): $2x + 3y = 11$ (1)
 $x - 2y + 12 = 0$ (2)
 On solving the equation (1) and equation (2) $\times 2$
 $x = -2, y = 5$
 $\therefore x_1 = -2$ and $y_1 = 5$
 $x - 2y + 12 = 0$ (2)
 Intersects the x-axis then,
 $y = 0$ (3)
 On solving the equation (2) and (3)
 $x = -12, y = 0$
 $y_2 = 0, x_2 = -12$
 $x_1 - x_2 + y_1 + y_2 = -2 + 12 + 5 + 0$
 $= 15$

7. The graphs of the equations $3x + y - 5 = 0$ and $2x - y - 5 = 0$ intersect at the point $P(\alpha, \beta)$. What is the value of $(3\alpha + \beta)$?

- (a) 3 (b) 5
(c) 4 (d) -4

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : If the point of intersection of $3x + y - 5 = 0$ and $2x - y - 5 = 0$ is $P(\alpha, \beta)$ then, $(\alpha, \beta) = (x, y)$
 $3x + y - 5 = 0$ (i)
 $2x - y - 5 = 0$ (ii)
 $5x - 10 = 0$
 $x = 2$
 Putting $x = 2$ in equation (1)
 $3 \times 2 + y - 5 = 0$
 $y = -1$
 $\therefore (\alpha, \beta) = (2, -1)$
 Hence, $3\alpha + \beta = 3 \times 2 + (-1) = 5$

8. The graph of the equation $x - 7y = -42$, intersects the y-axis at $P(\alpha, \beta)$ and the graph of $6x + y - 15 = 0$, intersects the x-axis at $Q(\gamma, \delta)$. What is the value of $\alpha + \beta + \gamma + \delta$?

- (a) 5 (b) 6
(c) $\frac{9}{2}$ (d) $\frac{17}{2}$

SSC CGL (Tier-II) 11-9-2019

Ans. (d) : $x - 7y = -42$,... (i)
 intersects the y-axis then, $x = 0$... (ii)
 From equation (i) & (ii)
 $\therefore 0 - 7y = -42 \Rightarrow y = 6$
 Hence $p(\alpha, \beta) = (0, 6)$
 If $6x + y - 15 = 0$, ... (iii)
 intersects the x-axis then, $y = 0$ (iv)
 From equation (iii) & (iv)
 $\therefore 6x + 0 - 15 = 0 \Rightarrow x = \frac{5}{2}$
 Hence, $Q(\gamma, \delta) = \left(\frac{5}{2}, 0\right)$
 $\therefore \alpha + \beta + \gamma + \delta = 0 + 6 + \frac{5}{2} + 0$
 $= \frac{17}{2}$

9. What is the equation of a circle with centre of origin and radius of 6 cm?

- (a) $x^2 + y^2 - x - y = 36$ (b) $x^2 + y^2 - 36 = 0$
(c) $x^2 + y^2 - y = 36$ (d) $x^2 + y^2 - x = 36$

SSC CHSL -17/03/2020 (Shift-III)

Ans. (b) : Centre of origin of circle = $(0, 0)$
 Radius of the circle = 6 cm.
 \therefore Required equation of circle-
 $(x - 0)^2 + (y - 0)^2 = 6^2$
 $x^2 + y^2 = 36$
 $x^2 + y^2 - 36 = 0$

10. The equation of a straight line on a point $(3, -5)$ and slope 2 is:

- (a) $3x - 5y - 2 = 0$ (b) $5x - 2y + 3 = 0$
(c) $2x - y - 11 = 0$ (d) $3x - 2y - 5 = 0$

SSC CHSL -19/10/2020 (Shift-III)

Ans. (c) : \therefore The equation of the line passing through the point (x, y) and the slope m .

$$(y - y_1) = m(x - x_1)$$

Point = $(3, -5)$, slope $(m) = 2$ (given)

$$(y + 5) = 2 \times (x - 3)$$

$$y + 5 = 2x - 6$$

$$2x - y = 11$$

$$2x - y - 11 = 0$$

11. Find the equation of a circle whose diameter has end points $(4, 3)$ and $(-2, 1)$.

- (a) $x^2 + y^2 - 2x + 4y = 5$
(b) $x^2 + y^2 - 2x - 4y = 5$
(c) $x^2 + y^2 - 2x - 4y = 3$
(d) $x^2 + y^2 - 6x + 2y = 3$

SSC CHSL -15/10/2020 (Shift-II)

Ans. (b) : If the ends of the diameter are (x_1, y_1) and (x_2, y_2)

equation of the circle is $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$

\therefore Ends of the diameter of the circle are $(4, 3)$ and $(-2, 1)$ respectively, then the equation of circle is.

$$(x - 4)(x + 2) + (y - 3)(y - 1) = 0$$

$$x^2 - 4x + 2x - 8 + y^2 - y - 3y + 3 = 0$$

$$x^2 + y^2 - 2x - 4y - 5 = 0$$

$$x^2 + y^2 - 2x - 4y = 5$$

12. The equation of circle with centre $(1, -2)$ and radius 4 cm is:

- (a) $x^2 + y^2 - 2x + 4y = 16$
(b) $x^2 + y^2 + 2x - 4y = 11$
(c) $x^2 + y^2 - 2x + 4y = 11$
(d) $x^2 + y^2 + 2x - 4y = 16$

SSC CHSL -17/03/2020 (Shift-II)

Ans. (c) : Centre of the circle = $(1, -2)$

Radius (a) = 4 cm.

\therefore equation of the circle $\Rightarrow (x - h)^2 + (y - k)^2 = r^2$

$$(x - 1)^2 + (y + 2)^2 = 16$$

$$x^2 - 2x + 1 + y^2 + 4y + 4 = 16$$

$$x^2 + y^2 - 2x + 4y + 5 = 16$$

$$x^2 + y^2 - 2x + 4y = 11$$

(I) Problems based on Triangle

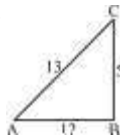
1. What will be the area of a triangle whose sides are 13 cm, 5 cm and 12 cm?

- (a) 50 cm^2 (b) 40 cm^2
(c) 35 cm^2 (d) 30 cm^2

SSC CHSL 02/06/2022 (Shift-I)

Ans. (d) : 5, 12 and 13 form triplet.

$$\text{Area of triangle ABC} = \frac{1}{2} \times \text{AB} \times \text{BC}$$



$$= \frac{1}{2} \times 5 \times 12 = 30 \text{ cm}^2$$

2. The lengths of the three sides of a triangle are 3 cm, 4 cm and 5 cm respectively. Find the area of this triangle.

- (a) 6 cm^2 (b) 12 cm^2
(c) 8 cm^2 (d) 10 cm^2

SSC CHSL 25/05/2022 (Shift-III)

Ans. (a) : Given,

Sides of the triangle are 3cm, 4cm and 5cm.
since, It forms triplet, so Δ is right angled.

$$\begin{aligned} \text{Now, Area of triangle} &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2 \end{aligned}$$

3. The sides of a triangular field are 360m, 480m and 600m. Its area is equal to the area of a square field. What is the side (in m) of the square field?

- (a) $120\sqrt{6}$ (b) $160\sqrt{6}$
(c) $160\sqrt{3}$ (d) $120\sqrt{3}$

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (a) Area of Triangle = Area of Square

Triplet $\rightarrow (3, 4, 5) \times 120$

Hence, Triangle is right angled triangle.

$$\begin{aligned} \frac{1}{2} \times 360 \times 480 &= a^2 \\ a^2 &= 86400 \\ a &= 120\sqrt{6} \text{m.} \end{aligned}$$

4. What is the height (in cm) of an equilateral triangle whose each side is 8 cm?

- (a) $4\sqrt{3}$ (b) $3\sqrt{2}$
(c) $4\sqrt{2}$ (d) $3\sqrt{5}$

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (a) Side of an equilateral triangle = 8

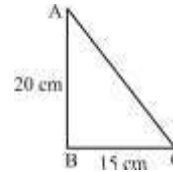
$$\begin{aligned} \text{Height of an equilateral triangle} &= \frac{a\sqrt{3}}{2} \\ &= \frac{8\sqrt{3}}{2} \\ &= 4\sqrt{3} \end{aligned}$$

5. The perimeter of a right-angled triangle whose sides that make right angles are 15 cm and 20 cm is:

- (a) 60 cm (b) 50 cm
(c) 70 cm (d) 40 cm

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) :



\therefore Sides 15 cm and 20 cm make right angle triangle

So, by Pythagoras theorem

$$\begin{aligned} AC^2 &= 20^2 + 15^2 \\ AC^2 &= 400 + 225 = 625 \\ AC &= 25 \text{ cm} \end{aligned}$$

Hence, the perimeter of right angle triangle

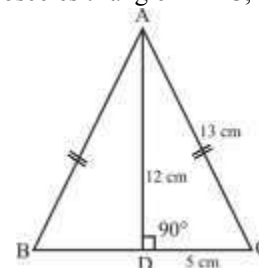
$$\begin{aligned} &= \text{AB} + \text{BC} + \text{AC} \\ &= 20 + 15 + 25 \\ &= 60 \text{ cm} \end{aligned}$$

6. In an isosceles triangle ABC, $\text{AB} = \text{AC}$ and AD is perpendicular to BC. If $\text{AD} = 12 \text{ cm}$ and the perimeter of ΔABC is 36 cm, then the length of BC (in cm) as:

- (a) 5 (b) 12
(c) 10 (d) 13

SSC CHSL 05/08/2021 (Shift-I)

Ans. (c) : In isosceles triangle ΔABC , $\text{AB} = \text{AC}$



Perimeter of $\Delta \text{ABC} = 36 \text{ cm}$

From triplet method 5, 12, 13 cm, $\text{AD} = 12 \text{ cm}$, $\text{AC} = 13 \text{ cm}$ and $\text{DC} = 5 \text{ cm}$

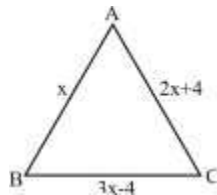
Hence, $\text{BC} = 2 \times \text{DC} = 2 \times 5 = 10 \text{ cm}$

7. In a triangle ABC, length of the side AC is 4 cm more than 2 times the length of the side AB. Length of the side BC is 4 cm less than the three times the length of the side AB. If the perimeter of $\triangle ABC$ is 60 cm, then its area (in cm^2) is :

- (a) 150 (b) 144
(c) 100 (d) 120

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (d) :



Let side $AB = x$ cm

According to the question

$$\therefore x + 2x + 4 + 3x - 4 = 60$$

$$6x = 60$$

$$x = 10$$

\therefore Sides are 10 cm, 24 cm and 26 cm.

10, 24, 26 follow triplet

So triangle is a right angled triangle

$$\text{Hence, Area of triangle} = \frac{1}{2} \times 10 \times 24 = 120 \text{ cm}^2$$

8. What is the perimeter (in cm) of an equilateral triangle whose height is 3.46 cm? Take $\sqrt{3} = 1.732$.

- (a) 10.4 (b) 9
(c) 6 (d) 12

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : Given, $h = 3.46$ cm and ($\sqrt{3} = 1.732$)

$$h = \frac{\sqrt{3}}{2} a \text{ ----- [Formula]}$$

$$a = \frac{3.46 \times 2}{\sqrt{3}} \quad (\sqrt{3} = 1.732)$$

$$a = 4 \text{ cm}$$

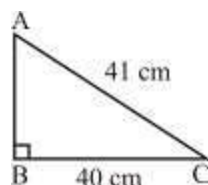
Perimeter of an equilateral triangle = $3a = 3 \times 4 = 12$ cm

9. The length of the base of a right-angle triangle is 40 cm and its hypotenuse is 41 cm long. What is its area (in cm^2) and perimeter (in cm), respectively?

- (a) 85 and 170 (b) 90 and 180
(c) 180 and 90 (d) 170 and 85

SSC CHSL 16/04/2021 (Shift-I)

Ans. (c) :



In $\triangle ABC$,
By Pythagoras theorem,

$$AB = \sqrt{41^2 - 40^2} = 9 \text{ cm}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 40 \times 9 = 180 \text{ cm}^2$$

$$\text{Perimeter of } \triangle ABC = 40 + 9 + 41 = 90 \text{ cm}$$

10. The base of a triangle is equal to the perimeter of a square whose diagonal is $6\sqrt{2}$ cm, and its height is equal to the side of a square whose area is 144 cm^2 . The area of the triangle (in cm^2) is:

- (a) 72 (b) 216
(c) 144 (d) 288

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : Diagonal of the square = $6\sqrt{2}$ cm

$$a\sqrt{2} = 6\sqrt{2}$$

\therefore Side of a square = 6 cm

Base of the triangle = $4 \times 6 = 24$ cm

Height of the triangle = $\sqrt{144} = 12$ cm = Side of the square

$$\therefore \text{Area of the triangle} = \frac{1}{2} \times 24 \times 12 = 144 \text{ cm}^2$$

11. The perimeter of an isosceles triangle is 91 cm and its base is $1\frac{1}{4}$ times each of its equal sides. What is the length (in cm) of its base?

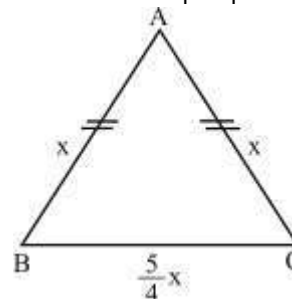
- (a) 25 (b) 20
(c) 28 (d) 35

SSC CHSL 16/04/2021 (Shift-I)

Ans. (d) :

Let the equal sides of given isosceles triangle = x
then, as per the question

$$\text{the base of that triangle} = x \times \frac{5}{4} = \frac{5}{4}x$$



$$\Rightarrow \text{Perimeter} = 91 \text{ cm ----- [Given]}$$

$$\Rightarrow x + x + \frac{5}{4}x = 91$$

$$\Rightarrow \frac{13x}{4} = 91$$

$$\Rightarrow x = 28$$

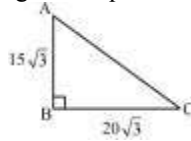
$$\therefore \text{length of its base} = \frac{5}{4} \times 28 = 35 \text{ cm}$$

12. What is the perimeter of a right-angled triangle whose sides (making 90°) are $20\sqrt{3}$ cm and $15\sqrt{3}$ cm?

- (a) $60\sqrt{3}$ cm (b) $55\sqrt{3}$ cm
(c) $65\sqrt{3}$ cm (d) $50\sqrt{3}$ cm

SSC CHSL 13/04/2021 (Shift-I)

Ans. (a) : According to the question:-



By Pythagoras triplet,
 $20\sqrt{3}$, $15\sqrt{3}$ and $25\sqrt{3}$

$$AC = 25\sqrt{3} \text{ cm}$$

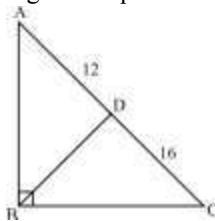
Hence, perimeter = $25\sqrt{3} + 15\sqrt{3} + 20\sqrt{3} = 60\sqrt{3}$ cm

13. ABC is a right angled triangle, right-angled at B, D is a point on AC such that $AD = 12$ cm and $CD = 16$ cm. If BD bisects $\angle ABC$, then the perimeter of $\triangle ABC$ will be:

- (a) 67.2 cm (b) 66 cm
(c) 56.2 cm (d) 66.2 cm

SSC CHSL 04/08/2021 (Shift-II)

Ans. (a) : According to the question:



\therefore BD is the bisector of $\angle ABC$.

$$\therefore \frac{BC}{AB} = \frac{16}{12} = \frac{4}{3}$$

Now, let the length of AB and BC is $3x$ and $4x$ respectively.

In right angle triangle ABC,

$$AB^2 + BC^2 = AC^2$$

$$9x^2 + 16x^2 = 28^2$$

$$25x^2 = 28^2 \Rightarrow 5x = 28$$

$$x = 28/5$$

Then, Perimeter = $AB + BC + CA$

$$= 7x + 28$$

$$= 7 \times \frac{28}{5} + 28$$

$$= 28 \left(\frac{12}{5} \right)$$

$$= 5.6 \times 12 = 67.2 \text{ cm}$$

14. The sides of a triangle are in the ratio $\frac{1}{3} : \frac{1}{5} : \frac{1}{4}$ and its perimeter is 141 cm. The difference between the greatest side and the smallest side is:

- (a) 18 cm (b) 12 cm
(c) 24 cm (d) 15 cm

SSC CHSL 10/08/2021 (Shift-II)

Ans. (c) : Given:- Ratio of side of the triangle

$$= \frac{1}{3} : \frac{1}{5} : \frac{1}{4} = 20 : 12 : 15 \text{ -----}$$

Let the sides of the triangle are $20x$, $12x$ and $15x$ respectively.

As per the question,

$$20x + 12x + 15x = 141$$

$$47x = 141$$

$$x = \frac{141}{47} = 3$$

Hence, the required difference = $20x - 12x = 8x$

$$= 8 \times 3$$

$$= 24 \text{ cm}$$

15. The base of a triangle is equal to the perimeter of a square whose diagonal is $9\sqrt{2}$ cm, and its height is equal to the side of a square whose area is 144 cm^2 . The area of the triangle (in cm^2) is:

- (a) 216 (b) 72
(c) 144 (d) 288

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : Given,

$$\text{Diagonal of the square} = 9\sqrt{2} \text{ cm.}$$

$$\therefore \text{Sides of the square} = 9 \text{ cm.}$$

Hence, base of triangles = perimeter of square

$$= 9 \times 4 = 36 \text{ cm.}$$

Again

$$\text{Area of square} = 144 \text{ cm}^2$$

$$\therefore \text{Height of triangle} = \sqrt{144} \text{ cm.}$$

$$= 12 \text{ cm.}$$

Hence area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

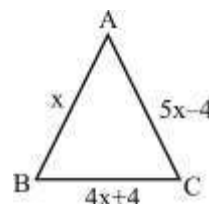
$$= \frac{1}{2} \times 36 \times 12 = 216 \text{ cm}^2$$

16. In a triangle ABC, the length of side AC is 4 cm less than five times the length of side AB. The length of side BC exceeds four times the length of side AB by 4 cm. If the perimeter of $\triangle ABC$ is 90 cm, then its area is:

- (a) 180 cm^2 (b) 148 cm^2
(c) 164 cm^2 (d) 160 cm^2

SSC CHSL 11/08/2021 (Shift-II)

Ans. (a) :



In ΔABC , Let $AB = x\text{cm}$

Then, as per the question

$$BC = 4x+4\text{cm}$$

$$AC = 5x-4\text{cm}$$

\therefore Perimeter of $\Delta ABC = 90\text{cm}$

$$\therefore x+(4x+4)+(5x-4) = 90$$

$$10x - 0 = 90$$

$$x = \frac{90}{10} = 9\text{cm}$$

Hence $AB = x = 9\text{cm}$

$$BC = 4x+4 = 4 \times 9+4 = 40\text{cm}$$

$$CA = 5x-4 = 5 \times 9-4 = 41\text{cm}$$

$$\text{Semi perimeter}(s) = \frac{40+41+9}{2} = 45\text{cm}$$

$$\begin{aligned} \text{Area of } \Delta ABC &= \sqrt{45(45-9)(45-40)(45-41)} \\ &= 180\text{cm}^2 \end{aligned}$$

17. The sum of three sides of an isosceles triangle is 20 cm, and the ratio of an equal side to the base is 3 : 4. The altitude of the triangle is:

- (a) $3\sqrt{3}\text{cm}$ (b) $4\sqrt{5}\text{cm}$
 (c) $2\sqrt{5}\text{cm}$ (d) $3\sqrt{5}\text{cm}$

SSC CHSL 11/082021 (Shift-II)

Ans. (c) : Let the length of each equal side and base $3x$ and $4x$ respectively.

$$\text{Sum of all side of triangle} = 3x+3x+4x = 20$$

$$x = \frac{20}{10} = 2$$

$$\text{Now base} = 4x = 4 \times 2 = 8\text{ cm}$$

$$\text{other side } 3x = 3 \times 2 = 6\text{ cm}$$

$$\begin{aligned} \text{Height of the given triangle}(h) &= \sqrt{(6)^2 - (4)^2} \\ &= \sqrt{36-16} = \sqrt{20} \\ &= 2\sqrt{5}\text{ cm} \end{aligned}$$

18. The in-radius and circumradius of a right-angled triangle is 3 cm and 12.5 cm respectively. The area of the triangle is:

- (a) 65 cm^2 (b) 48 cm^2
 (c) 88 cm^2 (d) 84 cm^2

SSC CHSL 05/08/2021 (Shift-III)

Ans. (d) : Circumradius of a right angled triangle

$$= \frac{H}{2} = 12.5 \text{ ----- [where H=Hypotenuse]}$$

$$H = 12.5 \times 2 = 25\text{ cm}$$

$$\text{And, in radius} = \frac{P+B-H}{2} = 3$$

$$P+B-H = 3 \times 2 = 6$$

$$P+B = 31$$

On putting the value of H,

Now From Triplet rule the sides of given right angled triangle is 24cm, 7cm and 25cm.

$$\text{Area of triangle} = \frac{1}{2} \times 24 \times 7 = 84\text{cm}^2$$

19. The lengths of three sides of a triangle are in the ratio 3 : 4 : 5. Among three sides, the difference between the largest side and the smallest side of this triangle is 3.6cm. The area (in cm^2) of the triangle is:

- (a) 21.75 (b) 19.44
 (c) 32.44 (d) 15.64

SSC CHSL 16/04/2021 (Shift-III)

Ans.(b) : Let the length of sides of the triangle be $3x$, $4x$ and $5x$ respectively.

As per question,

$$5x-3x = 3.6$$

$$x = \frac{3.6}{2} = 1.8$$

$$\text{Now the area of triangle} = \frac{1}{2} \times 3x \times 4x$$

$$= \frac{1}{2} \times 3 \times 1.8 \times 4 \times 1.8$$

$$= 6 \times 3.24$$

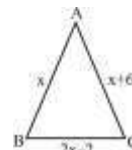
$$= 19.44\text{ cm}^2$$

20. In ΔABC , the length of BC is less than twice the length of AB by 2 cm. The length of AC exceeds the length of AB by 6 cm. The perimeter is 60 cm. The length (in cm) of the largest side of the triangle ABC is:-

- (a) 30 (b) 26
 (c) 28 (d) 36

SSC CHSL 05/08/2021 (Shift-II)

Ans. (b)



In the given triangle-

$$\text{Length of } AB = x$$

Then, as per the question

$$\text{Length of } BC = 2x-2$$

$$\text{and Length of } AC = x+6$$

Now, perimeter of the triangle

$$x+2x-2+x+6 = 60$$

$$4x+4 = 60$$

$$x = \frac{60-4}{4} = 14$$

$$\begin{aligned} \text{Largest side of given triangle} &= 2x-2 = 2 \times 14-2 \\ &= 26\text{ cm} \end{aligned}$$

21. The perimeter of an isosceles triangle is 220 cm. If the base is 40 cm, then the length of each of the other sides is:

- (a) 85 cm (b) 90 cm
(c) 80 cm (d) 95 cm

SSC CHSL 09/08/2021 (Shift-III)

Ans. (b) : Base of the given isosceles triangle
= 40cm ----- (Given)

Let the other two equal sides are x cm.

Then, As per question

$$x+x+40 = 220$$

$$2x = 220-40 = 180$$

$$x = \frac{180}{2} = 90 \text{ cm}$$

Hence, Length of other two sides =
x = 90 cm

22. If the perimeter of an isosceles right triangle is $15(\sqrt{2} + 1)$ cm, then the area of the triangle will be:

- (a) 46.5 cm² (b) 45 cm²
(c) 56.25 cm² (d) 55 cm²

SSC CHSL 09/08/2021 (Shift-II)

Ans. (c) : Let, the base and perpendicular of the isosceles right angle triangle = x cm

then hypotenuse = $\sqrt{x^2 + x^2} = x\sqrt{2}$

$$\text{Perimeter} = x + x + x\sqrt{2} = 15(\sqrt{2} + 1)$$

$$x(2 + \sqrt{2}) = 15(\sqrt{2} + 1)$$

$$x\sqrt{2}(\sqrt{2} + 1) = 15(\sqrt{2} + 1)$$

$$x = \frac{15}{\sqrt{2}}$$

$$\text{Now the area of triangle} = \frac{1}{2} \times x \times x = \frac{x^2}{2}$$

$$= \frac{1}{2} \times \left(\frac{15}{\sqrt{2}}\right)^2 = \frac{1}{2} \times \frac{225}{2}$$

$$= 56.25 \text{ cm}^2$$

23. The area of a equilateral triangle is $10.24\sqrt{3} \text{ m}^2$. Its perimeter (in m) is:

- (a) 9.6 (b) 3.2
(c) 6.4 (d) 19.2

SSC CHSL 12/08/2021 (Shift-II)

Ans. (d) : Let the side of given equilateral triangle = a cm

Then from formula-

$$\text{Area of equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$

$$\frac{\sqrt{3}}{4} a^2 = 10.24\sqrt{3}$$

$$a^2 = 10.24 \times 4$$

$$a = \sqrt{10.24 \times 4}$$

$$a = 3.2 \times 2 = 6.4$$

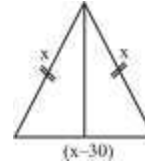
Hence, Perimeter of the equilateral triangle (3a) = 3×6.4
= 19.2 cm

24. The perimeter of an isosceles triangle is 3.6 m and its base is 30 cm shorter than each of the equal sides. What is the area (in m²) of the triangle?

- (a) 0.72 (b) 0.6
(c) 0.8 (d) 0.54

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b)



Let the each equal sides of the given isosceles triangle = x cm

And length of base = x-30 cm

∴ Perimeter of triangle = 3.6 m = $3.6 \times 100 = 360$ cm (Given)

Perimeter of triangle = x+x+x-30 = 360

$$3x = 360+30$$

$$x = \frac{390}{3}$$

$$\Rightarrow 130 \text{ cm}$$

$$\Rightarrow 1.3 \text{ m}$$

Then length of each equal sides = x = 1.3 m

and length of base = x - 0.3 = 1.3 - 0.3 = 1 m

∴ Area of isosceles triangle = $\frac{1}{2} \times \sqrt{(1.3)^2 - \left(\frac{1}{2}\right)^2} = 0.6$

25. What is the area (in m², up to one place of decimal) of an equilateral triangular field of side 8.5 m?

- (a) $\frac{18.1}{\sqrt{3}}$ (b) $\frac{72.25}{\sqrt{3}}$
(c) $18.1\sqrt{3}$ (d) $72.25\sqrt{3}$

SSC CHSL 12/04/2021 (Shift-II)

Ans : (c) Area of equilateral triangle = $\frac{\sqrt{3}}{4} a^2$

(where a = side of the triangle)

$$= \frac{\sqrt{3}}{4} \times 8.5 \times 8.5$$

$$= 18.06\sqrt{3} \approx 18.1\sqrt{3} \text{ m}^2$$

$$= 18.1\sqrt{3} \text{ m}^2$$

26. What is the area (in cm², correct to one decimal place) of a triangle whose base is 21.4 cm and height is 15.5 cm?

- (a) 165.9 (b) 156.6
(c) 165.6 (d) 156.9

SSC CHSL 06/08/2021 (Shift-II)

Ans. (a) : Base = 21.4 cm
 Height = 15.5 cm
 Area of triangle = $\frac{1}{2}$ Base \times Height = $\frac{1}{2} \times 15.5 \times 21.4$
 $= 15.5 \times 10.7$
 $\Rightarrow 165.85$
 $165.85 \approx 165.9$

27. **If the area of a right-angled isosceles triangle is 676cm^2 , then the length of its hypotenuse is:**
 (a) 52 cm (b) 53 cm
 (c) 50 cm (d) 51 cm
SSC CHSL 15/04/2021 (Shift-III)

Ans.(a) : Let, the length of perpendicular and base of given isosceles right angle triangle = x
 Then area of given triangle = $\frac{1}{2} \times x \times x = 676$
 $x^2 = 676 \times 2 = 1352$ ——— (i)
 From Pythagoras theorem,
 Hypotenuse = $\sqrt{x^2 + x^2} = \sqrt{2x^2}$
 From equation (i),
 Hypotenuse = $\sqrt{2x^2} = \sqrt{2 \times 1352} = \sqrt{2704}$
 $= 52$ cm

28. **The sum of the three sides of an equilateral triangles is $15\sqrt{3}$ cm. Find the height of the triangle.**
 (a) 7 cm (b) 9 cm
 (c) 8 cm (d) 7.5 cm
SSC CHSL 12/08/2021 (Shift-III)

Ans. (d) : Let the each side of equilateral triangle = a cm
 Sum of each side of triangle = $3 \times a = 15\sqrt{3}$
 $a = \frac{15\sqrt{3}}{3} = 5\sqrt{3}$
 Height of the triangle = $\frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 5\sqrt{3} = \frac{15}{2} = 7.5$ cm

29. **Two sides of a triangle are 12.8 m and 9.6 m. If the height of the triangle is 12 m, corresponding to 9.6 m, then what is its height (in m) corresponding to 12.8 m?**
 (a) 8 (b) 10
 (c) 9 (d) 12
SSC CHSL 13/04/2021 (Shift-II)

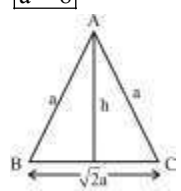
Ans. (c) : Let the height corresponding to 12.8m = x m
 From the formula-
 \therefore Area of triangle = $\frac{1}{2} \times$ Base \times height
 $\frac{1}{2} \times 9.6 \times 12 = \frac{1}{2} \times x \times 12.8$
 $x = \frac{9.6 \times 12}{12.8} = 9$ cm

30. **The length of the base of a triangle is 3 cm smaller than the length of its altitude. Its area is 104cm^2 . What is the length of the base?**
 (a) 14 cm (b) 13 cm
 (c) 11 cm (d) 12 cm
SSC CHSL 19/04/2021 (Shift-III)

Ans. (b) : Let the altitude of a triangle = x cm
 then base of triangle = x - 3 cm
 Area of triangle = $\frac{1}{2} \times x \times (x - 3) = 104$
 $x(x-3) = 104 \times 2 = 208$
 $x^2 - 3x - 208 = 0$
 $x^2 - 16x + 13x - 208 = 0$
 $x(x-16) + 13(x-16) = 0$
 $x = 16, -13$ (Invalid)
 Hence, Base = (x - 3)
 $= 16 - 3 = 13$ cm

31. **In a triangle ABC, AB = AC and the perimeter of ΔABC is $8(2 + \sqrt{2})$ cm. If the length of BC is $\sqrt{2}$ times the length of AB, then find the area of ΔABC .**
 (a) 36cm^2 (b) 32cm^2
 (c) 28cm^2 (d) 16cm^2
SSC CGL (Tier-II)-2019 - 18/11/2020

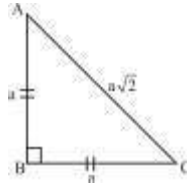
Ans. (b) : In triangle ABC,
 AB = AC
 Perimeter of triangle P = a + b + c
 $8(2 + \sqrt{2}) = a + a + \sqrt{2}a$
 $8(2 + \sqrt{2}) = a \times (2 + \sqrt{2})$
 \therefore $a = 8$



Height $h = \sqrt{a^2 - \frac{a^2}{2}} = \sqrt{\frac{a^2}{2}}$
 Area of $\Delta ABC = \frac{1}{2} \times$ Base \times Height
 $= \frac{1}{2} \times \sqrt{2}a \times \sqrt{\frac{a^2}{2}}$
 $= \frac{a^2}{2} = \frac{8^2}{2} = \frac{64}{2}$
 $= 32\text{cm}^2$

32. **If the perimeter of an isosceles right angle triangle is $8(\sqrt{2} + 1)$ cm, then the length of the hypotenuse of the triangle is:**
 (a) 10 cm (b) 12 cm
 (c) 8 cm (d) 24 cm
SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (c) :



$$\text{Perimeter} = a(2 + \sqrt{2})$$

$$8(\sqrt{2} + 1) = a(2 + \sqrt{2})$$

$$8(\sqrt{2} + 1) = a\sqrt{2}(\sqrt{2} + 1)$$

$$a = \frac{8}{\sqrt{2}} \text{ or } a = 4\sqrt{2}$$

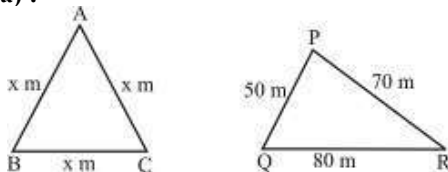
$$\begin{aligned} \text{Length of the hypotenuse of the triangle} &= a\sqrt{2} \\ &= 4\sqrt{2} \times \sqrt{2} \\ &= 8 \text{ cm} \end{aligned}$$

33. The area of a field in the shape of a triangle with each side x metres is equal to the area of another triangular field having sides 50m, 70m and 80 m. The value of x is closer to:

- (a) 63.2 m. (b) 62.4 m.
(c) 65.5 m. (d) 61.8 m.

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (a) :



According to the question,

$$S = \frac{a + b + c}{2}$$

$$S = \frac{80 + 70 + 50}{2}$$

$$S = \frac{200}{2} = 100$$

Area of equilateral $\Delta ABC = \text{Area of } \Delta PQR$

$$\frac{\sqrt{3}}{4} \times x^2 = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\frac{\sqrt{3}}{4} x^2 = \sqrt{100(100-50)(100-70)(100-80)}$$

$$\frac{\sqrt{3}}{4} x^2 = \sqrt{100 \times 50 \times 30 \times 20}$$

$$\frac{\sqrt{3}}{4} x^2 = \sqrt{3000000}$$

$$\frac{\sqrt{3}}{4} x^2 = \sqrt{3} \times 1000$$

$$x^2 = 4000$$

$$\begin{aligned} x &= 20\sqrt{10} \\ &= 20 \times 3.16 \end{aligned}$$

$$x = 63.20 \text{ m.}$$

34. If the area of an equilateral triangle is $36\sqrt{3} \text{ cm}^2$, then the perimeter of the triangle is:

- (a) $36\sqrt{3} \text{ cm}$ (b) $18\sqrt{3} \text{ cm}$
(c) 12 cm (d) 36 cm

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (d) : Area of equilateral triangle = $36\sqrt{3} \text{ cm}^2$

$$\frac{\sqrt{3}}{4} a^2 = 36\sqrt{3}$$

$$a^2 = 144$$

$$a = 12$$

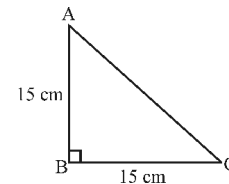
$$\text{Perimeter} = 3a = 36 \text{ cm}$$

35. The length of each equal side of an isosceles triangle is 15 cm and the included angle between those two sides is 90° . Find the area of the triangle.

- (a) $\frac{225}{2} \text{ cm}^2$ (b) $\frac{125}{2} \text{ cm}^2$
(c) 225 cm^2 (d) $\frac{255}{2} \text{ cm}^2$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (a) :



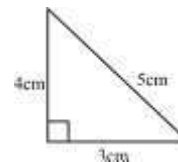
$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} \times 15 \times 15 \\ &= \frac{225}{2} \text{ cm}^2 \end{aligned}$$

36. What is the area of a triangle whose sides are 3 cm, 5 cm and 4 cm ?

- (a) 6 cm^2 (b) $2\sqrt{3} \text{ cm}^2$
(c) $2\sqrt{6} \text{ cm}^2$ (d) 3 cm^2

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (a) :



Since 3cm, 4cm, 5cm are the sides of right angle triangle

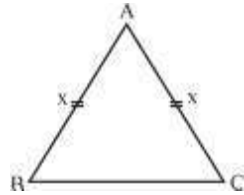
$$\begin{aligned} \therefore \text{Area of triangle} &= \frac{1}{2} \times 3 \times 4 \\ &= 6 \text{ cm}^2 \end{aligned}$$

37. The perimeter of an isosceles triangle is 50 cm. If the base is 18 cm, then find the length of the equal sides.

- (a) 16 cm (b) 18 cm
(c) 32 cm (d) 25 cm

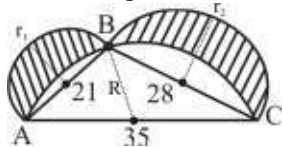
SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (a)



Let the length of the equal sides = x cm
 $x + x + 18 = 50$
 $2x = 32$
 $x = 16$ cm

38. In the given figure, 3 semicircles are drawn on three sides of triangle ABC. AB = 21 cm. BC = 28 cm and AC = 35 cm. What is the area (in cm^2) of the shaded part?



- (a) 588 (b) 324
 (c) 294 (d) 286

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : 21, 28, 35 are the sides of right angle triangle

$$\therefore R = \frac{AC}{2} = \frac{35}{2}$$

$$r_1 = \frac{AB}{2} = \frac{21}{2}$$

$$r_2 = \frac{BC}{2} = 14$$

Area of shaded part = (Area of triangle + Area of Semicircle with diameter AB + Area of Semicircle with diameter BC – Area of Semicircle with diameter AC)

$$= \frac{1}{2} \times 28 \times 21 + \pi \frac{r_1^2}{2} + \frac{\pi r_2^2}{2} - \frac{\pi R^2}{2}$$

$$= 294 + \frac{22}{7 \times 2} \left[\frac{441}{4} + 196 - \frac{1225}{4} \right]$$

$$294 + \frac{11}{7} \times [196 - 196]$$

$$= 294 \text{ cm}^2$$

Note: In this type of figure the area of the shaded part is equal to the area of right angled triangle.

Trick-

$$\text{Area of right angle triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

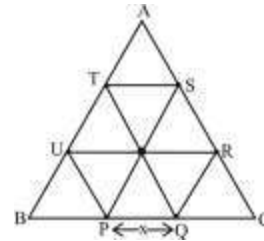
$$= \frac{1}{2} \times 21 \times 28 = 294 \text{ cm}^2$$

39. An equilateral triangle of area 300 cm^2 is cut from its three vertices to form a regular hexagon. Area of hexagon is what percent of the area of triangle?

- (a) 66.66% (b) 33.33%
 (c) 83.33% (d) 56.41%

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Let $AB = 3x$ cm
 $PQ = x$ cm



$$\text{Area of regular hexagon} = 6 \times \frac{\sqrt{3}}{4} x^2 = \frac{3\sqrt{3}}{2} x^2$$

.....(i)

Area of equilateral triangle

$$= \frac{\sqrt{3}}{4} (3x)^2 = \frac{9\sqrt{3}}{4} x^2 \text{(ii)}$$

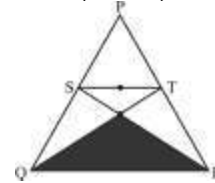
Now, from equations (i) and (ii)

The ratio of equilateral triangle to regular hexagon

$$= \frac{9\sqrt{3}}{4} x^2 : \frac{3\sqrt{3}}{2} x^2 = 3 : 2$$

$$\therefore \text{Required percentage} = \frac{2}{3} \times 100 = 66.66\%$$

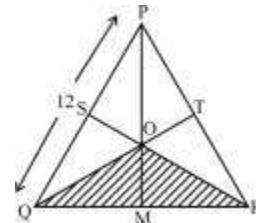
40. In the given figure, PQR is an equilateral triangle with side as 12 cm. S and T are the mid-points of the sides PQ and PR respectively. What is the area (in cm^2) of the shaded region?



- (a) $10\sqrt{3}$ (b) $12\sqrt{3}$
 (c) $9\sqrt{3}$ (d) $14\sqrt{3}$

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :



S and T are the mid-points of PQ and PR respectively. RS and QT are the medians and point O is the centroid.

$$\text{Height of an equilateral triangle (PM)} = \frac{\sqrt{3}}{2} \times \text{side}$$

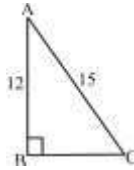
$$= \frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3} \text{ cm}$$

$$OM = \frac{1}{3} PM = \frac{1}{3} \times 6\sqrt{3} = 2\sqrt{3} \text{ cm}$$

$$\text{Area of } \Delta QOR = \frac{1}{2} \times QR \times OM$$

$$= \frac{1}{2} \times 12 \times 2\sqrt{3} = 12\sqrt{3} \text{ cm}^2$$

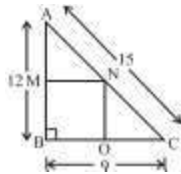
41. In the given figure, in a right angle triangle ABC, AB = 12 cm and AC = 15 cm. A square is inscribed in the triangle. One of the vertices of square coincides with the vertex of triangle. What is the maximum possible area (in cm²) of the square?



- (a) 1296/49 (b) 25
(c) 1225/36 (d) 1225/64

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Given AB = 12, AC = 15, BC = 9
Triplet → 9, 12, 15
The maximum possible area of square in right angle triangle ΔABC



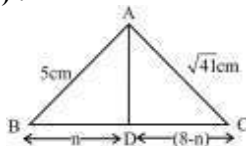
Side of square MNOB = $\frac{12 \times 9}{12 + 9} = \frac{36}{7}$ (From the formula)

Area of the MNOB = $\left(\frac{36}{7}\right)^2 = \frac{1296}{49}$ cm²

42. ABC is a triangle, AB = 5 cm, AC = $\sqrt{41}$ cm and BC = 8 cm, AD is perpendicular to BC. What is the area (in cm²) of triangle ABD?
- (a) 12 (b) 6
(c) 10 (d) 20

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :



$$\text{In } \triangle ABD, AD = \sqrt{5^2 - n^2} \text{ -----(i)}$$

$$\text{In } \triangle ADC, AD = \sqrt{41 - (8-n)^2} \text{ -----(ii)}$$

From equations (i) and (ii),

$$5^2 - n^2 = 41 - (8-n)^2$$

$$(8-n)^2 - n^2 = 41 - 25$$

$$64 + n^2 - 16n - n^2 = 16$$

$$16n = 48$$

$$n = 3$$

In ΔADB ,

$$AD = \sqrt{5^2 - 3^2} = \sqrt{16} = 4$$

$$\text{Area of } \triangle ABD = \frac{1}{2} \times BD \times AD$$

$$= \frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2$$

43. The sides of a triangular park are 35m, 53m and 66m. The cost of levelling the park at the rate of ₹9.25/m² is:
- (a) ₹8,510 (b) ₹8,584
(c) ₹8,621 (d) ₹8,547

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Semiperimeter of triangular park

$$= \frac{35 + 53 + 66}{2} = \frac{154}{2} = 77 \text{m}$$

Area of triangular park = $\sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{77(77-35)(77-53)(77-66)}$$

$$= \sqrt{77 \times 42 \times 24 \times 11}$$

$$= \sqrt{7 \times 11 \times 7 \times 6 \times 6 \times 4 \times 11}$$

$$= 11 \times 6 \times 7 \times 2$$

$$= 924 \text{m}^2$$

Cost of levelling = $924 \times 9.25 = ₹8547$

44. The sides of a triangular park are in the ratio of 12:17:25 and its perimeter is 1080m. The area (in hectares) of the park is _____.

- (a) 3.6 (b) 4.5
(c) 4.2 (d) 4.8

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) The ratio of sides of triangular park = 12 : 17 : 25

Let the sides are 12x, 17x and 25x respectively.

Perimeter of park = 1080.....[Given]

$$12x + 17x + 25x = 1080$$

$$54x = 1080$$

$$x = \frac{1080}{54} = 20$$

$$a = 12x = 12 \times 20 = 240 \text{m}$$

$$b = 17x = 17 \times 20 = 340 \text{m}$$

$$c = 25x = 25 \times 20 = 500 \text{m}$$

Semi perimeter of the park = $\frac{1080}{2} = 540$

Area of the park =

$$\sqrt{540 \times (540 - 240)(540 - 340)(540 - 500)}$$

$$= \sqrt{540 \times 300 \times 200 \times 40}$$

$$= 36000 \text{ m}^2$$

$$= 3.6 \text{ hectares } (\because 1 \text{ hectares} = 10000 \text{m}^2)$$

45. The sides of triangular park are 60 m, 112 m and 164 m. The cost of leveling of the park at the rate of ₹8.50/m² is:

- (a) ₹18,316 (b) ₹17,136
(c) ₹18,164 (d) ₹17,085

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b)

The sides of triangular park are 60m, 112m and 164m respectively.

Perimeter of triangular park

$$= 60 \text{m} + 112 \text{m} + 164 \text{m} = 336 \text{m}$$

Semi perimeter of triangular park = $\frac{336}{2} = 168 \text{m}$

Area of the triangular park,

$$= \sqrt{168 \times (168 - 60) \times (168 - 112) \times (168 - 164)}$$

$$= \sqrt{168 \times 108 \times 56 \times 4}$$

$$= \sqrt{14 \times 12 \times 12 \times 3 \times 3 \times 14 \times 4 \times 4}$$

$$= 14 \times 12 \times 3 \times 4$$

$$= 2016 \text{ m}^2$$

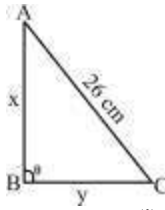
The cost of leveling of the park at the rate of ₹8.5/m² = 8.5 × 2016 = ₹ 17136

46. The perimeter of a right angle triangle is 60 cm and its hypotenuse is 26 cm. What is the area (in cm²) of the triangle?

- (a) 90 (b) 96
(c) 60 (d) 120

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : ∴ x + y + 26 = 60



$$x + y = 34 \quad \text{_____ (i)}$$

In ΔABC ,

$$26^2 = x^2 + y^2$$

$$x^2 + y^2 = 676 \quad \text{_____ (ii)}$$

$$\therefore (x + y)^2 = x^2 + y^2 + 2xy$$

$$34^2 = 676 + 2xy$$

$$2xy = 1156 - 676$$

$$2xy = 480$$

$$xy = 240$$

From triplet

$$x + y = 34$$

$$x = 24, y = 10$$

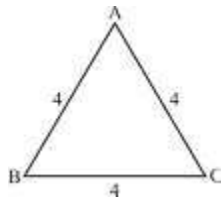
$$\text{Area of triangle} = \frac{1}{2}xy = \frac{1}{2} \times 240 = 120 \text{ cm}^2$$

47. Each of the 12 rods of unit length is used to form an equilateral triangle. Area of the triangle is :

- (a) $3\sqrt{3}$ square unit (b) $8\sqrt{3}$ square unit
(c) $2\sqrt{3}$ square unit (d) $4\sqrt{3}$ square unit

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d):



∴ The length of each of the 12 rods is 1 unit. Therefore to form an equilateral triangle the measure of all the three sides should be 4 units.

∴ Area of the equilateral triangle

$$= \frac{\sqrt{3}}{4} (\text{Side})^2 = \frac{\sqrt{3}}{4} \times (4)^2$$

$$= \frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3} \text{ square unit}$$

48. If the height of an equilateral triangle is 12 cm, then what is the area of the triangle?

- (a) 89.567 cm² (b) 96.897 cm²
(c) 67.9843 cm² (d) 83.1384 cm²

SSC CHSL -17/03/2020 (Shift-III)

Ans. (d) : ∴ Height of an equilateral triangle

$$\frac{\sqrt{3}}{2} a = 12 \text{ cm.}$$

$$\therefore a = \frac{12 \times 2}{\sqrt{3}} \text{ cm}$$

$$= \frac{24 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = 8\sqrt{3} \text{ cm}$$

$$\therefore \text{Area of equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$

$$= \frac{\sqrt{3}}{4} (8\sqrt{3})^2$$

$$= \frac{\sqrt{3}}{4} \times 64 \times 3$$

$$= \sqrt{3} \times 16 \times 3$$

$$= 48\sqrt{3} \text{ Square unit } (\because \sqrt{3} = 1.732)$$

$$= 48 \times 1.732$$

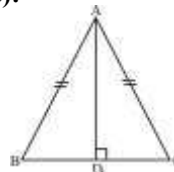
$$= 83.136 \text{ cm}^2 \approx 83.1384 \text{ cm}^2$$

49. In an isosceles triangle ABC, AB = AC and AD is perpendicular to BC at D. If AD = 8 cm and perimeter of ΔABC is 64 cm, then the area of ΔABC is:

- (a) 130 cm² (b) 70 cm²
(c) 120 cm² (d) 125 cm²

SSC CHSL -26/10/2020 (Shift-III)

Ans. (c):



Let AB = AC = x cm

And BC = 2y cm

Then, BD = CD = y cm

According to the question,

Perimeter of triangle = 64

$$(2x + 2y) = 64 \quad \text{_____ (i)}$$

In ΔABD ,

$$x^2 = y^2 + 64$$

$$(x + y)(x - y) = 64$$

$$(x + y)(x - y) = 2(x + y) \quad \text{[From equation (i)]}$$

$$x - y = 2 \quad \text{_____ (ii)}$$

On solving equations (i) and (ii),

$$x = 17, y = 15$$

$$\text{Hence, Area of } \Delta ABC = \frac{1}{2} \times 2y \times 8$$

$$= \frac{1}{2} \times 2 \times 15 \times 8$$

$$= 120 \text{ cm}^2$$

50. What is the area of a triangle whose sides measure 5 cm, 6 cm and 7 cm?

- (a) 14.6969 cm² (b) 16.4545 cm²
 (c) 12.8484 cm² (d) 10.9797 cm²

SSC CHSL -17/03/2020 (Shift-III)

Ans. (a) : ∴ The sides of triangle are 5cm, 6cm and 7 cm respectively.

$$\begin{aligned} \therefore \text{Semi perimeter of triangle } s &= \frac{a+b+c}{2} \\ &= \frac{5+6+7}{2} \\ &= \frac{18}{2} \\ &= 9 \text{ cm.} \end{aligned}$$

$$\begin{aligned} \therefore \text{Area of triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{9(9-5)(9-6)(9-7)} \\ &= \sqrt{9 \times 4 \times 3 \times 2} \\ &= 6\sqrt{3} \cdot \sqrt{2} \\ &= 6 \times 1.732 \times 1.414 \\ &= 14.6942 \text{ cm}^2 \approx 14.6969 \text{ cm}^2. \end{aligned}$$

51. A triangle has sides 25, 39, 34 units. If the area of a square exceeds the area of this triangle by 21 sq units, then the side of the square is:

- (a) 21 unit (b) 22 unit
 (c) 25 unit (d) 18 unit

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) ∴

$$s = \frac{a+b+c}{2} \Rightarrow s = \frac{25+39+34}{2} = \frac{98}{2} = 49$$

∴ Area of triangle =

$$\begin{aligned} \sqrt{49 \times 24 \times 10 \times 15} &= \sqrt{7^2 \times 6^2 \times 2^2 \times 5^2} \\ &= 7 \times 6 \times 2 \times 5 = 420 \text{ square unit} \end{aligned}$$

According to the question,

Area of square = Area of triangle + 21

$$(\text{Side})^2 = 420+21= 441$$

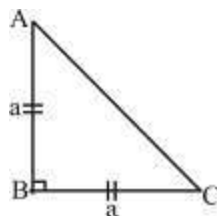
Side = 21 unit

52. The area of an isosceles right angle triangle is 121 cm². Find its hypotenuse.

- (a) 21 cm (b) 20 cm
 (c) 23 cm (d) 22 cm

SSC CHSL -19/03/2020 (Shift-II)

Ans. (d) :



Let two equal sides of an isosceles right angle triangle
 AB = BC = a cm

$$\therefore \text{Area of triangle} = \frac{1}{2} \text{Base} \times \text{Height}$$

$$\therefore 121 = \frac{1}{2} a \times a$$

$$\text{or } \frac{1}{2} a^2 = 121$$

$$a = 11\sqrt{2}$$

$$\therefore \text{Hypotenuse of right angle triangle} = a\sqrt{2} = 11\sqrt{2} \times \sqrt{2} = 22 \text{ cm}$$

53. The perimeter of an isosceles triangle is 90 cm. If the base is 26 cm, then find the length of the equal sides.

- (a) 42 cm (b) 30 cm
 (c) 32 cm (d) 40 cm

SSC CHSL -18/03/2020 (Shift-III)

Ans. (c) : Let the sides on isosceles triangle are a, a and b respectively.

As per the question.

$$2a + b = 90 \quad (b = 26 \text{ cm})$$

$$2a + 26 = 90$$

$$2a = 90 - 26 \Rightarrow 2a = 64$$

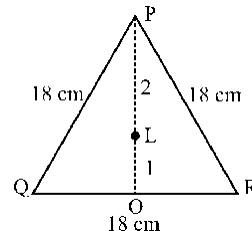
$$a = 32 \text{ cm}$$

54. The centroid of an equilateral triangle ΔPQR is L. If RQ = 18 cm, then the length of PL is:

- (a) 5√3 cm (b) 3√3 cm
 (c) 4√3 cm (d) 6√3 cm

SSC CHSL -20/10/2020 (Shift-III)

Ans : (d)



$$\text{Height of equilateral triangle (h)} = \frac{\sqrt{3}}{2} (\text{Side}) =$$

$$\frac{\sqrt{3}}{2} \times 18$$

$$PO = 9\sqrt{3}$$

$$\therefore PL : LO = 2 : 1$$

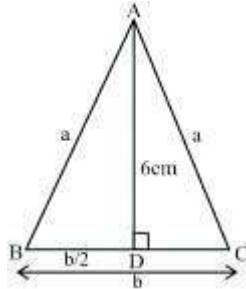
$$\therefore PL = \frac{2}{3} \times 9\sqrt{3} = 6\sqrt{3} \text{ cm.}$$

55. In an isosceles triangle ABC with AB = AC and AD is perpendicular to BC, if AD = 6 cm and the perimeter of ΔABC is 36 cm, then the area of ΔABC is:

- (a) 48 cm² (b) 45 cm²
 (c) 54 cm² (d) 64 cm²

SSC CHSL -20/10/2020 (Shift-I)

Ans : (a)



Let equal side of triangle is a cm.

$$\text{Perimeter} = 2a + b = 36 \text{ cm} \quad \dots(i)$$

$$\text{Height (AD)} = 6 \text{ cm} = \frac{\sqrt{4a^2 - b^2}}{2}$$

On squaring both sides,

$$36 \times 4 = 4a^2 - b^2$$

$$36 \times 4 = (2a+b)(2a-b)$$

$$2a - b = 4 \quad \dots(ii)$$

From equations (i) and (ii)

$$a = 10 \text{ cm, } b = 16 \text{ cm}$$

$$\therefore \text{Area of an isosceles triangle} = \frac{b}{4} \sqrt{4a^2 - b^2}$$

$$= \frac{16}{4} \sqrt{(2a+b)(2a-b)} = 4\sqrt{36 \times 4}$$

$$= 4 \times 6 \times 2 = 48 \text{ cm}^2$$

56. If one side of a triangle is 7 with its perimeter equal to 18, and area equal to $\sqrt{108}$, then the other two sides are:

- (a) 3 and 8 (b) 7 and 4
(c) 3.5 and 7.5 (d) 6 and 5

SSC CHSL -18/03/2020 (Shift-I)

Ans. (a) \therefore One side of the triangle = 7

$$\therefore \text{Sum of other two sides} = (18-7) = 11$$

Let the second side = x

$$\text{Third side} = (11-x)$$

$$\text{Semi perimeter} = \frac{18}{2} = 9$$

$$\text{Area of triangle} = \sqrt{108}$$

$$\therefore \sqrt{9 \times (9-7)(9-x)(9-11+x)} = \sqrt{108}$$

$$\sqrt{9 \times 2 \times (9-x)(x-2)} = \sqrt{108} \text{ (on squaring both sides)}$$

$$(9-x)(x-2) = 6$$

$$9x - 18 - x^2 + 2x = 6$$

$$x^2 - 11x + 24 = 0$$

$$x^2 - 8x - 3x + 24 = 0$$

$$(x-8)(x-3) = 0$$

$$x-8 = 0 \Rightarrow x = 8$$

$$\text{And } x-3 = 0 \Rightarrow x = 3$$

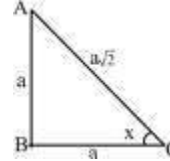
Hence, the values of the other two sides are 3 and 8.

57. In an isosceles right-angled triangle, the perimeter is 30 m. Find its area (Approximate)

- (a) 37.86 m² (b) 38.63 m²
(c) 40 m² (d) 39.60 m²

SSC CHSL -18/03/2020 (Shift-III)

Ans. (b) : Let ΔABC is isosceles right angled triangle



$$2a + a\sqrt{2} = 30$$

$$a(2 + \sqrt{2}) = 30$$

$$a = \frac{30}{(2 + \sqrt{2})} \times \frac{(2 - \sqrt{2})}{(2 - \sqrt{2})}$$

$$a = 15(2 - \sqrt{2})$$

$$\text{Area of } \Delta ABC = \frac{1}{2} a^2$$

$$= \frac{1}{2} \times 225(4 + 2 - 4\sqrt{2})$$

$$= \frac{1}{2} \times 225 \times 0.344 \quad (\because \sqrt{2} = 1.414)$$

$$= 38.63 \text{ m}^2$$

58. The sides of an isosceles triangles are 10 cm, 10 cm and 12 cm. What is the area of the triangle?

- (a) 60 cm² (b) 48 cm²
(c) 40 cm² (d) 44 cm²

SSC MTS 08/08/2019 (Shift-I)

Ans. (b) : a = 10 cm, b = 12 cm

Area of an isosceles triangle

$$= \frac{b}{4} \sqrt{4a^2 - b^2}$$

$$= \frac{12}{4} \sqrt{4 \times (10)^2 - (12)^2}$$

$$= \frac{12}{4} \sqrt{400 - 144}$$

$$= 3 \times 16$$

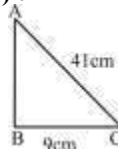
$$= 48 \text{ cm}^2$$

59. The base and hypotenuse of a right angled triangle are 9cm and 41 cm respectively. What is the area of the triangle?

- (a) 180 cm² (b) 170 cm²
(c) 190 cm² (d) 160 cm²

SSC MTS 07/08/2019 (Shift-II)

Ans. (a) :



$$AB^2 = 1681 - 81 = 1600$$

$$AB = 40 \text{ cm}$$

$$\therefore \text{Area of right angled triangle} = \frac{1}{2} \times \text{Base} \times \text{height}$$

$$= \frac{1}{2} \times 9 \times 40$$

$$= 20 \times 9$$

$$= 180 \text{ cm}^2$$

60. What is the area of triangle having sides 35 cm, 84 cm and 91 cm?

- (a) 2135 cm² (b) 1530 cm²
(c) 1470 cm² (d) 1880 cm²

SSC MTS 19/08/2019 (Shift-II)

Ans. (c) :

$$\text{Triplet} \rightarrow (5, 12, 13) \times 7$$

$$= 35, 84, 91$$

Hence, these are the sides of right angled triangle

$$\therefore \text{Area of triangle} = \frac{1}{2} \times 35 \times 84 = 1470 \text{ cm}^2$$

61. The side of an equilateral triangle is 4 cm. What is its Area?

- (a) $8\sqrt{3}$ cm² (b) $6\sqrt{3}$ cm²
(c) $9\sqrt{3}$ cm² (d) $4\sqrt{3}$ cm²

SSC MTS 05/08/2019 (Shift-III)

Ans. (d) :

$$\text{Area of equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$

$$\therefore a = 4 \text{ cm.}$$

$$\therefore \text{Area} = \frac{\sqrt{3}}{4} \times 16 = 4\sqrt{3} \text{ cm}^2$$

62. If in a triangle, angles are in the ratio 1 : 1 : 2 and the length of its longest side of $6\sqrt{2}$ cm, then what is the Area (in cm²) of the triangle?

- (a) $18\sqrt{2}$ (b) 18
(c) 36 (d) $36\sqrt{2}$

SSC MTS 09/08/2019 (Shift-II)

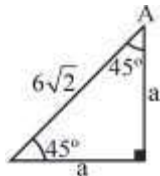
Ans. (b) : Let the angles of triangle are x° , x° and $2x^\circ$
 $x + x + 2x = 180^\circ$
 $4x = 180^\circ$
 $x = 45^\circ$

$$a^2 + a^2 = (6\sqrt{2})^2$$

$$2a^2 = 72$$

$$a^2 = 36 \Rightarrow a = 6$$

$$\therefore \text{Area of triangle} = \frac{1}{2} \times 6 \times 6 = 18 \text{ cm}^2$$

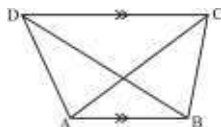


63. Let ΔABC and ΔABD be on the same base AB and between the same parallels AB and CD. Then the relation between areas of ΔABC and ΔABD will be:

- (a) Area of $(\Delta ABC) = \frac{1}{2}$ Area of (ΔABD)
 (b) Area of $(\Delta ABC) =$ Area of (ΔABD)
 (c) Area of $(\Delta ABD) = \frac{1}{3}$ Area of (ΔABC)
 (d) Area of $(\Delta ABD) = \frac{1}{2}$ Area of (ΔABC)

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) :



Area of triangles are same which drawn between two parallel line on same base.

$$\text{Area of } (\Delta ABC) = \text{Area of } (\Delta ABD)$$

64. The ratio of the areas of two triangles is 1 : 2 and the ratio of their bases is 3 : 4. What will be the ratio of their height?

- (a) 1 : 3 (b) 4 : 3
(c) 2 : 1 (d) 2 : 3

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Let the height of first triangle is h_1 and second triangle is h_2 .

According to the question,

$$\frac{1}{2} = \frac{\frac{1}{2} \times 3 \times h_1}{\frac{1}{2} \times 4 \times h_2}$$

$$\Rightarrow \frac{h_1}{h_2} = \frac{4}{6}$$

$$\Rightarrow h_1 : h_2 = 2 : 3$$

65. The sides of a triangular field are 140m, 225 m and 265 m, What is the cost of levelling it at Rs. 5.50 per m²?

- (a) Rs. 85,050 (b) Rs. 80, 437
(c) Rs. 88,200 (d) Rs. 86,625

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (d) : Let the sides of triangle are a, b and c.

$$\therefore \text{Semi perimeter (s)} = \frac{a+b+c}{2} = \frac{140+225+265}{2} = \frac{630}{2} = 315$$

$$\therefore \text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{315 \times (315-140)(315-225)(315-265)}$$

$$= \sqrt{315 \times 175 \times 90 \times 50}$$

$$= \sqrt{2480625 \times 100} = 15750$$

$$\therefore \text{Total cost} = 15750 \times 5.50$$

$$= ₹ 86625$$

(II) Problems based on Quadrilateral

66. The base of a parallelogram is twice as long as its corresponding height. If the area of the parallelogram is 144 cm² find the mentioned height.

- (a) $2\sqrt{2}$ cm (b) $6\sqrt{2}$ cm
(c) $3\sqrt{2}$ cm (d) $8\sqrt{2}$ cm

SSC CHSL 10/06/2022 (Shift- II)

Ans. (b) : Given that -

Base of parallelogram (b) = 2 × Height of parallelogram (h)

$$\text{Area of parallelogram} = 144 \text{ cm}^2$$

From formula-

$$\text{Area of parallelogram} = b \times h$$

$$\Rightarrow 144 = 2h \times h$$

$$\begin{aligned} \Rightarrow 144 &= 2 \times h^2 \\ \Rightarrow 72 &= h^2 \\ \Rightarrow h &= \sqrt{9 \times 4 \times 2} \\ \therefore h &= 6\sqrt{2} \text{ cm} \end{aligned}$$

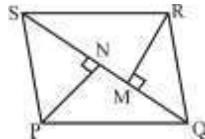
Hence, option (b) is correct.

67. In quadrilateral PQRS, $RM \perp QS$, $PN \perp QS$ and $QS = 6\text{ cm}$. If $RM = 3\text{ cm}$ and $PN = 2\text{ cm}$, then the area of PQRS is:

- (a) 15 cm^2 (b) 14 cm^2
(c) 13 cm^2 (d) 11 cm^2

SSC CGL (Tier-I)-2019-07/03/2020 (Shift-II)

Ans. (a) :



$$\begin{aligned} \text{Area of quadrilateral PQRS} &= \text{Area of } \triangle PQS + \text{Area of } \triangle QRS \\ &= \frac{1}{2} \times 6 \times 2 + \frac{1}{2} \times 6 \times 3 \\ &= 15\text{ cm}^2 \end{aligned}$$

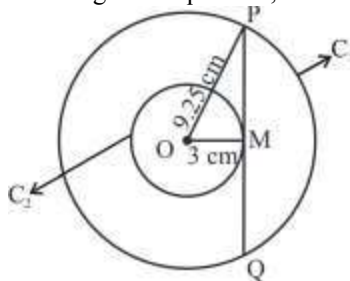
(III) Problems based on Circle

68. A chord PQ of a circle C_1 of radius 9.25 cm touches another circle C_2 that is concentric in C_1 and the radius of C_2 is 3 cm. What is the length (in cm) of PQ?

- (a) 12 (b) 19.5
(c) 17.5 (d) 15

SSC CHSL 05/08/2021 (Shift-I)

Ans. (c) : According to the question,



In $\triangle OPM$, by Pythagoras theorem,

$$\begin{aligned} MP &= \sqrt{(9.25)^2 - (3)^2} \\ &= \sqrt{85.56 - 9} \\ &= \sqrt{76.56} = 8.75 \end{aligned}$$

$$PQ = 2PM = 2 \times 8.75 = 17.5\text{ cm}$$

69. A field is in the form of a circle. The cost of fencing around it at ₹11 per metre is ₹2420. What is the area (in m^2) of the field?

(Take $\pi = \frac{22}{7}$)

- (a) 3850 (b) 4500
(c) 4250 (d) 2700

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) : According to the question,

$$2\pi r \times 11 = 2420$$

$$\pi r = 110$$

$$r = 110 \times \frac{7}{22} = 35\text{ m}$$

$$\begin{aligned} \text{Area of circular field} &= \pi r^2 \\ &= \frac{22}{7} \times 35 \times 35 \\ &= 3850\text{ m}^2 \end{aligned}$$

70. The area of a circular park is 12474 m^2 . There is 3.5 m wide path around the park. What is the area (in m^2) of the path? (Take $\pi = \frac{22}{7}$) :

- (a) 1424.5 (b) 1435.5
(c) 1440.5 (d) 1380.5

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (a) : According to the question,

$$\text{Area of circular park} = 12474\text{ m}^2 \text{ (given)}$$

$$\Rightarrow \pi r^2 = 12474$$

$$\Rightarrow r^2 = 12474 \times \frac{7}{22}$$

$$\Rightarrow r^2 = 81 \times 49$$

$$\Rightarrow r = 9 \times 7$$

$$\boxed{r = 63\text{ m}}$$

New radius with the width of the park (R) = $63\text{ m} + 3.5\text{ m}$

$$= 66.5\text{ m}$$

\therefore Area of the path = Area of the park with path - Area of the park

$$\begin{aligned} &= \pi R^2 - \pi r^2 \\ &= \frac{22}{7} \times 66.5 \times 66.5 - 12474 \\ &= 13898.5 - 12474 \\ &= 1424.5\text{ m}^2 \end{aligned}$$

71. What is the area (in cm^2) of a circle inscribed in a square of area 784 cm^2 ? (Take $\pi = \frac{22}{7}$)

- (a) 660 (b) 616
(c) 924 (d) 462

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (b) : Area of square = a^2

$$a^2 = 784$$

$$a^2 = 4^2 \times 7^2$$

$$a = 4 \times 7 = 28\text{ cm}$$

$$\text{Area of circle} = \pi r^2$$

$$\therefore r = \frac{a}{2} = \frac{28}{2} = 14\text{ cm}$$

$$\begin{aligned} \text{Area of circle} &= \frac{22}{7} \times 14 \times 14 \\ &= 616\text{ cm}^2 \end{aligned}$$

72. The inner and outer radii of two concentric circles are 6.7 cm and 9.5 cm respectively. What is the difference between their circumferences (in cm)? (Take $\pi = 22/7$)
 (a) 20.5 (b) 10.4
 (c) 6.5 (d) 17.6

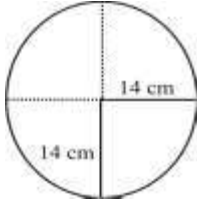
SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : Difference of circumference of concentric circle
 $= 2\pi(r_1 - r_2)$
 $= 2 \times \frac{22}{7} (6.7 - 9.5)$
 $= 2 \times \frac{22}{7} \times 2.8$
 $= 2 \times 22 \times 0.4 = 17.6 \text{ cm}$

73. One-quarter of a circular pizza of diameter 28 cm was removed from the whole pizza. What is the perimeter (in cm) of the remaining pizza? (Take $\pi = 22/7$)
 (a) 88 (b) 94
 (c) 80 (d) 66

SSC CHSL 04/08/2021 (Shift-I)

Ans. (b) : Diameter of the circle = 28 cm
 Radius = 14 cm
 Circumference of the circle = $2 \times \frac{22}{7} \times 14 = 88 \text{ cm}$
 According to the question,
 \therefore One-quarter of a circular pizza taken out



Remaining circumference of the pizza (3/4 part) = $88 \times \frac{3}{4} = 66$
 Perimeter of the remaining parts = $66 + 2 \times 14 = 94 \text{ cm}$

74. A bicycle wheel has a radius of 42 cm. It makes 40 revolutions in 25 seconds. What is its speed (in km/h, up to one decimal place)?
 (a) 9.5 (b) 15.2
 (c) 3.5 (d) 11.6

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : Circumference of wheel = $2\pi r$
 Distance travelled by a bicycle in 40 revolutions =
 $40 \times 2 \times \frac{22}{7} \times 42$
 $= 10560 \text{ cm} = \frac{10560}{1000 \times 100} = 0.1056 \text{ km}$
 $\therefore \left[S = \frac{d}{t} \right]$
 Speed of wheel = $\frac{0.1056 \times 3600}{25} \approx 15.2 \text{ km/h}$

75. If the radius of a circle is equal to a diagonal of a square whose area is 12 cm^2 , then the area of the circle is:
 (a) $24 \pi \text{ cm}^2$ (b) $36 \pi \text{ cm}^2$
 (c) $28 \pi \text{ cm}^2$ (d) $32 \pi \text{ cm}^2$

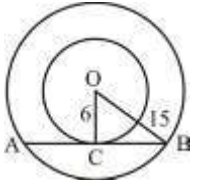
SSC CHSL 11/08/2021 (Shift-II)

Ans. (a) : Given:
 Area of square = 12 cm^2
 then side of the square = $\sqrt{12}$
 Diagonal of square = side $\sqrt{2}$
 $= \sqrt{12} \times \sqrt{2} = \sqrt{24} \text{ cm}$
 According to the question,
 Radius of circle = diagonal of square = $\sqrt{24} \text{ cm}$
 Hence,
 Area of circle = $\pi (\sqrt{24})^2 = 24\pi$

76. Two concentric circles are of radii 15 cm and 6 cm. What is the length (in cm) of the chord of the larger circle that is tangent to the smaller circle?
 (a) $9\sqrt{21}$ (b) $3\sqrt{21}$
 (c) $4\sqrt{21}$ (d) $6\sqrt{21}$

SSC CHSL 16/04/2021 (Shift-III)

Ans. (d) : According to the question,



$CB = \sqrt{15^2 - 6^2}$
 $CB = \sqrt{189}$
 $CB = 3\sqrt{21}$
 $AB = 2 \times 3\sqrt{21} = 6\sqrt{21}$

77. If the perimeter of a circle is 88 cm, then what is the area of the circle? ($\pi = \frac{22}{7}$)
 (a) 566 m^2 (b) 616 m^2
 (c) 886 m^2 (d) 446 m^2

SSC CHSL 19/04/2021 (Shift-III)

Ans. (b) : Perimeter of circle ($2\pi r$) = 88
 $2 \times \frac{22}{7} \times r = 88$
 $r = 14$
 Area of circle = πr^2
 $= \frac{22}{7} \times 14 \times 14$
 $= 616 \text{ m}^2$

78. The area of a circle that is inscribed in a square of area $17\frac{9}{11}\text{ cm}^2$ is:
- (a) 22 cm^2 (b) 28 cm^2
(c) 16 cm^2 (d) 14 cm^2

SSC CHSL 15/04/2021 (Shift-III)

Ans.(d) : Let the side of square = a

$$\text{Area of square} = 17\frac{9}{11}$$

$$a^2 = \frac{196}{11}$$

$$a = \frac{14}{\sqrt{11}}$$

$$\text{Radius of circle (r)} = \frac{a}{2} = \frac{14}{2\sqrt{11}} = \frac{7}{\sqrt{11}}$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 \\ &= \frac{22}{7} \times \frac{7 \times 7}{11} \\ &= 14\text{ cm}^2 \end{aligned}$$

79. Find the area (in cm^2) and the diameter (in cm), respectively, of a circle whose circumference is $40\pi\text{ cm}$?
- (a) 40 and 400 (b) 400π and 40
(c) 40 and 400π (d) 400 and 40

SSC CHSL 12/04/2021 (Shift-II)

Ans : (b) Circumference of circle = 40π

$$2\pi r = 40\pi$$

$$r = 20$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 \\ &= 400\pi\text{ cm}^2 \end{aligned}$$

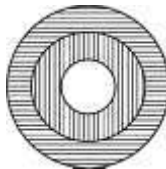
$$\begin{aligned} \text{Diameter of circle (d)} &= 2r \\ &= 2 \times 20 \\ &= 40\text{ cm} \end{aligned}$$

80. The radii of three concentric circles are in the ratio of 4 : 5 : 7. What is the ratio of the area between the two inner circles to that between the two outer circles?

- (a) 4 : 5 (b) 3 : 8
(c) 5 : 9 (d) 4 : 7

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (b) : Let the radii of three concentric circles are $4r$, $5r$ and $7r$.



$$\begin{aligned} \therefore \frac{\text{Area between two inner circles}}{\text{Area between two outer circles}} &= \frac{\pi[25r^2 - 16r^2]}{\pi[49r^2 - 25r^2]} \\ &= \frac{9r^2}{24r^2} = \frac{9}{24} = 3 : 8 \end{aligned}$$

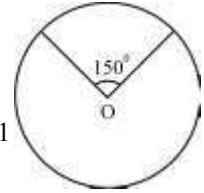
81. A sector is cut out from a circle of diameter 42 cm. If the angle of the sector is 150° , then its area (in cm^2) is: (Take $\pi = \frac{22}{7}$)

- (a) 577.5 (b) 574
(c) 580.6 (d) 564

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (a) :

$$\begin{aligned} \text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{150}{360} \times \frac{22}{7} \times 21 \times 21 \\ &= \frac{5}{12} \times 22 \times 63 \\ &= \frac{6930}{12} = 577.5\text{ cm}^2 \end{aligned}$$



82. The radius of a circular garden is 42m. The distance (in m) covered by running 8 rounds around it, is: (Take $\pi = \frac{22}{7}$)

- (a) 3248 (b) 2112
(c) 1124 (d) 4262

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) : Circumference of given circular garden = $2\pi r$

$$= 2 \times \frac{22}{7} \times 42$$

And the total distance covered by running 8 rounds around it = $8 \times$ circumference of circular garden

$$\begin{aligned} &= 8 \times 2 \times \frac{22}{7} \times 42 \\ &= 2112\text{ cm}^2 \end{aligned}$$

83. The inner and outer radius of a circular track are, respectively, 29m and 23m. The cost of leveling the track at ₹7/m^2 is:

- (a) ₹3,284 (b) ₹5,300
(c) ₹7,215 (d) ₹6,864

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (d) : Area of track = $\pi[R^2 - r^2]$

$$\begin{aligned} &= \frac{22}{7} [29^2 - 23^2] \\ &= \frac{22}{7} [(29 + 23)(29 - 23)] \\ &= \frac{22}{7} \times 52 \times 6 \end{aligned}$$

$$\begin{aligned} \text{Cost of leveling the track} &= \frac{22}{7} \times 52 \times 6 \times 7 \\ &= ₹6864 \end{aligned}$$

84. A circular disc of area $0.64\pi\text{ m}^2$ rolls down a length of 1.408 km. The number of revolutions it makes is: (Take $\pi = \frac{22}{7}$)

- (a) 280 (b) 360
(c) 140 (d) 180

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (a) : Area of disc = $0.64\pi \text{ m}^2$
 $\pi r^2 = 0.64\pi$
 $r = 0.8\text{m}$

Number of revolutions = $\frac{\text{Distance}}{\text{Circumference of disc}}$

$$= \frac{1.408 \times 1000}{2 \times \frac{22}{7} \times 0.8} = \frac{1408 \times 7}{2 \times 22 \times 0.8} = 280$$

85. Find the area and circumference of a circle if the radius is 14 cm (Take $\pi = \frac{22}{7}$)

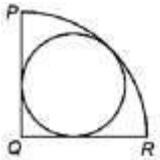
- (a) Area = 88 cm^2 ; Circumference = 616 cm
 (b) Area = 44 cm^2 ; Circumference = 308 cm
 (c) Area = 308 cm^2 ; Circumference = 44 cm
 (d) Area = 616 cm^2 ; Circumference = 88 cm

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) : Area of circle
 $= \pi r^2 = \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2$

Circumference of circle = $2\pi r = 2 \times \frac{22}{7} \times 14 = 88 \text{ cm}$

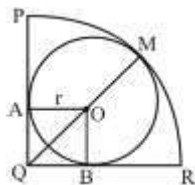
86. In the given figure, PQR is a quadrant whose radius is 7 cm. A circle is inscribed in the quadrant as shown in the figure. What is the area (in cm^2) of the circle ?



- (a) $385 - 221\sqrt{2}$ (b) $308 - 154\sqrt{2}$
 (c) $154 - 77\sqrt{2}$ (d) $462 - 308\sqrt{2}$

SSC CGL (Tier-II) 20-02-2018

Ans. (d):



$\angle AOB = 90^\circ$
 $OA = OB = r$ (Suppose)
 $QM = 7 \text{ cm}$
 $\therefore OQ = (7-r) \text{ cm}$
 $\therefore AOBQ$ Square
 $\therefore \sqrt{2} r = 7-r$
 $r(\sqrt{2}+1) = 7$
 $r = \frac{7}{\sqrt{2}+1}$

$$r = 7(\sqrt{2}-1)$$

Area of circle-

$$= \frac{22}{7} \times 7 \times 7(\sqrt{2}-1)(\sqrt{2}-1)$$

$$= 22 \times 7(3-2\sqrt{2})$$

$$= (462 - 308\sqrt{2}) \text{ cm}^2$$

87. The sum of radii of the two circles is 91 cm and the difference between their areas is 2002 cm^2 . What is the radius (in cm) of the larger circle?

- (a) 56 (b) 42
(c) 63 (d) 49

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : Let the radius of the circle is R and r.

$$R + r = 91 \quad \dots\dots(i)$$

$$\pi R^2 - \pi r^2 = 2002$$

$$\frac{22}{7}(R^2 - r^2) = 2002$$

$$(R+r)(R-r) = 91 \times 7$$

$$91 \times (R-r) = 91 \times 7$$

$$R-r = 7 \text{ cm} \quad \dots\dots(ii)$$

On adding equation (i) and (ii)

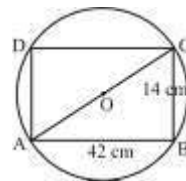
$$\text{Radius of the larger circle (R)} = \frac{91+7}{2} = 49 \text{ cm}$$

88. A rectangular sheet of length 42 cm and breadth 14 cm is cut from a circular sheet. What is the minimum area (in cm^2) of circular sheet ?

- (a) 3080 (b) 1540
(c) 770 (d) 1030

SSC CGL (Tier-II) 09-03-2018

Ans. (b):



According to the question,
 Diagonal of rectangle = diameter of circle

$$\text{Diagonal of rectangle} = \sqrt{42^2 + 14^2}$$

$$= \sqrt{14^2(3^2 + 1^2)}$$

$$= 14\sqrt{10} \text{ cm}$$

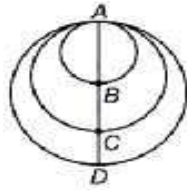
$$r = 7\sqrt{10} \text{ cm}$$

The minimum area of a circular sheet = πr^2

$$= \frac{22}{7} \times 7\sqrt{10} \times 7\sqrt{10}$$

$$= 1540 \text{ cm}^2$$

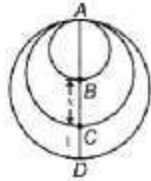
89. ABCD passes through the centres of the three circles as shown in the figure. AB = 2 cm and CD = 1 cm. If the area of middle circle is the average of the areas of the other two circles, then what is the length (in cm) of BC ?



- (a) $(\sqrt{6})-1$ (b) $(\sqrt{6})+1$
 (c) $(\sqrt{6})-3$ (d) $(\sqrt{6})+3$

SSC CGL (Tier-II) 9-3-2018

Ans. (a)



Let $BC = x$ cm

Area of middle circle = Average of the areas of the remaining two circles

$$\frac{\pi \times (x+2)^2}{4} = \frac{\pi \times (2)^2}{4} + \frac{\pi \times (x+3)^2}{4}$$

$$(x+2)^2 = \frac{4+(x+3)^2}{2}$$

$$2(x^2 + 4 + 4x) = 4 + (x^2 + 9 + 6x)$$

$$2x^2 + 8 + 8x = 4 + x^2 + 9 + 6x$$

$$x^2 + 2x - 5 = 0$$

$$x = \frac{-2 \pm \sqrt{4+20}}{2}$$

Taking the positive sign,

$$x = \frac{-2 + 2\sqrt{6}}{2} = \sqrt{6} - 1 \text{ cm.}$$

90. A = Area of the largest circle drawn inside a square of side 1 cm.
 B = Sum of areas of 4 identical (largest possible) circles drawn inside a square of side 1 cm.
 C = Sum of areas of 9 identical circle (largest possible) drawn inside a square of side 1 cm.
 D = Sum of areas of 16 identical circles (largest possible) drawn inside a square of side 1 cm.

Which of the following is TRUE about A, B, C and D ?

- (a) $A > B > C > D$ (b) $A < B < C < D$
 (c) $A > B = C > D$ (d) No option is correct

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$A = \pi \times \left(\frac{1}{2}\right)^2 = \frac{\pi}{4} \text{ cm}^2$$

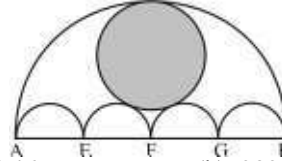
$$B = 4 \times \pi \times \left(\frac{1}{4}\right)^2 = \frac{\pi}{4} \text{ cm}^2$$

$$C = 9 \times \pi \times \left(\frac{1}{6}\right)^2 = \frac{\pi}{4} \text{ cm}^2$$

$$D = 16 \times \pi \times \left(\frac{1}{8}\right)^2 = \frac{\pi}{4} \text{ cm}^2$$

$$\therefore A = B = C = D$$

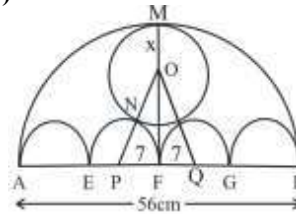
91. In the given figure, AB, AE, EF, FG and GB are semicircles. $AB = 56$ cm and $AE = EF = FG = GB$. What is the area (in cm^2) of the shaded region?



- (a) 414.46 (b) 382.82
 (c) 406.48 (d) 394.24

SSC CGL (Tier-II) 17-2-2018

Ans. (d)



$$\therefore AE = EF = FG = GB = \frac{56}{4} = 14$$

Let the radius of shaded region (MO) = x cm

In ΔPOF -

$$PO^2 = OF^2 + PF^2$$

$$(7+x)^2 = (28-x)^2 + 7^2$$

$$49 + x^2 + 14x = 784 + x^2 - 56x + 49$$

$$70x = 784$$

$$x = \frac{56}{5} = 11.2$$

$$\therefore \text{Area of the shaded region} = \pi \cdot x^2 = \frac{22}{7} \times 11.2 \times 11.2 = 394.24 \text{ cm}^2$$

92. If a wheel has diameter 42 cm, then how far does the wheel go (in metres) in 12 revolutions?

(Take $\pi = \frac{22}{7}$)

- (a) 21.45 (b) 23.27
 (c) 15.84 (d) 17.64

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : Distance = Circumference of wheels \times number of revolutions.

$$\text{distance} = 2 \times \frac{22}{7} \times 21 \times 12$$

$$= 22 \times 72 = 1584 \text{ cm}$$

$$= 15.84 \text{ m}$$

93. A field is in the form of a circle. The cost of fencing around it at ₹12 per metre is ₹2,640. What is the area (in m^2) of field?

(Take $\pi = \frac{22}{7}$)

- (a) $2772m^2$ (b) $1925m^2$
 (c) $5544m^2$ (d) $3850m^2$

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d)

Circumference of circular field = $\frac{2640}{12} = 220$ m.

$2\pi r = 220$

$2 \times \frac{22}{7} \times r = 220$

$r = \frac{10 \times 7}{2} = 35$ m.

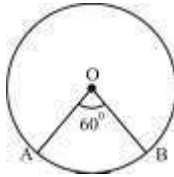
Area of the field = $\frac{22}{7} \times 35 \times 35 = 3850$ m²

94. The area of a circle with a central angle of 60° is A. The circumference of circle is C. What is the value of A ?

- (a) $\frac{C^2}{6\pi}$ (b) $\frac{C^2}{24\pi}$
 (c) $\frac{C^2}{4\pi}$ (d) $\frac{C^2}{18\pi}$

SSC CHSL 10/07/2019 (Shift-III)

Ans. (b) :



Area of sector = $\frac{\theta}{360^\circ} \pi r^2$

$A = \frac{60^\circ}{360^\circ} \pi r^2 = \frac{\pi r^2}{6}$ (i)

Circumference of circle

$= C = 2\pi r \Rightarrow \frac{C}{2\pi} = r$ (ii)

From equation (i) and (ii),

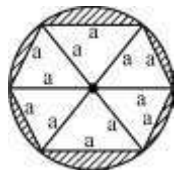
$A = \frac{\pi}{6} \times \left(\frac{C}{2\pi}\right)^2 = \frac{\pi C^2}{6 \times 4\pi^2} = \frac{C^2}{24\pi}$

95. A regular hexagon is formed inside a circle. What is the ratio of the area of the circle to that part which is not covered by the hexagon ?

- (a) $\frac{2\pi}{2\pi - 3\sqrt{3}}$ (b) $\frac{2\pi}{\sqrt{3}}$
 (c) $\frac{\pi}{\pi - 3\sqrt{3}}$ (d) $\frac{\pi}{\sqrt{3}}$

SSC CHSL 10/07/2019 (Shift-I)

Ans. (a) :



Let the side of hexagon is a then,

\therefore Area of circle = πR^2
 $= \pi(a)^2$

Where $R = a$

Area of hexagon = $6 \times$ (Area of equilateral Triangle)

$= 6 \times \frac{\sqrt{3}}{4} \times a^2 = \frac{3\sqrt{3}a^2}{2}$

Area of the shaded region = Area of circle – Area of

hexagon = $\pi a^2 - \frac{3\sqrt{3}}{2} a^2 = \frac{a^2(2\pi - 3\sqrt{3})}{2}$

\therefore Area of circle : Area of shaded

region = $\pi a^2 : \frac{a^2(2\pi - 3\sqrt{3})}{2} = 2\pi : (2\pi - 3\sqrt{3})$

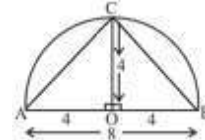
96. The area of the largest triangle that can be inscribed in a semi-circle of radius 4 cm in square centimetres is:

- (a) 18 cm² (b) 12 cm²
 (c) 14 cm² (d) 16 cm²

SSC CHSL –15/10/2020 (Shift-III)

Ans. (d) : Radius of semi-circle = 4 cm

Diameter of semi-circle (AB) = 8 cm



\therefore The height of triangle will be equal to the radius of the semicircle.

Area of area largest triangle = $\frac{1}{2} \times 8 \times 4 = 16$ cm²

97. The radii of two circles are 20 cm and 13 cm, respectively. Find the radius of the circle which has a circumference equal to the sum of the circumferences of the two circles.

- (a) 30 cm (b) 33 cm
 (c) 28 cm (d) 32 cm

SSC CHSL –19/10/2020 (Shift-I)

Ans. (b) : Let the radius of two circles are r_1 and r_2 respectively

And the radius of other circle = R

\therefore Circumference of radius of larger circle = Sum of circumference of both smaller circles

$2\pi R = 2\pi r_1 + 2\pi r_2$

$R = 20 + 13$

$R = 33$ cm

98. The area of the quadrant of a circle whose circumference is 22 cm, will be:

- (a) 38.5 cm² (b) 10 cm²
 (c) 3.5 cm² (d) 9.625 cm²

SSC CHSL –19/03/2020 (Shift-II)

Ans. (d) : \therefore Circumference of circle = 22 cm

$\therefore 2\pi r = 22$

or $2 \times \frac{22}{7} \times r = 22$

or $r = \frac{7}{2}$
 \therefore In the quadrant of the circle $\theta = 90^\circ$
 \therefore Area of the sector = $\frac{\pi r^2 \theta}{360^\circ}$
 $\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 90$
 \therefore Area of Quadrant = $\frac{77}{8}$
 $= 9.625 \text{ cm}^2$

99. The wheel of a car has 210 cm diameter. How many revolutions per minute must the wheel make so that the speed of the car is kept at 120 km/h?
 (a) 245 (b) 326.42
 (c) 303.03 (d) 289

SSC CHSL -18/03/2020 (Shift-II)

Ans. (c) : Let the required number of revolutions = n
 According to the question,
 Distance covered by car in 1 hour = 120 km
 Distance covered by car in 1 minute = $\frac{120}{60}$ km
 $\frac{120}{60} = 2 \times \frac{22}{7} \times \frac{105}{100 \times 1000} \times n$
 $n = \frac{120 \times 1000}{6 \times 22 \times 3} = \frac{20000}{66}$
 $n = 303.03$

100. Two concentric circles form a ring. The inner and outer circumferences of the ring are 22 cm and 44 cm, respectively. The width of the ring is : (take $\pi = \frac{22}{7}$)
 (a) 1.5 cm (b) 2.5 cm
 (c) 3 cm (d) 3.5 cm

SSC CHSL -20/10/2020 (Shift-II)

Ans : (d) Outer circumferences - inner circumferences = 44 - 22
 $2\pi R - 2\pi r = 22$
 $2\pi (R-r) = 22$
 $2 \times \frac{22}{7} (R-r) = 22$
 $(R-r) = \frac{7}{2} = 3.5 \text{ cm}$
 Hence the width of the ring = 3.5 cm

101. The measure of central angle of a sector of circle of radius 30 cm is 210° . What is the area of the sector (in cm^2)?
 (a) 1650 (b) 1645
 (c) 1649 (d) 1647

SSC MTS 20/08/2019 (Shift-III)

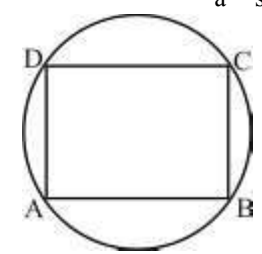
Ans. (a) : Area of sector
 $= \frac{\theta}{360^\circ} \times \pi r^2$

$= \frac{210^\circ}{360^\circ} \times \frac{22}{7} \times 900$
 $= \frac{11}{6} \times 900 = 11 \times 150 = 1650 \text{ cm}^2$

102. What is the area of the largest square which can be inscribed in a circle of radius 28 cm?
 (a) 3136 cm^2 (b) 1568 cm^2
 (c) 784 cm^2 (d) 196 cm^2

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) :
 \therefore Diagonal of square = Diameter of circle
 $\sqrt{2}a = 2R = 2 \times 28 = 56$ Where, R = radius of circle
 $a = \text{side of square}$

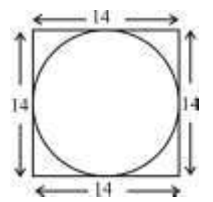


$a = \frac{56}{\sqrt{2}} \text{ cm}$
 \therefore Area of square = $(a)^2 = \frac{56 \times 56}{2} = 28 \times 56 = 1568 \text{ cm}^2$

103. What is the circumference of the largest circle which can be inscribed in a square of side 14 cm? (Take $\pi = \frac{22}{7}$)
 (a) 66 cm (b) 88 cm
 (c) 22 cm (d) 44 cm

SSC MTS 08/08/2019 (Shift-III)

Ans. (d) :
 \therefore Side of square = 14 cm
 \therefore Diameter of circle = 14 cm
 Radius of circle = $\frac{14}{2} = 7 \text{ cm}$.
 Then, Perimeter of circle = $2\pi r$
 $= 2 \times \frac{22}{7} \times 7 = 44 \text{ cm}$



104. What is the area of a sector of a circle of radius 14 cm and central angle 45° ? (Take $\pi = \frac{22}{7}$)
 (a) 67 cm^2 (b) 77 cm^2
 (c) 70 cm^2 (d) 11 cm^2

SSC CGL (Tier-I)-2019 - 09/03/2020 (Shift-I)

Ans. (b) :
 Area of a sector = $\frac{\pi r^2 \theta}{360^\circ}$
 $= \frac{22 \times 14 \times 14 \times 45^\circ}{7 \times 360^\circ} = 77 \text{ cm}^2$

105. Two small circular grounds of diameters 42 m and 26 m are to be replaced by a bigger circular ground. What would be the radius of the new ground if the new ground has the same area as the two small grounds?

- (a) 25.01 m (b) 24.69 m
(c) 25 m (d) 23 m

SSC CHSL -18/03/2020 (Shift-III)

Ans. (b) : $2r_1 = 26$ m., $2r_2 = 42$ m.
 $r_1 = 13$ m. $r_2 = 21$ m.
 Let the radius of the bigger circular ground is R.
 $\therefore \pi r_1^2 + \pi r_2^2 = \pi R^2$
 $(13)^2 + (21)^2 = R^2$
 $169 + 441 = R^2$
 $R = \sqrt{610} \Rightarrow R = 24.69$
 Hence the radius of the bigger circular ground is 24.69 m.

106. A wire, in the form of a circle, encloses an area 3118.5 cm². It is now bent to form a rectangle whose length and breadth are very nearly in the ratio 7 : 4. The length of the rectangle, in cm, is :

(Take $\pi = \frac{22}{7}$)

- (a) 56 (b) 49
(c) 70 (d) 63

SSC MTS 22/08/2019 (Shift-II)

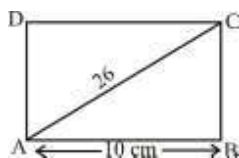
Ans. (d) : When the wire is bent in the form of a circle
 Area of the circle = 3118.5
 $\pi r^2 = 3118.5$
 $\frac{22}{7} \times r^2 = 3118.5$
 $r^2 = \frac{3118.5 \times 7}{22}$
 $r^2 = 992.25$
 $r = 31.5$
 Let the length of the rectangle = 7x
 and, the breadth of the rectangle = 4x
 Circumference of circle = Perimeter of rectangle
 $2\pi r = 2(7x + 4x)$
 $2 \times \frac{22}{7} \times 31.5 = 22x$
 $22x = 9 \times 22$
 $x = 9$
 Length of the rectangle = 7x = 7 × 9 = 63 cm

107. The length of the diagonal of a rectangle is 26 cm and one side is 10 cm. The area of the rectangle is:

- (a) 240 cm² (b) 260 cm²
(c) 65 cm² (d) 130 cm²

SSC MTS 09/08/2019 (Shift-I)

Ans. (a) :
 In right angled triangle,
 $BC = \sqrt{AC^2 - AB^2}$
 $BC = \sqrt{(26)^2 - (10)^2}$
 $BC = \sqrt{676 - 100}$



$$BC = \sqrt{576}$$

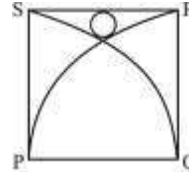
$$BC = 24 \text{ cm}$$

$$\text{Area of the rectangle} = \text{Length} \times \text{Breadth}$$

$$= 24 \times 10$$

$$= 240 \text{ cm}^2$$

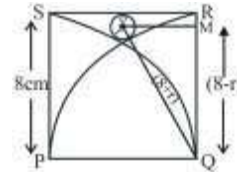
108. In the given figure, PQRS is a square whose side is 8 cm. PQS and QPR are two quadrants. A circle is placed touching both the quadrants and the square as shown in the figure. What is the area (in cm²) of the circle?



- (a) 13/17 (b) 11/14
(c) 19/31 (d) 15/19

SSC CGL (Tier-II) 21-02-2018

Ans. (b) :



Let radius of the circle = r cm.
 $\therefore QM = (8-r)$, $OQ = (8+r)$, $OM = SR/2$
 $\Rightarrow OM = 8/2 = 4$

In ΔOMQ ,
 $(OM)^2 = (OQ)^2 - (MQ)^2$
 $(4)^2 = (8+r)^2 - (8-r)^2$
 $\Rightarrow 16 = (16) \times 2r$
 $\Rightarrow r = 1/2$
 $\therefore \text{Area of circle} = \pi r^2$
 $= \frac{22}{7} \times \left(\frac{1}{2}\right)^2 = \frac{11}{14} \text{ cm}^2$

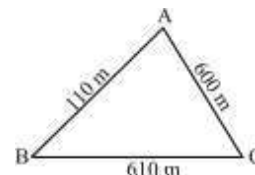
109. The area of a circular park is approximately equal to the $\frac{7}{15}$ of area of a triangular park whose sides are 110m, 600m and 610 m. What is the diameter of the park?

$$\left(\pi = \frac{22}{7}\right)$$

- (a) 160 m (b) 120 m
(c) 150 m (d) 140 m

SSC MTS 20/08/2019 (Shift-I)

Ans. (d) :



$$S = \frac{a+b+c}{2}, S = \frac{110+600+610}{2} = \frac{1320}{2} = 660$$

$$\text{area of the triangle} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$= \sqrt{660(660-110) \times (660-600) \times (660-610)}$$

$$= \sqrt{660 \times 550 \times 60 \times 50}$$

$$= 60 \times 11 \times 50 = 33000 \text{ m}$$

area of a circular park

$$= 33000 \times \frac{7}{15} = 15400 \text{ m}^2$$

$$\text{area of the circle} = \pi \times (r)^2$$

$$15400 = \frac{22}{7} \times r^2$$

$$r^2 = 700 \times 7$$

$$r = \sqrt{4900}$$

$$r = 70$$

$$\begin{aligned} \text{Diameter of circular park} &= 2 \times r \\ &= 2 \times 70 = 140 \text{ m.} \end{aligned}$$

110. If the area of circle is 154 cm^2 , then ratio of circumference of this circle to circumference of another circle whose radius is 21 cm.

- (a) 1 : 3 (b) 2 : 3
(c) 2 : 1 (d) 1 : 2

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) : area of first circle = 154 cm^2

then $\pi r_1^2 = 154$

$$r_1^2 = \frac{154 \times 7}{22}$$

$$r_1^2 = 7 \times 7$$

Radius of first circle (r_1) = 7

According to the question,

$$\frac{\text{Circumference of first circle}}{\text{Circumference of another circle}} = \frac{2\pi \times 7}{2\pi \times 21}$$

$$\text{Ratio} = \frac{1}{3} = 1 : 3$$

111. The perimeter of a square and a circle are same. If the area of the circle is 1386 cm^2 , then what will be the area of the square?

- (a) 1089 cm^2 (b) 841 cm^2
(c) 1024 cm^2 (d) 1225 cm^2

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : area of the circle = 1386 cm^2

$$\pi r^2 = 1386$$

$$\frac{22}{7} r^2 = 1386$$

$$r^2 = \frac{1386 \times 7}{22} = 63 \times 7$$

$$r = 21 \text{ cm}$$

Perimeter of a square = circumference of circle

$$4 \times \text{sides} = 2 \times \frac{22}{7} \times 21$$

$$\text{Side} = 33 \text{ cm.}$$

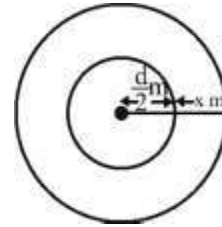
$$\text{area of the square} = (33)^2 = 1089$$

112. The area (in m^2) of a circular path of uniform width x metres surrounding a circular region of diameter d meters is _____.

- (a) $\pi x(x+2d)$ (b) $\pi x \left(x + \frac{d}{2}\right)$
(c) $\pi x(x+d)$ (d) $\pi x(2x+d)$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c)



$$\text{Area of a circular path} = \pi \left(\frac{d}{2} + x\right)^2 - \pi \left(\frac{d}{2}\right)^2$$

$$= \pi \left[\frac{d^2}{4} + x^2 + 2 \frac{d}{2} \cdot x - \frac{d^2}{4} \right]$$

$$= \pi x(x+d) \text{ m}^2$$

113. A race track is in the shape of a ring whose inner and outer circumferences are 440m and 506m, respectively. What is the cost of leveling the track at ₹ 6/m²? (Take $\pi = \frac{22}{7}$)

- (a) ₹19,866 (b) ₹24,832
(c) ₹29,799 (d) ₹18,966

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : Inner perimeter of race track = 440 m

$$2 \times \frac{22}{7} \times r = 440$$

$$r = 70 \text{ m}$$

Outer perimeter of race track = 506 m

$$2 \times \frac{22}{7} \times R = 506$$

$$R = \frac{161}{2} = 80.5 \text{ m}$$

$$\text{Area of track} = \pi(R^2 - r^2)$$

$$= \frac{22}{7} [(80.5)^2 - (70)^2]$$

$$= \frac{22}{7} \times 150.5 \times 10.5 = 4966.5 \text{ m}^2$$

$$\text{Cost of leveling the track} = 4966.5 \times 6 = \text{Rs. } 29799$$

(IV) Problems based on Square

114. If the length of a diagonal of a square is $(a+b)$, then the area of the square is:

- (a) a^2+b^2 (b) $(a+b)^2/2$
(c) a^2+b^2+2ab (d) $\frac{1}{2}(a^2+b^2)$

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (b) Given length of a diagonal of square = $a + b$

$$\text{Side of square} = \frac{a+b}{\sqrt{2}}$$

According to the question,

$$\text{Area of Square} = \left(\frac{a+b}{\sqrt{2}}\right) \times \left(\frac{a+b}{\sqrt{2}}\right)$$

$$= \frac{1}{2}(a^2 + b^2 + ab + ab)$$

$$= \frac{1}{2}(a+b)^2$$

115. If the width of the path around a square field is 4.5m and the area of path is 252m² then the length of the side of the field is:

- (a) 9.5 m (b) 9 m
(c) 8 m (d) 8.5

SSC MTS 06/10/2021 (Shift-I)

Ans. (a) : Let the side of square field = a

Side of square field along the path

$$(a+4.5+4.5) = (a+9)$$

Area of square = a^2

Now, According to the question,

$$252 = (a+9)^2 - a^2$$

$$252 = a^2 + 81 + 18a - a^2$$

$$252 - 81 = 18a$$

$$\frac{171}{18} = a$$

$$9.5\text{m} = a$$

$$\therefore a = 9.5\text{m}$$

116. A wire is in the form of a square of side 33 cm. If the wire is molded to form a circle, then what is the radius of the circle? (Use $\pi = \frac{22}{7}$)

- (a) 21 cm (b) 33 cm
(c) 16.5 cm (d) 42 cm

SSC MTS 11/10/2021 (Shift-I)

Ans. (a) : Circumference of circle = Perimeter of square

$$2\pi r = 4 \times 33$$

$$2 \times \frac{22}{7} \times r = 4 \times 33$$

$$r = 21\text{cm}$$

117. The area of a square shaped field is 1764 m². The breadth of a rectangular park is $\frac{1}{6}$ th of the side of the square field and the length is four times its breadth. What is the cost (₹in) of leveling the park at ₹30 per m²?

- (a) 5880 (b) 4768
(c) 2940 (d) 6342

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (a) : Side of square = $\sqrt{1764} = 42\text{m}$

$$\text{Breadth of rectangular park} = 42 \times \frac{1}{6} = 7\text{m}$$

Length of rectangular park = 28 m

$$\begin{aligned} \text{Cost of levelling the part} &= \text{Area} \times \text{cost per m}^2 \\ &= 7 \times 28 \times 30 \\ &= ₹5880 \end{aligned}$$

118. The area of a square shaped field is 1764 m².

The breadth of a rectangular park is $\frac{1}{3}$ rd

the side of the square field and its length is two times its breadth. What is the cost (in ₹) of levelling the park at ₹15 per m²?

- (a) 4290 (b) 4200
(c) 5880 (d) 4320

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (c) : Given:

$$\text{Area of square shaped field} = 1764\text{m}^2$$

Then, side of square shaped field = $\sqrt{1764} = 42\text{m}$

$$\text{Breadth of rectangular park} = \frac{1}{3} \times 42 = 14\text{m}$$

$$\begin{aligned} \text{And length of rectangular park} &= 2 \times \text{breadth} \\ &= 2 \times 14 = 28\text{m} \end{aligned}$$

Hence, Area of rectangular field = $14 \times 28 = 392\text{ m}^2$

$$\begin{aligned} \text{Then the cost of leveling the park at ₹15 per m}^2 \\ &= 392 \times 15 = ₹5880 \end{aligned}$$

119. The perimeter of a square is 64 cm. Its area will be:

- (a) 256 cm² (b) 32 cm²
(c) 8 cm² (d) 128 cm²

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (a) : The perimeter of a square = 64 cm

$$4a = 64$$

$$a = 16\text{ cm}$$

$$\text{area } (a^2) = 256\text{cm}^2$$

120. The diagonal of a square A is $(a + b)$ units. What is the area (in square units) of the square drawn on the diagonal of square B whose area is twice the area of A?

- (a) $2(a+b)^2$ (b) $4(a+b)^2$
(c) $8(a+b)^2$ (d) $(a+b)^2$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

$$\text{Ans. (a)} : \text{Area of square} = \left(\frac{\text{Diagonal of square}}{\sqrt{2}}\right)^2$$

$$= \frac{(a+b)^2}{2}$$

$$\text{area of square B} = (a+b)^2$$

$$\left(\frac{\text{diagonal}}{\sqrt{2}}\right)^2 = (a+b)^2$$

$$\text{diagonal} = (a+b)\sqrt{2}$$

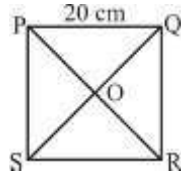
$$\text{required area} = [(a+b)\sqrt{2}]^2 = 2(a+b)^2$$

121. PQRS is a square whose side is 20 cm. By joining opposite vertices of PQRS are get four triangles. What is the sum of the perimeters of the four triangles ?

- (a) $40\sqrt{2}$ (b) $80\sqrt{2} + 80$
 (c) $40\sqrt{2} + 40$ (d) $40\sqrt{2} + 80$

SSC CGL (Tier-II) 21-02-2018

Ans. (b) :



\therefore Diagonal of square $= \sqrt{2} \times$ sides

$$PR = 20\sqrt{2} \text{ cm}$$

$$\Rightarrow OP = OR = OQ = OS = \frac{PR}{2} = \frac{20\sqrt{2}}{2} = 10\sqrt{2}$$

\therefore The sum of perimeter of Four triangle (ΔPOQ , ΔQOR , ΔROS , ΔSOP) $= 4 \times$ perimeter of ΔPOQ

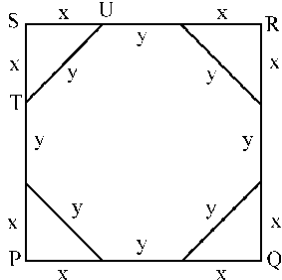
$$= 4 \times (20 + 20\sqrt{2}) \\ = \boxed{80 + 80\sqrt{2} \text{ cm}}$$

122. PQRS is a square whose side is 16 cm. What is the value of the side (in cm) of the largest octagon that can be cut from the given square ?

- (a) $8 - 4\sqrt{2}$ (b) $16 + 8\sqrt{2}$
 (c) $16\sqrt{2} - 16$ (d) $16 - 8\sqrt{2}$

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :



Let the side of the octagon $= y$ cm

$$SR = 16 \text{ cm}$$

$$2x + y = 16$$

$$x = \frac{16 - y}{2} \dots\dots\dots (i)$$

In ΔSTU ,
 $x^2 + x^2 = y^2$

$$2\left(\frac{16 - y}{2}\right)^2 = y^2$$

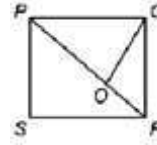
$$256 + y^2 - 32y = 2y^2$$

$$y^2 + 32y - 256 = 0$$

$$y = \frac{-32 \pm \sqrt{1024 + 4 \times 256}}{2}$$

$$= \frac{-32 \pm 32\sqrt{2}}{2} = 16\sqrt{2} - 16 \text{ (Taking the positive sign)}$$

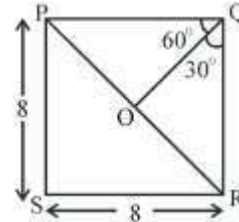
123. In the given figure, PQRS is a square of side 8 cm. $\angle PQO = 60^\circ$. What is the area (in cm^2) of the triangle POQ ?



- (a) $32\sqrt{3}$ (b) $24[(\sqrt{3}) - 1]$
 (c) $48[(\sqrt{3}) - 1]$ (d) $16[3 - (\sqrt{3})]$

SSC CGL (Tier-II) 18-02-2018

Ans. (d) :



$$\angle PQO = 60^\circ, \angle OQR = 30^\circ$$

$$\Delta PQR = \frac{8 \times 8}{2} = 32$$

$$\text{Area of } \Delta PQR = \text{Area of } \Delta POQ + \text{Area of } \Delta QOR$$

$$\text{Area of triangle} = \frac{1}{2} ab \sin \theta$$

$$32 = \frac{1}{2} \times PQ \times OQ \times \sin 60^\circ + \frac{1}{2} \times QR \times OQ \times \sin 30^\circ$$

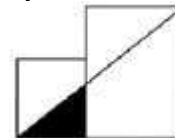
$$= \frac{1}{2} \times 8 \times OQ \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times 8 \times OQ \times \frac{1}{2}$$

$$32 = OQ(2\sqrt{3} + 2)$$

$$OQ = \frac{32}{2 + 2\sqrt{3}} = \frac{16}{\sqrt{3} + 1} \times \frac{\sqrt{3} - 1}{\sqrt{3} - 1} = 8(\sqrt{3} - 1)$$

$$\text{Area of } \Delta POQ = \frac{1}{2} \times 8 \times 8(\sqrt{3} - 1) \times \sin 60^\circ \\ = 16(\sqrt{3} - 1) \times \sqrt{3} = 16(3 - \sqrt{3}) \text{ cm}^2$$

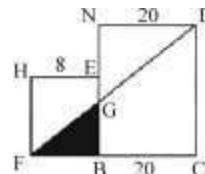
124. In the given figure, two squares of sides 8 cm and 20 cm are given. What is the area (in cm^2) of the shaded part?



- (a) 120/7 (b) 160/7
 (c) 180/7 (d) 240/13

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :



From the figure

$\Delta FGB \sim \Delta FDC$

$$\frac{GB}{DC} = \frac{FB}{FC} \Rightarrow \frac{GB}{20} = \frac{8}{28}$$

$$GB = \frac{40}{7}$$

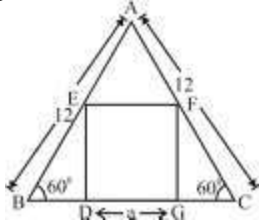
$$\begin{aligned} \text{The area of the shaded part} &\Rightarrow \frac{1}{2} \times 8 \times \frac{40}{7} \\ &\Rightarrow \frac{160}{7} \text{ cm}^2 \end{aligned}$$

125. An equilateral triangle of side 12 cm is drawn. What is the area (in cm^2) of the largest square which can be drawn inside it?

- (a) $1512 - 864\sqrt{3}$ (b) $3024 - 1728\sqrt{3}$
 (c) $3024 + 1728\sqrt{3}$ (d) $1512 + 864\sqrt{3}$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let a be the side of the largest square formed is an equilateral triangle.



In ΔBED ,

$$\tan 60^\circ = \frac{DE}{BD}$$

$$\sqrt{3} = \frac{a}{BD}$$

$$BD = \frac{a}{\sqrt{3}}$$

$$\text{Same as, } GC = \frac{a}{\sqrt{3}}$$

$$\therefore \frac{a}{\sqrt{3}} + \frac{a}{\sqrt{3}} + a = 12$$

$$a + a + a\sqrt{3} = 12\sqrt{3}$$

$$a(2 + \sqrt{3}) = 12\sqrt{3}$$

$$a = \frac{12\sqrt{3}}{2 + \sqrt{3}}$$

$$a = 12\sqrt{3}(2 - \sqrt{3})$$

$$\begin{aligned} \text{Area of the square} &= [12\sqrt{3}(2 - \sqrt{3})]^2 \\ &= 432(4 + 3 - 4\sqrt{3}) \\ &= (3024 - 1728\sqrt{3}) \text{ cm}^2 \end{aligned}$$

126. If the area of a square is decreased by 19%, then the diagonal of the square is decreased by:

- (a) 10% (b) 15%
 (c) 5% (d) 12%

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : Let the initial area of the square = 100

Area after decreased = $(100 - 19) = 81$

Side of initial square = 10

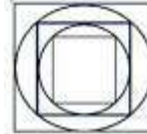
side of the square after decreased = 9

Now initial diagonal = $10\sqrt{2}$

And diagonal of the square after decreased = $9\sqrt{2}$

$$\text{Then required percentage} = \frac{10\sqrt{2} - 9\sqrt{2}}{10\sqrt{2}} \times 100 = 10\%$$

127. In the given figure, the ratio of the area of the largest square to that of the smallest square is:



- (a) 4:1 (b) 2:1
 (c) 3:1 (d) $\sqrt{2}:1$

SSC CHSL -14/10/2020 (Shift-II)

Ans. (a) : In this type of figure, the area of the square and the circle is Half respectively from outward to inward

If the area of the largest square = 8 square units

then area of smallest square = 2 square units

Required ratio = $8:2 = 4:1$

128. The side of a square is a cm. Ratio of diagonal to side is:

- (a) $\sqrt{2}:1$ (b) 1:2
 (c) $1:\sqrt{2}$ (d) 2:1

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) : Side of a square = a cm

Diagonal of square = $a\sqrt{2}$

$$\frac{\text{Diagonal of square}}{\text{Side of square}} = \frac{a\sqrt{2}}{a} = \frac{\sqrt{2}}{1}$$

129. The area of a square is 144 cm^2 . What is the perimeter of the square formed with the diagonal of the original square as its side?

- (a) $48\sqrt{2}$ (b) 48
 (c) $24\sqrt{2}$ (d) 24

SSC MTS 08/08/2019 (Shift-I)

Ans. (a) : Let the side of a square = a cm

$$\therefore a^2 = 144$$

$$\therefore a = 12 \text{ cm}$$

Diagonal of the original square = $12\sqrt{2}$

The perimeter of the square formed by diagonal = $4 \times 12\sqrt{2} = 48\sqrt{2}$

130. The diagonal of a square is equal to the side of an equilateral triangle. If the area of the square is $18\sqrt{3} \text{ sq.cm}$. What is the area (in cm^2) of the equilateral triangle?

- (a) $54\sqrt{2}$ (b) $27\sqrt{2}$
 (c) 54 (d) 27

SSC MTS 14/08/2019 (Shift-III)

135. The length of a rectangle is three-fifth of the radius of a circle. The radius of the circle is equal to the side of a square, whose area is 6400 m². The perimeter (in m) of the rectangle, if the breadth is 15 m, is:

- (a) 120 (b) 126
(c) 160 (d) 180

SSC MTS 14/10/2021 (Shift-I)

Ans. (b) : According to the question,

$$\ell = \frac{3}{5}r$$

Radius of circle (r) = Side of square

Area of square (a)² = 6400

$$a = 80$$

$$\ell = \frac{3}{5} \times 80 = 48\text{m}$$

Breadth = 15 metre

Perimeter of rectangle = 2(ℓ + b)

$$= 2(48 + 15)$$

$$= 2 \times 63$$

$$= 126 \text{ metre}$$

136. The perimeter of rectangular field is 386 m and the difference between its two adjacent sides is 95 m. The side of a square field, having the same area as that of the rectangle, is:

- (a) 64 m (b) 84 m
(c) 74 m (d) 82 m

SSC MTS 06/10/2021 (Shift-I)

Ans. (b) : Perimeter of rectangular field = 2(L+B)

Area of rectangular field = (L×B)

Area of square = a²

Let the length and breadth of rectangular field are L and B respectively.

Perimeter of rectangular field = 2(L+B) = 386

$$(L+B) = 193 \text{---(I)}$$

Given,

$$(L-B) = 95 \text{---(II)}$$

On adding equation I and II,

$$2L = 288$$

$$L = 144$$

Putting the value of L in equation (I)

$$B = 49$$

Now according to the question,

$$a^2 = (L \times B)$$

$$a^2 = 144 \times 49$$

$$a^2 = 7056$$

$$a = 84$$

137. The perimeter of a square is the same as the perimeter of a rectangle. The perimeter of the square is 40 m. If its breadth is two-thirds of its length, then the area (in m²) of the rectangle is :

- (a) 96 (b) 100
(c) 121 (d) 84

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a): Given,

Perimeter of a square = 40 m.

Let the length of the rectangle is ℓ metre.

$$\therefore \text{Breadth of the rectangle} = \frac{2\ell}{3} \text{ metre}$$

∴ Perimeter of the rectangle = perimeter of the square (taken)

$$2\left(\ell + \frac{2\ell}{3}\right) = 40$$

$$\frac{5\ell}{3} = 20$$

$$\ell = 12 \text{ metre}$$

Hence breadth of the rectangle = $\frac{2\ell}{3} = \frac{2 \times 12}{3} = 8 \text{ metre}$

∴ Area of the rectangle = ℓ × b = 12 × 8 = 96 m²

138. A rectangular room has an area of 60m² and perimeter of 34m. The length of the diagonal of the rectangular room is same as the side of a square. The area of the square (in m²) is:

- (a) 169 (b) 144
(c) 300 (d) 244

SSC MTS 13/10/2021 (Shift-I)

Ans. (a) : Area of rectangular room = 60 m²

$$\ell \times b = 60 \text{ m}^2 \dots (i)$$

$$\text{Perimeter of rectangle} = 2(\ell + b) = 34 \text{ m} \dots (ii)$$

According to the question,

$$\sqrt{\ell^2 + b^2} = \text{side of square}$$

$$a^2 = \ell^2 + b^2 = ? \dots (iii)$$

From equation (ii),

$$(\ell + b)^2 = (17)^2$$

$$\ell^2 + b^2 + 2\ell b = 289$$

$$\ell^2 + b^2 = 289 - 120$$

$$\ell^2 + b^2 = 169$$

Putting value of ℓ² + b² in equation (iii),

$$a^2 = 169 \text{ m}^2$$

Hence Area of square = 169 m²

139. The area of a triangular plot having sides 12 m, 35 m and 37 m is equal to the area of a rectangular field whose sides are in the ratio 7 : 3. The perimeter (in m) of the field is :

- (a) 20√10 (b) 20√5
(c) 24√10 (d) 24√5

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (a) : Let the length and breadth of rectangle is 7x and 3x respectively.

Side of triangle is 12, 35 and 37 m respectively.....

Area of triangle = $\frac{1}{2} \times 12 \times 35$ [∴ Given side 12, 35, 37

make triplet]

$$= 210 \text{ m}^2.$$

∴ Area of triangle = Area of rectangle.....[Given]

$$210 = 7x \times 3x$$

$$x^2 = 10$$

$$x = \sqrt{10}$$

$$\begin{aligned} \text{Perimeter of rectangle} &= 2[7 \times \sqrt{10} + 3 \times \sqrt{10}] \\ &= 2[10\sqrt{10}] \\ &= 20\sqrt{10}\text{m} \end{aligned}$$

140. The area of a triangular field whose sides are 65 m, 72 m, and 97 m is equal to the area of a rectangular park whose sides are in the ratio of 5 : 13. What is the perimeter (in m) of the rectangular park?

- (a) 108 (b) 180
(c) 216 (d) 144

SSC CHSL 19/04/2021 (Shift-I)

Ans. (c) : Given,

Sides of triangle $a = 65$ m, $b = 72$ m, $c = 97$ m

Let the length and breadth of the rectangle is $13x$ and $5x$ respectively.

$$s = \frac{a+b+c}{2} = \frac{65+72+97}{2} = 117$$

Area of triangle = Area of rectangle

$$\sqrt{s(s-a)(s-b)(s-c)} = l \times b$$

$$\sqrt{117(117-65)(117-72)(117-97)} = 5x \times 13x$$

$$\sqrt{117 \times 52 \times 45 \times 20} = 65x^2$$

$$\frac{2340}{65} = x^2$$

$$x^2 = 36$$

$$x = 6$$

$$\begin{aligned} \text{Perimeter of rectangle} &= 2(13x + 5x) \\ &= 2 \times 18 \times 6 \\ &= 216 \text{ m.} \end{aligned}$$

141. The area of a square and rectangle are equal. The length of the rectangle is greater than the length of a side of the square by 10 cm and the breadth is less than 5 cm. The perimeter (in cm) of the rectangle is:

- (a) 40 (b) 50
(c) 100 (d) 80

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b): Let the length of a side of the square = x cm

length of the rectangle = $(x+10)$ cm

breadth = $(x-5)$ cm

Area of the square = area of the rectangle

$$x^2 = (x+10)(x-5)$$

$$x^2 = x^2 - 5x + 10x - 50$$

$$50 = 5x$$

$$x = 10$$

$$\begin{aligned} \text{Perimeter of the rectangle} &= 2(x+10+x-5) \\ &= 2(2x+5) = 2 \times 25 = 50 \text{ cm} \end{aligned}$$

142. A boy walked along two adjacent sides of a rectangular field. If he had walked along the diagonal, then he would have saved a distance equal to one-fourth of the larger side. The ratio of the larger to the smaller side is:

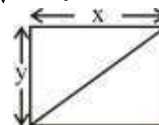
- (a) 7 : 24 (b) 11 : 18
(c) 24 : 7 (d) 18 : 11

SSC MTS 13/10/2021 (Shift-I)

Ans. (c) : Let larger side = x

Smaller side = y

$$\text{Diagonal} = \sqrt{x^2 + y^2}$$



According to the question,

$$\sqrt{x^2 + y^2} = x + y - \frac{x}{4}$$

$$\sqrt{x^2 + y^2} = \frac{4x + 4y - x}{4}$$

On squaring both sides,

$$16x^2 + 16y^2 = 9x^2 + 16y^2 + 24xy$$

$$7x^2 = 24xy$$

$$\frac{x}{y} = \frac{24}{7}$$

Required ratio = 24 : 7

143. In a rectangular park having dimensions 60 m \times 40 m two circular flower beds with radius 7 m are developed. What is the area of the remaining portion of the park? (Use $\pi = 22/7$)

- (a) 1196 m² (b) 1749 m²
(c) 2092 m² (d) 2246 m²

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : \therefore Area of the rectangular park = $l \times b$

$$= 60 \times 40 = 2400 \text{ m}^2$$

\therefore Area of circle = πr^2

\therefore Area of two circular beds = $2\pi r^2 = 2\pi \times (7)^2$

$$= 2 \times \frac{22}{7} \times 49 = 308 \text{ m}^2$$

\therefore Remaining area = $2400 - 308 = 2092 \text{ m}^2$

144. If the adjacent sides of a rectangle whose perimeter is 60 cm are in the ratio 3:2, then what will be the area of the rectangle?

- (a) 300 cm² (b) 216 cm²
(c) 60 cm² (d) 864 cm²

SSC CHSL 06/08/2021 (Shift-III)

Ans. (b) : Let the sides of rectangle are $3x$ and $2x$ respectively.

So, $2(3x + 2x) = 60$

$$\Rightarrow 2(5x) = 60$$

$$\Rightarrow 10x = 60$$

$$\Rightarrow x = 6$$

Sides of rectangle are 18 cm and 12 cm

\therefore Area of the rectangle = $18 \times 12 = 216 \text{ cm}^2$

145. The perimeter and the area of a rectangular sheet are 42 m and 108 m², respectively. The length of the diagonal is:

- (a) 10 m (b) 12 m
(c) 14 m (d) 15 m

SSC CHSL 13/04/2021 (Shift-III)

Ans.(d) : Perimeter of rectangle = $2(l+b) = 42$

$$l + b = 21 \text{ cm} \dots\dots(i)$$

And, Area of rectangle = $l \times b = 108 \dots\dots(ii)$

On squaring both sides of equation (i),

$$(l + b)^2 = (21)^2$$

$$l^2 + b^2 + 2lb = 441$$

On putting the value of l b from equation (ii),

$$l^2 + b^2 + 2 \times 108 = 441$$

$$l^2 + b^2 = 441 - 216 = 225 \dots\dots(iii)$$

Length of the diagonal of rectangular sheet

$$= \sqrt{l^2 + b^2}$$

$$= \sqrt{225} \dots\dots \text{[From equation (iii)]}$$

$$= 15 \text{ cm}$$

146. The length of a rectangle is 10 cm more than the side of a square and is 8 cm less than the side of the square. If the areas of both the rectangle and square are equal then, what will be the perimeter (in cm) of the rectangle?

- (a) 160 (b) 156
(c) 164 (d) 144

SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : Let each side of the square be a cm.

According to the question,

$$(a + 10)(a - 8) = a^2$$

$$\Rightarrow a^2 - 8a + 10a - 80 = a^2$$

$$\Rightarrow 2a = 80$$

$$\Rightarrow a = 40 \text{ cm}$$

\therefore Length of the rectangle = $40 + 10 = 50 \text{ cm}$

Breadth of the rectangle = $40 - 8 = 32 \text{ cm}$

Hence, perimeter of the rectangle = $2(50 + 32)$
 $= 164 \text{ cm}$

147. The perimeter of a rectangle is 86 cm. The numbers representing its area and breadth are in the ratio of 9:1, respectively. The breadth of the rectangle is:

- (a) 34 cm (b) 32 cm
(c) 30 cm (d) 36 cm

SSC CHSL 11/08/2021 (Shift-III)

Ans. (a) : \therefore Perimeter of rectangle = 86 cm
[Given]

$\therefore 2(l+b) = 86 \dots\dots$ [where l = length and b = breadth of rectangle]

$$l+b = \frac{86}{2} = 43 \dots\dots (i)$$

Let the area and breadth of rectangle is $9x$ and x respectively.

$$\text{Then, } l = \frac{\text{Area}}{\text{Breadth}} = \frac{9x}{x} = 9 \text{ cm}$$

On putting the value of l in equation (i)

$$9+b = 43$$

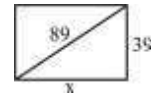
$$b = 43 - 9 = 34 \text{ cm}$$

148. One side of a rectangular field is 39 m and its diagonal is 89 m. What is the area of the field?

- (a) 2160 m² (b) 3120 m²
(c) 3140 m² (d) 2100 m²

SSC CHSL 06/08/2021 (Shift-II)

Ans. (b)



$$x^2 + 39^2 = 89^2$$

$$x^2 = (89-39)(89+39) = 50 \times 128$$

$$x^2 = 6400$$

$$x = 80$$

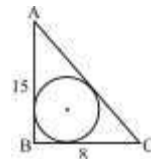
$$\therefore \text{Area of rectangle} = 39 \times 80 = 3120 \text{ m}^2$$

149. A circle is inscribed in a right-angled triangle. The lengths of the two sides containing the right angle are 15 cm and 8 cm. What is the radius of the in-circle?

- (a) 4.5 cm (b) 3 cm
(c) 3.75 cm (d) 4 cm

SSC CHSL 09/08/2021 (Shift-II)

Ans. (b) :



In ΔABC

$$\text{Hypotenuse } AC = \sqrt{(15)^2 + (8)^2}$$

$$= \sqrt{289} = 17 \text{ cm}$$

$$\text{Radius of in- circle} = \frac{P + B - H}{2} = \frac{15 + 8 - 17}{2} = \frac{6}{2} = 3 \text{ cm}$$

150. The diagonal of a rectangular field is 18 m and its area is 126 m². What will be the total expenditure in fencing the field at the rate of Rs. 9 per metre?

- (a) ₹442 (b) ₹432
(c) ₹420 (d) ₹430

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (b) : Let the length and breadth of rectangle are l and b respectively.

As per question,

$$lb = 126$$

And $l^2 + b^2 = 324$

$$(l+b)^2 = l^2 + b^2 + 2lb$$

$$= 324 + 2 \times 126$$

$$= 324 + 252 = 576$$

$$(l + b) = 24$$

Perimeter of rectangle = $2(l + b) = 48 \text{ m}$

$$\text{Total cost in the fencing} = 48 \times 9 = ₹432$$

151. How much iron sheet (in m²) will be needed to construct a rectangular tank measuring 10m × 8m × 6m, if a circular opening of radius one metre is to be left at the top of the tank? (correct to one decimal place)

- (a) 370.4 (b) 371.6
(c) 372.9 (d) 370.8

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (c): Iron sheet needed to construct a rectangular tank

$$\begin{aligned} &= 2(lb + bh + hl) - \pi r^2 \\ &= 2(10 \times 8 + 8 \times 6 + 6 \times 10) - \pi(1)^2 \\ &= 2 \times 188 - 3.14 \\ &= 376 - 3.14 \\ &= 372.86 \approx 372.9 \text{ m}^2 \end{aligned}$$

152. If the perimeter of a certain rectangle is 50 units and its area is 150 sq. units, then how many units is the length of its shorter side?

- (a) 15 (b) 9
(c) 10 (d) 12

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (c) : Let the sides of the rectangle are l and b respectively

$$2(l+b) = 50$$

$$l + b = 25 \dots\dots (1)$$

$$lb = 150 \dots\dots (2)$$

$$(l-b)^2 = (l+b)^2 - 4lb$$

$$= 625 - 600$$

$$l - b = 5 \dots\dots (3)$$

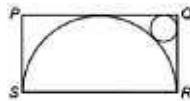
on solving both equations (1) and (3),

$$2b = 20$$

$$b = 10$$

Hence, shorter side = 10 units

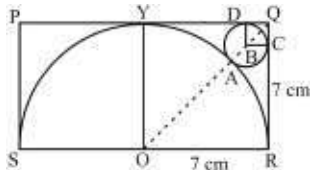
153. In the given figure, PQRS is a rectangle and a semicircle with SR as diameter is drawn. A circle is drawn as shown in the figure. If QR = 7 cm, then what is the radius (in cm) of the small circle?



- (a) $21 + 14\sqrt{2}$
(b) $21 - 14\sqrt{2}$
(c) Both $21 + 14\sqrt{2}$ and $21 - 14\sqrt{2}$
(d) None of these

SSC CGL (Tier-II) 20-02-2018

Ans. (b) :



OY = OR = 7, OQ = $7\sqrt{2}$ (diagonal of square ORQY)

BC = BD = r (Let the radius of the circle)

$$BQ = r\sqrt{2}$$

$$\therefore AQ = r + r\sqrt{2} \dots\dots (i)$$

$$AQ = OQ - OA = $7\sqrt{2} - 7 \dots\dots (ii)$$$

From the equation (i) and equation (ii)

$$r + r\sqrt{2} = 7\sqrt{2} - 7$$

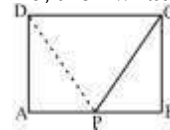
$$r(\sqrt{2} + 1) = 7(\sqrt{2} - 1)$$

$$r = \frac{7(\sqrt{2} - 1)}{\sqrt{2} + 1}$$

$$r = \frac{7(2 + 1 - 2\sqrt{2})}{1}$$

$$r = (21 - 14\sqrt{2}) \text{ cm}$$

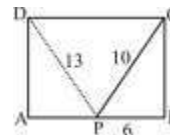
154. ABCD is a rectangle. P is a point on the side AB as shown in the given figure. If DP = 13, CP = 10 and BP = 6, then what is the value of AP?



- (a) $\sqrt{105}$ (b) $\sqrt{133}$
(c) 12 (d) 10

SSC CGL (Tier-II) 19-02-2018

Ans. (a) :



In ΔPBC

$$BC^2 = 10^2 - 6^2$$

$$BC^2 = 64$$

$$BC = 8$$

$$AD = 8$$

In ΔDAP ,

$$AP^2 = (13)^2 - (8)^2 = 169 - 64 = 105$$

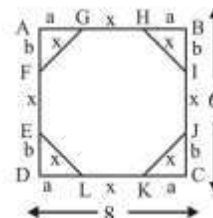
$$AP = \sqrt{105}$$

155. Length and breadth of a rectangle are 8 cm and 6 cm respectively. The rectangle is cut on its four vertices such that the resulting figure is a regular octagon. What is the side (in cm) of the octagon?

- (a) $3(\sqrt{11}) - 7$ (b) $5(\sqrt{13}) - 8$
(c) $4(\sqrt{3}) - 11$ (d) $6(\sqrt{11}) - 9$

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :



$$2a + x = 8$$

$$a = \frac{8 - x}{2}$$

$$\text{and } 2b + x = 6$$

$$b = \frac{6 - x}{2}$$

Let the side of the regular octagon is x.

By Pythagoras theorem-

$$x^2 = a^2 + b^2$$

$$x^2 = \left(\frac{8-x}{2}\right)^2 + \left(\frac{6-x}{2}\right)^2$$

$$4x^2 = 36 + x^2 - 12x + 64 + x^2 - 16x$$

$$2x^2 + 28x - 100 = 0$$

$$x^2 + 14x - 50 = 0$$

$$x = \frac{-14 \pm \sqrt{196 + 200}}{2}$$

$$x = \frac{-14 \pm 6\sqrt{11}}{2}$$

$$x = 3\sqrt{11} - 7 \text{ cm}$$

- 156.** A circular wire of diameter 77 cm is bent in the form of a rectangle whose length is 142% of its breadth. What is the area of the rectangle? (Take $\pi = 22/7$)

- (a) 3550 sq. cm (b) 3450 sq. cm
(c) 3620 sq. cm (d) 3520 sq. cm

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (a) : Circumference of the circular wire =

$$2 \times \frac{22}{7} \times \frac{77}{2} = 11 \times 22 \text{ cm}$$

Let the breadth of the rectangle formed by bending the wire = x cm

$$\text{and length of the rectangle} = x \times \frac{142}{100} = \frac{71x}{50}$$

According to the question,

Circumference of the circular wire = Perimeter of rectangle

$$11 \times 22 = 2 \left(x + \frac{71x}{50} \right)$$

$$121 \times 50 = 50x + 71x$$

$$x = \frac{121 \times 50}{121} = 50 \text{ cm}$$

$$\text{Area of the rectangle} = x \times \frac{71x}{50}$$

$$= \frac{50 \times 71 \times 50}{50} = 3550 \text{ sq. cm}$$

- 157.** The length of a rectangular park is 20 m more than its breadth. If the cost of fencing of the park at the rate of ₹53 per meter is ₹21200, what is the area (in m^2) of the park?

- (a) 9900 (b) 8925
(c) 9240 (d) 9504

SSC CHSL (Tier-I) 03/07/2019 (Shift-III)

Ans. (a): Perimeter of the park = $\frac{21200}{53} = 400$ metre

Let breadth of the park is x metre then length = (x + 20) metre

$$\text{Perimeter of the park} = 2 (\text{length} + \text{breadth})$$

$$2(x + 20 + x) = 400$$

$$2x + 20 = 200$$

$$2x = 180$$

$$x = 90$$

Hence breadth of the park = 90 m.

$$\begin{aligned} \text{Length} &= 90 + 20 \\ &= 110 \text{ m.} \\ \text{area of the park} &= 90 \times 110 \\ &= 9900 \text{ m.}^2 \end{aligned}$$

- 158.** The ratio of the length and the perimeter of a rectangle is 2 : 7. What is the ratio of the length and breadth of the rectangle?

- (a) 5 : 4 (b) 4 : 3
(c) 4 : 5 (d) 5 : 3

SSC CHSL -21/10/2020 (Shift-III)

Ans. (b)

$$\frac{\text{Length}}{\text{Perimeter}} = \frac{2}{7}$$

$$l = 2, \quad \text{Perimeter} = 7$$

$$\text{Perimeter} = 2(l + b)$$

$$7 = 2(2 + b)$$

$$3.5 = 2 + b$$

$$b = 1.5$$

$$l : b = 2 : 1.5$$

$$= 4 : 3$$

- 159.** The perimeter of a rectangle is 80cm and its area is 375cm^2 . What is the difference between the length and the breadth of the rectangle?

- (a) 20cm (b) 10cm
(c) 16cm (d) 12cm

SSC CHSL -21/10/2020 (Shift-I)

Ans. (b) Let the length and breadth of the rectangle are l and b respectively.

$$\text{area of the circle } (\ell b) = 375\text{cm}^2$$

$$\text{Perimeter of rectangle} = 2(\ell + b) = 80$$

$$\therefore \ell + b = 40$$

$$\therefore (\ell - b)^2 + 4\ell b = (\ell + b)^2$$

$$\text{or } (\ell - b)^2 + 4\ell b = (40)^2$$

$$(\ell - b)^2 + 4 \times 375 = 1600$$

$$(\ell - b)^2 = 1600 - 1500$$

$$\ell - b = \sqrt{100}$$

$$\ell - b = 10\text{cm}$$

- 160.** A circle is drawn circumscribing a rectangle of sides 24 cm and 7 cm. Find the area of the circle. (Take $\pi = 3.14$)

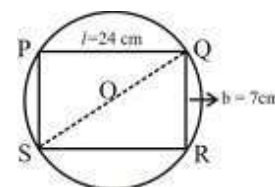
- (a) 490.625 cm^2 (b) 478.967 cm^2
(c) 420.545 cm^2 (d) 397.982 cm^2

SSC CHSL -19/10/2020 (Shift-III)

Ans. (a): Let the length and breadth of the rectangle are l and b respectively.

$$\therefore l = 24 \text{ cm}$$

$$b = 7 \text{ cm}$$



$$\begin{aligned} \because (QS)^2 &= (RS)^2 + (RQ)^2 \\ (QS)^2 &= (24)^2 + (7)^2 \\ QS &= 2R = \sqrt{(24)^2 + (7)^2} \\ 2R &= \sqrt{576 + 49} = \sqrt{625} = 25 \\ R &= \frac{25}{2} \text{ cm} \\ \therefore \text{area of the circle} &= \pi R^2 = 3.14 \times \frac{25}{2} \times \frac{25}{2} \\ &= 3.14 \times 156.25 \\ &= 490.625 \text{ cm}^2 \end{aligned}$$

161. The breadth of rectangular field is two-thirds of its length. If its area is 864 m², then find the cost of fencing it all around at ₹15/m.

- (a) ₹2,400 (b) ₹1,800
(c) ₹2,000 (d) ₹1,600

SSC CHSL -19/10/2020 (Shift-I)

Ans. (b) : Let the length and breadth of the rectangular field be l and b respectively.

$$\begin{aligned} \because b &= l \times \frac{2}{3} \\ \text{Area (A) of the rectangular field} &= l \times b = 864 \\ l \times l \times \frac{2}{3} &= 864 \\ l^2 &= 432 \times \frac{3}{2} = 1296 \\ l &= 36 \\ \text{Cost of fencing it all around} &= (\text{Perimeter of the rectangle}) \times 15 \text{ ₹/m} \\ &= 2(l + b) \times 15 \\ &= 2 \times (36 + 24) \times 15 = 2 \times 60 \times 15 \\ &= ₹1800 \end{aligned}$$

162. The length and breadth of a rectangle are in the ratio 8 : 3. If the perimeter of the rectangle is 220 cm, then what is the length (in cm) of the rectangle?

- (a) 60 (b) 70
(c) 80 (d) 85

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : Let length of the rectangle = $8x$ cm.
and breadth = $3x$ cm.
Perimeter of the rectangle = $2(l + b)$
 $220 = 2(8x + 3x)$
 $220 = 2 \times 11x$
 $x = 10$
Hence length of the rectangle = $8 \times 10 = 80$ cm.

163. The length of a rectangle is 16 cm. If the length of the diagonal is 20 cm, then what will be the breadth of the rectangle?

- (a) 8 cm. (b) 12 cm
(c) 10 cm. (d) 14 cm.

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (b) :

$$\begin{aligned} \because \text{Diagonal of the rectangle} &= \sqrt{(\text{length})^2 + (\text{breadth})^2} \\ 20 &= \sqrt{(16)^2 + (\text{breadth})^2} \\ 400 &= 256 + (\text{breadth})^2 \\ 144 &= (\text{breadth})^2 \\ \Rightarrow \text{breadth} &= 12 \text{ cm.} \\ \therefore \text{breadth of the rectangle} &= 12 \text{ cm.} \end{aligned}$$

164. The breadth of a rectangle is four times of its length. If the area of the rectangle is 1764, then what is the breadth of the rectangle?

- (a) 21 cm (b) 84 cm
(c) 44 cm (d) 56 cm

SSC CHSL -15/10/2020 (Shift-II)

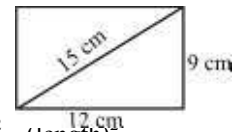
Ans. (b) : Let length of the rectangle = x , then
breadth of the rectangle = $4x$
area of the rectangle = $x \times 4x = 1764$
 $4x^2 = 1764$
 $x^2 = 441$
 $x = 21$
Hence breadth of the rectangle = $4x$
 $= 4 \times 21 = 84$ cm

165. The diagonal of rectangle is 15 cm and length is 12 cm. Find the area of the rectangle.

- (a) 108 cm² (b) 112 cm²
(c) 114 cm² (d) 116 cm²

SSC CHSL -12/10/2020 (Shift-I)

Ans. (a) : Given
diagonal = 15 cm
length = 12 cm



Formula $\text{breadth}^2 = (\text{diagonal})^2 - (\text{length})^2$
Length = $\sqrt{(15)^2 - (12)^2}$
 $= \sqrt{225 - 144}$
 $= \sqrt{81}$
 $= 9$ cm
 \therefore area of the rectangle = $l \times b = 12 \times 9 = 108$ cm²

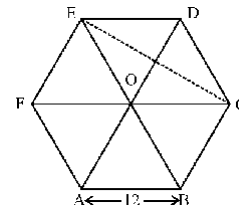
VI Hexagon

166. ABCDEF is a regular hexagon of side 12 cm. What is the area (in cm²) of the triangle ECD ?

- (a) $18\sqrt{3}$ (b) $24\sqrt{3}$
(c) $36\sqrt{3}$ (d) $42\sqrt{3}$

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :



Triangles on the same base and between the same parallel lines have equal areas.

ar (ΔECD) = ar (ΔEOD)

A regular hexagon would have been made up of six equal equilateral triangles.

$$\therefore \text{Area of } \Delta ECD = \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3} \text{ cm}^2$$

167. The area of a field in the shape of a hexagon is $3750\sqrt{3}$ m². What will be the cost (in ₹) of putting fence around it at ₹ 29 per metre?

- (a) 10,150 (b) 9,425
 (c) 7,250 (d) 8,700

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : Area of hexagonal region

$$= 6 \times \frac{\sqrt{3}}{4} \times (\text{Side})^2$$

$$= 6 \times \frac{\sqrt{3}}{4} \times (\text{Side})^2 = 3750 \times \sqrt{3}$$

$$\text{Side}^2 = 625 \times 4$$

$$\text{Side} = 25 \times 2 = 50 \text{ m}$$

$$\therefore \text{Perimeter of hexagon} = 6 \times \text{Side} = 6 \times 50 = 300 \text{ m}$$

$$\therefore \text{Total cost of putting fence around it.} = 300 \times 29 = ₹ 8700$$

168. The area of a field in the shape of a hexagon is $1944\sqrt{3} \text{ m}^2$. What will be the cost (in ₹) of fencing it at the rate of ₹11.50 per metre?

- (a) 2,256 (b) 2,484
 (c) 2,785 (d) 3,200

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) :

According to the question

$$\text{Area of a field in the shape of a hexagon} = 1944\sqrt{3} \text{ m}^2$$

$$\text{Hence, } \frac{6\sqrt{3}}{4} a^2 = 1944\sqrt{3}$$

$$a^2 = 324 \times 4$$

$$a = 36$$

$$\text{Perimeter} = 6a = 6 \times 36 = 216 \text{ m.}$$

On fencing around the hexagonal field at the rate of ₹11.50 Per meter, the total cost = 216×11.50

$$= 216 \times \frac{23}{2} = 108 \times 23 = ₹2484$$

169. The area of a field in the shape of a regular hexagon is $2400\sqrt{3} \text{ m}^2$. The cost of fencing the field at ₹16.80/ meter is:

- (a) ₹3,528 (b) ₹4,536
 (c) ₹4,032 (d) ₹3,024

SSC CGL (Tier-I)-2019-04/03/2020 (Shift-III)

Ans. (c) : Let the side of regular hexagon = a m

$$\text{area of regular hexagon} = \frac{3\sqrt{3}}{2} a^2$$

$$2400\sqrt{3} = \frac{3\sqrt{3}}{2} a^2$$

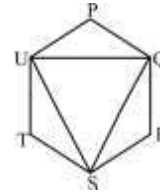
$$a = 40 \text{ m}$$

$$\text{The cost of fencing all around of the field} = 6a \times 16.80$$

$$= 240 \times 16.80$$

$$= ₹4032$$

170. In the given figure, PQRSTU is a regular hexagon of side 12 cm. what is the area (in cm^2) of triangle SQU?



- (a) $162\sqrt{3}$ (b) $216\sqrt{3}$
 (c) $108\sqrt{3}$ (d) $54\sqrt{3}$

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Area of the largest triangle SQU

$$= \frac{1}{2} \times \text{Area of regular hexagon PQRSTU}$$

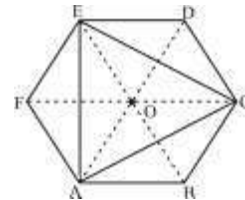
$$= \frac{1}{2} \times \frac{3\sqrt{3}}{2} \times 12 \times 12 = 108\sqrt{3} \text{ cm}^2$$

171. ABCDEF is a regular hexagon. What is the ratio of the area of triangle ACE and area of triangle AEF?

- (a) 6 : 1 (b) 4 : 1
 (c) 3 : 1 (d) 5 : 1

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :



A regular hexagon is made up of six equilateral triangles.

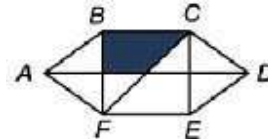
ΔOAB , ΔOBC , ΔOCD , ΔODE , ΔOEF and ΔOAF are equilateral triangles.

$$\text{Area of } \Delta ACE = \frac{1}{2} \times \text{Area of six equilateral triangles}$$

$$\text{Area of } \Delta AEF = \frac{1}{6} \times \text{Area of six equilateral triangles}$$

$$\therefore \text{ar}(\Delta ACE) : \text{ar}(\Delta AEF) = 3 : 1$$

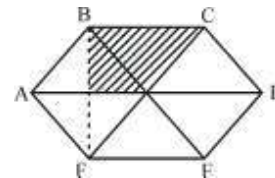
172. In the given figure, ABCDEF is a regular hexagon whose side is 12 cm. What is the shaded area (in cm^2) ?



- (a) $54\sqrt{3}$ (b) $36\sqrt{3}$
 (c) $48\sqrt{3}$ (d) $52\sqrt{3}$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :



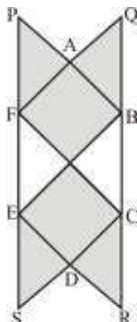
A regular hexagon would have been made up six equal equilateral triangles.

Let the area of an equilateral triangles = 1 unit = $\frac{\sqrt{3}}{4} a^2$

Area of shaded part = $1 + \frac{1}{2} = \frac{3}{2}$ unit

$$= \frac{3}{2} \times \frac{\sqrt{3}}{4} \times 12 \times 12 = 54\sqrt{3} \text{ cm}^2$$

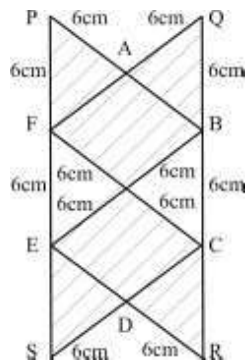
173. In the given figure, ABCDEF is a regular hexagon whose side is 6 cm. APF, QAB, DCR and DES are equilateral triangles. What is the area (in cm^2) of the shaded region?



- (a) $24\sqrt{3}$ (b) $18\sqrt{3}$
(c) $72\sqrt{3}$ (d) $36\sqrt{3}$

SSC CGL (Tier-II) 17-2-2018

Ans. (c):



All area = area of regular hexagon + 4 × area of equilateral triangles.

$$= 6 \times \frac{\sqrt{3}}{4} \cdot 6^2 + 4 \times \frac{\sqrt{3}}{4} \cdot 6^2 = 10 \cdot \frac{\sqrt{3}}{4} \cdot 6^2$$

$$\text{Area of covered/Shaded part} = 10 \cdot \frac{\sqrt{3}}{4} \cdot 6^2 - 2 \cdot \frac{\sqrt{3}}{4} \cdot 6^2$$

$$= 8 \times \frac{\sqrt{3}}{4} \cdot 6^2$$

$$= 72\sqrt{3} \text{ cm}^2$$

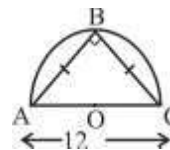
VII Semi circle

174. The area of the largest triangle that can be inscribed in a semi-circle of radius 6 cm is:

- (a) 34 cm^2 (b) 36 cm^2
(c) 38 cm^2 (d) 35 cm^2

SSC CHSL 11/08/2021 (Shift-III)

Ans. (b) : According to the question:-



On inscribed largest triangle ABC in semi-circle of radius 6 cm

$$AB = BC$$

and $AC = 2 \times 6 = 12 \text{ cm}$

$$\angle B = \text{Right angle (By theorem)}$$

$$\text{Now } AB = BC = \frac{12}{\sqrt{2}} = 6\sqrt{2}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times 6\sqrt{2} \times 6\sqrt{2} = 36 \text{ cm}^2$$

175. The diameter of a semi-circle is 5.6 m. What is its perimeter (in m, correct to one decimal place)? (Take $\pi = 22/7$)

- (a) 14.4 (b) 17.6
(c) 11.2 (d) 8.8

SSC CHSL 15/04/2021 (Shift-II)

Ans : (a) ATQ,

$$\text{Radius of semi-circle} = \frac{5.6}{2} = 2.8$$

$$\begin{aligned} \text{Perimeter of semi-circle} &= \pi r + 2r \\ &= 3.14 \times 2.8 + 2 \times 2.8 \\ &= 14.4 \text{ m} \end{aligned}$$

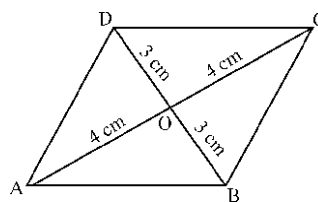
VIII Rhombus

176. The lengths of two diagonals of a rhombus are 6 cm and 8 cm. What is the side (in cm) of the rhombus?

- (a) 5 (b) 10
(c) $5\sqrt{2}$ (d) $10\sqrt{2}$

SSC MTS 11-10-2017 (Shift-I)

Ans: (a)



In rhombus ABCD

$$AB = BC = CD = AD$$

\therefore Diagonal BD = 6 cm.

$$\therefore OB = OD = \frac{6}{2} = 3 \text{ cm.}$$

Diagonal CA = 8 cm.

$$OA = OC = \frac{8}{2} = 4 \text{ cm.}$$

ΔDOC is an right angle triangle

$$\therefore DC^2 = OD^2 + OC^2$$

$$DC^2 = 3^2 + 4^2$$

$$DC^2 = 25$$

$$DC = 5$$

Hence sides of the rhombus = 5 cm.

177. The lengths of two diagonals of a rhombus are 15 cm and 20 cm. What is the area (in cm^2) of the rhombus?

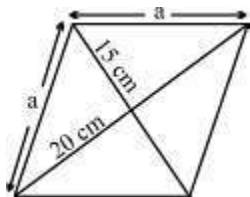
- (a) 120 (b) 150
(c) 190 (d) 180

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) Given—

Diagonal $d_1 = 15$ cm

$d_2 = 20$ cm



$$\text{Area of the rhombus} = \frac{\text{Product of diagonals}}{2}$$

$$A = \frac{d_1 \times d_2}{2}$$

$$A = \frac{15 \times 20}{2}$$

$$A = 150 \text{ cm}^2$$

(IX)

Miscellaneous

178. The area of a triangle is 15 sq cm and the radius of its incircle is 3 cm. Its perimeter is equal to:

- (a) 20 cm (b) 10 cm
(c) 12 cm (d) 5 cm

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (b) : $r = \frac{\Delta}{S}$

$$S = \frac{15}{3} = 5$$

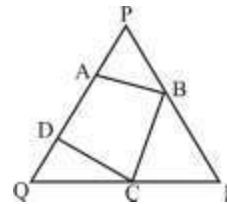
$$\text{Semiperimeter of } \Delta (S) = \frac{a + b + c}{2}$$

$$S = 5 \text{ cm}$$

$$\text{Perimeter of } \Delta = 2S$$

$$= 2 \times 5 = 10 \text{ cm}$$

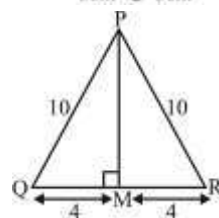
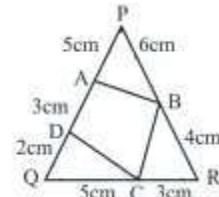
179. In the given figure, PQR is a triangle and quadrilateral ABCD is inscribed in it. $QD = 2$ cm, $QC = 5$ cm, $CR = 3$ cm, $BR = 4$ cm, $PB = 6$ cm, $PA = 5$ cm and $AD = 3$ cm. What is the area (in cm^2) of the quadrilateral ABCD?



- (a) $(23\sqrt{21})/4$ (b) $(15\sqrt{21})/4$
(c) $(17\sqrt{21})/5$ (d) $(23\sqrt{21})/5$

SSC CGL (Tier-II) 17-2-2018

Ans. (c) :



$$\text{Area of triangle} = \frac{1}{2} ab \sin \theta$$

$$\frac{\text{ar}(\Delta PAB)}{\text{ar}(\Delta PQR)} = \frac{\frac{1}{2} \times 5 \times 6 \times \sin P}{\frac{1}{2} \times 10 \times 10 \times \sin P} = \frac{3}{10}$$

$$\text{Same as, } \frac{\text{ar}(\Delta QDC)}{\text{ar}(\Delta PQR)} = \frac{10}{80} = \frac{1}{8}$$

$$\text{and } \frac{\text{ar}(\Delta BRC)}{\text{ar}(\Delta PQR)} = \frac{12}{80} = \frac{3}{20}$$

Let $\text{ar}(\Delta PQR) = 40$

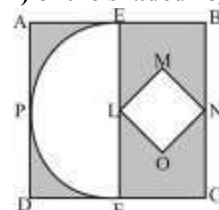
$$\text{ar}(\Delta PAB) : \text{ar}(\Delta QDC) : \text{ar}(\Delta BRC) = 12 : 5 : 6$$

$$\text{ar}(\Delta PQR) = \frac{1}{2} \times 8 \times \sqrt{100 - 16} = 8\sqrt{21} \text{ cm}^2$$

$$\therefore 40 \text{ unit} = 8\sqrt{21}$$

$$\begin{aligned} \text{ar}(ABCD) &= 40 - (12 + 5 + 6) = 17 \text{ unit} = \frac{8\sqrt{21}}{40} \times 17 \\ &= \frac{17\sqrt{21}}{5} \text{ cm}^2 \end{aligned}$$

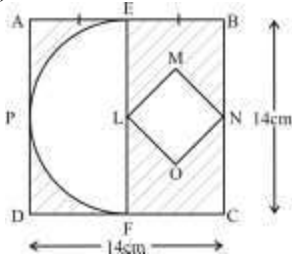
180. In the given figure, ABCD is a square of side 14 cm. E and F are mid points of sides AB and DC respectively. EPF is a semicircle whose diameter is EF. LMNO is a square. What is the area (in cm^2) of the shaded region?



- (a) 108.5 (b) 94.5
(c) 70 (d) 120

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :



$$\text{Area of } \square ABCD = 14^2 = 196 \text{ cm}^2$$

Area of semi circle

$$= \frac{\pi r^2}{2} = \frac{22}{7 \times 2} \times 7 \times 7 = 77 \text{ cm}^2$$

$$\text{Area of square LMNO} = \frac{d_1 \times d_2}{2} = \frac{7 \times 7}{2} = \frac{49}{2}$$

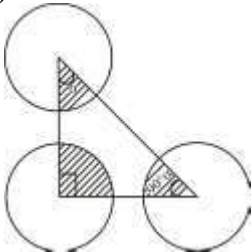
$$\begin{aligned} \text{Area of the shaded parts} &= 196 - \left(77 + \frac{49}{2}\right) \\ &= 196 - \frac{203}{2} = \frac{392 - 203}{2} \\ &= \frac{189}{2} = 94.5 \text{ cm}^2 \end{aligned}$$

181. The sides of a triangle are 24 cm, 26 cm and 10 cm. At each of its vertex, circles of radius 4.2 cm are drawn. What is the area (in cm^2) of the portion covered by the three sectors of the circle? ($\pi = \frac{22}{7}$)

- (a) 27.72 (b) 92.28
(c) 120 (d) 105.86

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) :



\therefore 24cm, 26 cm and 10 cm one Triplet
 \therefore A triangle is a right angled triangle

\therefore Sum of the three interior angles of a triangles = 180°

Hence the total area of the three sectors will be equal of semi circle's area.

area of the three circles =

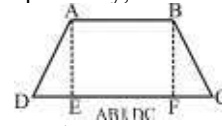
$$\begin{aligned} \frac{\pi r^2}{2} &= \frac{22}{7} \times \frac{1}{2} \times 4.2 \times 4.2 \\ &= 22 \times 1.26 = 27.72 \text{ cm}^2 \end{aligned}$$

182. The two parallel sides of a trapezium are 17 cm and 15 cm, respectively. If the height of the trapezium is 6 cm, then its area (in m^2) is:

- (a) 960 (b) 0.96
(c) 0.0096 (d) 9.6

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c): The two parallel sides of a trapezium are 17 cm and 15 cm respectively,



$$\text{Area of a trapezium} = \frac{1}{2} \times (\text{Sum of parallel sides}) \times \text{height}$$

$$\text{distance between it} = \frac{1}{2} \times (17 + 15) \times 6 = 96 \text{ cm}^2$$

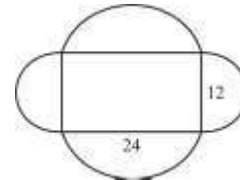
Hence area of a trapezium = 0.0096 m^2 .

183. A rectangular lawn whose length is twice of its breadth is extended by having four semi-circular portions on its sides. What is the total area (in m^2) of the lawn if the smaller side of the rectangle is 12 m? (Take $\pi = 3.14$)

- (a) 444 (b) 853.2
(c) 308.64 (d) 548.32

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) :



The smaller side of the rectangle (breadth) = 12 m

\therefore Length of the rectangle = $12 \times 2 = 24$ m

A semi circle is drawn around the rectangle

area of the circle = πr^2

area of the rectangle = $a \times b$

Hence total area of the lawn = area of circles + area of rectangles

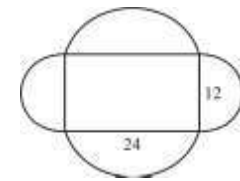
$$\begin{aligned} &= \pi \times (12)^2 + \pi \times (6)^2 + (24 \times 12) \\ &= 180\pi + 288 \\ &= 565.2 + 288 \\ &= 853.2 \text{ m}^2 \end{aligned}$$

184. A rectangular lawn whose length is twice of its breadth is extended by having four semi-circular portions on its sides. What is the total cost (in ₹) of levelling the entire lawn at the rate of ₹100 per square metre, if the smaller side of the rectangular lawn is 12 m? (Take $\pi = 3.14$)

- (a) 85,320 (b) 78,650
(c) 86,540 (d) 97,625

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) :



Area of rectangular ABCD = $24 \times 12 = 288 \text{ m}^2$
 Total area of semicircle figures
 $= \pi[(12)^2 + (6)^2]$
 $= 3.14 [144 + 36]$
 $= 3.14 \times 180 = 565.2 \text{ m}^2$
 Total area = $(288 + 565.2) = 853.2 \text{ m}^2$
 Required/intended cost = $853.2 \times 100 = ₹85,320$

185. The sides of a triangle are 24 cm, 26 cm and 10 cm. At each of its vertices, circles of radius 4.2 cm are drawn. What is the area (in cm^2) of the triangle, excluding the portion covered by the sectors of the circles?

$$\left(\pi = \frac{22}{7} \right)$$

- (a) 105.86 (b) 92.28
 (c) 27.72 (d) 120

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) :
 24 cm, 26 cm and 10 cm are triplet, So they are the sides of a right angled triangle.

Then,

$$\text{Area of triangle} = \frac{1}{2} \times 24 \times 10 = 120 \text{ cm}^2$$

radius of the circle = 4.2 cm

$$\begin{aligned} \text{Area of the part covered by the circle} &= \frac{180^\circ}{360^\circ} \times \pi \times r^2 \\ &= \frac{1}{2} \times 3.14 \times (4.2)^2 \\ &= 27.6948 \\ &= 27.69 \text{ cm}^2 \end{aligned}$$

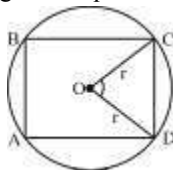
$$\text{Required area} = 120 - 27.69 = 92.31 \text{ cm}^2$$

186. A square is inscribed in a circle. What is the ratio of the length of the side of the square to the radius of the circle?

- (a) $\sqrt{2} : 1$ (b) $2 : 1$
 (c) $1 : 2$ (d) $1 : \sqrt{2}$

SSC CHSL 11/07/2019 (Shift-II)

Ans. (a) : According to the question on drawing figure,



If sides of a square is a

$$\text{Then diagonal of the square} = a\sqrt{2}$$

$$\therefore \text{Radius of the circle} = \frac{a\sqrt{2}}{2} = \frac{a}{\sqrt{2}}$$

$$\text{Intended ratio} = a : \frac{a}{\sqrt{2}} = \sqrt{2} : 1$$

187. A wire in the shape of a circle of radius 28 cm is bent in the form of a square. What is the difference of their areas? (Take $\pi = \frac{22}{7}$)

- (a) 528 cm^2 (b) 538 cm^2
 (c) 532 cm^2 (d) 530 cm^2

SSC CHSL -19/10/2020 (Shift-I)

Ans. (a) : Perimeter of circular wire = perimeter of the square

$$2\pi r = 4a$$

$$4a = 2 \times \frac{22}{7} \times 28 = 176 \quad \text{where } a = \text{side of a square}$$

$$a = 44 \text{ cm}$$

$$\begin{aligned} \therefore \text{Difference of their areas} &= \pi r^2 - (a)^2 \\ &= \frac{22}{7} \times 28 \times 28 - 44 \times 44 \\ &= 2464 - 1936 = 528 \text{ cm}^2 \end{aligned}$$

188. The sum of the squares of the sides of a rhombus is 900 m^2 . What is the side of the rhombus?

- (a) 14 m (b) 17 m
 (c) 16 m (d) 15 m

SSC CHSL -19/10/2020 (Shift-II)

Ans. (d) : \because Each side of a rhombus is of equal length

\therefore According to the question,

Let sides of a rhombus = a meter.

$$\text{Then, } a^2 + a^2 + a^2 + a^2 = 900$$

$$4a^2 = 900 \Rightarrow a^2 = 225$$

$$a = 15 \text{ m.}$$

189. A regular octagon ABCDEFGH is inscribed in a circle with centre O. What will be the ratio of $\angle OAB$ to $\angle AOB$?

- (a) $4 : 3$ (b) $3 : 1$
 (c) $8 : 3$ (d) $3 : 2$

SSC CHSL 10/07/2019 (Shift-II)

Ans. (d) :



$$\angle AOB = \frac{360^\circ}{8} = 45^\circ$$

$$\therefore OA = OB \quad (\text{radius})$$

$$\therefore \angle OAB = \angle OBA = x^\circ$$

$$\therefore x^\circ + x^\circ + \angle AOB = 180^\circ$$

$$2x^\circ + 45^\circ = 180^\circ$$

$$2x^\circ = 135^\circ$$

$$x^0 = \frac{135^0}{2}$$

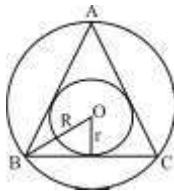
$$\frac{\angle OAB}{\angle AOB} = \frac{135^0}{45^0} = \frac{135^0}{2 \times 45^0} = 3 : 2$$

190. Given that the area of a triangle is A. Its perimeter, inradius, circumradius and the average of medians are p, r, R and d respectively. The ratio A : p will be equal to :

- (a) $(R - r)^2 : r$ (b) $r : 1$
 (c) $(R + r)^2 : d$ (d) $r : 2$

SSC CHSL 10/07/2019 (Shift-II)

Ans. (d) :



According to the question,

The radius (r) of the circle of the interior of the triangle ABC $(r) = \frac{\Delta}{s}$

where Δ = Area of the triangle
 and s = Semi-perimeter of a triangle

\therefore From the question,

$$r = \frac{A}{p/2}$$

$$\Rightarrow r = \frac{2A}{p}$$

$$\Rightarrow \frac{A}{p} = \frac{r}{2}$$

$$\therefore \boxed{A : p = r : 2}$$

191. The length of two parallel sides of a trapezium are 30 cm and 40 cm. If the area of the trapezium is 350 cm^2 , then what is the value (in cm) of its height?

- (a) 8 (b) 10
 (c) 15 (d) 12

SSC MTS 9-10-2017 (Shift-I)

Ans : (b) Area of trapezium = $\frac{1}{2}(\text{Sum of sides}) \times \text{height}$

According to the question,

$$\therefore 350 = \frac{1}{2} \times (30 + 40) \times \text{height}$$

$$\text{height} = \frac{350 \times 2}{70} = 10 \text{ cm}$$

192. The area of circular ground is $73\frac{1}{3}\%$ approximately equal to area of triangular ground whose sides are 400m, 420m and 580m. What is the circumference of the ground?

(Take $\pi = \frac{22}{7}$)

- (a) 528 (b) 1056
 (c) 440 (d) 880

SSC MTS 21/08/2019 (Shift-III)

Ans. (d) : Triplet $\rightarrow (20, 21, 29) \times 20$

Hence 400, 420 and 580 are the sides of right angle triangle.

$$\text{Area of the triangle } \Delta = \frac{1}{2} \times 420 \times 400$$

$$\Delta = 210 \times 400$$

$$\Delta = 84000 \text{ m}^2$$

$$\text{Area of the circular ground} = 84000 \times \frac{220}{3} \times \frac{1}{100}$$

$$\pi r^2 = 280 \times 220$$

$$\frac{22}{7} r^2 = 280 \times 220$$

$$r^2 = 280 \times 10 \times 7$$

$$r^2 = 7 \times 4 \times 10 \times 10 \times 7$$

$$r = 7 \times 10 \times 2 = 140$$

$$\therefore \text{Circumference of the circular ground} = 2\pi r \\ = 2 \times \frac{22}{7} \times 140 = 880 \text{ m}$$

193. A radius of the circle is equal to the length of the rectangle. The circumference of a circle and breadth of the rectangle is 132 cm and 20 cm respectively. What is the diagonal of the rectangle?

(Take $\pi = \frac{22}{7}$)

- (a) 28 cm (b) 29 cm
 (c) 25 cm (d) 27 cm

SSC MTS 21/08/2019 (Shift-II)

Ans. (b) : According to the question,

$$2\pi r = 132$$

$$2 \times \frac{22}{7} \times r = 132$$

$$\boxed{r = 21}$$

$\therefore l = 21$ ------(Given, $l = r$)

$$\text{Diagonal of rectangle} = \sqrt{b^2 + l^2}$$

$$= \sqrt{(20)^2 + (21)^2}$$

$$= \sqrt{400 + 441}$$

$$= \sqrt{841}$$

$$= 29 \text{ cm}$$

(I) Problems based on Cube

1. If the volume of a cube is 64 cm^3 , then find its total surface area.

- (a) 96 cm^2 (b) 82 cm^2
(c) 88 cm^2 (d) 64 cm^2

SSC CHSL 01/06/2022 (Shift- III)

Ans. (a) : Volume of cube = a^3

$$a^3 = 64 = 4^3$$

$$a = 4 \text{ cm,}$$

$$\therefore \text{Total surface area of cube} = 6a^2$$

$$\therefore \text{Total surface area of cube} = 6 \times (4)^2 = 96 \text{ cm}^2$$

2. From the body of a solid cube of edge 7 cm, a solid sphere is removed. The volume of the remaining solid was found to be $163\frac{1}{3} \text{ cm}^3$. What is the diameter (in cm) of the sphere? (Take $\pi = \frac{22}{7}$)

(a) 10 (b) 7
(c) 5 (d) 8

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (b) According to the question,
Volume of solid left = Volume of cube - Volume of sphere

$$163\frac{1}{3} = (7)^3 - \frac{4}{3}\pi r^3$$

$$343 - 163\frac{1}{3} = \frac{4}{3} \times \frac{22}{7} r^3$$

$$\frac{1029-490}{3} = \frac{4}{3} \times \frac{22}{7} r^3$$

$$\frac{539}{33} = \frac{4}{3} \times \frac{22}{7} r^3$$

$$\frac{7^3}{2^3} = r^3$$

$$r = \frac{7}{2} = 3.5$$

$$2r = 2 \times 3.5 = 7 \text{ cm}$$

Hence the diameter of the sphere is 7cm.

3. The sum of three numbers is 98. If the ratio of the first to the second is 2 : 3 and that of the second to the third is 5 : 8, then the third number is:

- (a) 30 (b) 20
(c) 49 (d) 48

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (d) Let three numbers are a, b and c.

$$a : b \rightarrow (2 : 3) \times 5 = 10 : 15$$

$$b : c \rightarrow (5 : 8) \times 3 = 15 : 24$$

$$a : b : c \rightarrow 10 : 15 : 24$$

$$a + b + c \rightarrow 49 \text{ unit} = 98$$

$$1 \text{ unit} = 2$$

$$\text{Hence, third number} = 24 \text{ unit} = 2 \times 24 = 48$$

4. A metal cube of edge 18 cm is melted to form three smaller cubes, which are unequal in dimensions. If the edges of two smaller cubes are 9 cm and 15 cm, what is the surface area in (cm^2) of the third smaller cube?

- (a) 1944 (b) 864
(c) 1728 (d) 486

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) :

$$\text{Volume of bigger cube} = 3 \times [\text{Volume of smaller cubes}]$$

$$(18)^3 = (9)^3 + (15)^3 + x^3$$

$$5832 = 729 + 3375 + x^3$$

$$x^3 = 5832 - 4104$$

$$x^3 = 1728 \text{ cm}^3$$

$$x = 12 \text{ cm.}$$

$$\begin{aligned} \text{Surface area of third smaller cube} &= 6x^2 \\ &= 6 \times 144 \\ &= 864 \text{ cm}^2 \end{aligned}$$

5. A solid cube having volume 46656 cm^3 is cut into 27 cubes of equal volume. The surface area (in cm^2) of the smaller cubes is:

- (a) 864 (b) 756
(c) 936 (d) 921

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) :

$$\text{Volume of smaller cube} = \frac{\text{Volume of bigger cube}}{\text{No. of smaller cube}}$$

$$= \frac{46656}{27} = 1728 \text{ cm}^3$$

$$\text{Volume of smaller cube} = (\text{side})^3 = (12)^3$$

$$\text{Side of smaller cube} = 12 \text{ cm}$$

$$\begin{aligned} \text{So, Surface area of smaller cube} &= 6 \times (\text{side})^2 \\ &= 6 \times 144 = 864 \text{ cm}^2 \end{aligned}$$

6. Three cubes each having volume 1728 cm^3 are placed one above the other. What is the total surface area of the resulting solid?

- (a) 2304 cm^2 (b) 2592 cm^2
(c) 2160 cm^2 (d) 2016 cm^2

SSC MTS 20/10/2021 (Shift-I)

Ans. (d) : Volume of cube = $(\text{Side})^3 = (a)^3$

$$(\text{Side})^3 = 1728 \text{ cm}^3$$

$$\text{Side} = \sqrt[3]{1728 \text{ cm}^3}$$

$$\text{Side} = 12 \text{ cm}$$

Now,

$$l = a, b = a, h = 3a$$

Total surface area = $2(lb + bh + hl)$

$$= 2[(12 \times 12) + (12 \times 36) + (36 \times 12)]$$

$$= 2(144 + 432 + 432)$$

$$= 2 \times 1008$$

$$= 2016 \text{ cm}^2$$

7. A solid cube of volume 13824 cm^3 is cut into 8 cube of equal volumes. The ratio of the surface area of the original cube to the sum of the surface areas of three of the smaller cubes is:

- (a) 8 : 3 (b) 2 : 1
(c) 2 : 3 (d) 4 : 3

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d) : Volume of first cube $(a_1)^3 = 13824 \text{ cm}^3$

Length of side of first cube $(a_1) = 24 \text{ cm}$

And volume of second cube,

$$8(a_2)^3 = 13824$$

$$a_2^3 = 1728$$

$$a_2 = 12 \text{ cm}$$

According to the question,

$$\begin{aligned} \text{Surface area of original cube} &= 6a_1^2 \\ &= 6 \times 24 \times 24 \end{aligned}$$

$$\begin{aligned} \text{Surface area of three small cubes} &= 3 \times 6a_2^2 \\ &= 3 \times 6 \times 12 \times 12 \end{aligned}$$

$$\frac{\text{Surface area of original cube}}{\text{Surface area of three small cube}} = \frac{4}{3}$$

8. Five cubes, each of edge 3 cm are joined end to end. What is the total surface area of the resulting cuboid, in cm^2 ?

- (a) 280 (b) 244
(c) 270 (d) 198

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (d) : Length of side of each cube = 3 cm

According to the question,

$$\text{Length of resulting cuboid} = 3 \times 5 = 15 \text{ cm}$$

$$\text{Breadth of resulting cuboid} = 3 \text{ cm}$$

$$\text{Height of resulting cuboid} = 3 \text{ cm}$$

Hence, Total surface area of cuboid = $2(lb + bh + hl)$

$$= 2(15 \times 3 + 3 \times 3 + 3 \times 15)$$

$$= 2 \times 99$$

$$= 198 \text{ cm}^2$$

9. Six cubes, each of edge 2 cm, are joined end to end. What is the total surface area of the resulting cuboid in cm^2 ?

- (a) 104 (b) 128
(c) 96 (d) 144

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (a) : \therefore According to question

$$\text{Length of resulting cuboid} = 2 \times 6 = 12 \text{ cm}$$

$$\text{Breadth} = 2 \text{ cm}$$

$$\text{Height} = 2 \text{ cm}$$

$$\text{Hence, Total surface area of cuboid} = 2(lb + bh + hl)$$

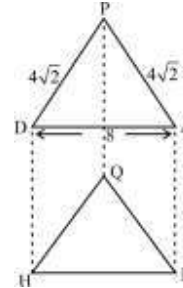
$$= 2(12 \times 2 + 2 \times 2 + 2 \times 12) = 2 \times 52 = 104 \text{ cm}^2$$

10. A solid cube has side 8 cm. It is cut along diagonals of top face to get 4 equal parts. What is the total surface area (in cm^2) of each part?

- (a) $96 + 64\sqrt{2}$ (b) $80 + 64\sqrt{2}$
(c) $96 + 48\sqrt{2}$ (d) $80 + 48\sqrt{2}$

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :

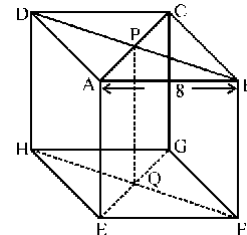


Total surface area of each parts.

= Area of ΔPDA + Area of ΔQHE + Area of $\Delta ADHE$
+ Area of $\Delta PQEA$ + Area of $\Delta PDQH$

$$= \left(\frac{1}{2} \times 4\sqrt{2} \times 4\sqrt{2} + \frac{1}{2} \times 4\sqrt{2} \times 4\sqrt{2} \right) + 8 \times 8 + 4\sqrt{2} \times 8 + 8 \times 4\sqrt{2}$$

$$= 32 + 64 + 64\sqrt{2} = 96 + 64\sqrt{2} \text{ cm}^2$$



11. A solid cube is cut into 27 identical cubes. What is the percentage increase in the total surface area?

- (a) 150 (b) 200
(c) 300 (d) 250

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :

Let, side of original cube = 3 cm

Side of each of 27 cubes cut = a cm

$$27(a)^3 = (3)^3$$

$$27(a)^3 = 27$$

$$a = 1$$

According to the question

$$\begin{aligned} \text{Ratio of surface area} &= 6 \times (3)^2 : 27 \times 6 \times (1)^2 \\ &= 1 : 3 \end{aligned}$$

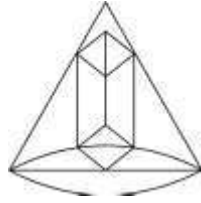
$$\text{Required increased percentage} = \frac{2}{1} \times 100 = 200\%$$

12. A cube is placed inside a cone of radius 20 cm and height 10 cm, one of its face being on the base of the cone and vertices of opposite face touching the cone. What is the length (in cm) of side of the cube?

- (a) 5 (b) 6
(c) 8 (d) 9

SSC CGL (Tier-II) 18-02-2018

Ans. (c) :



Let side of cube = a cm

∴ Length of side of cube put inside the cone

$$\frac{\sqrt{2}rh}{h + \sqrt{2}r} \quad (\text{Formula})$$

$$= \frac{\sqrt{2} \times 20 \times 10}{10 + \sqrt{2} \times 20}$$

$$= \frac{200\sqrt{2}}{10 + 20\sqrt{2}}$$

$$= \frac{20\sqrt{2}}{1 + 2\sqrt{2}} = \frac{20 \times 1.414}{1 + 2 \times 1.414}$$

$$= \frac{28.28}{3.828}$$

$$= 7.38 \approx 8 \text{ cm}$$

13. A solid cube is cut into three cuboids of same volumes. What is the ratio of the surface area of the cube to the sum of the surface areas of any two of the cuboids so formed?

- (a) 27 : 10 (b) 9 : 8
(c) 27 : 16 (d) 9 : 10

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : Let, side of cube = 3a

By cutting a solid cube in three cuboid

Length of cuboid = a

Breadth of cuboid = 3a

Height of cuboid = 3a

$$\frac{\text{Surface area of cube}}{\text{Sum of surface area of two cuboid}}$$

$$= \frac{6(\text{Side})^2}{2[2(\ell b + bh + hl)]}$$

$$= \frac{6 \times 9a^2}{4 \times (15a^2)}$$

$$= \frac{9}{10}$$

$$= 9 : 10$$

14. A right circular cylinder of maximum volume is cut out from a solid wooden cube. The material left is what percent of the volume (nearest to an integer) of the original cube?

- (a) 21 (b) 28
(c) 19 (d) 23

SSC CGL (Tier-II) 11-9-2019

Ans. (a) Let, side of cube = r cm

Volume of cube = $r^3 \text{ cm}^3$

Maximum volume of the cylinder cut from solid wooden cube.

$$= \pi \left(\frac{r}{2}\right)^2 \times r = \frac{\pi}{4} r^3$$

$$\text{Remaining volume} = r^3 - \frac{\pi}{4} r^3 = \frac{28r^3 - 22r^3}{28} = \frac{6}{28} r^3$$

$$\text{Required \%} = \frac{\frac{6}{28} r^3 \times 100}{r^3}$$

$$\approx 21\%$$

15. A solid metallic cube of side 9 cm and a solid metallic cuboid having dimensions 5 cm, 13 cm and 31 cm are melted to form a single cube. How much (in ₹) is the cost to polish the new cube at a rate of ₹ 10 per cm^2 ?

- (a) 13,620 (b) 11,760
(c) 27,440 (d) 8,650

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) : Let the side of resulting cube = a cm

$$\text{Volume of resulting cube } (a^3) = 9^3 + 5 \times 13 \times 31$$

$$= 729 + 2015 = 2744$$

$$a = 14$$

$$\text{Surface Area} = 6 \times a^2$$

$$= 6 \times 14 \times 14$$

$$= 1176 \text{ cm}^2$$

$$\text{Cost of polish at rate Rs } 10/\text{cm}^2$$

$$= \text{Surface area} \times 10 = 11760$$

16. The volume of a cube is 343 cm^3 . The edge of cube is:

- (a) 7 cm (b) 6 cm
(c) 5 cm (d) 4 cm

SSC CHSL -19/03/2020 (Shift-III)

Ans. (a) ∴ Volume of cube = 343 cm^3

Let length of side of cube is a then

$$\text{Volume of cube} = a^3$$

$$\therefore a^3 = 343 \text{ cm}^3$$

$$a = 7 \text{ cm}$$

Hence, Length of side of cube = 7 cm

17. If each edge of a cube is increased by 10%, then the percentage increase in its surface area is:

- (a) 20% (b) 22%
(c) 19% (d) 21%

SSC CHSL -13/10/2020 (Shift-II)

Ans. (d) ∴ Given

$$\text{Surface area of cube} = 6a^2$$

$$\text{Increased percentage} = \left(x + y + \frac{xy}{100} \right) \%$$

$$= 10 + 10 + \frac{100}{100} = 21\%$$

18. If the diagonal of a cube is $\sqrt{27}$ cm, then its volume is:

- (a) 27 cm^3 (b) 32 cm^3
(c) 30 cm^3 (d) 25 cm^3

SSC CHSL -26/10/2020 (Shift-III)

Ans. (a) : Diagonal of cube = $\sqrt{3}a = \sqrt{27}$

By squaring the both side

$$3a^2 = 27$$

$$a^2 = 9$$

$$a = 3$$

$$\text{Volume of cube} = (a)^3 = (3)^3$$

$$\text{Volume of cube} = 27 \text{ cm}^3$$

19. If the ratio of the volume of two cubes is 64:27, then what is the ratio of their edges?

- (a) 4:3 (b) 16:9
(c) 64:27 (d) 4:9

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) Ratio of volume of two cube $V_1 : V_2 = 64:27$

$$\begin{aligned} \text{Ratio of side of both cube } a_1 : a_2 &= \sqrt[3]{V_1} : \sqrt[3]{V_2} \\ &= \sqrt[3]{64} : \sqrt[3]{27} \\ &= 4:3 \end{aligned}$$

20. The total surface area of a cube is 2904 cm². What is the volume of this cube?

- (a) 11748 cm³ (b) 10848 cm³
(c) 10748 cm³ (d) 10648 cm³

SSC MTS 7-10-2017 (Shift-I)

Ans. (d) : Total surface area of cube = 2904 cm²

$$6a^2 = 2904$$

$$a^2 = \frac{2904}{6}$$

$$a^2 = 484$$

$$a = 22$$

$$\text{Volume of cube} = a^3 = 22 \times 22 \times 22 = 10648 \text{ cm}^3$$

21. If the lateral surface area of the cube is 144 cm², then what is the length of its side?

- (a) 4 cm (b) 8 cm
(c) 5 cm (d) 6 cm

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) Lateral surface area of cube = 4a²

$$4a^2 = 144$$

$$a^2 = 36$$

$$\text{Side of cube } a = 6$$

22. If two 10 mm cubes made of iron is put in a box such that they hold 200 cc of water, then what is total volume of material in the box (in ml)?

- (a) 201 (b) 202
(c) 200002 (d) 200001

SSC MTS 14/08/2019 (Shift-I)

Ans. (b) : Volume of material in box

$$= 2 \text{ Volume of cube} + 200 \text{ cm}^3$$

$$= 2 \times (1)^3 + 200 \quad [\because 1 \text{ cm} = 10 \text{ mm}]$$

$$= 202 \text{ cm}^3$$

$$= 202 \text{ ml} \quad [\because 1 \text{ cm}^3 = 1 \text{ ml}]$$

23. The edge of a cube is 8 cm. What is the total surface area of the cube?

- (a) 128 cm² (b) 256 cm²
(c) 384 cm² (d) 484 cm²

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) : $\because a = 8$

$$\text{Then, total surface area} = 6a^2$$

$$= 6 \times (8)^2$$

$$= 6 \times 64$$

$$= 384 \text{ cm}^2$$

24. How many cubes with a side 10 cm can be cut out of a cube having a side of 10 meter?

- (a) 10,000 (b) 1,00,00,000
(c) 1,00,000 (d) 10,00,000

SSC MTS 13/08/2019 (Shift-III)

Ans. (d)

$$\text{Number of required cube} = \frac{\text{Volume of large cube}}{\text{Volume of a small cube}}$$

$$= \frac{(10 \times 10 \times 10) \times 100 \times 100 \times 100}{10 \times 10 \times 10}$$

$$= 1000000$$

25. 2541 spherical metallic balls are melted to form a cube each of whose radius is 1cm. The total surface area of cube (in cm²) in nearest values will be.

- (a) 1936 (b) 2904
(c) 2992 (d) 3168

SSC MTS 21/08/2019 (Shift-III)

Ans. (b) Let, side of cube = a cm

$$\therefore 2541 \times \frac{4}{3} \pi r^3 = a^3$$

$$2541 \times \frac{4}{3} \times \frac{22}{7} \times (1)^3 = a^3$$

$$121 \times 4 \times 22 = a^3$$

$$a^3 = 484 \times 22$$

$$a = 22$$

$$\begin{aligned} \text{Surface area of cube} &= 6a^2 \\ &= 6 \times (22)^2 = 6 \times 484 \\ &= 2904 \text{ cm}^2 \end{aligned}$$

(II) Problems based on Cuboid

26. If the length of a cuboid is 20 m, breadth is 5 m and height is 4 m, then find the length of diagonal of the cuboid.

- (a) 12 m (b) 21 m
(c) 18 m (d) 24 m

SSC CHSL 01/06/2022 (Shift- III)

Ans. (b) : \because Length of diagonal of the cuboid =

$$\sqrt{l^2 + b^2 + h^2}$$

\therefore Length of diagonal of the cuboid

$$= \sqrt{(20)^2 + (5)^2 + (4)^2}$$

$$= \sqrt{400 + 25 + 16}$$

$$= \sqrt{441}$$

$$= \sqrt{21 \times 21}$$

$$= 21 \text{ m}$$

27. A rectangular water tank is 1.5 m high, 3 m long and 3.5 m wide. How much water (in litres) can it hold?

- (a) 13520 (b) 14510
(c) 15750 (d) 11780

SSC CHSL 25/05/2022 (Shift- III)

Ans. (c) : Given, Dimensions of the rectangular tank are 1.5m high 3m long and 3.5 wide.

\therefore Water holds in tank = Volume of rectangular tank

\Rightarrow Volume of rectangular tank = length \times breadth \times height

$$= 3 \times 3.5 \times 1.5$$

$$= 15.75 \text{ m}^3$$

$$= 15750 \text{ liters} \quad [\because 1 \text{ m}^3 = 1000 \text{ litres}]$$

28. The area of a cardboard (in cm^2) needed to make a closed box of size $20 \text{ cm} \times 10 \text{ cm} \times 8 \text{ cm}$ will be:
 (a) 880 (b) 690
 (c) 750 (d) 960

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (a) Given that—
 Length of box (l) = 20cm
 Breadth of box (b) = 10cm
 Height of box (h) = 8cm
 According to the question,
 Area of cardboard = Total surface area of box
 $= 2(lb + bh + lh)$
 $= 2(20 \times 10 + 10 \times 8 + 20 \times 8)$
 $= 2(200 + 80 + 160)$
 $= 2 \times 440$
 $= 880 \text{ cm}^2$

29. Four cubes, each of edge 5 cm are joined end to end. What is the total surface area of the resulting cuboid?

- (a) 450 cm^2 (b) 500 cm^2
 (c) 475 cm^2 (d) 600 cm^2

SSC CHSL (Tier-I) 11/07/2019 (Shift-III)

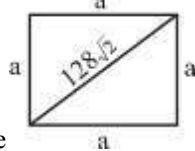
Ans. (a) : Length of cuboid made by joining 4 cube of 5cm core = $5 \times 4 = 20 \text{ cm}$
 Breadth = 5 cm, Height = 5 cm
 Total surface area of cuboid
 $= 2(l \times b + b \times h + h \times l)$
 $= 2(20 \times 5 + 5 \times 5 + 5 \times 20)$
 $= 2 \times (100 + 25 + 100)$
 $= 2 \times 225 = 450 \text{ cm}^2$

30. A solid cube whose each face diagonal is $128\sqrt{2} \text{ cm}$ is moulded to form a cuboid. the length and breadth of a cuboid is 512 cm and 160 cm respectively. What is the height of the cuboid?

- (a) 25.6 cm (b) 16 cm
 (c) 20.8 cm (d) 16.4 cm

SSC MTS 14/08/2019 (Shift-I)

Ans. (a) :
 $a^2 + a^2 = (128\sqrt{2})^2$
 $2a^2 = 128 \times 128 \times 2$
 $a = 128$
 Height of cuboid = $\frac{\text{Volume of cube}}{l \times b}$
 $= \frac{128 \times 128 \times 128}{512 \times 160} = 25.6 \text{ cm}$



31. How many bricks each measuring $64 \text{ cm} \times 11.25 \text{ cm} \times 6 \text{ cm}$ will be needed to build a wall measuring $8 \text{ m} \times 3 \text{ m} \times 22.5 \text{ m}$?

- (a) 200000 (b) 250000
 (c) 67500 (d) 125000

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) : No. of bricks = $\frac{\text{Volume of a wall}}{\text{Volume of a brick}}$

$$= \frac{8 \times 3 \times 22.5}{64 \times 10^{-2} \times 11.25 \times 10^{-2} \times 6 \times 10^{-2}}$$

$$= \frac{8 \times 3 \times 225 \times 10^7}{64 \times 1125 \times 6}$$

$$= \frac{24 \times 10^7}{64 \times 30}$$

$$= \frac{10^7}{80} = 125000$$

32. From a rectangle sheet of dimensions $32 \text{ cm} \times 18 \text{ cm}$, a square of side 3 cm is cut from the four corners of the sheet and a box is made. The volume of the box is:

- (a) 946 cm^3 (b) 1300 cm^3
 (c) 936 cm^3 (d) 1305 cm^3

SSC CHSL 05/08/2021 (Shift-II)

Ans. (c) : If square of side 3cm is cut off from corners then height of box = 3cm

Length of box = $32 - (3 + 3) = 26 \text{ cm}$

Breadth of box = $18 - (3 + 3) = 12 \text{ cm}$

Hence, the volume of the box = $26 \times 12 \times 3 = 936 \text{ cm}^3$

33. The sum of the length, breadth and height of a cuboid is 28 cm. If the total surface area of the cuboid is 588 cm^2 , then its diagonal is:

- (a) 14 cm (b) 12 cm
 (c) 16 cm (d) 15 cm

SSC MTS 18/10/2021 (Shift-I)

Ans. (a) : Sides of the cuboid respectively, length = l , breadth = b and height = h

Given,

$$l + b + h = 28 \dots\dots\dots(i)$$

Surface area of cuboid

$$\Rightarrow 2(lb + bh + hl) = 588 \dots\dots(ii)$$

Diagonal of cuboid,

$$= \sqrt{l^2 + b^2 + h^2} = ?$$

From equation (i),

$$l + b + h = 28$$

On squaring both sides,

$$(l + b + h)^2 = (28)^2$$

$$l^2 + b^2 + h^2 + 2(lb + bh + hl) = 784$$

Putting value of equation (ii),

$$l^2 + b^2 + h^2 + 588 = 784$$

$$l^2 + b^2 + h^2 = 784 - 588$$

$$l^2 + b^2 + h^2 = 196$$

$$\sqrt{l^2 + b^2 + h^2} = \sqrt{196}$$

$$\sqrt{l^2 + b^2 + h^2} = 14$$

Hence, diagonal of cuboid = 14 cm

34. The length (in m, correct to one decimal place) of the longest pole that can be fitted in a room of dimensions $12 \text{ m} \times 6 \text{ m} \times 4 \text{ m}$ is:

- (a) 7.2 (b) 14.0
 (c) 13.4 (d) 12.6

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) : Length of the longest pole = length of diagonal

$$\begin{aligned} &= \sqrt{l^2 + b^2 + h^2} \\ &= \sqrt{12^2 + 6^2 + 4^2} \\ &= \sqrt{144 + 36 + 16} \\ &= \sqrt{196} \\ &= 14 \text{ m} \end{aligned}$$

35. If the internal dimensions of a rectangular closed wooden box are 30 cm, 18 cm and 23 cm, what space (in cm³) will it occupy, if the wood used is 1 cm thick?

- (a) 12420 (b) 16000
(c) 14136 (d) 9408

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) : Length of rectangular box = 30 cm
Width = 18 cm
and, Height = 23 cm

After use of wood in a rectangular box the length, breadth and height will increase by 2 cm each.

Now, the rectangular box will occupy space equal to the volume of box

$$\begin{aligned} &= 32 \times 20 \times 25 \\ &= 16000 \text{ cm}^3 \end{aligned}$$

36. What is the length (in cm) of the longest rod that can be fitted in a box of dimensions 28 cm × 4 cm × 10 cm?

- (a) 36 (b) 42
(c) 25 (d) 30

SSC CHSL 15/04/2021 (Shift-II)

Ans. (d) : As per question,

$$\begin{aligned} \text{Length of longest rod} &= \sqrt{(28)^2 + (4)^2 + (10)^2} \\ &= \sqrt{784 + 16 + 100} = \sqrt{900} \\ &= 30 \text{ cm} \end{aligned}$$

37. A solid metallic cube of side 20 cm is melted and recast into a cuboid of length 40 cm and breadth 40 cm. What is the length (in cm) of the body diagonal of the cuboid?

- (a) $15\sqrt{43}$ (b) $43\sqrt{15}$
(c) $129\sqrt{5}$ (d) $5\sqrt{129}$

SSC CHSL 13/04/2021 (Shift-II)

Ans. (d) : As per question,

$$\text{Height of cuboid} = \frac{20 \times 20 \times 20}{40 \times 40} = 5 \text{ cm}$$

Then, length of diagonal of cuboid

$$\begin{aligned} &= \sqrt{(40)^2 + (40)^2 + (5)^2} \\ &= \sqrt{1600 + 1600 + 25} \\ &= \sqrt{3225} \\ &= 5\sqrt{129} \text{ cm} \end{aligned}$$

38. The areas of three adjacent faces of a cuboidal solid block of wax are 216 cm², 96 cm² and 144 cm². It is melted and 8 cubes of the same size are formed from it. What is the lateral surface area (in cm²) of 3 such cubes?

- (a) 648 (b) 432
(c) 576 (d) 288

SSC CGL (Tier-II) 03/02/2022

Ans. (b) : Given—

$$lb = 216 \text{ cm}^2 \text{-----(i)}$$

$$bh = 96 \text{ cm}^2 \text{-----(ii)}$$

$$hl = 144 \text{ cm}^2 \text{-----(iii)}$$

On multiplying the equation (i), (ii) and (iii)

$$l^2b^2h^2 = 216 \times 96 \times 144$$

$$lbh = \sqrt{2^3 \times 3^3 \times 2^5 \times 3 \times 2^4 \times 3^2}$$

$$= 2^6 \times 3^3$$

$$= 1728$$

Let, The side of cube = a cm

Volume of cuboid = volume of cube

$$1728 = 8 \times a^3$$

$$a^3 = 216$$

$$a = 6$$

$$\text{Lateral surface area of 3 cubes} = 3 \times 4a^2$$

$$= 3 \times 4 (6)^2$$

$$= 432 \text{ cm}^2$$

39. The sum of length, breadth and height of a cuboid is 20 cm. If the length of the diagonal is 12 cm, then find the total surface area of cuboid.

- (a) 356 cm² (b) 364 cm²
(c) 256 cm² (d) 264 cm²

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) :

According to the question

$$l + b + h = 20 \text{ ----- (1)}$$

$$\text{Diagonal} = 12 \text{ cm}$$

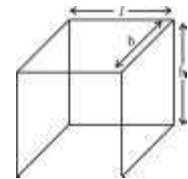
$$\text{Hence, Diagonal} = \sqrt{l^2 + b^2 + h^2} = 12$$

$$= l^2 + b^2 + h^2 = 144 \text{ ---- (2)}$$

$$\therefore (l+b+h)^2 = l^2 + b^2 + h^2 + 2(lb+bh+hl)$$

$$(20)^2 = 144 + 2(lb+bh+hl)$$

$$2(lb+bh+hl) = 256$$



40. The areas of the three adjacent faces of a cuboid are 32 cm², 24 cm² and 48 cm². What is the volume of the cuboid?

- (a) 192 cm³ (b) 288 cm³
(c) 128 cm³ (d) 256 cm³

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (a) : Length = l cm

Breadth = b cm

Height = h cm

$$l \times b = 32 \text{ cm}^2 \quad \dots \text{ (i)}$$

$$b \times h = 24 \text{ cm}^2 \quad \dots \text{ (ii)}$$

$$h \times l = 48 \text{ cm}^2 \quad \dots \text{ (iii)}$$

By multiplying the equation (i), (ii) and (iii)

$$l^2b^2h^2 = 32 \times 24 \times 48$$

$$lbh = \sqrt{16 \times 48 \times 48}$$

$$\text{volume of cuboid} = 192 \text{ cm}^3$$

41. The area of the four walls of a room having length 6m, breadth 4m and height 4m, is:
 (a) 50 (b) 60
 (c) 40 (d) 80

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (d) : Area of four walls of room = $2(\ell + b) \times h$
 $= 2(6 + 4) \times 4 = 80 \text{ m}^2$

42. The length, breadth and height of a cuboidal box are in the ratio 7 : 5 : 3 and its whole surface area is 27832 cm². Its volume is:
 (a) 208120 cm³ (b) 280120 cm³
 (c) 288100 cm³ (d) 288120 cm³

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (d) : Let $l = 7x$, $b = 5x$, $h = 3x$
 Total surface Area = 27832 cm^2
 $2(lb + bh + hl) = 27832$
 $35x^2 + 15x^2 + 21x^2 = 13916$
 $71x^2 = 13916$
 $x^2 = 196$
 $x = 14$

\therefore Volume of box = $l \times b \times h$
 $= 105x^3 = 105 \times 14 \times 14 \times 14 = 288120 \text{ cm}^3$

43. A cuboid has dimensions 8 cm × 10 cm × 12 cm. It is cut into small cubes of side 2 cm. What is the percentage increase in the total surface area?
 (a) 286.2 (b) 314.32
 (c) 250.64 (d) 386.5

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :
 Total surface area of cuboid = $2[(8 \times 10) + (10 \times 12) + (12 \times 8)]$
 $= 2[80 + 120 + 96] = 592 \text{ cm}^2$

Number of cube of side 2cm = $\frac{8 \times 10 \times 12}{2 \times 2 \times 2} = 120$

Total surface area of cube of side 2cm = $120 \times 6 \times (2)^2$
 $= 2880 \text{ cm}^2$

Hence, Increased percentage in total surface are

$= \left(\frac{2880 - 592}{592} \right) \times 100$

$= \left(\frac{2288}{592} \right) \times 100 = 386.48$

$= \boxed{386.5 \text{ cm}^2}$

44. Identical cubes of largest possible size are cut from a solid cuboid of size 65 cm × 26 cm × 3.9 cm. What is the total surface are (in cm²) of all the small cubes together?
 (a) 30420 (b) 32001
 (c) 20280 (d) 16440

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Volume of cuboid = $65 \times 26 \times 3.9$
 $= 13 \times 5 \times 13 \times 2 \times 1.3 \times 3$
 $= 1.3 \times 50 \times 1.3 \times 20 \times 1.3 \times 3$
 Number of small cube = $50 \times 20 \times 3 = 3000$
 Cone of each cube = 1.3 cm
 Total surface area of all small cube = $3000 \times 6a^2$
 $= 3000 \times 6 \times 1.3 \times 1.3 = 30420 \text{ cm}^2$

45. A solid cuboid has dimensions 14 cm × 18 cm × 24 cm. A hemisphere of radius 3.5 cm is cut from the centre of each face of cuboid. What is the total surface area (in cm²) of the remaining solid?

- (a) 1902 (b) 1809
 (c) 1706 (d) 2271

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Total surface area of reaming solid
 $= 2(lb + bh + hl) + 6 \times 2\pi r^2 - 6\pi r^2$
 $= 2[252 + 432 + 336] + 6\pi r^2$
 $= 2 \times 1020 + 6 \times \frac{22}{7} \times 3.5 \times 3.5$
 $= 2040 + 231 = 2271 \text{ cm}^2$

46. A cuboid of size 50 cm × 40 cm × 30 cm is cut into 8 identical parts by 3 cuts. What is the total surface area (in cm²) of all the 8 parts?
 (a) 11750 (b) 14100
 (c) 18800 (d) 23500

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Size of original cuboid = $50 \text{ cm} \times 40 \text{ cm} \times 30 \text{ cm}$
 Size of cuboid after cutting = $25 \text{ cm} \times 20 \text{ cm} \times 15 \text{ cm}$
 Total surface area of eight parts
 $= 8[2(25 \times 20 + 20 \times 15 + 15 \times 25)]$
 $= 16 \times [500 + 300 + 375]$
 $= 16 \times 1175$
 $= 18800 \text{ cm}^2$

47. A 15 m deep well with radius 2.8 m is dug and the earth taken out from it is spread evenly to form a platform of breadth 8 m and height 1.5 m. What will be the length of the platform?
 (Take $\pi = \frac{22}{7}$)

- (a) 28.8 m (b) 30.8 m
 (c) 30.2 m (d) 28.4 m

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :
 Volume of soil taken out from well = Volume of platform.

$\frac{22}{7} \times 2.8 \times 2.8 \times 15 = \ell \times 8 \times 1.5$

$22 \times 6 \times 2.8 = \ell \times 12$

$\ell = 11 \times 2.8 = 30.8 \text{ m}$

48. A tank is in the form of a cuboid with length 12 m. If 18 kilolitre of water is removed from it, the water level goes down by 30 cm. What is the width (in m) of the tank?

- (a) 5 (b) 4.5
 (c) 4 (d) 5.5

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : Amount of water = 18 kg-liter
 Volume of water at height 30cm in cuboid shape tank.

$l \times b \times h = 18 \text{ m}^3$ ($\because 1 \text{ kg-liter} = 1 \text{ m}^3$)

$12 \times b \times 0.30 = 18$

$b = \frac{18}{3.6} = 5 \text{ m}$

49. If a cuboid of dimensions 32 cm × 12 cm × 9 cm is cut into two cubes of same size, what will be the ratio of the surface area of the cuboid to the total surface area of the two cubes ?
 (a) 32 : 39 (b) 24 : 35
 (c) 37 : 48 (d) 65 : 72

SSC CGL (Tier-II) 11-9-2019

Ans. (d) :

$$\text{Volume of cuboid} = 32 \times 12 \times 9 \text{ cm}^3$$

$$\text{Volume of each cube} = \frac{32 \times 12 \times 9}{2} = 1728 \text{ cm}^3$$

$$\therefore \text{Side of each cube} = 12 \text{ cm}$$

$$\frac{\text{surface area of cuboid}}{\text{surface area of two cube}} = \frac{2(\ell b + bh + h\ell)}{2 \times 6a^2}$$

$$= \frac{32 \times 12 + 12 \times 9 + 9 \times 32}{6 \times 12 \times 12}$$

$$= \frac{32 + 9 + 24}{72} = \frac{65}{72}$$

$$= 65 : 72$$

50. A cuboidal tank has 25000 litres of water. If the depth of the cuboid is 1/5 of its length and breadth is 1/8 of its length, then the length of the tank is:
 (a) 18 m (b) 12 m
 (c) 10 m (d) 15 m

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c) : Volume of tank = 25000 L = 25m³

Let, Length of tank = x m

According to the question

$$\text{Depth of tank} = \frac{x}{5} \text{ m}$$

$$\text{Breadth of tank} = \frac{x}{8} \text{ m}$$

$$\text{Volume of tank} = l \times b \times h$$

$$25 = x \times \frac{x}{8} \times \frac{x}{5}$$

$$x^3 = 2^3 \times 5^3$$

$$x = 10 \text{ m}$$

51. The length and breadth of a cuboidal store are in the ratio 2 : 1 and its height is 3.5 metres. If the area of its four walls (including doors) is 210m², then its volume is _____.
 (a) 700m³ (b) 679m³
 (c) 567m³ (d) 1050m³

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)

Let Length(ℓ) = 2x

Breadth(b) = x

According to the question

$$2(\ell + b) \times h = 210$$

$$2 \times 3x \times 3.5 = 210$$

$$x = 10$$

$$\text{Volume of cuboid} = \ell \times b \times h$$

$$= 20 \times 10 \times 3.5 = 700 \text{ m}^3$$

52. The internal length of a room is two times its breadth and three times its height. The total cost of painting its four walls at the rate of ₹25/m² is ₹3,600. What is the cost of laying a carpet on its floor at the rate of ₹90.50/m²?
 (a) ₹5,430 (b) ₹5,970
 (c) ₹6,516 (d) ₹7,240

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c) Let length of floor = 6K

And Breadth = 3K

Height = 2K

$$\text{Area of four walls} = \frac{3600}{25} = 144 \text{ m}^2$$

$$\text{Area of four walls} = \text{Height} \times \text{Perimeter}$$

$$= 2K \times 2(6K + 3K)$$

$$144 = 36K^2$$

$$K = 2$$

$$\text{Area of floor} = 18K^2 = 72 \text{ m}^2$$

$$\text{Total cost of laying of carpet} = 72 \times 90.50 = ₹ 6516$$

53. The internal measures of a cuboidal room are with length as 12 m, breadth as 8 m and height as 10m. The total cost (in ₹) of whitewashing all four walls of the room and also the ceiling of the room, if the cost of whitewashing is ₹25 per m², is:
 (a) 12,000 (b) 13,600
 (c) 12,400 (d) 18,000

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : Area of four walls and roof of room

$$= \ell b + 2bh + 2h\ell$$

$$= 12 \times 8 + 2 \times 8 \times 10 + 2 \times 10 \times 12$$

$$= 96 + 160 + 240 = 496 \text{ m}^2$$

$$\text{Total cost} = 496 \times 25 = ₹12400$$

54. The cuboid of dimensions 343 cm × 49 cm × 7 cm is melted down to form cube of sides 7cm. Find the total surface area of all such produced cubes?
 (a) 16807 (b) 10842
 (c) 120506 (d) 100842

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : Number of cubes = $\frac{343 \times 49 \times 7}{7 \times 7 \times 7}$

$$= 49 \times 7 = 343$$

$$\text{Total surface area of all produced cube} = (6a^2) \times 343$$

$$= 6 \times (7)^2 \times 343$$

$$= 6 \times 49 \times 343$$

$$= 100842 \text{ cm}^2$$

55. The length, breadth and height of a cuboid are 18cm, 24cm and 4cm respectively. The volume of cube is equal to the volume of given cuboid. The side of the cube is:
 (a) 9 cm (b) 16 cm
 (c) 12 cm (d) 8 cm

SSC MTS 13/08/2019 (Shift-I)

Ans. (c) : Let side of cube is a.

$$\text{Volume of cuboid} = \text{Volume of cube}$$

$$18 \times 24 \times 4 = a^3$$

$$a^3 = 1728$$

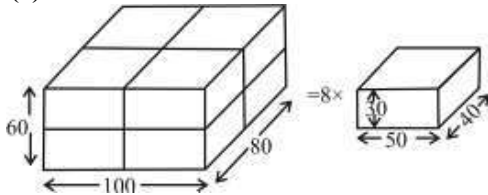
$$a = 12 \text{ cm}$$

56. A cuboid of size 100 cm × 80 cm × 60 cm cut into eight identical parts by three cuts. What is the total surface area (in square cm.) of all the eight parts?

- (a) 22500 (b) 84100
(c) 50750 (d) 75200

SSC MTS 09/08/2019 (Shift-I)

Ans. (d) :



$$\begin{aligned}
 &= 8 \times [2(lb + bh + hl)] \\
 &= 8 \times [2(30 \times 50 + 50 \times 40 + 40 \times 30)] \\
 &= 8 \times [2(1500 + 2000 + 1200)] \\
 &= 8 \times [2(4700)] \\
 &= 8 \times [9400] = 75200 \text{ cm}^2
 \end{aligned}$$

57. The area of the sheet metal needed to make a box of size 7 cm × 8 cm × 9 cm is:

- (a) 382 cm² (b) 156 cm²
(c) 412 cm² (d) 139 cm²

SSC MTS 13/08/2019 (Shift-II)

Ans. (a) : Area of required sheet metal = $2(\ell b + bh + h\ell)$

$$\begin{aligned}
 &= 2(7 \times 8 + 8 \times 9 + 9 \times 7) \\
 &= 2(56 + 72 + 63) \\
 &= 2 \times 191 \\
 &= 382 \text{ cm}^2
 \end{aligned}$$

58. The length, breadth and height of a solid cuboid is 14 cm, 12 cm and 8 cm respectively. If cuboid is melted in form of identical cubes of side 2 cm, then what will be the number of identical cubes?

- (a) 168 (b) 144
(c) 156 (d) 128

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (a) : Let, the number of identical cube = n

$$\begin{aligned}
 n \times \text{Volume of one cube} &= \text{Volume of cuboid} \\
 n \times (2)^3 &= 14 \times 12 \times 8 \\
 n &= 14 \times 12 \\
 n &= 168
 \end{aligned}$$

(III) (Problems based on Cylinder)

59. Find the volume of a cylinder whose diameter of base is 20 cm and height is two times that of the radius of its base.

- (a) 4000 cm³ (b) 2000π cm³
(c) 6000π cm³ (d) 3000 cm³

SSC CHSL 02/06/2022 (Shift-I)

Ans. (b) :



Radius of cylinder = 10 cm
Height of cylinder = 20 cm
Volume of cylinder = $\pi r^2 h$

$$\begin{aligned}
 &= \pi (10)^2 \times 20 \\
 &= 2000 \pi \text{ cm}^3
 \end{aligned}$$

60. A solid right-circular cylinder, whose radius of the base is 15 cm and height is 12 cm, is melted and moulded into the solid right-circular cone, whose radius of the base is 24 cm. What will be the height of this cone?

- (a) 14.0625 cm (b) 14.0675 cm
(c) 14.0675 cm (d) 14.0525 cm

SSC CHSL 27/05/2022 (Shift-III)

Ans. (a) : Given,

→ Radius of cylinder (r) = 15 cm, Height (h) = 12 cm

→ Radius of cone (R) = 24 cm, Height = H (Let)

According to the question,

Volume of cylinder = Volume of cone (after melted and moulded)

$$\therefore \pi (15)^2 \times 12 = \frac{1}{3} \times \pi \times 24 \times 24 \times H$$

$$H = \frac{8100}{576} \Rightarrow 14.0625 \text{ cm}$$

61. The curved surface area of a right circular cylinder is 616 cm² and the area of its base is 38.5 cm². What is the volume (in cm³) of the cylinder? (take $\pi = 22/7$)

- (a) 1155 (b) 1408
(c) 1243 (d) 1078

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (d) Given,

CSA = 616 cm² and Area of base = 38.5

$$\pi r^2 = 38.5$$

$$r^2 = \frac{38.5 \times 7}{22}$$

$$r^2 = \sqrt{12.25}$$

$$r = 3.5$$

$$2\pi r h = 616 \text{ cm}^2 \text{ -----(Given)}$$

$$2 \times \frac{22}{7} \times 3.5 \times h = 616$$

$$h = 28 \text{ cm.}$$

$$\text{Volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7} \times 3.5 \times 3.5 \times 28$$

$$= 88 \times 12.25$$

$$= 1078 \text{ cm}^3$$

62. Two similar jugs have their heights of 8 cm and 12 cm, respectively. If the capacity of the smaller jug is 80 cm³, what is the capacity of the bigger jug (in cm³)?
 (a) 120 (b) 192
 (c) 216 (d) 270

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (d) According to the question,
 Ratio of heights = $\frac{8}{12} = \frac{2}{3}$
 Ratio of volume = (Ratio of heights)³
 $\frac{\text{Volume of smaller jug}}{\text{Volume of bigger jug}} = \left(\frac{2}{3}\right)^3$
 $\frac{80}{\text{Volume of bigger jug}} = \frac{8}{27}$
 $\therefore \text{Volume of bigger jug} = \frac{80 \times 27}{8} = 270 \text{ cm}^3$

63. The circumference of the base of a right circular cylinder is 62.8 cm and its volume is 8792 cm³. What is the curved surface area (in cm²) of the cylinder? (Take $\pi = 3.14$)
 (a) 1695.6 (b) 1758.4
 (c) 1632.8 (d) 1570.2

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b) Circumference of the base of a right circular cylinder = $2\pi r = 62.8$
 $2 \times 3.14 \times r = 62.8 \Rightarrow 6.28 \times r = 62.8$
 $r = 10 \text{ cm}$
 Now, Volume of cylinder = 8792 cm³
 $\pi r^2 h = 8792 \Rightarrow 3.14 \times 100 \times h = 8792$
 $h = 28 \text{ m}$
 Hence, curved surface area of the cylinder = $2\pi r h = 2 \times 3.14 \times 10 \times 28$
 $= 1758.4 \text{ cm}^2$

64. If the ratio of the curved surface area and volume of a right circular cylinder is 5:7, then its radius is:
 (a) 2.6 units (b) 3.8 units
 (c) 3.2 units (d) 2.8 units

SSC CHSL 15/04/2021 (Shift-I)

Ans. (d) : Given,
 $\frac{\text{Curved surface area of the cylinder}}{\text{Volume of the cylinder}} = \frac{5}{7}$
 $\Rightarrow \frac{2\pi r h}{\pi r^2 h} = \frac{5}{7}$
 $2 \times 7 = 5r$
 $r = \frac{14}{5} = 2.8 \text{ units}$

65. A solid metallic right circular cylinder has diameter 32 cm and height 9 cm. It is melted and recast into a solid sphere. What is the radius (in cm) of the sphere?
 (a) 14 (b) 25
 (c) 12 (d) 10

SSC CHSL 16/04/2021 (Shift-I)

Ans. (c) : \therefore Solid metallic circular cylinder is melted and recast into a solid sphere.

\therefore Volume of sphere = Volume of right circular cylinder

$$\frac{4}{3}\pi R^3 = \pi r^2 h$$

$$\frac{4}{3}R^3 = 16 \times 16 \times 9$$

$$R^3 = 64 \times 27$$

$$R = 12 \text{ cm}$$

66. The volume of a metallic cylindrical pipe is 3564 cm³. If its external radius is 12 cm and thickness is 3 cm, then the length of the pipe will be: (Take $\pi = 22/7$)
 (a) 22 cm (b) 18 cm
 (c) 16 cm (d) 20 cm

SSC CHSL 04/08/2021 (Shift-II)

Ans. (b) : Let the length of pipe is h cm
 Internal radius of pipe = $(12-3) = 9 \text{ cm}$

According to question,

$$\pi r^2 h = 3564$$

$$\pi (12^2 - 9^2) \times h = 3564$$

$$h = \frac{3564 \times 7}{22 \times 21 \times 3} = 18 \text{ cm}$$

67. The total surface area of a solid right circular cylinder is 1617 cm². If the diameter of its base is 21 cm, then what is its volume (in cm³)?
 (Take $\pi = \frac{22}{7}$)

- (a) 5324 (b) 3971
 (c) 4851 (d) 5228

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) : Radius = $\frac{\text{Diameter}}{2} = \frac{21}{2} \text{ cm}$

Total surface area of cylinder = $2\pi r(r+h)$

$$2 \times \frac{22}{7} \times \frac{21}{2} \left(\frac{21}{2} + h \right) = 1617$$

$$\left(\frac{21}{2} + h \right) = \frac{1617}{66}$$

$$\frac{21}{2} + h = \frac{49}{2}$$

$$h = \frac{49 - 21}{2} = \frac{28}{2} = 14 \text{ cm}$$

Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 14$$

$$= 11 \times 3 \times 21 \times 7 = 4851 \text{ cm}^3$$

68. The circumference of the base of a cylindrical vessel is 264 cm and its height is 50 cm. The capacity (in litres) of the vessel is:

(Take $\pi = \frac{22}{7}$)

- (a) 277.2 (b) 278.4
(c) 280.6 (d) 267.4

SSC CGL (Tier-II) 03/02/2022

Ans : (a) Circumference of the base of a cylindrical vessel = $2\pi r$
 $2\pi r = 264$
 $r = 42\text{cm}$
 capacity of the vessel = $\pi r^2 h$
 $= \frac{22}{7} \times 42 \times 42 \times 50$
 $= 277,200\text{cm}^3$
 $= \frac{277200}{100 \times 100 \times 100}$
 $= 0.2772\text{m}^3$
 $\therefore 1\text{m}^3 = 1000 \text{ liters}$
 $\therefore 0.2772\text{m}^3 = 0.2772 \times 1000 = 277.2 \text{ liter}$
 Hence, The capacity of vessel is 277.2 liters.

69. The curved surface area of a cylinder is five times the area of its base. Find the ratio of radius and height of the cylinder.

- (a) 3 : 5 (b) 2 : 5
(c) 2 : 3 (d) 3 : 4

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let, The radius and height of cylinder is r and h respectively

Curved surface area of cylinder = $2\pi r h$

Area of base of cylinder = πr^2

According to the question

C.S.A. = $5 \times$ area of its base

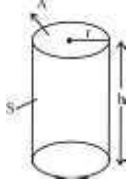
$$2\pi r h = 5 [\pi r^2]$$

$$2\pi r h = 5\pi r^2$$

$$2h = 5r$$

$$\frac{r}{h} = \frac{2}{5}$$

Hence, The ratio of radius and height of cylinder = 2:5



70. The radius and height of a cylinder are in the ratio 4 : 7 and its volume is 2816 cm^3 . Find its radius. (Take $\pi = \frac{22}{7}$)

- (a) 8 cm (b) 6 cm
(c) 7 cm (d) 5 cm

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let, radius of cylinder = $4x$

And height of cylinder = $7x$

Volume of cylinder = $\pi r^2 h$

$$2816 = \frac{22}{7} \times (4x)^2 \times 7x$$

$$2816 = \frac{22}{7} \times 16x^2 \times 7x$$

$$x = 2$$

Hence, radius = $4x = 4 \times 2 = 8 \text{ cm}$

71. The radii of two cylinders are in the ratio 3 : 4 and their heights are in the ratio 8 : 5. The ratio of their volumes is equal to :

- (a) 9 : 10 (b) 8 : 9
(c) 9 : 11 (d) 7 : 10

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : According to the question

$$\frac{V_1}{V_2} = \frac{r_1^2 \cdot h_1}{r_2^2 \cdot h_2}$$

$$= \frac{9}{16} \times \frac{8}{5} = \frac{9}{10}$$

$$V_1 : V_2 = 9 : 10$$

72. The length of a metallic pipe is 7.56 m. Its external and internal radii are 2.5 cm and 1.5 cm respectively. If 1 cm^3 of the metal weight 7.5 g, then the weight of the pipe is :

(Take $\pi = \frac{22}{7}$)

- (a) 71.28 kg (b) 72.82 kg
(c) 69.68 kg (d) 70.14 kg

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : $R = 2.5 \text{ cm}$

$r = 1.5 \text{ cm}$

$$\ell = 7.56 \text{ m} = 7.56 \times 100 = 756 \text{ cm}$$

Volume of metallic pipe = $\pi(R^2 - r^2)\ell$

$$= \frac{22}{7} [(2.5)^2 - (1.5)^2] \times 756$$

$$= \frac{22}{7} (2.5 + 1.5)(2.5 - 1.5) \times 756$$

$$= 22 \times 4 \times 1 \times 108 = 9504 \text{ cm}^3$$

Given

Weight of 1 cm^3 metal = 7.5 g

$$\therefore \text{Weight of pipe} = \frac{9504 \times 7.5}{1000} \text{ kg}$$

$$= 71.28 \text{ kg}$$

73. The volume of a metallic cylindrical pipe is 7480 cm^3 . If its length is 1.4 m and its external radius is 9 cm, then its thickness

(given $\pi = \frac{22}{7}$) is :

- (a) 1 cm (b) 0.9 cm
(c) 0.8 cm (d) 1.2 cm

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (a) : Outer radius = $R = 9 \text{ cm}$

Inner radius = r

$\ell = 140 \text{ cm}$

volume of cylindrical pipe of metal = 7480 cm^3

$$\pi(R^2 - r^2)\ell = 7480$$

$$\frac{22}{7}(R^2 - r^2) \times 140 = 7480$$

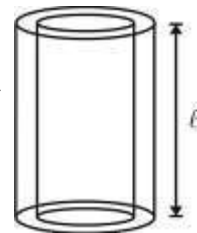
$$R^2 - r^2 = \frac{7480}{440}$$

$$81 - r^2 = 17$$

$$r^2 = 64$$

$$r = 8$$

$$\therefore \text{Thickness} = R - r = 9 - 8 = 1 \text{ cm}$$

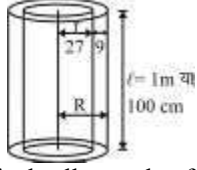


74. A cylindrical road roller made of metal is one meter. Its inner radius is 27 cm and the thickness of the metal sheet rolled into it is 9 cm. What is the weight of the roller if 1 cm³ of the metal weight 8g?

- (a) 442.4π kg (b) 449π kg
(c) 453.6π kg (d) 441π kg

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (c) : Inner radius (r) = 27 cm
External radius (R) = 27 + 9 = 36 cm
ℓ = 1 m or 100 cm



Volume of cylindrical roller made of metal

$$= \pi(R^2 - r^2)\ell$$

$$= \pi[36^2 - 27^2] \times 100$$

$$= \pi(36+27)(36-27) \times 100$$

$$= \pi \times 63 \times 9 \times 100$$

$$= 56700\pi \text{ cm}^3$$
 Weight of roller. $= \frac{56700\pi \times 8}{1000} \text{ kg}$
 $= 453.6\pi \text{ kg}$

75. The curved surface area and the volume of a cylinder are 264 cm² and 924 cm³ respectively. What is the ratio of its radius to height? (Take

$$\pi = \frac{22}{7})$$

- (a) 4 : 3 (b) 3 : 2
(c) 7 : 6 (d) 5 : 4

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (c) : $\frac{\text{Curved surface area of cylinder}}{\text{Volume of cylinder}} = \frac{2\pi rh}{\pi r^2 h}$

$$\frac{264}{924} = \frac{2}{r}$$

$$r = \frac{924}{132} = 7 \text{ cm}$$

∴ $2\pi rh = 264$

$$2\pi \times 7 \times h = 264 \Rightarrow h = \frac{264}{2 \times 7 \times \frac{22}{7}} = \frac{264}{44} = 6 \text{ cm}$$

∴ Radius(r) : Height (h) = 7 : 6

76. A right circular cylinder is formed A = sum of total surface area and the area of the two bases. B = the curved surface area of this cylinder. If A : B = 3 : 2 and the volume of cylinder is 4312 cm³, then what is the sum of area (in cm²) of the two bases of this cylinder ?

- (a) 154 (b) 308
(c) 462 (d) 616

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given

$$A = 2\pi r(h+r) + 2\pi r^2$$

$$B = 2\pi rh$$

$$A : B = 3 : 2$$

$$\Rightarrow \frac{2\pi r(h+r) + 2\pi r^2}{2\pi rh} = \frac{3}{2}$$

$$\Rightarrow \frac{(h+r)+r}{h} = \frac{3}{2}$$

$$\Rightarrow 3h = 4r + 2h$$

$$\Rightarrow \frac{h}{r} = \frac{4}{1}$$

$$\therefore \pi r^2 h = 4312$$

$$\Rightarrow \frac{22}{7} \times r^2 \cdot 4r = 4312$$

$$\Rightarrow r^3 = 49 \times 7 \Rightarrow r = 7 \text{ cm}$$

$$\therefore \text{Sum of area of two bases of cylinder} = 2\pi r^2$$

$$= 2 \times \frac{22}{7} \times 49$$

$$= \boxed{308 \text{ cm}^2}$$

77. The ratio of the curved surface area and total surface area of a right circular cylinder is 2:5. If the total surface area is 3080 cm², then what is the volume (in cm³) of the cylinder?

- (a) 4312√6 (b) 3822√6
(c) 4522√6 (d) 4642√6

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : $\frac{2\pi rh}{2\pi r(r+h)} = \frac{2}{5}$

$$\frac{h}{r+h} = \frac{2}{5}$$

$$5h = 2r + 2h$$

$$3h = 2r$$

$$h = \frac{2}{3}r \dots\dots\dots(i)$$

$$\text{Total surface area} = 3080 \text{ cm}^2$$

$$2\pi r(r+h) = 3080$$

$$r\left(r + \frac{2}{3}r\right) = 3080 \times \frac{7}{22 \times 2}$$

$$r \times \frac{5r}{3} = 490$$

$$r^2 = 98 \times 3$$

$$r = 7\sqrt{6} \text{ cm}$$

$$h = \frac{14}{3}\sqrt{6} \text{ cm}$$

$$\text{Volume of cylinder} = \frac{22}{7} \times 7\sqrt{6} \times 7\sqrt{6} \times \frac{14}{3}\sqrt{6}$$

$$= 4312\sqrt{6} \text{ cm}^3$$

78. The radius and height of a solid cylinder are increased by 2% each. What will be the approximate percentage increase in volume?

- (a) 6.76 (b) 5.88
(c) 6.12 (d) 3.34

SSC CGL (Tier-II) 19-02-2018

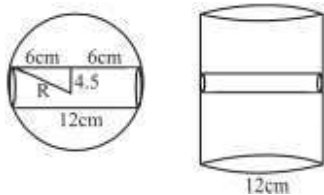
Ans. (c) : $r = 2\%$ increased $h = 2\%$ Increased
 $\% \text{ increase in volume} = 2 + 2 + 2 + \frac{4+4+4}{100} + \frac{8}{(100)^2}$
 $= 6 + 0.12 + 0.0008$
 $= 6.1208\%$

79. A cylinder of radius 4.5 cm and height 12 cm just fits in another cylinder completely with their axis perpendicular. What is the radius (in cm) of second cylinder ?

- (a) 5 (b) 6
(c) 15 (d) 7.5

SSC CGL (Tier-II) 18-02-2018

Ans. (d):



Radius of second cylinder (R) $\Rightarrow R^2 = (6)^2 + (4.5)^2$
 $R^2 = 36 + 20.25$
 $R = 7.5 \text{ cm}$

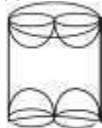
80. A right circular cylinder has height 28 cm and radius of base 14 cm. Two hemispheres of radius 7 cm each are cut from each of the two bases of the cylinder. What is the total surface area (in cm^2) of the remaining part ?

- (a) 3842 (b) 4312
(c) 3296 (d) 4436

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : Radius of cylinder (R) = 14 cm
(h) = 28

Radius of hemisphere (r) = 7 cm



Area of upper and lower surface after cutting the hemisphere = $2\pi R^2 - 4\pi r^2$

$$= 2\pi(R^2 - 2r^2)$$

$$= 2\pi(14^2 - 2 \times 7^2)$$

$$= 2 \times \frac{22}{7} \times 98$$

$$= 616 \text{ cm}^2$$

Area of curved surface of cylinder = $2\pi r^2 + 2\pi r^2 + 2\pi r^2$

$$= 8\pi r^2$$

$$= 8 \times \frac{22}{7} \times 7 \times 7$$

$$= 1232 \text{ cm}^2$$

Area of curved surface of cylinder = $2\pi R h$

$$= 2 \times \frac{22}{7} \times 14 \times 28 = 2464 \text{ cm}^2$$

According to the question

Surface area of remains part = $616 + 1232 + 2464$
 $= 4312 \text{ cm}^2$

81. N solid metallic spherical balls are melted and recast into a cylindrical rod whose radius is 3 times that of a spherical ball and height is 4 times the radius of a spherical ball. The value of N is :

- (a) 30 (b) 27
(c) 24 (d) 36

SSC CGL (Tier-II) 13-09-2019

Ans. (b): Let, radius of solid metallic sphere = r

$N \times \text{Volume of one solid} = \text{Volume of cylindrical rod}$

$$N \times \frac{4}{3} \pi r^3 = \pi \times (3r)^2 \times 4r$$

$$N = 9 \times 3 = 27$$

82. The radius of the base of a right circular cylinder is increased by 20%. By what percent should its height be reduced so that its volume remains the same as before ?

- (a) 28 (b) $30\frac{2}{9}$
(c) 25 (d) $30\frac{5}{9}$

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Let, radius of base of cylinder = r

$$\text{Radius after increment} = r \times \frac{120}{100} = \frac{6r}{5}$$

\therefore Initial volume of cylinder = $\pi r^2 h$

$$\text{Last volume of cylinder} = \pi \times \left(\frac{6r}{5}\right)^2 \times h_1 = \frac{36}{25} \pi r^2 h_1$$

\therefore Volume is constant

$$\therefore \pi r^2 h = \frac{36}{25} \pi r^2 h_1$$

$$\frac{h_1}{h} = \frac{25}{36}$$

Required decrement %

$$= \frac{36 - 25}{36} \times 100 = \frac{11}{36} \times 100 = 30\frac{5}{9}\%$$

83. The ratio of the volumes of two cylinders is x : y and the ratio of their diameters is a : b. What is the ratio of their heights ?

- (a) $xb : ya$ (b) $xb^2 : ya^2$
(c) $xa : yb$ (d) $xa^2 : yb^2$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Let, ratio of heights of cylinders = $h_1 : h_2$

Ratio of radiuses = $r_1 : r_2$

According to question-

$$\frac{\text{Volume of first cylinder}}{\text{Volume of second cylinder}} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \frac{\pi d_1^2 h_1}{\pi d_2^2 h_2}$$

$$\frac{x}{y} = \left(\frac{a}{b}\right)^2 \times \frac{h_1}{h_2}$$

$$\frac{h_1}{h_2} = \frac{xb^2}{ya^2}$$

$$h_1 : h_2 = xb^2 : ya^2$$

84. If the radius of a right circular cylinder is decreased by 20% while its height is increased by 40%, then the percentage change in its volume will be :

- (a) 10.4% decrease
- (b) 1.04% increase
- (c) No increase or decrease
- (d) 10.4% Increase

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : Percentage change in volume of cylinder
 $= -20 - 20 + 40 + \frac{400 - 800 - 800}{100} + \frac{16000}{10000}$
 $= -12 + 1.6 = -10.4\% = 10.4\% \text{ Decrement}$

85. The lateral surface area of a cylinder is 352 cm². If its height is 7 cm, then its volume (in cm³) is :

(Take $\pi = \frac{22}{7}$)

- (a) 1243
- (b) 891
- (c) 1078
- (d) 1408

SSC CGL (Tier-II) 11-9-2019

Ans. (d): Area of curved surface of cylinder = 352 cm²
 $2\pi rh = 352$
 $2 \times \frac{22}{7} \times r \times 7 = 352$
 $r = 8 \text{ cm}$
 Volume of cylinder
 $= \pi r^2 h = \frac{22}{7} \times 8 \times 8 \times 7 = 1408 \text{ cm}^3$

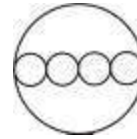
86. The ratio of curved surface area of a right circular cylinder to the total area of its two bases is 2 : 1. If the total surface area of cylinder is 23100 cm², then what is the volume (in cm³) of cylinder?

- (a) 247200
- (b) 269500
- (c) 312500
- (d) 341800

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : According to the question
 Area of curved surface of cylinder = 2 × Sum of area of base
 $2\pi rh = 2 \times 2\pi r^2$
 $h = 2r$
 Total surface area of cylinder = $2\pi r(h + r)$
 $23100 = 2\pi r(2r + r) = 6\pi r^2$
 $r = 35 \text{ cm}$
 Volume of cylinder = $\pi r^2 h = 2\pi r^3$
 $= 2 \times \frac{22}{7} \times 35 \times 35 \times 35$
 $= 269500 \text{ cm}^3$

87. A solid cylinder has radius of base 14 cm and height 15 cm. 4 identical cylinders are cut from each base as shown in the given figure. Height of small cylinder is 5 cm. What is the total surface area (in cm²) of the remaining part?



- (a) 3740
- (b) 3432
- (c) 3124
- (d) 2816

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :

Radius of base of solid cylinder (r_1) = 14cm
 Height of solid cylinder (h_1) = 15cm

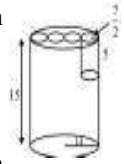
Radius of small cylinder (r_2) = $\frac{14}{4} = \frac{7}{2}$ cm

Height of small cylinder (h_2) = 5cm

Total surface area = $2\pi r_1(h_1 + r_1) + 8 \times 2\pi r_2 h_2$

$$= 2 \times \frac{22}{7} \times 14(15 + 14) + 8 \times 2 \times \frac{22}{7} \times \frac{7}{2} \times 5$$

$$= 44(58 + 20) = 44 \times 78 = 3432 \text{ cm}^2$$

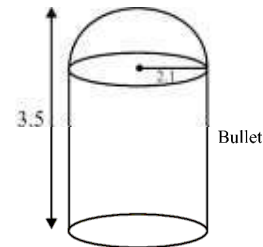


88. The radius of base of a solid cylinder is 7 cm and its height is 21 cm. It is melted and converted into small bullets. Each bullet is of same size. Each bullet consisted of two parts viz. a cylinder and a hemisphere on one of its base. The total height of bullet is 3.5 cm and radius of base is 2.1 cm. Approximately how many complete bullets can be obtained?

- (a) 83
- (b) 89
- (c) 74
- (d) 79

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :



Let, Total number of bullets = n

Height of cylindrical bullets (h)

$$= 3.5 - 2.1 = 1.4 \text{ cm}$$

Total volume of solid cylinder =

Number of total bullets × Volume of small bullets

$$\pi \times R^2 H = n \times \left[\pi \times 2.1 \times 2.1 \times 1.4 + \frac{2}{3} \cdot \pi \times 2.1 \times 2.1 \times 2.1 \right]$$

$$7 \times 7 \times 21 = n \times 2.1 \times 2.1 [1.4 + 1.4]$$

$$h = \frac{7 \times 7 \times 21}{2.1 \times 2.1 \times 2.8} = 83.33 \approx 83$$

89. The curved surface area of a cylinder is 594 cm² and its volume is 1336.5 cm³. What is the height (in cm) of the cylinder ?

- (a) 14
- (b) 21
- (c) 24.5
- (d) 10.5

SSC CGL (Tier-II) 9-3-2018

Ans. (b)

Curved surface area of cylinder = 594 cm² -----(Given)

$$2\pi rh = 594 \text{ (1)}$$

$$\pi r^2 h = 1336.5 \text{ cm}^2 \text{ (2)}$$

From equation (2) ÷ equation (1)

$$\frac{r}{2} = \frac{1336.5}{594}$$

$$r = 4.5 \text{ cm}$$

From equation (1)

$$2 \times \frac{22}{7} \times 4.5 \times h = 594$$

$$h = \frac{594 \times 7}{22 \times 9} = 21 \text{ cm}$$

90. A hollow cylinder is made up of metal. The difference between outer and inner curved surface area of this cylinder is 352 cm^2 . Height of the cylinder is 28 cm . If the total surface area of this hollow cylinder is 2640 cm^2 , then what are the inner and outer radius (in cm) ?

(a) 4, 6 (b) 10, 12
(c) 8, 10 (d) 6, 8

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

Let, outer and inner radius are R and r cm respectively

$$2\pi (R-r) h = 352 \text{ cm}^2$$

$$2 \times \frac{22}{7} (R-r) \times 28 = 352$$

$$R - r = 2 \dots\dots (1)$$

Total surface area = 2640 cm^2

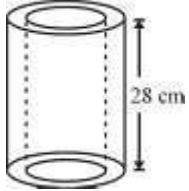
$$2\pi (R+r) (R-r+h) = 2640$$

$$2 \times \frac{22}{7} \times (R+r)(2+28) = 2640$$

$$R + r = 14 \text{ cm} \dots\dots\dots (ii)$$

By solving the equation (i) and (ii)

$$R = 8 \text{ cm}, \quad r = 6 \text{ cm}$$



91. A hollow cylinder of thickness 0.7 cm and height 15 cm is made of iron. If inner radius of cylinder is 3.5 cm , then what is the total surface area (in cm^2) of the hollow cylinder ?

(a) 812.12 (b) 768.42
(c) 759.88 (d) 828.42

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : $r = 3.5 \text{ cm}$

$$R = 3.5 + 0.7 = 4.2 \text{ cm}$$

$$h = 15 \text{ cm}$$

Total surface area of hollow cylinder = $2\pi (R+r) (h + R-r)$

$$= 2 \times \frac{22}{7} \times (4.2+3.5)(15+4.2-3.5)$$

$$= 2 \times 22 \times 1.1 \times 15.7 = 759.88 \text{ cm}^2$$

92. A hollow cylinder has height 90 cm and the outer curved surface area is 11880 cm^2 . It can hold 55440 cm^3 of air inside it. What is the thickness (in cm) of this cylinder ?

(a) 10.5 (b) 14
(c) 7 (d) 3.5

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Area of outer curved surface = 11880 cm^2

$$2\pi Rh = 11880$$

$$R = \frac{11880 \times 7}{2 \times 22 \times 90}$$

$$R = 21 \text{ cm}$$

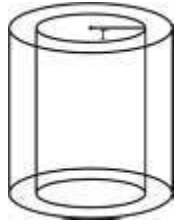
Volume of air which can hold inside the hollow cylinder insides the cylinder = 55440 cm^3

$$\pi r^2 h = 55440$$

$$r^2 = \frac{55440 \times 7}{22 \times 90}$$

$$r = 14 \text{ cm}$$

\therefore Thickness of cylinder = $R - r = 21 - 14 = 7 \text{ cm}$



93. Let A and B be two cylinders such that the capacity of A is the same as the capacity of B. The ratio of the diameters of A and B is $1:4$. What is the ratio of the heights of A and B?

(a) 16:1 (b) 1:16
(c) 3:16 (d) 16:3

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : Given

Ratio of diameter of A and B = $1:4$

Hence, Ratio of radius of A and B = $1:4$

$$\Rightarrow R_1 : R_2 = 1 : 4$$

$$\left\{ \begin{array}{l} \because R_1 = \text{Radius of cylinder A} \\ R_2 = \text{Radius of cylinder B} \end{array} \right.$$

According to the question

$$\pi R_1^2 h_1 = \pi R_2^2 h_2$$

$$\Rightarrow \frac{h_1}{h_2} = \left(\frac{R_2}{R_1} \right)^2$$

$$\Rightarrow \frac{h_1}{h_2} = \left(\frac{4}{1} \right)^2$$

$$\Rightarrow \frac{h_1}{h_2} = \frac{16}{1}$$

$$\Rightarrow \boxed{h_1 : h_2 = 16 : 1}$$

94. The radius of the base of a cylinder is 14 cm and its volume is 6160 cm^3 . The curved surface area (in cm^2) is: (Take $\pi = \frac{22}{7}$)

(a) 660 (b) 778
(c) 880 (d) 940

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (c) : Radius of base of cylinder (r) = 14 cm

Volume of cylinder = 6160 cm^3

$$\Rightarrow \pi r^2 h = 6160$$

$$\Rightarrow \pi r h = \frac{6160}{r}$$

$$\Rightarrow \pi r h = \frac{6160}{14}$$

$$\Rightarrow \pi r h = 440 \dots\dots (i)$$

\therefore Area of curved surface of cylinder = $2\pi r h$

$$= 2 \times 440 \quad \{\text{From equation (i)}\}$$

$$= 880 \text{ cm}^2$$

95. The ratio of the volumes of two right circular cylinders A and B is x/y and the ratio of their heights is $a:b$. What is the ratio of the radii of A and B?

- (a) $\sqrt{\frac{xb}{ya}}$ (b) $\sqrt{\frac{xa}{yb}}$
 (c) $\frac{yb}{xa}$ (d) $\frac{xb}{ya}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)

Let, Radius of cylinder A = r_1

Radius of Cylinder B = r_2

According to the question

$$\frac{\text{Volume of cylinder A}}{\text{Volume of cylinder B}} = \frac{x}{y}$$

$$\frac{\frac{1}{3}\pi r_1^2 \cdot a}{\frac{1}{3}\pi r_2^2 \cdot b} = \frac{x}{y}$$

$$\frac{r_1^2}{r_2^2} = \frac{bx}{ay}$$

$$\frac{r_1}{r_2} = \sqrt{\frac{bx}{ay}}$$

96. The volume of a solid right circular cylinder is 5236 cm^3 and its height is 34 cm . What is its curved surface area (in cm^2)? [Take $\pi = 22/7$]

- (a) 1496 (b) 1804
 (c) 1573 (d) 1650

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) Volume of cylinder = $\pi (\text{Radius})^2 \times \text{height}$

$$5236 = \frac{22}{7} (r)^2 \times 34$$

$$\text{Radius } (r) = 7 \text{ cm}$$

And surface area of cylinder = $2 \times \pi \times \text{Radius} \times \text{Height}$

$$= 2 \times \frac{22}{7} \times 7 \times 34 = 1496 \text{ cm}^2$$

97. A rectangular sheet of paper which is 88 cm long and 11 cm wide is rolled to form a cylinder of height equal to its width of the paper. What is the volume of the cylinder so formed?"

- (a) 7676 cm^3 (b) 6786 cm^3
 (c) 6776 cm^3 (d) 6546 cm^3

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c)

Height of cylinder after folding the paper (h) = 11 cm

Perimeter of cylinder = 88 cm

$$2\pi r = 88$$

$$r = 14 \text{ cm}$$

$$\text{Volume of cylinder} = \pi r^2 h = \frac{22}{7} \times 14 \times 14 \times 11 = 6776 \text{ cm}^3$$

98. The ratio of radius of the base and the height of solid right circular cylinder is $2:3$. If its volume is 202.125 cm^3 , then its total surface area is:

(Take $\pi = 22/7$)

- (a) 115.5 cm^2 (b) 192.5 cm^2
 (c) 168 cm^2 (d) 154 cm^2

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b) Let, radius = $2x \text{ cm}$

Height = $3x \text{ cm}$

\therefore Volume of solid perpendicular cylinder = 202.125 cm^3

$$\frac{22}{7} \times 2x \times 2x \times 3x = 202.125$$

$$x^3 = \frac{202.125 \times 7}{22 \times 12}$$

$$x = \sqrt[3]{5.359375} = 1.75 \text{ cm}$$

Total surface area = $2\pi r (h + r)$

$$= 2 \times \frac{22}{7} \times 2x \times 5x$$

$$= \frac{440}{7} \times 1.75 \times 1.75 = 192.5 \text{ cm}^2$$

99. A cylinder 84 cm long is made of steel. Its external and internal diameters are 10 cm and 8 cm respectively. What is the volume of the steel in the cylinder (in 10^{-3} m^3 and correct up to three decimal places)?

- (a) 2.376 (b) 9.504
 (c) 4.752 (d) 2.112

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (a) Length of cylinder (h) = 84 cm

$$\text{Outer radius } (R) = \frac{10}{2} = 5 \text{ cm}$$

$$\text{Inner radius } (r) = \frac{8}{2} = 4 \text{ cm}$$

Volume of steel used in cylinder = $\pi(R^2 - r^2)h$

$$= \frac{22}{7} \times (5^2 - 4^2) \times 84$$

$$= \frac{22}{7} \times 9 \times 84$$

$$= 2376 \text{ cm}^3$$

$$= 2.376 \times 10^{-3} \text{ m}^3$$

100. Total surface area of a right circular cylinder is 1848 cm^2 . The ratio of its total surface area to the curved surface area is $3:1$. The volume of the cylinder is: (Take $\pi = 22/7$)

- (a) 4002 cm^3 (b) 4312 cm^3
 (c) 3696 cm^3 (d) 4851 cm^3

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) According to the question

$$\frac{2\pi r(h+r)}{2\pi rh} = \frac{3}{1}$$

$$\frac{h+r}{h} = \frac{3}{1}$$

$$1 + \frac{r}{h} = \frac{3}{1}$$

$$\frac{r}{h} = 2$$

$$r = 2h$$

Total surface area of perpendicular cylinder = 1848cm^2
 $2\pi r(r+h) = 1848$
 $2 \times \frac{22}{7} \times 2h(2h+h) = 1848$
 $h \times 3h = 21 \times 7$
 $h^2 = 7 \times 7$
 $h = 7\text{cm}$
 $\therefore r = 2h = 14\text{cm}$
Volume of cylinder = $\pi r^2 h$
 $= \frac{22}{7} \times 14 \times 14 \times 7$
 $= 4312\text{cm}^3$

101. The curved surface area and volume of cylindrical pole is 132m^2 and 528m^3 respectively. What is the height (in m) of the pole ?

$$\left(\pi = \frac{22}{7} \right)$$

- (a) $2\frac{1}{2}$ (b) $2\frac{5}{8}$
(c) $3\frac{5}{8}$ (d) $3\frac{1}{2}$

SSC CHSL (Tier-I) 02/07/2019 (Shift-II)

Ans. (b) According to the question
 $2\pi rh = 132\text{m}^2$
 $\Rightarrow rh = \frac{132}{2\pi}$ (i)
and $\pi r^2 h = 528\text{m}^3$
 $\pi r \times rh = 528$
 $\pi r \times \frac{132}{2\pi} = 528$ From equation (i)
 $r = 8\text{m}$
 $\therefore 2\pi rh = 132\text{m}^2$ ----- [Given]
 $\therefore h = \frac{132 \times 7}{2 \times 22 \times 8} = \frac{21}{8}$
 $h = 2\frac{5}{8}\text{m}$

102. The radius of base of a cylinder is 7cm and its curved surface area is 440cm^2 . Its volume will be :

- (a) 1760 (b) 1540
(c) 1430 (d) 1650

SSC CHSL (Tier-I) 02/07/2019 (Shift-III)

Ans. (b) : Curved surface area = $2\pi rh$
 $440 = 2 \times \frac{22}{7} \times 7 \times h$
 $h = 10\text{cm}$
Volume = $\pi r^2 h$
 $= \frac{22}{7} \times 7 \times 7 \times 10 = 1540\text{cm}^3$

103. Water flows into a tank $180\text{m} \times 140\text{m}$ through a rectangular pipe of $1.2\text{m} \times 0.75\text{m}$ at a rate of 5 km/h. In what time will the water rise by 4 m?

- (a) 6 hours 42 minutes
(b) 5 hours 46 minutes
(c) 7 hours 28 minutes
(d) 8 hours 12 minutes

SSC CHSL -14/10/2020 (Shift-II)

Ans. (c) : Let, water fill at height 4cm in t hour
Water flow in one hour = 15 km distance
Water will be flow in t hour = $15 \times 1000 \times t\text{m}$
Volume of water flow in t hour from rectangular pipe = Volume of tank at height 4m
 $1.2 \times 0.75 \times 15 \times 1000 \times t = 180 \times 140 \times 4$
 $t = \frac{180 \times 140 \times 4}{12 \times 75 \times 15} = \frac{28 \times 4}{15} \times 60\text{m}$
 $= 448\text{m}$
 $= 7\text{ hour } 28\text{ minute}$

104. If 3.96 cubic dm of lead is to be drawn into a cylindrical wire of diameter 0.6 cm, then the length of the wire (in metres), is:

- (a) 140 m (b) 120 m
(c) 130 m (d) 125 m

SSC CHSL -20/10/2020 (Shift-I)

Ans : (a) 1 dm = 10 cm
Volume of cube = Volume of cylinder
 $3.96 \times 10 \times 10 \times 10 = \frac{22}{7} \times 0.3 \times 0.3 \times \ell$
 $\ell = \frac{3960 \times 7}{22 \times 0.3 \times 0.3}\text{cm}$
 $= 14000\text{cm} = 140\text{m}$

105. The curved surface area of cylinder is 25344cm^2 and its height is 32 cm. What is the volume of cylinder whose capacity is $\frac{\pi}{792}$ times the volume of the cylinder?

- (a) 3168cm^3 (b) 6336cm^3
(c) 1584cm^3 (d) 9504cm^3

SSC MTS 06/08/2019 (Shift-I)

Ans. (b) : Let radius of cylinder is r.
According to the question $2\pi r \times 32 = 25344$
 $r = \frac{396}{\pi}$
 \therefore Volume of new cylinder = Volume of original cylinder $\times \frac{\pi}{792}$
 $= \pi r^2 h \times \frac{\pi}{792}$
 $= \pi \times \frac{396 \times 396}{\pi \times \pi} \times 32 \times \frac{\pi}{792}$
 $= 6336\text{cm}^3$

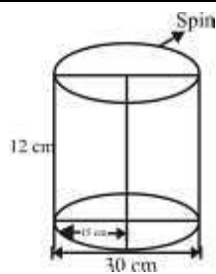
106. The length and the breadth of rectangle are 15 cm and 12cm respectively. If the rectangle is given on full rotation about its breadth as the axis. What is the volume (in cm^3) through which the rectangle moves?

- (a) 2160π (b) 1440π
(c) 1800π (d) 2700π

SSC MTS 08/08/2019 (Shift-II)

Ans. (d)

$$\begin{aligned} r &= 15 \\ h &= 12 \\ v &= \pi r^2 h \\ v &= \pi(15)^2 \times 12 \\ v &= \pi \times 225 \times 12 \\ v &= \pi \times 2700 \\ v &= 2700\pi \end{aligned}$$



107. The diameter of a right circular cylinder is decreased to one third of its initial value. If the volume of the cylinder remains the same, then the height becomes how many times of the initial height.

- (a) 1 (b) 9
(c) 6 (d) 3

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : If we decrease diameter to one third of its initial value then radius will be also decreased to one third of its initial value.

Let, initial radius and height is R and H respectively
According to the question

$$\pi R^2 H = \pi \times \left(\frac{R}{3}\right)^2 \times H_1$$

$$H_1 = 9H$$

Hence, height will be 9 times of initial height.

108. The radii of two cylinders A and B are in the ratio of 5 : 6 and the heights are in the ratio of 7 : 4 respectively. The ratio of curved surface area of cylinder B to that of A is:

- (a) 35 : 24 (b) 24 : 35
(c) 49 : 35 (d) 35 : 49

SSC MTS 14/08/2019 (Shift-III)

Ans. (b) :

$$\because r_1 : r_2 = 5 : 6$$

$$\text{and } h_1 : h_2 = 7 : 4$$

$$\text{then } \frac{2\pi r_2 h_2}{2\pi r_1 h_1} = \frac{r_2}{r_1} \times \frac{h_2}{h_1}$$

$$= \frac{6}{5} \times \frac{4}{7}$$

$$= 24 : 35$$

109. The volume of a right circular cylinder is 3 times the volume of a right circular cone. The radius of the cone and the cylinder are 3cm and 6 cm respectively. If the height of the cylinder is 1 cm, then what is the slant height of the cone?

- (a) $\sqrt{13}$ cm (b) 4 cm
(c) 5 cm (d) 6 cm

SSC MTS 19/08/2019 (Shift-I)

Ans. (c): According to the question

$$\text{Volume of cylinder} = \text{volume of cone} \times 3$$

$$\pi r^2 h = \frac{1}{3} \times \pi R^2 H \times 3$$

$$r^2 h = R^2 H$$

$$(6)^2 \times 1 = (3)^2 \times H$$

$$36 = 9 \times H$$

$$H = 4\text{cm}$$

\therefore The slant height of cone

$$\begin{aligned} &= \sqrt{H^2 + R^2} = \sqrt{(4)^2 + (3)^2} \\ &= \sqrt{16 + 9} = \sqrt{25} \\ &= 5\text{cm} \end{aligned}$$

(IV) Problems based on Cone

110. How many small solid spheres each of 5 mm radius can be made out of a metallic solid cone whose base has radius 21 cm and height 30 cm?

- (a) 32000 (b) 26460
(c) 25000 (d) 18260

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(b) Given that –

$$\text{Radius of sphere (r)} = 5 \text{ mm}$$

$$\text{Radius of cone (R)} = 21 \text{ cm} = 210 \text{ mm}$$

$$\text{Height of cone (H)} = 30 \text{ cm} = 300 \text{ mm}$$

According to the question,

$$\text{Volume of cone} = N \times \text{volume of sphere}$$

$$\frac{1}{3} \pi R^2 H = N \times \frac{4}{3} \pi r^3$$

$$210 \times 210 \times 300 = N \times 4 \times 5 \times 5 \times 5$$

$$42 \times 42 \times 60 = 4N$$

$$1764 \times 60 = 4N$$

$$441 \times 60 = N$$

$$\therefore \boxed{N = 26460}$$

111. A container in the shape of a right circular cone, whose radius and depth are equal, gets completely filled by 128000 spherical droplets, each of diameter 2 mm. What is the radius (in cm) of the container?

- (a) 6 (b) 4
(c) 8 (d) 2

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) Let the radius of cone be r, then height will be r.

According to the question,

$$\text{Volume of cone} = \text{Volume of one spherical drop} \times 128000$$

$$\frac{1}{3} \pi r^2 \times r = \frac{4}{3} \pi \left(\frac{2}{20}\right)^3 \times 128000 \{ \because 1\text{cm} = 10\text{mm} \}$$

$$r^3 = 4 \times \frac{1}{1000} \times 128000$$

$$r^3 = 512$$

$$r = 8 \text{ cm.}$$

112. The curved surface area of a right circular cone is $65\pi \text{ cm}^2$ and the radius of its base is 5 cm. What is half of the volume of the cone, in cm^3 ?

- (a) 50π (b) 100π
(c) 180π (d) 45π

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) : Given, $\pi r l = 65 \pi \text{ cm}^2$
 $r = 5 \text{ cm.}$
 $\therefore l = 13 \text{ cm}^2$
 $h = \sqrt{l^2 - r^2} = \sqrt{169 - 25} = \sqrt{144}$
 $h = 12 \text{ cm}$

According to the question,

Volume of half cone $= \frac{1}{2} \times \frac{1}{3} \pi r^2 h$
 $= \frac{1}{2} \times \frac{1}{3} \times \pi \times 25 \times 12$
 $= \frac{100\pi}{2}$
 $= 50\pi$

113. A heap of wheat is in the form of a cone whose base diameter is 8.4 m and height is 1.75 m. The heap is to be covered by canvass. What is the area (in m^2) of the canvas required ? (Use $\pi = \frac{22}{7}$)

- (a) 60.06 (b) 60.6
(c) 115.05 (d) 115.5

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (a) : Given that—
Diameter of cone = 8.4 m
 \therefore Radius of cone = $\frac{8.4}{2} = 4.2\text{m}$
Height of cone (h) = 1.75m
According to the question,
Curved surface area of cone = $\pi r l$
where, r = radius
l = slant height
 \therefore Slant height (l) = $\sqrt{\text{Radius}^2 + \text{Height}^2}$
 $= \sqrt{(4.2)^2 + (1.75)^2}$
 $= \sqrt{17.64 + 3.0625}$
 $= \sqrt{20.7025}$
 $= 4.55\text{m}$

So, curved surface are of cone = $\pi r l$
 $= \frac{22}{7} \times 4.2 \times 4.55$
 $= 22 \times 6 \times 4.55$
 $= 60.06 \text{ m}^2$

Hence, option (a) is right answer.

114. The volume of a right circular cone is 462 cm^3 . If its height is 12 cm, then the area of its base (in cm^2) is:

- (a) 103.5 (b) 115.5
(c) 98.5 (d) 124.5

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) : Volume of right circular cone =

$\frac{1}{3} \times \text{area of base} \times \text{height}$
 $462 = \frac{1}{3} \times \text{area of base} \times 12$
Area of base = $\frac{462 \times 3}{12} = 115.5 \text{ cm}^2$

115. If the diameter of the base of a cone is 18 cm and its curved surface area is $424 \frac{2}{7} \text{ cm}^2$, then

its height will be: (Take $\pi = \frac{22}{7}$)

- (a) 10 cm (b) 15 cm
(c) 12 cm (d) 14 cm

SSC CHSL 19/04/2021 (Shift-III)

Ans. (c) : Given:-

Curved surface area of cone = $424 \frac{2}{7} \text{ cm}^2$

Diameter of cone = 18 cm

Then, Radius of cone = $\frac{\text{diameter}}{2} = \frac{18}{2} \text{ cm}$

Curved surface area of cone = $\pi r l = \frac{2970}{7} \text{ cm}^2$

$\Rightarrow \frac{22}{7} \times 9 \times l = \frac{2970}{7}$

$l = \frac{2970}{22 \times 9} = 15 \text{ cm}$

Height of the given cone = $\sqrt{l^2 - r^2}$

$= \sqrt{(15)^2 - (9)^2}$

$= \sqrt{225 - 81}$

$= \sqrt{144} = 12\text{cm}$

116. The radius of a solid right circular cone is 36 cm and its height is 105cm. The total surface area (in cm^2) of the cone is:

- (a) 4296π (b) 3996π
(c) 5292π (d) 3969π

SSC CGL (Tier-II) 29/01/2022

Ans : (c) $l = \sqrt{(h)^2 + (r)^2}$

$= \sqrt{(105)^2 + (36)^2}$

$= \sqrt{11025 + 1296}$

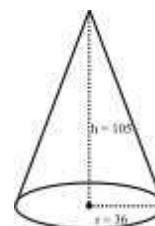
$= \sqrt{12321}$

$l = 111 \text{ cm}$

Total surface area of cone = $\pi r(l + r)$

$= \pi \times 36 \times 147$

$= 5292\pi$



117. The ratio of the height and the diameter of a right circular cone is 6 : 5 and its volume is $\frac{2200}{7} \text{ cm}^3$. What is its slant height?

(Take $\pi = \frac{22}{7}$)

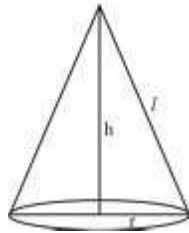
- (a) 5 cm (b) 26 cm
(c) 25 cm (d) 13 cm

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : According to the question

$$\frac{h}{2r} = \frac{6}{5}$$

$$\frac{h}{r} = \frac{12}{5}$$



$$h = 12, r = 5$$

$$\text{Let } h = 12x, r = 5x$$

$$l = \sqrt{r^2 + h^2} \\ = 13x$$

$$\text{Volume of cone} = \frac{2200}{7} \text{ cm}^3$$

$$\frac{1}{3} \times \frac{22}{7} \times (5x)^2 \times 12x = \frac{2200}{7}$$

$$x^3 = \frac{2200 \times 3 \times 7}{22 \times 25 \times 12 \times 7}$$

$$x^3 = 1$$

$$x = 1$$

∴ Slant height = 13 cm

118. A conical tent has to accommodate 25 persons. Each person must have 4 m² of space on the ground and 80 m³ of air to breathe. Find the height of the tent.

- (a) 50 m (b) 60 m
(c) 40 m (d) 45 m

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : According to the question

$$\text{Space for 1 person} = 4 \text{ m}^2$$

$$\text{Space for 25 person} = 25 \times 4 = 100 \text{ m}^2$$

$$\text{Air for breathing of 1 person} = 80 \text{ m}^3$$

$$\text{Hence, Air for breathing of 25 persons} = 80 \times 25 \\ = 2000 \text{ m}^3$$

$$\text{Area of base} = \pi r^2 = 100 \text{ m}^2 \quad (1)$$

$$\text{Volume} = \frac{\pi r^2 h}{3} = 2000 \text{ m}^3 \quad (2)$$

From equation (i) and (ii)

$$\frac{\pi r^2 h}{3} \times \frac{1}{\pi r^2} = \frac{2000}{100}$$

$$h = 20 \times 3 = 60$$

$$\boxed{h = 60 \text{ m}}$$

119. The radii of the two circular faces of the frustum of a cone of height 14 cm are 5 cm and 2 cm. What is its volume in cm³? ($\pi = \frac{22}{7}$)

- (a) 540 (b) 520
(c) 572 (d) 560

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (c) :



Volume of frustum of cone

$$= \frac{1}{3} \pi h (R^2 + r^2 + R.r)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 14 [(5)^2 + (2)^2 + 5 \times 2]$$

$$= \frac{1}{3} \times \frac{22}{7} \times 14 \times 39$$

$$= 572 \text{ cm}^3$$

120. The radii of two circular faces of the frustum of a cone of height 10.5 cm are 5 cm and 3 cm respectively. What is its volume in cm³

($\pi = \frac{22}{7}$).

- (a) 564 (b) 545
(c) 552 (d) 539

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (d) According to the question

$$R = 5, r = 3 \text{ and } h = 10.5$$

$$\therefore \text{Volume of frustum} = \frac{1}{3} \pi h [R^2 + r^2 + Rr]$$

$$= \frac{1}{3} \times \frac{22}{7} \times 10.5 [25 + 9 + 15]$$

$$= 22 \times 0.5 \times 49$$

$$= 539$$

121. The circumference of the base of a conical tent is 66m. If the height of the tent is 36m, what is the area (in m²) of the canvas used in making the tent? (take $\pi = \frac{22}{7}$)

(a) 1254 (b) 1237.5
(c) 1171.5 (d) 1155

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (b) Perimeter of base = 66 m

$$2 \times \frac{22}{7} \times r = 66$$

$$r = \frac{21}{2} \text{ m}$$

$$l = \sqrt{\frac{441}{4} + 1296} = 37.5 \text{ m}$$

$$\text{Area of canvas} = \frac{22}{7} \times \frac{21}{2} \times 37.5 = 1237.5 \text{ m}^2$$

122. The height of a cone is 45 cm. It is cut at a height of 15 cm from its base by a plane parallel to its base. If the volume of the smaller cone is 18480 cm^3 , then what is the volume (in cm^3) of the original cone?

- (a) 34650 (b) 61600
(c) 36960 (d) 62370

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :

Volume of small cone = 18480

$$\frac{1}{3} \times \frac{22}{7} \times r^2 \times 30 = 18480$$

$$r^2 = 12 \times 7 \times 7$$

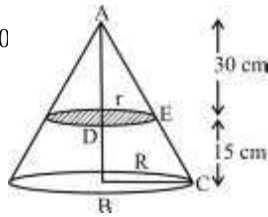
$$r = 14\sqrt{3}$$

$$\triangle ADE \sim \triangle ABC$$

$$\frac{AD}{AB} = \frac{DE}{BC} \Rightarrow \frac{30}{45} = \frac{14\sqrt{3}}{BC}$$

$$R = 21\sqrt{3} \text{ cm}$$

$$\begin{aligned} \text{Volume of original cone} &= \frac{1}{3} \times \frac{22}{7} \times 21\sqrt{3} \times 21\sqrt{3} \times 45 \\ &= 62370 \text{ cm}^3 \end{aligned}$$

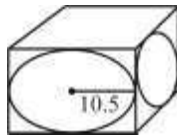


123. Four identical cones each of radius 10.5 cm and height 14 cm are cut from a cuboid of dimensions 30 cm × 32 cm × 40 cm (base of each cone lies on the surface of cuboid). What is the total surface area (in cm^2) of the remaining solid?

- (a) 6528 (b) 7804
(c) 5926 (d) 6824

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :



Four cones are made inward on lateral surface

$$\text{Slant height of cone } (\ell) = \sqrt{\left(\frac{21}{2}\right)^2 + 14^2} = \frac{35}{2} \text{ cm}$$

Total surface area of remaining solid

$$\begin{aligned} &= 2(\ell b + bh + h\ell) + 4\pi r\ell - 4\pi r^2 \\ &= 2[960 + 1280 + 1200] + 4 \times \frac{22}{7} \times 10.5[17.5 - 10.5] \end{aligned}$$

$$= 2 \times 3440 + 4 \times \frac{22}{7} \times 10.5 \times 7$$

$$= 6880 + 924 = 7804 \text{ cm}^2$$

124. A cone of radius 90 cm and height 120 cm stands on its base. It is cut into 3 parts by 2 cuts parallel to its base such that the height of the three parts (from top to bottom) are in ratio of 1 : 2 : 3. What is the total surface area (in cm^2) of the middle part ?

- (a) 14600 (b) 16500
(c) 17800 (d) 18500

SSC CGL (Tier-II) 9-3-2018

Ans. (b)

$$\triangle AFG \sim \triangle ABC$$

$$\frac{20}{120} = \frac{FG}{90}$$

$$\text{(Let) } FG = 15 \text{ cm} = r$$

$$\text{Again } \triangle ADE \sim \triangle ABC$$

$$\frac{60}{120} = \frac{DE}{90}$$

$$\text{(Let) } DE = 45 \text{ cm} = R$$

$$\therefore \ell = \sqrt{h^2 + (R-r)^2}$$

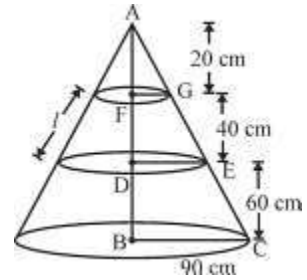
$$= \sqrt{40^2 + (45-15)^2}$$

$$= \sqrt{1600 + 900} = 50 \text{ cm}$$

$$\text{Surface area of middle part} = \pi(r+R)\ell + \pi r^2 + \pi R^2$$

$$= \pi[60 \times 50 + 225 + 2025]$$

$$= \frac{22}{7} \times 5250 = 16500 \text{ cm}^2$$

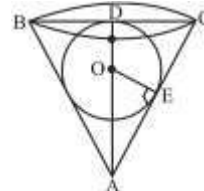


125. Radius of base of a hollow cone is 8 cm and its height is 15 cm. A sphere of largest radius is put inside the cone. What is the ratio of radius of base of cone to the radius of sphere?

- (a) 5 : 3 (b) 4 : 1
(c) 2 : 1 (d) 7 : 3

SSC CGL (Tier-II) 17-2-2018

Ans. (a):



Let $OD = OE = r$ cm Radiuses

$$\therefore AC^2 = AD^2 + DC^2$$

$$AC = \sqrt{15^2 + 8^2} = 17 \text{ cm}$$

$$\therefore \triangle AEO \sim \triangle ADC$$

$$\frac{EO}{DC} = \frac{AO}{AC}$$

$$\frac{r}{8} = \frac{15-r}{17}$$

$$17r = 120 - 8r$$

$$r = \frac{120}{25} = \frac{24}{5}$$

$$\text{Required ratio} = 8 : \frac{24}{5}$$

$$= 5 : 3$$

126. A sector of radius 10.5 cm with the central angle 120° is folded to form a cone by joining the two bounding radii of the sector. What is the volume (in cm^3) of the cone so formed ?

- (a) $\frac{343\sqrt{2}}{12} \pi$ (b) $\frac{343\sqrt{3}}{12} \pi$
(c) $\frac{343\sqrt{3}}{6} \pi$ (d) $\frac{343\sqrt{2}}{6} \pi$

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : Length of arc of radial section will be circumference of base of cone and radius of sector will be slant height of cone.

$$l = 2\pi r$$

$$\frac{2\pi R\theta}{360^\circ} = 2\pi r$$

$$\frac{10.5 \times 120^\circ}{360^\circ} = r$$

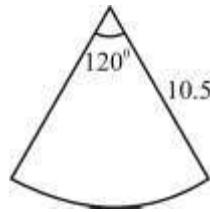
$$r = 3.5 = \frac{7}{2} \text{ cm}$$

$$h^2 = \sqrt{\ell^2 - r^2} = \sqrt{\left(\frac{21}{2}\right)^2 - \left(\frac{7}{2}\right)^2} = \sqrt{\frac{392}{4}} = \sqrt{98}$$

$$h = 7\sqrt{2} \text{ cm}$$

Volume of cone formed

$$= \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times \frac{49}{4} \times 7\sqrt{2} = \frac{343\sqrt{2}}{12} \pi \text{ cm}^3$$



127. If the radius of the base of a cone is doubled, and the volume of the new cone is three times the volume of the original cone, then what will be the ratio of the height of the original cone to that of the new cone ?

- (a) 9 : 4 (b) 4 : 3
(c) 2 : 9 (d) 1 : 3

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

Let radius of original cone (r_1) = r cm

Height = h_1 cm

Radius of new cone (r_2) = $2r$ cm

Height = h_2 cm

According to the question

$$\frac{1}{3} \pi r_2^2 h_2 = 3 \times \frac{1}{3} \pi r_1^2 h_1$$

$$4r^2 h_2 = 3r^2 h_1$$

$$\frac{h_1}{h_2} = \frac{4}{3}$$

128. The height of a right circular cone is 35 cm and the area of its curved surface is four times the area of its base. What is the volume of the cone (in 10^{-3} m^3 and correct up to three decimal places)?

- (a) 2.994 (b) 2.625
(c) 3.384 (d) 3.316

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (a) Height of cone (h) = 35cm

According to the question

Area of curved surface of cone = $4 \times$ Area of base of cone

$$\pi r \ell = 4 \times \pi r^2$$

$$\ell = 4r$$

$$\therefore \ell^2 = h^2 + r^2$$

$$(4r)^2 = 35^2 + r^2$$

$$15r^2 = 35^2$$

$$r^2 = \frac{35^2}{15}$$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times \frac{22}{7} \times \frac{35^2}{15} \times 35$$

$$= 2994.444 \text{ cm}^3$$

$$= 0.0029944 \text{ m}^3$$

$$= 2.994 \times 10^{-3} \text{ m}^3$$

129. The curved surface area of a right circular cone is 156π and the radius of its base is 12cm. What is the volume of the cone, in cm^3 ?

- (a) 180π (b) 240π
(c) 192π (d) 210π

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b) Area of curved surface of perpendicular cone = 156π

$$\pi r \ell = 156\pi$$

$$12 \times \ell = 156$$

$$\ell = 13 \text{ cm}$$

$$\therefore h = \sqrt{\ell^2 - r^2} = \sqrt{169 - 144} = 5 \text{ cm}$$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \pi \times 12 \times 12 \times 5 = 240\pi \text{ cm}^3$$

130. A conical vessel whose internal base radius is 18cm and height 60cm is full of a liquid. The entire liquid of the vessel is emptied into a cylindrical vessel with internal radius 15cm. The height (in cm) to which the liquid rises in the cylindrical vessel is?

- (a) 24cm (b) 30.2cm
(c) 27cm (d) 28.8cm

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d) Given

Inner radius of conical pot (r) = 18cm

Height of conical pot (h) = 60cm

\therefore Liquid fill to cylinder vessel from conical vessel.

\therefore The volume of liquid will same in both vessel

$$\therefore \frac{1}{3} \times \pi \times (18)^2 \times 60 = \pi (15)^2 h$$

$$\text{Height (h)} = \frac{18 \times 18 \times 60}{3 \times 15 \times 15} = 28.8 \text{ cm}$$

131. The radius and height of a right circular cone are in the ratio $1 : 2.4$. If its curved surface area is 2502.5 cm^2 , then what is its volume?

(Take $\pi = 22/7$)

- (a) 11550 cm^2 (b) 13475 cm^3
(c) 8085 cm^3 (d) 8820 cm^3

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) $r : h = 1 : 2.4$

$$= 5 : 12$$

Let $r = 5x$, $h = 12x$

$$\therefore \ell = \sqrt{r^2 + h^2}$$

$$\ell = \sqrt{(5x)^2 + (12x)^2}$$

$$\begin{aligned} \ell &= 13x \\ \text{Curved surface area} &= 2502.5 \text{ cm}^2 \\ \frac{22}{7} \times 5x \times 13x &= 2502.5 \\ x^2 &= \frac{2502.5 \times 7}{22 \times 5 \times 13} = 12.25 \\ x &= 3.5 \\ \text{Volume of cone} &= \frac{1}{3} \times \frac{22}{7} \times 25x^2 \times 12x \\ &= \frac{22 \times 25 \times 12 \times x^3}{21} \\ &= \frac{22 \times 25 \times 12 \times 3.5 \times 3.5 \times 3.5}{21} \\ &= 13475 \text{ cm}^3 \end{aligned}$$

132. The volume of a circular cone is equal to the sphere whose radius is half of the radius of the base of the cone. What is the ratio of the radius of the base of the cone to its height ?

- (a) 1 : 4 (b) 4 : 1
(c) 1 : 2 (d) 2 : 1

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (d) : Let, Radius of base of perpendicular cone is $2x$ and radius of sphere is x
According to the question
Volume of perpendicular cone = Volume of sphere

$$\begin{aligned} \frac{1}{3} \pi r_1^2 h &= \frac{4}{3} \pi r_2^3 \\ \frac{1}{3} \times \pi \times (2x)^2 \times h &= \frac{4}{3} \times \pi \times x^3 \\ 4x^2 \times h &= 4 \times x^3 \\ \frac{x}{h} &= \frac{1}{1} \end{aligned}$$

Hence, ratio of radius of base of cone to height.

$$\frac{2x}{h} = \frac{2}{1} \text{ or } 2 : 1$$

133. A cone has a radius of 20 cm and height 21 cm, the total surface area (in cm^2) of the cone is:

$$\left(\pi = \frac{22}{7} \right)$$

- (a) 3080 (b) 3160
(c) 2920 (d) 3240

SSC MTS 13/08/2019 (Shift-I)

Ans. (a)

$$\begin{aligned} \ell &= \sqrt{r^2 + h^2} \\ &= \sqrt{(20)^2 + (21)^2} \\ &= \sqrt{841} \\ &= 29 \text{ cm} \\ \text{Total surface area of cone} &= \pi r(\ell + r) \\ &= \frac{22}{7} \times 20(29 + 20) \\ &= \frac{22}{7} \times 20 \times 49 \\ &= 3080 \text{ cm}^2 \end{aligned}$$

134. The height of a cone is equal to its base radius and its volume is $72\pi \text{ cm}^3$. What is its curved surface area in cm^2 ?

- (a) $72\sqrt{2}\pi$ (b) $36\sqrt{2}\pi$
(c) $48\sqrt{2}\pi$ (d) $54\sqrt{2}\pi$

SSC MTS 22/08/2019 (Shift-II)

Ans. (b) : Let, radius of cone = r cm
Height of cone (h) = r cm
According to the question
Volume of cone = 72π
 $\frac{1}{3} \pi r^2 h = 72\pi$
 $r^3 = 216$
 $r = 6$
Slant height of cone (ℓ) = $\sqrt{h^2 + r^2} = \sqrt{6^2 + 6^2} = 6\sqrt{2}$
Curved surface area of cone = $\pi r \ell$
 $= \pi \times 6 \times 6\sqrt{2}$
 $= 36\sqrt{2}\pi \text{ cm}^2$

135. The volume of perpendicular circular cone is 1232 cm^3 and its height is 24 cm. What is the area of its curved surface? $\left(\pi = \frac{22}{7} \right)$

- (a) 354 cm^2 (b) 550 cm^2
(c) 430 cm^2 (d) 604 cm^2

SSC MTS 05/08/2019 (Shift-III)

Ans. (b) :
Let, radius and height are r and h .
According to the question
 $\frac{1}{3} \pi r^2 h = 1232$ [given $h = 24$]
 $\frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232$
 $r^2 = 49$
 $r = 7$
Slant height of cone $\ell = \sqrt{r^2 + h^2}$
 $= \sqrt{49 + 576} = 25 \text{ cm}$.
 \therefore Area of curved surface of cone = $\pi r \ell$
 $= \frac{22}{7} \times 7 \times 25 = 550 \text{ cm}^2$

136. The volume of a perpendicular cone is equal to the volume of that perpendicular cylinder whose height is 27 cm and diameter of its base is 30 cm. If the height of the cone is 25 cm, then what will be the diameter of its base?

- (a) 24 cm (b) 54 cm
(c) 27 cm (d) 35 cm

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : Given
Diameter of cylinder ($2R$) = 30 cm.
 $R = 15$ cm.
Height of cylinder (H) = 27 cm.
Height of cone (h) = 25 cm.

According to the question

∴ Volume of cone = Volume of cylinder

$$\Rightarrow \frac{1}{3}\pi r^2 h = \pi R^2 H$$

$$\Rightarrow \frac{1}{3}\pi \times r^2 \times 25 = \pi \times (15)^2 \times 27$$

$$\Rightarrow r^2 = \frac{225 \times 27 \times 3}{25}$$

$$r = 27 \text{ cm.}$$

$$\begin{aligned} \text{Hence, diameter of base of cone} &= 2r \\ &= 2 \times 27 \\ &= 54 \text{ cm} \end{aligned}$$

137. Height of a right circular cone is 8 cm. If diameter of its base is 12 cm, then what will be the curved surface area of the cone?

- (a) $1056/7 \text{ cm}^2$ (b) $1320/7 \text{ cm}^2$
(c) $1440/7 \text{ cm}^2$ (d) $2112/7 \text{ cm}^2$

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : Given

Height of cone = 8 cm

Radius of base of cone (r) = $\frac{12}{2} = 6 \text{ cm}$

∴ Slant height of cone (l) = $\sqrt{r^2 + h^2}$

$$= \sqrt{(6)^2 + (8)^2}$$

$$= \sqrt{100}$$

$$= 10 \text{ cm}$$

Hence, curved surface of cone = $\pi r l$

$$= \frac{22}{7} \times 6 \times 10$$

$$= \frac{1320}{7} \text{ cm}^2$$

(V) Problems based on Sphere and Hemisphere

138. Find the total surface area of a solid hemisphere whose radius is 4.2 cm. (Take $\pi = 22/7$)

- (a) 266.32 cm^2 (b) 366.32 cm^2
(c) 166.32 cm^2 (d) 466.32 cm^2

SSC CHSL 09/06/2022 (Shift-I)

Ans. (c) : Radius (R) of solid hemisphere = 4.2 cm

∴ Total surface area of a solid hemisphere = $3\pi R^2$

$$= 3 \times \frac{22}{7} \times 4.2 \times 4.2$$

$$= 66 \times 0.6 \times 4.2 = 166.32 \text{ cm}^2$$

139. If the diameter of a solid hemisphere is 14 cm, then what will be its total surface area?

$$\left(\pi = \frac{22}{7} \right)$$

- (a) 462 cm^2 (b) 362 cm^2
(c) 486 cm^2 (d) 261 cm^2

SSC CHSL 26/05/2022 (Shift-III)

Ans. (a) : We know that :-

Total surface area of solid hemisphere = $3\pi r^2$

∴ Diameter = 14 cm (Given)

$$\therefore \text{Radius (r)} = \frac{14}{2} = 7 \text{ cm}$$

Total surface area of solid hemisphere

$$= 3 \times \frac{22}{7} \times 7 \times 7 \Rightarrow \boxed{462 \text{ cm}^2}$$

140. If the surface area of a sphere is 1386 cm^2 , then radius of the sphere.

- (a) 12.5 cm (b) 10 cm
(c) 10.5 cm (d) 12 cm

SSC CHSL 24/05/2022 (Shift-III)

Ans. (c) : Given, TSA of sphere = 1386 cm^2

Radius of sphere = ?

We know that,

TSA of sphere = $4\pi r^2$

$$\Rightarrow 4\pi r^2 = 1386$$

$$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 1386$$

$$\Rightarrow r^2 = \frac{1386 \times 7}{22 \times 4}$$

$$\Rightarrow r = \frac{21}{2}$$

$$\Rightarrow r = 10.5 \text{ cm}$$

141. If the volume of a sphere is $4,851 \text{ cm}^3$, then what is its diameter (in cm)?

$$\left(\text{Take } \pi = \frac{22}{7} \right)$$

- (a) 18 (b) 16
(c) 12 (d) 21

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (d) According to the question,

Volume of sphere = 4851

$$\frac{4}{3}\pi r^3 = 4851$$

$$\frac{4}{3} \times \frac{22}{7} \times r^3 = 11 \times 441$$

$$r^3 = \frac{11 \times 441 \times 7 \times 3}{4 \times 22}$$

$$r^3 = \frac{11 \times 21 \times 21 \times 21}{4 \times 2 \times 11}$$

$$\therefore r = \frac{21}{2}$$

∴ Diameter of sphere = 2r

$$= 2 \times \frac{21}{2} = 21 \text{ cm}$$

142. A hemispherical depression of diameter 4 cm is cut out from each face of a cubical block of sides 10 cm. Find the surface area of the remaining solid (in cm^2).

$$\left(\text{Use } \pi = \frac{22}{7} \right)$$

- (a) $900\frac{4}{7}$ (b) $112\frac{4}{7}$
 (c) $675\frac{3}{7}$ (d) $713\frac{1}{7}$

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (c) Surface area of remaining solid = $6a^2 + 6\pi r^2$
 $= 6a^2 + 6\pi r^2$
 $= 6 \times 10^2 + 6 \times \frac{22}{7} \times 2^2$
 $= 600 + \frac{528}{7}$
 $= \frac{4200 + 528}{7} = \frac{4728}{7} = 675\frac{3}{7} \text{ cm}^2$

143. The radius of a sphere is 9 cm. It is melted and drawn into a wire of radius 0.3 cm. The length of the wire is:

- (a) 112 m (b) 108 m
 (c) 118 m (d) 106 m

SSC CHSL 05/08/2021 (Shift-I)

Ans. (b) : Volume of sphere = Volume of cylinder.

$$\frac{4}{3}\pi R^3 = \pi r^2 h$$

$$\frac{4}{3} \times 9 \times 9 \times 9 = 0.3 \times 0.3 \times h$$

$$h = 10800 \text{ cm} = 108 \text{ m}$$

144. Eight metallic spheres of radius 1 cm are melted to form one sphere. The radius of the resulting sphere is:

- (a) 2 cm (b) 8 cm
 (c) 3 cm (d) 6 cm

SSC MTS 20/10/2021 (Shift-I)

Ans. (a) : Let the resulting radius of sphere = x
 Radius of smaller sphere = 1 cm
 Number of smaller spheres = 8

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

According to the question.

$$\Rightarrow \frac{4}{3}\pi r^3 \times n = \frac{4}{3}\pi r^3$$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times (1)^3 \times 8 = \frac{4}{3} \times \frac{22}{7} x^3$$

$$8 = x^3$$

$$x = 2 \text{ cm}$$

145. What is the volume (in cm^3) of a spherical shell whose inner and outer radii are respectively 2 cm and 3 cm ?

- (a) $\frac{86\pi}{3}$ (b) $\frac{56\pi}{3}$
 (c) $\frac{106\pi}{3}$ (d) $\frac{76\pi}{3}$

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (d) : Volume of a spherical shell having inner radius

$$\text{as 2 cm \& outer radius as 3 cm.} = \frac{4}{3}\pi[R^3 - r^3] \text{ cm}^3$$

where R = Outer Radius & r = Inner Radius

$$= \frac{4}{3}\pi[3^3 - 2^3] \text{ cm}^3$$

$$= \frac{76\pi}{3} \text{ cm}^3$$

146. A solid metallic sphere of radius 10 cm is melted and recast into spheres of radius 2 cm each. How many such spheres can be made?

- (a) 64 (b) 216
 (c) 100 (d) 125

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) : Number of smaller spheres

$$= \frac{\text{Volume of larger sphere}}{\text{Volume of smaller sphere}}$$

$$= \frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3}$$

$$= \frac{10 \times 10 \times 10}{2 \times 2 \times 2} = 125$$

147. A solid metallic hemisphere of radius 6.3 cm is melted and recast into a right circular cylinder of radius 9 cm. What is the height (in cm, correct to one decimal place) of the cylinder?

- (a) 1.9 (b) 2.7
 (c) 2.5 (d) 2.1

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) :

Volume of the hemisphere = Volume of the cylinder

$$\frac{2}{3}\pi R^3 = \pi r^2 h$$

$$\frac{2}{3}\pi \times 6.3 \times 6.3 \times 6.3 = \pi \times 9 \times 9 \times h$$

$$h = \frac{2 \times 6.3 \times 6.3 \times 6.3}{9 \times 9 \times 3}$$

$$h = \frac{500.094}{243}$$

$$h = 2.1 \text{ cm}$$

148. A solid metallic sphere of radius 12 cm is melted and recast in the form of small spheres of radius 2 cm. How many small spheres are formed?

- (a) 864 (b) 96
 (c) 216 (d) 24

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) Let, radius of solid metallic sphere (R) = 12 cm
Radius of small spheres (r) = 2 cm

No. of small spheres = $\frac{\text{Volume of solid sphere}}{\text{Volume of small sphere}}$

$$= \frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3} = \left(\frac{R}{r}\right)^3 = \left(\frac{12}{2}\right)^3 = 216$$

149. If the volume of a sphere is $697\frac{4}{21}$ cm³, then

its radius is: (Take $\pi = \frac{22}{7}$)

- (a) 5.5 cm (b) 5 cm
(c) 4.5 cm (d) 6 cm

SSC CHSL 11/08/2021 (Shift-II)

Ans. (a) : Let, radius of sphere = r cm

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3 = 697\frac{4}{21}$$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{14641}{21}$$

$$r^3 = \frac{14641}{21} \times \frac{7}{22} \times \frac{3}{4}$$

$$r^3 = \frac{1331}{8}$$

$$r = 5.5 \text{ cm}$$

150. The volume of a hemisphere is $2425\frac{1}{2}$ cm³.

Find its radius. (Take $\pi = \frac{22}{7}$)

- (a) 9.5 cm (b) 10 cm
(c) 10.5 cm (d) 12 cm

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : Volume of hemisphere = $\frac{2}{3}\pi r^3$

$$2425\frac{1}{2} = \frac{2}{3}\pi r^3$$

$$\frac{4851}{2} = \frac{2}{3} \times \frac{22}{7} \times r^3$$

$$r^3 = \frac{21^3}{2^3}$$

$$r = 10.5 \text{ cm}$$

151. The number of lead balls, each 3 cm in diameter, that can be made from a solid lead sphere of diameter 42 cm is:

- (a) 2742 (b) 2744
(c) 7244 (d) 4722

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Volume of solid sphere made of glass = n × 1 Volume solid small lead balls.

$$\frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3$$

$$R^3 = n \times r^3$$

$$21^3 = n \times \left(\frac{3}{2}\right)^3$$

$$n = \frac{21 \times 21 \times 21 \times 8}{27} = 2744$$

152. If the surface area of a sphere is 1386 cm², then

its volume is: (Take $\pi = \frac{22}{7}$)

- (a) 8451 cm³ (b) 4581 cm³
(c) 5418 cm³ (d) 4851 cm³

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : ∴ Surface area of sphere = $4\pi r^2$

$$1386 = 4 \times \frac{22}{7} \times r^2$$

$$r^2 = \frac{7 \times 63}{4}$$

$$r = \frac{21}{2} \text{ cm}$$

Hence, volume of sphere = $\frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \frac{22}{7} \times \left(\frac{21}{2}\right)^3$$

$$= 441 \times 11$$

$$= 4851 \text{ cm}^3$$

153. A sphere of radius 4 cm is melted and recast into smallest spheres of radii 2 cm each. How many such spheres can be made?

- (a) 8 (b) 4
(c) 16 (d) 32

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (a) : Number of sphere of radii 2cm made from

$$\text{melted sphere of 4cm radius} = \frac{\frac{4}{3} \times \pi \times 4^3}{\frac{4}{3} \times \pi \times 2^3} = \frac{64}{8} = 8$$

8 New sphere will be made.

154. A solid hemisphere has radius 14 cm. It is melted to form a cylinder such that the ratio of its curved surface area and total surface area is 2:3. What is the radius (in cm) of its base ?

- (a) $\frac{10}{\sqrt[3]{3}}$ (b) $\frac{14}{\sqrt[3]{3}}$
(c) $\frac{7}{\sqrt[3]{3}}$ (d) $\frac{21}{\sqrt[3]{3}}$

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Given

Radius of hemisphere (R) = 14 cm

According to the question

$$\frac{2\pi rh}{2\pi r(h+r)} = \frac{2}{3}$$

$$\Rightarrow \frac{h}{r} = \frac{2}{1}$$

∴ Volume of hemisphere = Volume of cylinder

$$\Rightarrow \frac{2}{3}\pi R^3 = \pi r^2 h$$

$$\Rightarrow \frac{2}{3} \times (14)^3 = x^2 \times 2x$$

$$\Rightarrow x^3 = \frac{(14)^3}{3}$$

$$\Rightarrow x = \frac{14}{\sqrt[3]{3}}$$

Hence, Radius of base of cylinder (r) = x

$$= \frac{14}{\sqrt[3]{3}} \text{ cm}$$

155. The ratio of total surface area and volume of a sphere is 1 : 7. This sphere is melted to form small spheres of equal size. The radius of each small sphere is 1/6th the radius of the large sphere. What is the sum (in cm²) of curved surface areas of all small spheres ?

- (a) 31276 (b) 36194
(c) 25182 (d) 33264

SSC CGL (Tier-II) 20-02-2018

Ans. (d) :

$$\frac{\text{Total surface area of sphere}}{\text{Volume of sphere}} = \frac{1}{7}$$

$$\frac{4\pi R^2}{\frac{4}{3}\pi R^3} = \frac{1}{7}$$

$$\frac{3}{R} = \frac{1}{7}$$

Radius of large sphere = 21 cm.

$$\text{Radius of small sphere (r)} = \frac{21}{6}$$

n × Volume of smaller sphere = Volume of large sphere

$$n \times \frac{4}{3} \times \pi \times \frac{21 \times 21 \times 21}{6 \times 6 \times 6} = \frac{4}{3} \times \pi \times 21 \times 21 \times 21$$

$$n = 216 \text{ Sphere}$$

According to the question-

Area of curved surface of small sphere

$$= 216 \times 4 \times \frac{22}{7} \times \frac{21}{6} \times \frac{21}{6}$$

$$= 33264 \text{ cm}^2$$

156. A sphere of radius 21 cm is cut into 8 identical parts by cuts (1 cut along each axis). What will be the total surface area (in cm²) of each part?

- (a) 844.5 (b) 1732.5
(c) 1039.5 (d) 1115.6

SSC CGL (Tier-II) 19-02-2018

Ans. (b) : By each cut sphere will be divided in 8 identical part and surface area will be increased by $2\pi r^2$ by each cut

$$\text{Hence, Total surface area} = 4\pi r^2 + 3 \times 2\pi r^2$$

$$= 10\pi r^2$$

$$\text{Total surface area of each part} = \frac{10\pi r^2}{8}$$

$$= \frac{5}{4} \times \frac{22}{7} \times 21 \times 21$$

$$= \frac{55 \times 63}{2} = 1732.5 \text{ cm}^2$$

157. A hollow sphere is melted to form small identical hollow spheres. Inner and outer radius of the bigger sphere are 4 cm and 6 cm respectively. If inner and outer radii of the smaller sphere are 2 cm and 3 cm respectively, then how many smaller spheres can be formed?

- (a) 4 (b) 8
(c) 6 (d) 12

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Number of small sphere

$$= \frac{\text{Volume of large sphere}}{\text{Volume of small sphere}}$$

$$= \frac{\frac{4}{3}\pi(6^3 - 4^3)}{\frac{4}{3}\pi(3^3 - 2^3)}$$

$$= \frac{216 - 64}{27 - 8} = \frac{152}{19} = 8$$

158. A hemispherical dome is open from its base and is made of iron. Thickness of dome is 3.5 meter. Total cost of painting domes outer curved surface is Rs. 2464. If the rate of painting is Rs. 8 per meter², then what is the volume (in meter³) of iron used in making dome ?

- (a) 656.42 (b) 614.21
(c) 524.46 (d) 628.83

SSC CGL (Tier-II) 9-3-2018

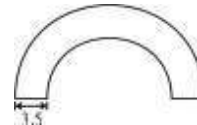
Ans. (d) : Area of outer curved surface of dome

$$= \frac{2464}{8} = 308 \text{ m}^2$$

$$2 \times \frac{22}{7} \times R^2 = 308$$

$$R = 7 \text{ m}$$

$$r = 7 - 3.5 = 3.5 \text{ m}$$



Volume of iron used in making of dome.

$$= \frac{2}{3} \times \frac{22}{7} \left[7^3 - \left(\frac{7}{2}\right)^3 \right]$$

$$= \frac{44}{21} \times 7^3 \times \frac{7}{8}$$

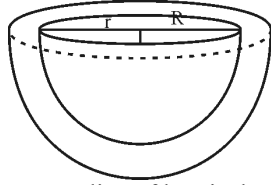
$$= 628.83 \text{ m}^3$$

159. A metallic hemispherical bowl is made up of steel. The total steel used in making the bowl is $342\pi \text{ cm}^3$. The bowl can hold $144\pi \text{ cm}^3$ water. What is the thickness (in cm) of bowl and the curved surface area (in cm²) of outer side ?

- (a) $6, 162\pi$ (b) $3, 162\pi$
 (c) $6, 81\pi$ (d) $3, 81\pi$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :



Let, inner and outer radius of hemisphere is R and r cm respectively.

$$\text{Volume of bowl} = 144 \pi \text{ cm}^3$$

$$\frac{2}{3} \pi r^3 = 144\pi$$

$$r^3 = 216$$

$$r = 6 \text{ cm}$$

$$\text{Volume of iron in bowl} = 342 \pi \text{ cm}^3$$

$$\frac{2}{3} \pi (R^3 - r^3) = 342\pi$$

$$R^3 - 6^3 = 513$$

$$R^3 = 513 + 216 = 729$$

$$R = 9$$

$$\text{Thickness of bowl} = R - r = 9 - 6 = 3 \text{ cm}$$

$$\begin{aligned} \text{Area of outer curved surface of bowl} &= 2\pi R^2 \\ &= 2\pi \times (9)^2 = 162\pi \text{ cm}^2 \end{aligned}$$

160. The internal diameter of a hollow hemispherical vessel is 24 cm. It is made of a steel sheet which is 0.5 cm thick. What is the total surface area (in cm^2) of the vessel ?

- (a) 468.75π (b) 600.5π
 (c) 600.2π (d) 612.75π

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : $r = 12 \text{ cm}$

$$R = 12 + 0.5 = 12.5 \text{ cm}$$

Total surface area of vessel

$$= 2\pi (R^2 + r^2) + \pi (R^2 - r^2)$$

$$= 3\pi R^2 + \pi r^2$$

$$= 3\pi \times 12.5 \times 12.5 + \pi \times 12 \times 12$$

$$= 468.75\pi + 144\pi$$

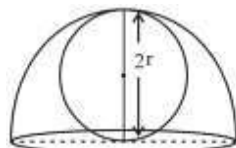
$$= 612.75\pi \text{ cm}^2$$

161. A sphere of maximum volume is cut out from a solid hemisphere. What is the ratio of the volume of the sphere to that of the remaining solid ?

- (a) 1 : 4 (b) 1 : 3
 (c) 1 : 1 (d) 1 : 2

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :



$$\begin{aligned} \frac{\text{Volume of sphere}}{\text{Volume of remaining solid}} &= \frac{\frac{4}{3} \pi r^3}{\frac{2}{3} \pi (2r)^3 - \frac{4}{3} \pi r^3} = \frac{\frac{4}{3} \pi r^3}{\frac{16\pi r^3}{3} - \frac{4}{3} \pi r^3} \\ &= \frac{\frac{4}{3} \pi r^3}{\frac{12\pi r^3}{3}} = \frac{4}{12} = 1 : 3 \end{aligned}$$

162. A hemispherical bowl of internal diameter 36 cm is full of a liquid. This liquid is to be filled into cylindrical bottles each of radius 3 cm and height 12 cm. How many such bottles are required to empty the bowl ?

- (a) 54 (b) 36
 (c) 72 (d) 27

SSC CGL (Tier-II) 12-09-2019

Ans. (b) :

$$\text{Number of bottles} = \frac{\text{Volume of hemispherical bowl}}{\text{Volume of cylindrical bottles}}$$

$$= \frac{\frac{2}{3} \pi r_1^3}{\pi r_2^2 h} = \frac{\frac{2}{3} \times 18 \times 18 \times 18}{12 \times 3 \times 3}$$

$$= \frac{18 \times 18 \times 18}{6 \times 9 \times 3} = 36$$

163. The internal and external radii of a hollow hemispherical vessel are 6 cm and 7 cm respectively. What is the total surface area (in cm^2) of the vessel ?

- (a) 183π (b) 177π
 (c) 189π (d) 174π

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : Total surface area of vessel

$$= 2\pi \times 7^2 + 2\pi \times 6^2 + \pi (7^2 - 6^2)$$

$$= 2\pi (49 + 36) + \pi \times 13$$

$$= 170\pi + 13\pi = 183\pi \text{ cm}^2$$

164. Three solid metallic spheres whose radii are 1 cm, x cm and 8 cm, are melted and recast into a single solid sphere of diameter 18 cm. The surface area (in cm^2) of the sphere with radius x cm is :

- (a) 72π (b) 64π
 (c) 144π (d) 100π

SSC CGL (Tier-II) 11-9-2019

Ans. (c) :

Sum of volume of small metallic sphere

$$= \text{Volume of new sphere}$$

$$\frac{4}{3} \pi (1^3 + x^3 + 8^3) = \frac{4}{3} \pi \times \left(\frac{18}{2}\right)^3$$

$$x^3 + 513 = 729$$

$$x^3 = 216$$

$$x = 6$$

$$\text{Surface area of sphere of radius x cm} = 4\pi x^2$$

$$= 4 \times \pi \times 6 \times 6$$

$$= 144\pi \text{ cm}^2$$

165. The ratio of the total surface area and volume of a sphere is 2:7. Its radius is:

- (a) 10 cm (b) 7.5 cm
(c) 10.5 cm (d) 7 cm

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : $\frac{\text{Total surface area of sphere}}{\text{Volume of sphere}} = \frac{2}{7}$

$$\Rightarrow \frac{4\pi R^2}{\frac{4}{3}\pi R^3} = \frac{2}{7}$$

$$\Rightarrow \frac{3}{R} = \frac{2}{7}$$

$$\Rightarrow R = 10.5 \text{ cm}$$

166. If the volume of a sphere is 4851 cm³, then its surface area (in cm²) is: (Take $\pi = \frac{22}{7}$)

- (a) 1427 (b) 1268
(c) 1386 (d) 1399

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Given

Volume of sphere = 4851 cm³

$$\Rightarrow \frac{4}{3}\pi R^3 = 4851$$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times R^3 = 4851$$

$$\Rightarrow R^3 = \frac{4851 \times 3 \times 7}{4 \times 22}$$

$$\Rightarrow R = \sqrt[3]{\frac{4851 \times 3 \times 7}{4 \times 22}}$$

$$\Rightarrow R = \frac{21}{2} \text{ cm}$$

$$\therefore \text{Area of sphere} = 4\pi R^2$$

$$= 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$$

$$= 22 \times 63$$

$$= 1386 \text{ cm}^2$$

167. A solid lead sphere of radius 11 cm is melted and recast into small solid spheres of radius 2 cm each. How many maximum number (in integer) of such spheres can be made?

- (a) 100 (b) 125
(c) 166 (d) 30

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Let, Number of recast small solid sphere = n
Volume of solid lead sphere = n × Volume of one small solid sphere

$$\frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3$$

$$R^3 = n \times r^3$$

$$(11)^3 = n \times 2^3$$

$$8n = 1331$$

$$n = \frac{1331}{8}$$

$$n = 166$$

168. The total surface area of a solid hemisphere is 1039.5cm². The volume (in cm³) of the hemisphere is: (Take $\pi = 22/7$)

- (a) 2530.6 (b) 2425.5
(c) 2525.6 (d) 2225.5

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (b) Total surface area of hemisphere = $3\pi r^2 = 1039.5$

$$\therefore r^2 = \frac{1039.5}{22 \times 3} \times 7$$

$$= 110.25$$

$$r = 10.5$$

$$\text{Volume of hemisphere} = \frac{2}{3}\pi r^3$$

$$= \frac{2}{3} \times \frac{22}{7} \times (10.5) \times (10.5) \times (10.5)$$

$$= 2425.5 \text{ cm}^3$$

169. A solid metallic sphere of radius x cm is melted and then drawn into 126 cones each of radius 3.5 cm and height 3 cm. There is no wastage of material in this process. What is the value of x?

- (a) 3.5 (b) 7
(c) 10.5 (d) 21

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c)

126 cone made by melting sphere Hence, the volume will be same of both.

$$\therefore \frac{4}{3}\pi(x)^3 = 126 \times \frac{1}{3} \times \pi \times (3.5)^2 \times 3$$

$$x^3 = \frac{3}{4} \times 126 \times 3.5 \times 3.5 = \frac{3 \times 63 \times 7 \times 7}{8}$$

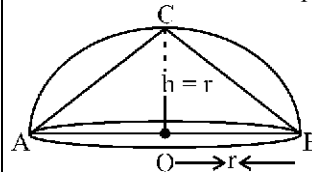
$$x = 10.5$$

170. A right circular cone of largest volume is cut out from a solid wooden hemisphere. The remaining material is what percentage of the volume of the original hemisphere?

- (a) 75% (b) 33½%
(c) 50% (d) 66⅔%

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) A right circular cone of largest volume cut out from a solid wooden hemisphere.



Hence, radius of cut out cone will equal to the radius of hemisphere and height of cone will equal to the radius of hemisphere.

∴ percentage of remaining material of the volume of original hemisphere

$$\begin{aligned} &= \frac{\frac{2}{3}\pi r^3 - \frac{1}{3}\pi r^3}{\frac{2}{3}\pi r^3} \times 100 \\ &= \frac{1}{3} \times \frac{3}{2} \times 100 \\ &= 50\% \end{aligned}$$

171. When the radius of a sphere is increased by 5 cm, its surface area increases by 704cm^2 . The diameter of the original sphere, is _____. (Take $\pi = 22/7$)

- (a) 5.2cm (b) 6.8cm
(c) 6.2cm (d) 8.2cm

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c) Let, Radius of sphere = r cm
Then, surface area of sphere = $4\pi r^2 \text{ cm}^2$
According to the question

$$\begin{aligned} 4\pi(r+5)^2 &= 4\pi r^2 + 704 \\ 4\pi(r^2 + 25 + 10r) &= 4\pi r^2 + 704 \\ 4\pi r^2 + 100\pi + 40\pi r &= 4\pi r^2 + 704 \\ \pi(100 + 40r) &= 704 \end{aligned}$$

$$100 + 40r = 704 \times \frac{7}{22} = 32 \times 7$$

$$40r = 224 - 100 = 124$$

$$r = 3.1 \text{ cm}$$

Hence, Diameter of original sphere = $2r = 2 \times 3.1 = 6.2\text{cm}$

172. A cylindrical vessel with radius 6 cm and height 5 cm is to be made by melting a number of spherical metal balls of diameter 2 cm. The minimum number of balls needed is:

- (a) 125 (b) 115
(c) 135 (d) 105

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) : $\because 2r = 2\text{cm}, r = 1\text{cm}$

$$\text{Volume of spherical ball} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi$$

$$\begin{aligned} \text{Volume of cylindrical vessel} &= \pi r^2 h \\ (\because r &= 6\text{cm}, h = 5\text{cm}) \\ &= 180\pi \end{aligned}$$

$$\text{Required number of sphere} = \frac{180\pi}{\frac{4}{3}\pi}$$

$$= \frac{180}{4} \times 3 = 135$$

Hence, The minimum number of balls needed is 135.

173. A sphere is placed in a cube so that it touches all the faces of the cube. If 'a' is the ratio of the volume of the cube to the volume of the sphere, and 'b' is the ratio of the surface area of the sphere to the surface area of the cube, then the value of ab is:

- (a) 1 (b) $\frac{\pi^2}{36}$
(c) 4 (d) $\frac{36}{\pi^2}$

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : Let, side of cube = diameter of sphere = x

$$\therefore \text{Radius of sphere} = \frac{x}{2}$$

As per question,

$$\therefore a = \frac{x^3}{\frac{4}{3}\pi \times \frac{x^3}{8}} = \frac{6}{\pi}$$

$$\text{Again } b = \frac{\text{Surface area of sphere}}{\text{Surface area of cube}} =$$

$$= \frac{4 \times \pi \times \frac{x^2}{4}}{6x^2} = \frac{\pi}{6}$$

$$\therefore ab = \frac{6}{\pi} \times \frac{\pi}{6} = 1$$

174. The radius of a hemisphere is 14 cm. What is the cost of painting the outer curved surface of the hemisphere at the rate of ₹45 per cm^2 ?

$$\left(\pi = \frac{22}{7} \right)$$

- (a) ₹53160 (b) ₹55440
(c) ₹56820 (d) ₹58280

SSC MTS 08/08/2019 (Shift-I)

Ans. (b): Radius of hemisphere (r) = 14 cm
Surface area of hemisphere = $2\pi r^2$

$$\begin{aligned} &= 2 \times \frac{22}{7} \times 14 \times 14 \\ &= 2 \times 22 \times 2 \times 14 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Total cost of painting at the rate of } 45/\text{cm}^2 &= 2 \times 22 \times 2 \times 14 \times 45 \\ &= ₹55440 \end{aligned}$$

175. A copper wire of radius 0.5 mm and length $42\frac{2}{3}\text{m}$ is melted and converted into a sphere of radius R cm. What is the value of R?

- (a) 3 (b) 2
(c) 1.5 (d) 1.8

SSC MTS 22/08/2019 (Shift-II)

Ans. (b) : Radius of copper wire (r) = 0.5 mm

$$= \frac{1}{2} \text{ mm} = \frac{1}{20} \text{ cm}$$

$$\begin{aligned} \text{length of wire } (l) &= \frac{128}{3} \text{ m} \\ &= \frac{12800}{3} \text{ cm} \end{aligned}$$

Volume of copper wire = Volume of sphere

$$\pi r^2 l = \frac{4}{3}\pi R^3$$

$$\left(\frac{1}{20}\right)^2 \times \frac{12800}{3} = \frac{4}{3} \times R^3$$

$$\frac{1}{400} \times \frac{12800}{3} = \frac{4R^3}{3}$$

$$R^3 = 8$$

$$R = 2$$

176. 0.1 percent of 1.728×10^6 spherical droplets of water, each of diameter 2 mm, coalesce to form a spherical bubble. What is the diameter (in cm) of the bubble?
- (a) 1.2 (b) 1.6
(c) 1.8 (d) 2.4

SSC MTS 02/08/2019 (Shift-I)

Ans. (d) : Let radius of droplets = R cm

$$\left[\left(\frac{4}{3}\pi r^3\right) \times 1.728 \times 10^6\right] \times 0.1\% = \frac{4}{3}\pi R^3$$

$$\frac{4}{3}\pi(0.1)^3 \times 1.728 \times 10^6 \times \frac{0.1}{100} = \frac{4}{3}\pi R^3$$

$$\frac{1}{1000} \times 1.728 \times 10^6 \times \frac{1}{1000} = R^3$$

$$1.728 = R^3$$

$$R^3 = (1.2)^3$$

$$R = 1.2$$

Diameter of droplets = 2.4 cm

177. The ratio of volume of two spheres is 64:125. What is the ratio of their surface areas?
- (a) 4/25 (b) 4/5
(c) 16/25 (d) 25/16

SSC MTS 20/08/2019 (Shift-III)

Ans. (c):

$$\frac{V_1}{V_2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$$

$$\frac{64}{125} = \frac{r_1^3}{r_2^3}$$

$$\left(\frac{4}{5}\right)^3 = \left(\frac{r_1}{r_2}\right)^3$$

$$\frac{r_1}{r_2} = \frac{4}{5}$$

$$\therefore \frac{SA_1}{SA_2} = \frac{4\pi r_1^2}{4\pi r_2^2}$$

$$\frac{SA_1}{SA_2} = \left(\frac{4}{5}\right)^2$$

$$\frac{SA_1}{SA_2} = \frac{16}{25}$$

178. If the surface area of two spheres is in the ratio of 49 : 25, then the ratio of their volumes will be:
- (a) 64 : 27 (b) 25 : 49
(c) 343 : 64 (d) 343 : 125

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : Let, radiuses of spheres are r_1 and r_2 respectively

$$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{49}{25}$$

$$\frac{r_1}{r_2} = \frac{7}{5}$$

$$\therefore \text{Ratio of volume} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1^3}{r_2^3} = \left(\frac{7}{5}\right)^3$$

$$= 343 : 125$$

(VI) Problems based on Prism and Pyramid

179. The base of a right prism is a triangle with sides 16 cm, 30 cm and 34 cm. Its height is 32 cm. The lateral surface area (in cm^2) and the volume (in cm^3) are, respectively:
- (a) 2560 and 7680 (b) 2688 and 7680
(c) 2624 and 7040 (d) 2560 and 6400

SSC CGL (Tier-II) 29/01/2022

Ans : (a) Given, sides of the triangle are 16cm, 30cm and 34cm and height = 32 cm.

We know that,
Lateral surface area of prism (LSA)
= Perimeter of base \times height
and, Volume of prism = Area of base \times height
Now, LSA = Perimeter of base \times height
Now, LSA = $(16 + 30 + 34) \times 32$
= 80×32
= 2560 cm^2
Again, Volume of prism = Area of base \times height
= $\frac{1}{2} \times 16 \times 30 \times 32$
= 7680 cm^3

180. The base of a pyramid is an equilateral triangle of side 10 m. If the height of the pyramid is $40\sqrt{3}$ m, then the volume of the pyramid is :
- (a) 800 m^3 (b) 900 m^3
(c) 1000 m^3 (d) 1200 m^3

SSC CGL (Tier-II)-2019-18/11/2020

Ans. (c) : Volume of pyramid = $\frac{1}{3} \times$ Area of base \times Height

$$V = \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 100 \times 40\sqrt{3}$$

\therefore $V = 1000 \text{ m}^3$

181. The base of a right prism is a square having side of 15 cm. If its height is 8 cm, then find the total surface area.
- (a) 900 cm^2 (b) 920 cm^2
(c) 940 cm^2 (d) 930 cm^2

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d) :

Total surface area = Perimeter \times Height + 2 \times Area of base

$$\begin{aligned} &= 4 \times 15 \times 8 + 2 \times 15^2 \\ &= 60 \times 8 + 2 \times 225 \\ &= 480 + 450 = 930 \text{ cm}^2 \end{aligned}$$

182. A regular pyramid has a square base. The height of the pyramid is 22 cm and side of its base is 14 cm. Volume of pyramid is equal to the volume of a sphere. What is the radius (in cm) of the sphere ?

- (a) $\sqrt[3]{49}$ (b) 7
(c) 14 (d) $\sqrt[3]{98}$

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Let, radius of sphere = R

According to the question

Volume of pyramid = Volume of sphere

$$\frac{1}{3} \times \text{Area of base} \times \text{height} = \frac{4}{3} \times \frac{22}{7} \times R^3$$

$$\frac{1}{3} \times 14 \times 14 \times 22 = \frac{4}{3} \times \frac{22}{7} \times R^3$$

$$R^3 = 7 \times 7 \times 7$$

$$R = 7 \text{ cm}$$

183. A prism has a regular hexagonal base with side 6 cm. If the total surface area of prism is $216\sqrt{3}$ cm², then what is the height (in cm) of prism ?

- (a) $3\sqrt{3}$ (b) $6\sqrt{3}$
(c) 6 (d) 3

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : Side of regular hexagonal = 6 cm.

Let height = h

\therefore Area of lateral surface of prism

= Perimeter of base \times height

$$= 6 \times 6 \times h$$

$$= 36h \text{ cm}^2$$

$$\text{Area of base of prism} = 6 \times \frac{\sqrt{3}}{4} \times 6 \times 6$$

$$= 54\sqrt{3} \text{ cm}^2$$

Total surface area of prism = area of lateral surface + 2 \times area of base

$$216\sqrt{3} = 36h + 2 \times 54\sqrt{3}$$

$$216\sqrt{3} = 36h + 108\sqrt{3}$$

$$108\sqrt{3} = 36h$$

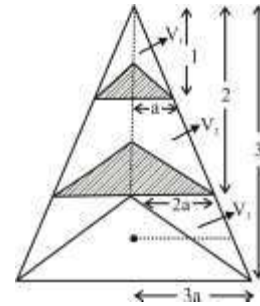
$$h = 3\sqrt{3}$$

184. A regular triangular pyramid is cut by 2 planes which are parallel to its base. The planes trisect the altitude of the pyramid. Volume of top, middle and bottom part is V_1 , V_2 and V_3 respectively. What is the value of $V_1 : V_2 : V_3$?

- (a) 1 : 8 : 27 (b) 1 : 8 : 19
(c) 2 : 9 : 27 (d) 1 : 7 : 19

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :



Let, side of base of smallest pyramid = a

Ratio of volume of, smallest, medium and largest prism =

$$\left(\frac{1}{3} \times \frac{\sqrt{3}}{4} a^2 \times 1 \right) : \frac{1}{3} \times \frac{\sqrt{3}}{4} (2a)^2 \times 2 : \frac{1}{3} \times \frac{\sqrt{3}}{4} \times (3a)^2 \times 3$$

$$= 1 : 8 : 27$$

$$\therefore V_1 : V_2 : V_3 = 1 : 7 : 19$$

185. A right triangular prism has equilateral triangle as its base. Side of the triangle is 15 cm. Height of the prism is $20\sqrt{3}$ cm. What is the volume (in cm³) of the Prism ?

- (a) 1125 (b) 6750
(c) 4500 (d) 3375

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : Volume of prism = Area of base \times height

$$= \frac{\sqrt{3}}{4} \times 15 \times 15 \times 20\sqrt{3}$$

$$= 3375 \text{ cm}^3$$

186. A regular square pyramid has side of its base 20 cm and height 45 cm is melted and recast into regular triangular pyramids of equilateral base of side 10 cm and height $10\sqrt{3}$ cm. What are the total numbers of regular triangular pyramids?

- (a) 24 (b) 20
(c) 27 (d) 28

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Volume of Pyramid built on the base of square = N \times Volume of Pyramid built on the base of the triangle

$$\frac{1}{3} \times 20 \times 20 \times 45 = N \times \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 10 \times 10 \times 10\sqrt{3}$$

$$N = 2 \times 2 \times 2 \times 3$$

$$N = 24$$

187. A right pyramid with square base has side of base 12 cm and height 40 cm. It is kept on its base. It is cut into 4 parts of equal heights by 3 cuts parallel to its base. What is the ratio of volume of the four parts ?

- (a) 1 : 8 : 27 : 70 (b) 1 : 7 : 19 : 47
(c) 1 : 7 : 19 : 37 (d) 1 : 8 : 27 : 64

Ans. (c) : ∴ Squarrel base pyramid is cut in to 4 equal part hence, Ratio of height of each part to side of base will always equal $\frac{\text{Height}}{\text{Side of base}} = \frac{40}{12} = \frac{10}{3}$

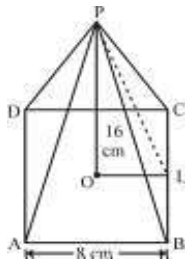
Volume of part I :
 Volume of part (I+II) :
 Volume of part (I+II+III) :
 Volume of part (I+II+III+IV)
 = $(3)^2 \times 10 : (6)^2 \times 20 : (9)^2 \times 30 : (12)^2 \times 40$
 = 1 : 8 : 27 : 64
 Part I : Part II : Part III : Part IV = 1 : 7 : 19 : 37

188. A pyramid has a square base, whose side is 8 cm. If the height of pyramid is 16 cm, then what is the total surface area (in cm^2) of the pyramid?

- (a) $64(\sqrt{17} + 1)$ (b) $31(\sqrt{13} + 1)$
 (c) $64(\sqrt{3} + 1)$ (d) $32(\sqrt{5} + 1)$

SSC CGL (Tier-II) 9-3-2018

Ans. (a):



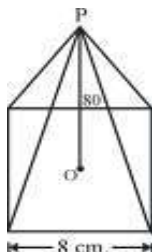
Slant height = $\sqrt{16^2 + 4^2} = 2\sqrt{20} = 4\sqrt{5} \text{ cm}$
 Total surface area of pyramid = Curved surface area + Area of base
 = $\frac{1}{2} \times \text{Perimeter of base} \times \text{Slant height} + \text{Area of base}$
 = $\frac{1}{2} \times (4 \times 8) \times 4\sqrt{5} + (8)^2$
 = $64\sqrt{5} + 64 = 64(\sqrt{5} + 1) \text{ cm}^2$

189. A prism has a square base whose side is 8 cm. The height of prism is 80 cm. The prism is cut into 10 identical parts by 9 cuts which are parallel to base of prism. What is the total surface area (in cm^2) of all the 10 parts together?

- (a) 4260 (b) 2560
 (c) 3840 (d) 3220

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :



∴ Prism is cut into 10 identical part by 9 cut parallel to base of prism.

Hence, height of each part = $\frac{80}{10} = 8 \text{ cm}$

total surface area of each part
 = Curved surface area + $2 \times$ Area of base
 = (Perimeter of base \times height) + $2 \times$ area of base
 = $(4 \times 8 \times 8) + 2 \times 8 \times 8$
 = $256 + 128 = 384 \text{ cm}^2$
 Total surface area of all 10 parts = $384 \times 10 = 3840 \text{ cm}^2$

190. A right prism has height 18 cm and its base is a triangle with sides 5 cm, 8 cm and 12 cm. What is its lateral surface area (in cm^2)?

- (a) 432 (b) 450
 (c) 486 (d) 468

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : Lateral surface area of prism = Perimeter of base \times Height
 = $(5+8+12) \times 18$
 = $25 \times 18 = 450 \text{ cm}^2$

191. The base of a right pyramid is an equilateral triangle with area $16\sqrt{3} \text{ cm}^2$. If the area of one of its lateral faces is 30 cm^2 , then its height (in cm) is:

- (a) $\sqrt{\frac{643}{12}}$ (b) $\sqrt{\frac{739}{12}}$
 (c) $\sqrt{\frac{611}{12}}$ (d) $\sqrt{\frac{209}{12}}$

SSC CGL (Tier-II) 13-09-2019

Ans. (c) :

Area of equilateral triangle = $16\sqrt{3} \text{ cm}^2$

$$\frac{\sqrt{3}}{4} a^2 = 16\sqrt{3}$$

$$a^2 = 64$$

$$a = 8 \text{ cm}$$

Curved surface area of right pyramid = $\frac{1}{2} \times$ perimeter of base \times slant height

$$3 \times 30 = \frac{1}{2} \times (3 \times 8) \times \ell$$

$$\ell = \frac{15}{2} \text{ cm}$$

$$\text{Radius of incircle } (r) = \frac{a}{2\sqrt{3}} = \frac{8}{2\sqrt{3}} = \frac{4}{\sqrt{3}}$$

$$h^2 = \ell^2 - r^2 = \frac{225}{4} - \frac{16}{3} = \frac{675 - 64}{12} = \frac{611}{12}$$

$$h = \sqrt{\frac{611}{12}} \text{ cm}$$

192. The base of a right pyramid is an equilateral triangle with side 8 cm, and the height of the pyramid is $24\sqrt{3}$ cm. The volume (in cm^3) of the pyramid is :
- (a) 384 (b) 576
(c) 1152 (d) 480

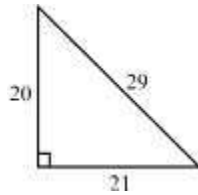
SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Area of equilateral triangle $= \frac{\sqrt{3}}{4}(a)^2$
 $= \frac{\sqrt{3}}{4} \times (8)^2 = 16\sqrt{3}\text{cm}$
 Volume of pyramid $= \frac{1}{3} \times \text{Area of base} \times \text{height}$
 $= \frac{1}{3} \times 16\sqrt{3} \times 24\sqrt{3} = 384 \text{ cm}^3$

193. The base of a right prism is a triangle with sides 20 cm, 21 cm and 29 cm. If its volume is 7560 cm^3 , then its lateral surface area (in cm^2) is:
- (a) 2448 (b) 2556
(c) 2520 (d) 2484

SSC CGL (Tier-II) 12-09-2019

Ans. (c) :



Volume of prism = Area of base \times height
 $7560 = \frac{1}{2} \times 20 \times 21 \times H$
 $H = \frac{7560 \times 2}{20 \times 21} = 36$
 Perimeter = $20 + 21 + 29 = 70 \text{ cm}$
 Lateral surface area = perimeter \times height
 $= 70 \times 36$
 $= 2520 \text{ cm}^2$

194. The volume of a right pyramid is $45\sqrt{3}$ and its base is an equilateral triangle with side 6 cm. What is the height (in cm) of the pyramid?
- (a) 20 (b) 15
(c) 12 (d) 18

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

Volume of equivalent pyramid $= \frac{1}{3} \times \text{Area of base} \times$
 height $45\sqrt{3} = \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 6^2 \times \text{height}$
 height = 15 cm

195. The base of right prism is a trapezium whose parallel sides are 11 cm and 15 cm and the distance between them is 9 cm. If the volume of the prism is 1731.6 cm^3 , then the height (in cm) of the prism will be :

- (a) 14.2 (b) 14.8
(c) 15.6 (d) 15.2

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

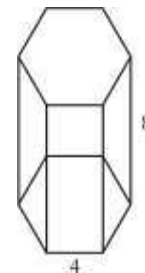
Area of base of given right prism $= \frac{1}{2} \times (11+15) \times 9$
 $= 117 \text{ cm}^2$
 Base area of prism \times height = 1731.6
 height $= \frac{1731.6}{117}$
 $= 14.8 \text{ cm}$

196. A regular hexagonal base prism has height 8 cm and side of base is 4 cm. What is the total surface area (in cm^2) of the prism ?
- (a) $54(3+\sqrt{3})$ (b) $36(3+\sqrt{3})$
(c) $48(4+\sqrt{3})$ (d) $24(4+\sqrt{3})$

SSC CGL (Tier-II) 18-02-2018

Ans. (c) :

Total surface area of prism
 $= \text{Perimeter of base} \times \text{height} + 2$
 $\times \text{Area of base}$
 $= (6 \times 4) \times 8 + 2 \times \frac{3\sqrt{3}}{2} \times (4)^2$
 $= 192 + 48\sqrt{3}$
 $= 48(4 + \sqrt{3}) \text{ cm}^2$



197. The volume of prism is 288 cm^3 and height is 24 cm. The base area (in cm^2) of the prism is:
- (a) 10 (b) 12
(c) 15 (d) 14

SSC MTS 13/08/2019

Ans. (b) : Volume of prism = Area of base \times height
 $288 = \text{Area of base} \times 24$
 Area of base $= \frac{288}{24}$
 $= 12 \text{ cm}^2$

(VII) Miscellaneous

198. A cylindrical vessel of radius 30 cm and height 42 cm is full of water. Its contents are emptied into a rectangular tub of length 75 cm and breadth 44 cm. The height (in cm) to which the water rises in the tub is : (take $\pi = \frac{22}{7}$)
- (a) 45 (b) 36
(c) 40 (d) 30

SSC CGL (Tier-I)-2019 - 04/03/2020

Ans. (b) : Let level of water rises to h cm height in tub
 Volume of cylindrical vessel = volume of water in cuboid shape vessel.

$$\frac{22}{7} \times 30 \times 30 \times 42 = 75 \times 44 \times h$$

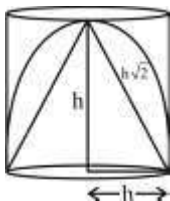
$$h = \frac{22 \times 30 \times 30 \times 6}{75 \times 44} = 36 \text{ cm}$$

199. Three toys are in a shape of cylinder, hemisphere and cone. The three toys have same base. Height of each toy is $2\sqrt{2}$ cm. What is the ratio of the total surface areas of cylinder, hemisphere and cone respectively ?

- (a) $4 : 3 : [(\sqrt{2}) + 1]$ (b) $4 : 3 : [2 + (\sqrt{2})]$
 (c) $4 : 3 : 2\sqrt{2}$ (d) $2 : 1 : (1 + \sqrt{2})$

SSC CGL (Tier-II) 18-02-2018

Ans. (a) :



If we consider the height h instead of $2\sqrt{2}$.
 Ratio of total surface area of cylinder hemisphere and cone.

$$= 2\pi r(r+h) : 3\pi r^2 : \pi r(r+l)$$

$$= 2\pi h \times 2h : 3\pi h^2 : \pi h(h+h\sqrt{2})$$

$$= 4 : 3 : (1 + \sqrt{2})$$

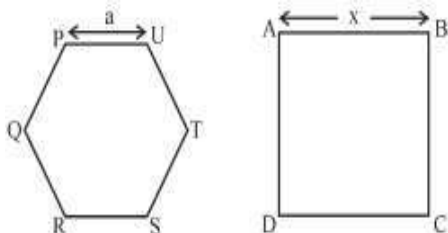
$$= 4 : 3 : [(\sqrt{2}) + 1]$$

200. The area of a regular hexagon is equal to the area of the square. What is the ratio of the perimeter of the regular hexagon to the perimeter of square?

- (a) $\sqrt{6\sqrt{3}} : \sqrt{3\sqrt{6}}$ (b) $2\sqrt{3} : \sqrt{6\sqrt{2}}$
 (c) $\sqrt{6\sqrt{3}} : 2$ (d) $\sqrt{6\sqrt{3}} : 2\sqrt{3}$

SSC CGL (Tier-II) 18-02-2018

Ans. (d) :



According to the question
 PQRSTU Area of = ABCD

$$6 \times \frac{\sqrt{3}}{4} \times a^2 = x^2$$

$$\frac{a^2}{x^2} = \frac{2}{3\sqrt{3}}$$

$$\frac{a}{x} = \frac{\sqrt{2}}{\sqrt{3\sqrt{3}}}$$

$$\frac{\text{Perimeter of hexagon}}{\text{Perimeter of square}} = \frac{6 \times \sqrt{2}}{4 \times \sqrt{3\sqrt{3}}}$$

$$= \frac{\sqrt{6\sqrt{3}}}{2\sqrt{3}}$$

201. A solid cylinder of base radius 12 cm and height 15 cm is melted and recast into n toys each in the shape of a right circular cone of height 9 cm mounted on a hemisphere of radius 3 cm. The value of n is :

- (a) 27 (b) 64
 (c) 54 (d) 48

SSC CGL (Tier-II) 13-09-2019

Ans. (d) :

Volume of toys

$$= \frac{1}{3} \pi r^2 h + \frac{2}{3} \pi r^3$$

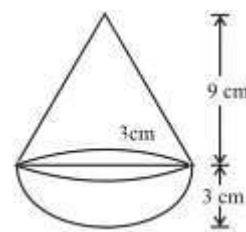
$$= \frac{1}{3} \pi r^2 (h + 2r)$$

$$= \frac{1}{3} \pi \times 3 \times 3 (9 + 2 \times 3)$$

$$= 3\pi \times 15 = 45\pi \text{ cm}^3$$

Volume of cylinder = $\pi \times 12 \times 12 \times 15 \text{ cm}^3$

$$\therefore n = \frac{\pi \times 12 \times 12 \times 15}{45\pi} = 48$$



202. A field roller, in the shape of a cylinder, has a diameter of 1 m and length of $1\frac{1}{4}$ m. If the speed at which the roller rolls is 14 revolutions per minute, then the maximum area (in m^2) that it can roll in 1 hour is :

(Take $\pi = \frac{22}{7}$)

- (a) 3560 (b) 3960
 (c) 3600 (d) 3300

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : Radius = $\frac{\text{Diameter}}{2} = \frac{1}{2} \text{ m}$

Length = $\frac{5}{4} \text{ m}$

Number of round in one hour = $14 \times 60 = 840$ rolled

Area rolled in one round = $2\pi rh$

$$\therefore \text{total rolled area in one hour} = 840 \times 2 \times \frac{22}{7} \times \frac{1}{2} \times \frac{5}{4}$$

$$= 3300 \text{ m}^2$$

203. A 9 cm solid metallic cube and a solid metallic cuboid having dimensions 5 cm, 13 cm, 31 cm are melted and recast into a single cube. What is the total surface area (in cm^2) of the new cube?

- (a) 865 (b) 1176
(c) 1362 (d) 2744

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : Let, side of new cube = x cm
According to the question
Volume of cube + volume of cuboid = volume of new cube
 $(9)^3 + 5 \times 13 \times 31 = x^3$
 $729 + 2015 = x^3$
 $x^3 = 2744 \Rightarrow x = 14 \text{ cm}$
Total surface area of new cube = $6a^2$
 $= 6 \times 196 = 1176 \text{ cm}^2$

204. A solid metallic sphere of radius 6.3cm is melted and recast into a right circular cone of height 25.2cm. What is the ratio of the diameter of the base to the height of the cone?
(a) 2 : 1 (b) 2 : 3
(c) 3 : 2 (d) 1 : 2

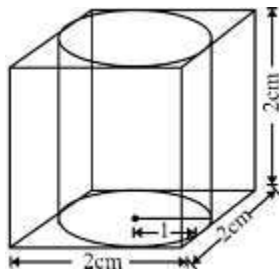
SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Volume of solid metallic sphere = volume of cone
 $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r_1^2 h$
 $4 \times 6.3 \times 6.3 \times 6.3 = r_1^2 \times 25.2$
 $r_1^2 = \frac{4 \times 6.3 \times 6.3 \times 6.3}{25.2}$
 $r_1^2 = 6.3 \times 6.3$
 $r_1 = 6.3 \text{ cm}$
 $\frac{\text{Diameter of base of cone}}{\text{Height}} = \frac{12.6}{25.2} = 1:2$

205. A right circular cylinder of maximum possible size is cut out from a solid wooden cube. The remaining material of the cube is what percentage of the original cube? (Take $\pi = 3.14$)
(a) 22.8 (b) 21.8
(c) 22.4 (d) 21.5

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d)



Let side of cube = 2cm
Volume of remaining material of cube
 $= (2)^3 - 3.14 \times 1 \times 1 \times 2$
 $= 8 - 6.28 = 1.72 \text{ cm}^3$
Required % = $\frac{1.72}{8} \times 100 = 21.5\%$

206. The volume of a tank is 72 cubic metres. Water is poured into it at the rate of 60 litres per minute. How much time it take to fill the tank?
(a) 20 hours (b) 12 hours
(c) 6 hours (d) 10 hours

SSC CHSL –16/10/2020 (Shift-II)

Ans. (a) : $\because 1 \text{ m}^3 = 1000 \text{ Litre}$
 $\therefore 72 \text{ m}^3 = 72000 \text{ Litre}$
 \therefore Water fill in 1 minute = 60Litre
 \therefore Water fill in 60 minute or 1 hour = $60 \times 60 \text{ litre}$
 $= 3600 \text{ litre}$
 \therefore Time taken to fill the 3600 litre water = 1hour
 \therefore Time taken to fill 72000 litre = 20 hour

207. The height of the cylindrical bucket is 27cm and base radius is 48cm and the bucket is filled with sand. When the bucket is emptied then a pile of cone of 54 cm radius is formed. What is the height of the pile (in cm)?
(a) 32 (b) 56
(c) 54 (d) 64

SSC MTS 21/08/2019 (Shift-III)

Ans. (d) :

$$\pi r^2 h = \frac{1}{3} \pi R^2 H$$

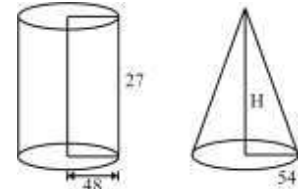
$$\pi (48)^2 \times 27 = \frac{1}{3} \pi (54)^2 H$$

$$48 \times 48 \times 27 = \frac{1}{3} \times 54 \times 54 \times H$$

$$48 \times 48 = 2 \times 18 \times H$$

$$H = \frac{48 \times 48}{36}$$

$$H = 64 \text{ cm}$$



208. The length of a ribbon is l which is to be wrapped up on a curved surface of a perpendicular circular cylinder. If the circumference of the base is c then ribbon is how many times wrapped upon the cylinder?

- (a) $\frac{l}{4c}$ (b) $\frac{l}{c}$
(c) $\frac{l}{2c}$ (d) $\frac{l}{2c}$

SSC MTS 05/08/2019 (Shift-III)

Ans. (b) :

Let, ribbon is wrapped n time on cylinder
Let, radius of cylinder is r
and $2\pi r = c$
and $2\pi r \times n = l$
 $c \times n = l$
 $n = l/c$

(I) Problems based on Divisibility Rule

1. Which of the following numbers is NOT divisible by 75?

- (a) 117975 (b) 275475
(c) 163750 (d) 666600

SSC CHSL 07/06/2022 (Shift- II)

Ans. (c) : From question,
 $75 = 25 \times 3$

Divisibility of 25 : If number ends with 00, 25, 50 or 75 then the number is divisible by 25.

Divisibility of 3: If sum of all digits of a number is multiple of 3 then the number is divisible by 3.

Except option (c), all options follow both rules. Hence, option (c) is not divisible by 75.

2. $5^{71} + 5^{72} + 5^{73} + 5^{74} + 5^{75}$ is divisible by which of the following number.

- (a) 71 (b) 69
(c) 89 (d) 73

SSC CGL (Tier-II) 03/02/2022

Ans. (a) : $5^{71} + 5^{72} + 5^{73} + 5^{74} + 5^{75}$
 $5^{71} (1 + 5 + 5^2 + 5^3 + 5^4)$
 $5^{71} (1 + 5 + 25 + 125 + 625)$
 $5^{71} (781)$
 $5^{71} (71 \times 11)$
Hence it is divisible by 71.

3. If a 10-digit number 75462A97B6 is divisible by 72, then the value of $\sqrt{8A - 4B}$ is:

- (a) $\sqrt{30}$ (b) $\sqrt{27}$
(c) $\sqrt{21}$ (d) $\sqrt{28}$

SSC CGL (Tier-II) 29/01/2022

Ans. (d) : A number which is divisible by 72, then it must be divisible by 8 and 9.

Divisibility Rule of 8—Last three digits of the number should be perfectly divisible by 8.

Divisibility Rule of 9— Sum of digits of the number must be divisible by 9.

For the 10-digit number 75462A97B6,
 $B = 3$

$\therefore 736$ is divisible by 8.

Now, sum of digits = $7 + 5 + 4 + 6 + 2 + A + 9 + 7 + 3 + 6 = 49 + A$

Then, $A = 5$ [$\because 54$ is divisible by 9]

$\therefore A = 5, B = 3$

Now, $\sqrt{8A - 4B}$

$\Rightarrow \sqrt{40 - 12}$

$\Rightarrow \sqrt{28}$

4. If a 10-digit number 54726x79y6 is divisible by 72, then what is the value of $5x - 3y$ for the least value of y?

- (a) 17 (b) 16
(c) 19 (d) 23

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans. (b) : The given number 54726x79y6 is divisible by 72. We can write $72 = 8 \times 9$.

By the divisibility rule of 8,

Last three digits of the number 9y6 is divisible by 8 if $y = 3$.

The 10-digit number 54726x7936 is divisible by 9 if the sum of the digit is divisible by 9 so,

$$\Rightarrow 5 + 4 + 7 + 2 + 6 + x + 7 + 9 + 3 + 6 = 49 + x$$

For $x = 5$, we get the resultant number divisible by 9.

$$\therefore \text{The value of } 5x - 3y = 5 \times 5 - 3 \times 3 = 16$$

5. How many numbers are there from 200 to 800 which are neither divisible by 5 nor by 7?

- (a) 410 (b) 407
(c) 413 (d) 411

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d) : Number divisible by 5 between 200 to 800
205, 210, 215 795

$$n = \frac{\ell - a}{d} + 1$$

$$= \frac{590}{5} + 1 = 119$$

Numbers divisible by 7 between 200 to 800

203, 210, 217 798

$$n = \frac{798 - 203}{7} + 1 = 86$$

Number divisible by 35 between 200 to 800

210, 245, 280 770

$$n = \frac{770 - 210}{35} + 1 = 17$$

Hence on removing numbers which are divisible by both 5 and 7 = $119 + 86 - 17 = 188$

Required number = $599 - 188 = 411$

6. Which of the following numbers is divisible by 3?

- (a) 8703572 (b) 8703593
(c) 8765001 (d) 8703541

SSC CHSL –15/10/2020 (Shift-III)

Ans. (c) :

Rule of divisibility by 3— If the sum of the all digits of the given number is exactly divisible by 3 then that number will be divisible by 3

From option (c),

$$= \frac{8 + 7 + 6 + 5 + 0 + 0 + 1}{3} = \frac{27}{3} = 9$$

Hence, the number 8765001 is exactly divisible by 3.

7. What is the greatest five-digit number that is completely divisible by 8, 15, 16, 21 and 5?

- (a) 92680 (b) 99120
(c) 95760 (d) 98320

SSC CHSL 04/08/2021 (Shift-I)

Ans. (b) : Greatest five digit number = 99999
LCM of 8, 15, 16, 21 and 5 = 1680

$$\begin{array}{r} 1680) 99999 \text{ (59)} \\ \underline{8400} \\ 15999 \\ \underline{15120} \\ 879 \end{array}$$

Required number = (99999 - 879) = 99120

8. If the nine-digit number $9m2365n48$ is completely divisible by 88, what is the value of $(m^2 \times n^2)$, for the smallest value of n , where m and n are natural numbers?

- (a) 36 (b) 64
(c) 32 (d) 20

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (b) The given number $9m2365n48$ is divisible by 88. We can write 88 as 8×11 .

By the divisibility rule of 8, we have $n48$ is divisible by 8.

For $n = 2$ (smallest value of n), we get the resultant number divisible by 8.

And for $n = 2$, we will check the divisibility of 11.

$$\Rightarrow (9 + 2 + 6 + 2 + 8) - (m + 3 + 5 + 4)$$

$$\Rightarrow 27 - (m - 12)$$

$$\Rightarrow 15 - m$$

For $m = 4$, we get the resultant number divisible by 11.

$$\begin{aligned} \therefore \text{The value of } (m^2 \times n^2) &= 4^2 \times 2^2 \\ &= 16 \times 4 \\ &= 64 \end{aligned}$$

9. If $8A5146B$ is divisible by 88, then what is the value of AB ?

- (a) 15 (b) 12
(c) 9 (d) 20

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (b) The given number $8A5146B$ is divisible by 88, so it must be perfectly divisible by both 8 and 11.

By the divisibility rule of 8, we have $46B$ is divisible by 8.

For $B = 4$, we get the resultant number divisible by 8.

And for $B = 4$, we will check the divisibility of 11.

$$= (8 + 5 + 4 + 4) - (A + 1 + 6)$$

$$= 21 - A - 7$$

$$= 14 - A$$

For $A = 3$, we get the resultant number divisible by 11.

$$\therefore \text{The value of } AB = 3 \times 4 = 12$$

10. If $8A5146B$ is divisible by 88, then what is the value of A^B ?

- (a) 27 (b) 64
(c) 81 (d) 12

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (c) The given number $8A5146B$ is divisible by 88.

So the number must be divisible by 8 and 11.

By the divisibility rule of 8, we have $46B$ is divisible by 8.

For $B = 4$, we get the resultant number divisible by 8.

And for $B = 4$, we will check the divisibility of 11

$$\Rightarrow (8 + 5 + 4 + 4) - (A + 1 + 6)$$

$$\Rightarrow 21 - A - 7$$

$$\Rightarrow 14 - A$$

For $A = 3$, we get the resultant number divisible by 11.

$$\therefore \text{The value of } A^B = 3^4 = 81$$

11. If a nine digit number $468x5138y$ is divisible by 72, then the value of $\sqrt{4x + 3y}$ is:

- (a) 8 (b) 9
(c) 12 (d) 6

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (d) Since the number $468x5138y$ is divisible by 72 then it must be divisible by both 8 and 9.

If any number is perfectly divisible by 8, then last three digits should be divisible by 8.

\therefore For $y = 4$, 384 is divisible by 8.

Again, if any number is perfectly divisible by 9 then the sum of its digits must be divisible by 9.

$$\Rightarrow 4 + 6 + 8 + x + 5 + 1 + 3 + 8 + 4$$

$$\Rightarrow 39 + x$$

$$\Rightarrow x = 6 \text{ [}\because 45 \text{ is divisible by 9]}$$

$$\text{Now, } \sqrt{4x + 3y}$$

$$\Rightarrow \sqrt{4 \times 6 + 3 \times 4}$$

$$\Rightarrow \sqrt{36}$$

$$\Rightarrow 6$$

12. Find the greatest number $234a5b$, which is divisible by 22, but NOT divisible by 5.

- (a) 234058 (b) 234850
(c) 234652 (d) 374151

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

$$\text{Ans. (c) } \frac{234a5b}{22} = \frac{234a5b}{2 \times 11}$$

Divisibility rule of 2 \rightarrow A number whose unit digit is 0 or even number

$$\therefore \frac{5b}{2} = \frac{52}{2} = 21$$

$$\therefore b = 2$$

Divisibility rule of 11 \rightarrow The difference of sum of even and odd places should be zero or multiple of 11.

$$\therefore (2 + 4 + 5) - (3 + a + b) = 0$$

$$\Rightarrow 11 - 5 - a = 0$$

$$\Rightarrow 6 - a = 0$$

$$\therefore a = 6$$

Hence, the greatest number = 234652

13. If the 9-digit number $7x79251y8$ is divisible by 36, what is the value of $(10x^2 - 3y^2)$ for the largest possible value of y ?

- (a) 490 (b) 289
(c) 192 (d) 298

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (d) The given number $7x79251y8$ is divisible by 36

Divisibility rule of 4 - A number is divisible by 4 if its last two digits are divisible by 4.

Divisibility rule of 9 - A number is divisible by 9 if sum of all its digits are divisible by 9

The number $7x79251y8$ is divisible by 4 if $y8$ is divisible by 4, if $y = 0, 4$ or 8

For maximum value of y ,
 $y = 8$

$7x7925188$ is divisible by 9 if, sum of its digits must be divisible by 9.

$$\Rightarrow 7 + x + 7 + 9 + 2 + 5 + 1 + 8 + 8$$

$$\Rightarrow 47 + x$$

For $x = 7$, we get the resultant number divisible by 9

$$\begin{aligned} \therefore \text{The value of } (10x^2 - 3y^2) &= 10(7)^2 - 3(8)^2 \\ &= 490 - 192 \\ &= 298 \end{aligned}$$

14. If $8A5146B$ is divisible by 88, then what is the value of B^A ?

- (a) 81 (b) 64
(c) 15 (d) 12

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(b) Divisibility rule of 8 :- If the last 3 digits of number are divisible by 8 then the number is divisible by 8.

Divisibility rule of 11:- If difference between sum of even place value and odd place value is multiple of 11 or 0 then the number is divisible by 11.

$$8A5146B \rightarrow \frac{46B}{8} \rightarrow \boxed{B=4}$$

$$\Rightarrow 8A51464$$

$$\text{And, } (8 + 5 + 4 + 4) - (A + 1 + 6) = 11$$

$$\Rightarrow 21 - A - 7 = 11$$

$$\Rightarrow 21 - 7 - 11 = A$$

$$\Rightarrow 21 - 18 = A$$

$$\therefore \boxed{A=3}$$

$$\therefore \text{Value of } B^A = 4^3 = 64$$

Hence, option (b) is correct.

15. If the five-digit number $672xy$ is divisible by 3, 7 and 11, then what is the value of $(6x + 5y)$?

- (a) 23 (b) 24
(c) 16 (d) 17

SSC CHSL 05/08/2021 (Shift-I)

Ans. (d) : $672xy$ is divisible by 3, 7 and 11.

$$\therefore \frac{6+7+2+x+y}{3} = \frac{15+(x+y)}{3}$$

$$x + y = 3, 6$$

$$x + y = 3 \quad \dots(i)$$

$$\frac{(6+2+y)-(7+x)}{11} = 0$$

$$8 + y - 7 - x = 0$$

$$x - y = 1 \quad \dots(ii)$$

On solving eqⁿ(i) and eqⁿ(ii),

$$x = 2, \quad y = 1$$

$$\therefore (6x + 5y) = (6 \times 2 + 5 \times 1) = 12 + 5 = 17$$

16. If the nine-digit number $23541y49x$ is divisible by 72, then $(3x + 5y) : (5x + 3y)$ is equal to:

- (a) 3 : 4 (b) 7 : 9
(c) 9 : 7 (d) 4 : 3

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : If $23541y49x$ is divisible by 72 that means it must be divisible by both 8 and 9.

$$\text{Now, } \frac{49x}{8} \Rightarrow x = 6$$

$$\text{And, } \frac{2+3+5+4+1+y+4+9+6}{9} \Rightarrow \frac{34+y}{9} \Rightarrow y = 2$$

According to the question,

$$\frac{3x + 5y}{5x + 3y} = \frac{3 \times 6 + 5 \times 2}{5 \times 6 + 3 \times 2} = \frac{28}{36} = \frac{7}{9}$$

$$\Rightarrow 7 : 9$$

17. Find the greatest value of b so that $30a68b$ ($a > b$) is divisible by 11 :

- (a) 4 (b) 6
(c) 3 (d) 9

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (c) : Divisibility rule of 11 : If the difference between the sum of the digits at the odd and the even places is equal to 0 or multiple of 11, then the number is divisible by 11.

$$\therefore (3 + a + 8) - (0 + 6 + b) = 0 \text{ or } 11$$

$$\Rightarrow 11 + a - 6 - b = 0 \text{ or } 11$$

$$\Rightarrow 5 + a - b \neq 0 \quad [a > b]$$

$$\therefore 5 + a - b = 11$$

$$\Rightarrow a - b = 6$$

$$\text{For, } a = 9, b = 3 \therefore [a > b]$$

$$\therefore 9 - 3 = 6$$

Hence, the greatest value of b is 3.

18. If the number $34k56k$ is divisible by 6, then what will be the largest value of k ?

- (a) 6 (b) 8
(c) 9 (d) 4

SSC CHSL 06/08/2021 (Shift-I)

Ans. (a) : Divisibility rule of 2: If a number is even or a number whose last digit is an even number i.e. 2, 4, 6, 8 including 0, then it is always completely divisible by 2.

Divisibility rule of 3: Divisibility rule for 3 states that a number is completely divisible by 3 if the sum of its digits is divisible by 3.

According to the question,

$$\frac{3+4+5+6+2k}{3} = \frac{18+2k}{3}$$

On taking $k=6$, the number is divisible by both 2 and 3.

So, the maximum value of k will be 6.

19. In the 5-digit number $593ab$ is divisible by 3, 7 and 11, then what is the value of $(a^2 - b^2 + ab)$?

- (a) 35 (b) 31

- (c) 25 (d) 29

SSC CGL–(Tier-I) 23/08/2021 (Shift I)

Ans. (d) : $3 \times 7 \times 11 = 231$

We take maximum value of ab i.e. 99

$$231) 59399 \text{ (257)}$$

$$\begin{array}{r} 462 \\ \underline{1319} \\ 1155 \\ \times 1649 \\ \times 1617 \\ \times \times 32 \end{array}$$

Hence, required number which is divisible by 3, 7 and 11 = $59399 - 32$

$$= 59367$$

$$\Rightarrow a = 6, b = 7$$

$$\therefore a^2 - b^2 + ab = 36 - 49 + 42 = 29$$

20. The sum of 3-digit numbers abc, cab and bca is not divisible by :

- (a) 37 (b) 3
(c) 31 (d) a+b+c

SSC CGL–(Tier-I) 24/08/2021 (Shift I)

Ans. (c) : Let three digit number = 123

$$a = 1$$

$$b = 2$$

$$\text{and } c = 3$$

$$\therefore 123 + 312 + 231 = 666$$

Hence, 666 is divisible by 37, 3 and also $a + b + c = 1 + 2 + 3 = 6$

But it is not divisible by 31.

21. If the seven-digit number 94x29y6 is divisible by 72, then what is the value of $(2x+3y)$ for $x \neq y$?

- (a) 35 (b) 37
(c) 23 (d) 21

SSC CGL–(Tier-I) 17/08/2021 (Shift I)

Ans. (b) : \because Number is divisible by 72

\therefore Number should be divisible by both 8 and 9.

For divisible by 9 \Rightarrow Sum of all digits are divisible by 9

$$\frac{9 + 4 + x + 2 + 9 + y + 6}{9} = \frac{30 + x + y}{9}$$

For divisible by 8 \Rightarrow Last three digits of a number are divisible by 8.

$$y = 3, 7$$

$$\because x \neq y$$

$$\therefore y = 7 \text{ and } x = 8$$

$$\therefore 2x + 3y = (2 \times 8) + (3 \times 7) = 37$$

22. If the 8-digit number 888x53y4 is divisible by 72, then what is the value of $(7x + 2y)$, for the maximum value of y?

- (a) 19 (b) 23
(c) 27 (d) 15

SSC CGL–(Tier-I) 18/08/2021 (Shift I)

Ans. (b) : Divisibility rule of 8 \rightarrow The last three digits of the given number must be divisible by 8.

Divisibility rule of 9 \rightarrow The sum of the digits of the given number must be divisible by 9.

From question,

$$888x53y4$$

$$y = 8 \text{ (Maximum value)}$$

$$888x5384$$

$$8 + 8 + 8 + x + 5 + 3 + 8 + 4$$

$$9$$

$$= \frac{44 + x}{9} \text{ (On putting } x = 1)$$

$$(7x + 2y) = (7 \times 1 + 2 \times 8)$$

$$= (7 + 16)$$

$$= 23$$

23. If a five digit number 247xy is divisible by 3, 7 and 11, then what is the value of $(2y-8x)$?

- (a) 11 (b) 17
(c) 6 (d) 9

SSC CGL–(Tier-I) 13/08/2021 (Shift II)

Ans. (c) : If a five digit number 247xy is divisible by 3, 7 and 11.

$$\text{LCM of } 3, 7, 11 = 231$$

According to the question,

Largest possible value of 247xy is 24799

Now, When we divide 24799 by 231 we get 82 as a remainder,

$$\text{Required Number} = 24799 - 82$$

$$= 24717$$

$$\text{Now } x = 1 \text{ and } y = 7$$

$$\therefore (2y - 8x) = (2 \times 7 - 8 \times 1)$$

$$= 6$$

24. If the nine-digit number 7p5964q28 is completely divisible by 88, what is the value of $(p^2 - q)$, for the largest value of q, where p and q are natural numbers?

- (a) 81 (b) 9
(c) 0 (d) 72

SSC CGL–(Tier-I) 16/08/2021 (Shift II)

Ans. (d) : The given number is divisible by 88 then number should be divisible by both 8 & 11.

$$\frac{q28}{8} \Rightarrow q = 9 \text{ (largest possible value)}$$

Again, number should be divisible by 11

$$= (7 + 5 + 6 + 9 + 8) - (p + 9 + 4 + 2)$$

$$= 20 - p$$

$(20 - p)$ should be divisible by 11 then for $p = 9$ this condition will satisfy.

So, possible value of $p = 9$

$$\therefore p^2 - q = 81 - 9 = 72$$

25. If the 5-digit number 688xy is divisible by 3, 7 and 11, then what is the value of $(5x + 3y)$?

- (a) 36 (b) 23
(c) 43 (d) 39

SSC CGL–(Tier-I) 18/08/2021 (Shift II)

Ans. (d) : LCM of 3, 7, 11 = $3 \times 7 \times 11$
 $= 21 \times 11$

=231

The 5 digit number = 688xy
 Largest possible 5- digit number = 68899
 When we divide 68899 by 231, we get 61 as a remainder.
 Now, required number
 $688xy = [68899 - 61]$
 $688xy = 68838$
 $x=3$ and $y = 8$
 The value of $(5x+3y)$
 $= 5 \times 3 + 3 \times 8$
 $= 15 + 24$
 $= 39$

26. If a number P is divisible by 2 and another number Q is divisible by 3, then which of the following is true ?

- (a) P + Q is divisible by 6
 (b) P + Q is divisible by 5
 (c) P × Q is divisible by 6
 (d) P × Q is divisible by 5

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (c) : If a number is divisible by 2 and another number is divisible by 3 then the number satisfies the divisibility rule of 6.

∴ P × Q is divisible by 6 satisfied all the conditions.

Note: P + Q is divisible by 5.

Some condition is satisfied but not all. That's why we have not considered option (b) is the correct answer.

Hence, option (c) is correct.

27. The number 823p2q is exactly divisible by 7, 11 and 13. What is the value of (p-q) ?

- (a) 8 (b) 5
 (c) 11 (d) 3

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (b) : LCM of 7, 11 and 13 = 1001

$$\text{Given number} = \frac{823p2q}{1001}$$

$$p = 8$$

$$q = 3$$

$$\text{Hence, } (p - q) = 8 - 3 = 5$$

28. The six-digit number 537xy5 is divisible by 125. How many such six-digit numbers are there?

- (a) 4 (b) 2
 (c) 3 (d) 5

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : Divisibility rule of 125—The number formed by the hundred, tens and units digits of the number must be divisible by 125.

∴ If we multiply last 3 digit number with the even number i.e. 2, 4, 6 and 8 we get 0 at the unit digit which is not possible. So, we can multiply last three digit numbers by odd number we need the last digit to be 5.

$$125 \times 1 = 125 \text{ (acceptable)}$$

$$125 \times 2 = 250$$

$$125 \times 3 = 375 \text{ (acceptable)}$$

$$125 \times 4 = 500$$

$$125 \times 5 = 625 \text{ (acceptable)}$$

$$125 \times 6 = 750$$

$$125 \times 7 = 875 \text{ (acceptable)}$$

$$125 \times 8 = 1000$$

We cannot multiply by 9 because it makes four-digit number.

So, there are 4 such six digit numbers.

29. What is the sum of all the possible values of k for which a seven-digit number 23k567k is divisible by 3?

- (a) 15 (b) 3
 (c) 109 (d) 16

SSC CHSL 10/08/2021 (Shift-I)

Ans. (a) : Divisibility rule of 3: Sum of all digits should be divisible by 3.

$$\frac{2+3+k+5+6+7+k}{3} = \frac{23+2k}{3}$$

∴ k = 2, 5, 8 (all possible value)

$$\text{Sum of all possible value of } k = 2+5+8 = 15$$

30. What is the product of the largest and the smallest possible values of m for which a number 5m83m4m1 is divisible by 9?

- (a) 10 (b) 16
 (c) 40 (d) 80

SSC CHSL 12/04/2021 (Shift-I)

$$\text{Ans : (b) } 5m83m4m1 = \frac{21+3m}{9}$$

(Minimum and maximum values of m are 2, 8 respectively)

$$\text{Required product} = 2 \times 8 = 16$$

31. n = 475AB is a positive integer whose tens and units digits are A and B, respectively. If n is divisible by 5, 8 and 9, then what is the value of (10A + B)?

- (a) 20 (b) 35
 (c) 15 (d) 60

SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) : ∴ The given number is divisible by 5, 8 and 9.

Hence, number is divisible by $5 \times 8 \times 9 = 360$.

On solving this type question we take AB = 99 (i.e. maximum value)

$$\text{Hence, number which is divisible by 360} = 47599 - 79 = 47520$$

$$\therefore A = 2, B = 0$$

$$10A + B = 20 + 0 = 20$$

32. If the five-digit number 457ab is divisible by 3, 7 and 11, then what is the value of $a^2 + b^2 - ab$?

- (a) 24 (b) 36
 (c) 33 (d) 49

SSC CHSL 12/08/2021 (Shift-I)

Ans. (d) : The 5-digit number 457ab is divisible by 3, 7 and 11.

38. If an eleven-digit number $6578x43267y$ is divisible by 72, then the value of $\sqrt{x+6y}$ will be:
- (a) 4 (b) 5
(c) 3 (d) 6

SSC CHSL 16/04/2021 (Shift-III)

Ans.(a) : The given 11-digit number $6578x43267y$ is divisible by 72 it means that it is also divisible by both 8 and 9.

∴ By divisibility rule of 8,

$$\frac{67y}{8} \Rightarrow \boxed{y=2}$$

By divisibility rule of 9,

$6578x432672$

$$\frac{6+5+7+8+x+4+3+2+6+7+2}{9}$$

$$\Rightarrow \frac{50+x}{9}$$

For, $x = 4$, 54 is divisible by 9

$$\Rightarrow \boxed{x=4}$$

$$\text{So, } \sqrt{x+6y} = \sqrt{4+6 \times 2} = \sqrt{4+12} = \sqrt{16} = 4$$

Hence, option (a) is correct.

39. If a nine-digit number $1263487xy$ is divisible by both 8 and 5, then the greatest possible values of x and y , respectively are:

- (a) 6 and 0 (b) 2 and 5
(c) 6 and 5 (d) 2 and 0

SSC CHSL 12/04/2021 (Shift-III)

Ans : (a) The given 9-digit number $1263487xy$ is divisible by both 8 and 5.

∴ By divisibility rule of 5,

Last digit will be 0 or 5 but if last digit is 5 then the number will not be divisible by 8.

∴ $y = 0$

By divisibility rule of 8,

$1263487x0$

$$\Rightarrow \frac{7x0}{8}$$

$$\Rightarrow \frac{760}{8}$$

∴ $x = 6$ (Greatest value)

So, the greatest value of x and y is 6 and 0.

Hence, option (a) is correct.

40. If a nine-digit number $489x6378y$ is divisible by 72, then the value of $\sqrt{8x+6y}$ will be:

- (a) 8 (b) 6
(c) 10 (d) 4

SSC CHSL 05/08/2021 (Shift-II)

Ans. (a) : The given 9-digit number $489x6378y$ is divisible by 72 it means that the number is also divisible by both 8 and 9.

∴ By divisibility rule of 8,

$$\frac{78y}{8} \Rightarrow \boxed{y=4}$$

By divisibility rule of 9,

$489x63784$

$$\frac{4+8+9+x+6+3+7+8+4}{9}$$

$$\Rightarrow \frac{49+x}{9}$$

[For $x = 5$, 54 is divisible by 9]

$$\Rightarrow \boxed{x=5}$$

$$\text{So, } \sqrt{8x+6y} = \sqrt{8 \times 5 + 6 \times 4} = \sqrt{40+24} = \sqrt{64} = 8$$

Hence, option (a) is correct.

41. If the nine-digit number $48x4923y8$ is divisible by 88, then the value of $(6x+5y)$ for the maximum value of y , will be:

- (a) 72 (b) 76
(c) 65 (d) 71

SSC CHSL 19/08/2021 (Shift-II)

Ans. (a) : The given 9-digit number $48x4923y8$ is divisible by 88 i.e. also divisible by both 8 and 11.

∴ By divisibility rule of 8,

$$\frac{3y8}{8} \Rightarrow \boxed{y=6} \text{ (Maximum value)}$$

By divisibility rule of 11,

$$(4+x+9+3+8)-(8+4+2+6) = 0 \text{ or } 11$$

$$\Rightarrow 24+x-20 = 0 \text{ or } 11$$

$$\Rightarrow x+4 = 0 \text{ or } 11$$

$$\Rightarrow x+4 = 11$$

$$\therefore \boxed{x=7}$$

$$\text{So, } (6x+5y) = (6 \times 7 + 5 \times 6) = (42+30) = 72$$

Hence, option (a) is correct.

42. The largest six-digit number exactly divisible by 243 is:

- (a) 999949 (b) 999947
(c) 999945 (d) 999943

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : Largest 6-digit number = 999999

∴ The largest 6-digit number is exactly divisible by 243.

$$\begin{array}{r} 243 \overline{)999999} \quad 4115 \\ \underline{972} \\ \times 279 \\ \underline{243} \\ \times 369 \\ \underline{243} \\ 1269 \\ \underline{1215} \\ \times \times 54 \end{array}$$

$$\text{So, the required 6-digit largest number} = 999999 - 54 = 999945$$

Hence, option (c) is correct.

43. If the number 645A2879B8 is divisible by both 8 and 9, then the smallest possible values of A and B will be:

- (a) A = 3, B = 4 (b) A = 4, B = 3
(c) A = 2, B = 3 (d) A = 3, B = 2

SSC CHSL 09/08/2021 (Shift-II)

Ans. (d) : The given number 645A2879B8 is divisible by both 8 and 9.

∴ By divisibility rule of 8,

$$\frac{9B8}{8} \Rightarrow \boxed{B=2} \quad (\text{Smallest value})$$

By divisibility rule of 9,

645A287928

$$\frac{6+4+5+A+2+8+7+9+2+8}{9}$$

$$\Rightarrow \frac{51+A}{9}$$

For A = 3, 54 is divisible by 9

$$\Rightarrow \boxed{A=3} \quad (\text{Smallest value})$$

So, the smallest possible value of A and B will be 3 and 2 respectively.

Hence, option (d) is correct.

44. If the nine-digit number 259876p05 is completely divisible by 11, then what is the value of (p²+5)?

- (a) 54 (b) 45
(c) 50 (d) 48

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : By divisibility rule of 11,

$$(2+9+7+p+5) - (5+8+6+0) = \text{Multiple of 11 or 0}$$

$$\Rightarrow 23+p-19 = \text{Multiple of 11 or 0}$$

$$\Rightarrow p+4=11$$

$$\therefore p=11-4=7$$

$$\text{So, } (p^2+5) = (7^2+5) = (49+5) = 54$$

Hence, option (a) is correct.

45. If the number A9257B684 is divisible by 11, then what is the least value of A-B?

- (a) 3 (b) 14
(c) -8 (d) 0

SSC CHSL 12/04/2021 (Shift-II)

Ans : (c) By divisibility rule of 11,

$$(A+2+7+6+4) - (9+5+B+8) = 0 \text{ or } 11 \text{ or } -11$$

$$\Rightarrow A+19-22-B=0 \text{ or } 11 \text{ or } -11$$

$$\Rightarrow A-B-3=-11 \quad (\text{For the least value})$$

$$\therefore A-B=-11+3=-8$$

So, the least value of (A-B) is -8.

Hence, option (c) is correct.

46. If the nine-digit number 87605x31y is divisible by 72, then the value of 2x-3y is:

- (a) 2 (b) 1
(c) 0 (d) -1

SSC CHSL 06/08/2021 (Shift-II)

Ans. (a) : The given number 87605x31y is divisible by 72 it means that it is also divisible by both 8 and 9.

By divisibility rule of 8,

31y is divisible by 8 when y = 2.

Again, by divisibility rule of 9,

$$\frac{8+7+6+0+5+x+3+1+2}{9}$$

Now,

$$= \frac{32+x}{9}$$

[On taking x = 4, 36 is divisible by 9]

$$\therefore 2x-3y = 2 \times 4 - 3 \times 2$$

$$= 8-6 = 2$$

47. If the number 579683pq is divisible by both 5 and 8, then the smallest possible values of p and q will be:

- (a) p = 2, q = 0 (b) p = 4, q = 3
(c) p = 3, q = 0 (d) p = 2, q = 2

SSC CHSL 15/04/2021 (Shift-III)

Ans.(a) : The given number 579683pq is divisible by both 5 and 8.

∴ By divisibility rule of 5,

Take last digit 0 or 5 but if last digit will be 5 then the number will not be divisible by 8.

$$\therefore \boxed{q=0}$$

By divisibility rule of 8,

579683p0

$$\frac{3p0}{8} \Rightarrow \boxed{p=2} \quad (\text{Smallest possible value})$$

So, the smallest possible value of p and q will be 2 and respectively.

Hence, option (a) is correct.

48. If the nine-digit number 8475639AB is divisible by 99, then find the value of A and B?

- (a) A = 5, B = 3 (b) A = 4, B = 8
(c) A = 4, B = 6 (d) A = 3, B = 9

SSC CHSL 12/08/2021 (Shift-III)

Ans. (b) : The given 9-digit number 8475639AB is divisible by 99 i.e. also divisible by both 9 and 11.

∴ By divisibility rule of 9,

$$8+4+7+5+6+3+9+A+B$$

$$= 42 + A + B$$

So, A + B can be 3 or 12.

Now, From options only option (b) and (d) satisfying as A + B = 12

From option (d)–

$$(8+7+6+9+9) - (4+5+3+3)$$

$$= 39 - 15$$

$$= 24 \quad (24 \text{ is not multiple of } 11)$$

∴ From option (b)–

$$(8+7+6+9+8) - (4+5+3+4)$$

$$= 38 - 16$$

$$= 22 \quad (22 \text{ is multiple of } 11)$$

So, required answer will be option (b).

49. A six-digit number 4ABB8A is a multiple of 33 for non-zero digits A and B. Which of the following could be the possible values of A and B?

- (a) A=3, B=6 (b) A=3, B=2
(c) A=6, B=3 (d) A=6, B=2

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-II)

Ans. (c) \because 4ABB8A, is a multiple of 33

\therefore 4ABB8A is divisible by both 11 and 3

For divisibility by 11,

$$\overbrace{4ABB8A} \Rightarrow \frac{(12+B) - (2A+B)}{11} = \frac{12-2A}{11}$$

To be divisible by 11, A=6

And for divisibility by 3,

The smallest minimum value of B = 3

Hence A = 6, B = 3

50. A divisor is 15 times the quotient and 3 times the remainder. If the remainder is 40, find the dividend.

- (a) 900 (b) 600
(c) 750 (d) 1000

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : According to question,

$$\text{Divisor} = 3 \times \text{Remainder} = 3 \times 40 = 120$$

$$\text{Divisor} = 15 \times \text{Quotient}$$

$$\text{Quotient} = \frac{\text{Divisor}}{15} = \frac{120}{15} = 8$$

$$\therefore \text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

$$= 120 \times 8 + 40 = 960 + 40 = 1000$$

$$\therefore \text{Dividend} = 1000$$

51. If the 8-digit number 179x091y is divisible by 88, the value of (5x – 8y) is:

- (a) 4 (b) 9
(c) 5 (d) 7

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (a) :

$$\frac{179x091y}{88} = \frac{179x091y}{11 \times 8}$$

- For divisible by 8, the last three digits of the given numbers should be divisibly by 8.

$$\therefore y = 2$$

- For divisible by 11, the difference between the number at the even place and the number at the odd place should be zero or divisible by 11.

$$= \frac{(1+9+0+1) - (7+x+9+y)}{11}$$

$$= \frac{11 - (18+x)}{11} = \frac{x+7}{11} \Rightarrow x = 4$$

Now,

$$(5x - 8y) = 5 \times 4 - 8 \times 2 = 20 - 16 = 4$$

52. If the 8-digit number 789x531y is divisible by 72, then the value of (5x – 3y) is :

- (a) 0 (b) -1
(c) 1 (d) 2

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b) : The given number is divisible by 72 it means that it is also divisible by 8 and 9.

By divisibility rule of 8,

$$y = 2$$

By divisibility rule of 9,

$$\frac{7+8+9+x+5+3+1+2}{9}$$

$$= \frac{35+x}{9}$$

$$\therefore x = 1$$

Now, (5x – 3y)

$$= 5 \times 1 - 3 \times 2$$

$$= 5 - 6 = -1$$

53. If a nine-digit number 985x3678y is divisible by 72, then the value of (4x – 3y) is :

- (a) 5 (b) 4
(c) 3 (d) 6

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (b)

Nine digit number = 985x3678y is divisible by 72

$$\begin{array}{c} \wedge \\ 9 \times 8 = 72 \end{array}$$

Divisibility rule of 8 → If the last three digits of the given number is divisible by 8 then that number will be perfectly divisible by 8

On putting y = 4 it will be divisible by 8

Divisibility rule of 9 → If the sum of digits of given number is divisible by 9 then the number will be divisible by 9

$$985x36784 = \frac{50+x}{9}$$

On putting x = 4, number will be divisible by 9

$$\therefore \text{On putting } x = 4, y = 4$$

$$(4x - 3y) = 4 \times 4 - 3 \times 4 = 16 - 12 = 4$$

54. If a 10-digit number 2094x843y2 is divisible by 88, then the value of (5x – 7y) for the largest possible value of x, is:

- (a) 5 (b) 3
(c) 2 (d) 8

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (a) \because 2094x843y2 is divisible by 88

\therefore 2094x843y2 is divisible by both 11 and 8.

From divisibility rule of 11,

$$\frac{(2+9+x+4+y) - (0+4+8+3+2)}{11}$$

$$= \frac{(15+x+y) - 17}{11}$$

$$= \frac{(x+y) - 2}{11}$$

For maximum value of x, value of x + y must be 13

For divisible by 8,

$$y = 1 \text{ or } 5 \text{ or } 9$$

$$\therefore x = 8, y = 5$$

$$\text{Hence } 5x - 7y = 40 - 35 = 5$$

55. If a 9-digit number $32x4115y2$ is divisible by 88, then the value of $(4x - y)$ for the smallest possible value of y , is:

- (a) -1 (b) 20
(c) 11 (d) 31

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (d) : Since $32x4115y2$ is divisible by 88

Hence it is divisible by both 11 and 8

For divisible by 8,

$$y = 1$$

For divisible by 11

$$\frac{(3+x+1+5+2) \sim (2+4+1+y)}{11}$$

$$= \frac{(11+x) \sim 8}{11} = \frac{3+x}{11}$$

$$\therefore x = 8$$

$$\text{Then, } 4x - y = 32 - 1 = 31$$

56. If the 8-digit number $2074x4y2$ is divisible by 88, then the value of $(4x + 3y)$ is :

- (a) 45 (b) 49
(c) 42 (d) 36

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (a) : $2074x4y2$ is divisible by 88

$\therefore 2074x4y2$ is divisible by both 11 and 8.

Divisibility rule of 8—Last three digits of given number should be divided by 8.

$\therefore 4y^2$ will be completely divisible by 8 at the minimum value of $y = 3$.

Divisibility rule of 11—

Sum of digits of even places \sim Sum of digits of odd places

$$= \frac{(0+4+4+2) \sim (2+7+x+y)}{11}$$

$$= \frac{10 \sim (12+x)}{11} \quad (y=3)$$

$$= \frac{2+x}{11}$$

$$\therefore x = 9$$

$$\text{Then, } 4x + 3y = 4 \times 9 + 3 \times 3 = 45$$

57. If 10-digit number $67127y76x2$ is divisible by 88, then the value of $(7x - 2y)$ is :

- (a) 3 (b) 5
(c) 10 (d) 7

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (d) : $\because 67127y76x2$ is divisible by 88

$67127y76x2$ will be divisible by both 8 and 11.

To be divisible by 8, the number formed by the last three digits of a given number should be exactly divisible by 8

$$\Rightarrow x = 3$$

To be divisible by 11, the difference between the sum of digits at even places and the sum of digits at odd places should be zero or multiple of 11.

$$\frac{(6+1+7+7+3) \sim (7+2+y+6+2)}{11}$$

$$= \frac{24 \sim (17+y)}{11}$$

$$= \frac{7-y}{11}$$

$$\therefore y = 7$$

$$\text{Hence, } 7x - 2y = 21 - 14 = 7$$

58. If the 10-digit number $897359y7x2$ is divisible by 72, then what is the value of $(3x - y)$, for the possible greatest value of y ?

- (a) 8 (b) 3
(c) 7 (d) 5

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (c) \because Number $897359y7x2$ is divisible by 72

Hence $897359y7x2$ is also divisible by both 8 and 9

For divisible by 8, possible values of x will be 1, 5, 9

For divisible by 9, the sum of digits should be divisible by 9

$$\frac{8+9+7+3+5+9+y+7+x+2}{9}$$

$$= \frac{50+x+y}{9}$$

For maximum value of y the value of $50 + x + y$ should be 63

$$\therefore x = 5, \quad y = 8$$

$$\text{Hence, } 3x - y = 15 - 8 = 7$$

59. If a 10-digit number $1330x558y2$ is divisible by 88, then the value of $(x + y)$ is:

- (a) 9 (b) 8
(c) 6 (d) 7

SSC CGL (TIER-I)-2018 – 07/06/2019 (Shift-I)

Ans. (a): We know that if the last three digits of any number is divisible by 8 then the number will be perfectly divisible by 8.

Hence, on taking $y = 3$ The given number will be exactly divisible by 8.

Similarly,

If the difference between the sum of digits at odd places and the sum of digits at even places of any number is zero or multiple of 11 then the number will be divisible by 11

$$\Rightarrow (1+3+x+5+y) - (3+0+5+8+2)$$

$$= 9+x+y-18$$

Hence $y = 3$ on taking, $x = 6$ on taking

$$= 9+6+3-18=0$$

Hence value of $x + y$ will be $6 + 3 = 9$

60. If the six digit number $6x2904$ is divisible by 88, then the value of x is :

- (a) 8 (b) 7
(c) 5 (d) 6

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (d) : \because If the number formed by the last three digits of a given number is divisible by 8 then the number will be divisible by 8.

$\therefore 904$ is divisible by 8.

∴ If the difference between the sum of digits at even places and sum of digits at odd places is 0 or multiple of 11, then the number will be divisible by 11.

$$\therefore \frac{(x+9+4)-(6+2+0)}{11} = \frac{x+5}{11}$$

Hence, on taking $x = 6$, the number will be divisible by 11.

61. If the six digit number $15x1y2$ is divisible by 44, then $(x + y)$ is equal to:
 (a) 6 (b) 8
 (c) 7 (d) 9

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (c) ∴ Since the given number is divisible by 44.

Hence the number will be divisible by both 11 and 4.

∴ **Divisibility rule of 11**—The difference between the sum of digits present at odd places and the sum of digits present at even places will be zero or multiple of 11.

Now,

$$(2 + 1 + 5) - (y + x + 1) = 0$$

$$\Rightarrow 8 - (x + y) - 1 = 0$$

$$\Rightarrow (x + y) = 7$$

62. If an 11-digit number $5y5884805x6$, $x \neq y$, is divisible by 72, then the value of \sqrt{xy} is:

- (a) 7 (b) 2
 (c) $2\sqrt{7}$ (d) $\sqrt{7}$

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (a) ∴ Number is divisible by 72 which means it will be divisible by both 9 and 8.

∴ The number will be only divisible by 8 when the last three digits of that number is divisible by 8 and to be divisible by 9 the sum of all digits should be divisible by 9.

$5x6$ divisible by 8, when $x = 7$,

To be divisible by 9,

$$= \frac{49 + x + y}{9} = \frac{49 + 7 + 7}{9} = \frac{63}{9} = 7$$

(where y is taken as 7)

∴ It is clear that 7 will be in place of x and y

$$\therefore \sqrt{xy} = \sqrt{7 \times 7} = 7$$

63. For what value of x is the seven digit number $46393x8$ divisible by 11?

- (a) 7 (b) 2
 (c) 5 (d) 3

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (d) : For divisible by 11

(Sum of digits of odd places) – (Sum of digits of even places) = Multiples of 11 or 0

$$(8 + 3 + 3 + 4) - (x + 9 + 6) = 0$$

$$\Rightarrow 18 - x - 15 = 0$$

$$\Rightarrow x = 3$$

64. If the six digit number $4x573y$ is divisible by 72 then the value of $(x + y)$ is:

- (a) 4 (b) 8
 (c) 9 (d) 6

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (b)

⇒ If the last three digit of the given number is divisible by 8 then the number will be divisible by 8

$$\therefore \frac{73y}{8}, y = 6$$

$$\frac{736}{8} = 92$$

⇒ The sum of all digits of given number is divisible by 9 then the number will be divisible by 9

$$\frac{4 + x + 5 + 7 + 3 + y}{9} = \frac{19 + x + y}{9}$$

$$= \frac{19 + 6 + x}{9} = \frac{25 + x}{9} \quad (\text{where } y = 6)$$

on taking $x = 2$

$$\therefore = \frac{25 + 2}{9} = \frac{27}{9} = 3$$

Hence, $x + y = 2 + 6 = 8$

65. What is the least value of x such that $517x324$ is divisible by 12?

- (a) 0 (b) 1
 (c) 2 (d) 3

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (c)

∴ If the last two digits of a given number is divisible by 4 then the number will be perfectly divisible by 4

$$\therefore \frac{24}{4} = 6$$

The sum of digits of the given number is divisible by 3 then the number will be perfectly divisible by 3

$$\therefore \frac{5 + 1 + 7 + x + 3 + 2 + 4}{3} = \frac{22 + x}{3}$$

For divisible by 3, the minimum possible positive value of $x = 2$ Hence, $x = 2$

66. What is the value of x so that the seven digit number $5656x52$ is divisible by 72?

- (a) 4 (b) 5
 (c) 7 (d) 8

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (c) ∴ The given number $5656x52$ is divisible by 72 which means the number will be divisible by 8 and 9 both.

Rule of divisibility for 9 – For any number to be divisible by 9, the sum of digits of that number should be divisible by 9

$$= \frac{5 + 6 + 5 + 6 + x + 5 + 2}{9} = \frac{29 + x}{9}$$

On taking $x = 7$ the number will be divisible by 9

Rule of divisibility for 8 – For any number to be divisible by 8 the last three digits of a number should be divisible by 8

$$\Rightarrow \frac{x52}{8}$$

$$\text{Hence on taking } x = 7 = \frac{752}{8} = 94$$

Hence required value of x will be 7

67. What is the value of x so that the seven digit number 6913x08 is divisible by 88?

- (a) 6 (b) 8
(c) 4 (d) 2

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (b) : ∵ Numbr 6913x08 is divisible by 88
Hence, The given number should be also divisible by 11 and 8

To be divisible by 8 – the last three digits of
The given number must be divisible by

$$\Rightarrow \frac{x08}{8} \text{ (on putting } x = 8)$$

To be divisible by 11,

$$\frac{(6+1+x+8) \sim (9+3+0)}{11} = \frac{(15+x) \sim 12}{11}$$

$$= \frac{3+x}{11} \quad (\because \text{ on taking } x = 8)$$

In both situations x = 8

68. What is the value of x so that the seven digit number 8439x53 is divisible by 99?

- (a) 6 (b) 3
(c) 4 (d) 9

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c) : If the number 8439x53 is divisible by 99 then it is also divisible by 9 and 11.

∴ **Rule of divisibility by 9,**

Sum of digits of number will be divisible by 9

$$= \frac{8+4+3+9+x+5+3}{9}$$

$$= \frac{32+x}{9}$$

on putting x = 4,

$$= \frac{32+4}{9} = \frac{36}{9} \Rightarrow \text{remainder} = 0$$

Hence for value of x = 4 the number is divisible by 99.

69. What is the value of x so that the seven digit number 55350x2 is divisible by 72?

- (a) 7 (b) 1
(c) 3 (d) 8

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (a) : As per question,

Seven digit number 55350x2 is divisible by 72 that's mean it is divisible by both 9 and 8.

Rule of divisibility by 9:–For any number to be divisible by 9 the sum of all digits of given number will be divisible by 9.

$$\Rightarrow \frac{5+5+3+5+0+x+2}{9}$$

On taking x = 7 the number will be divisible by 9.

Rule of divisibility by 8:–For any number to be divisible by 8, the last three digits of given number should be divisible by 8.

Which means, $\frac{0x2}{8}$

$$\text{Hence on taking } x = 7 \Rightarrow \frac{072}{8} = 9$$

Hence the value of x = 7

70. What should replace * in the number 94*2357, so that number is divisible by 11?

- (a) 3 (b) 8
(c) 7 (d) 1

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (a) : For divisibility by 11,

The difference between sum of digits at even places and sum of digits at odd places should be 0 or multiple of 11.

$$= \frac{11 \sim (19+*)}{11} = \frac{8+*}{11}$$

$$\therefore * = 3$$

71. When 200 is divided by a positive integer x, the remainder is 8. How many values of x are there?

- (a) 8 (b) 5
(c) 6 (d) 7

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (a) :

Required number which is divisible by x
= 200–8=192= 2⁶ × 3

The value of x will always be greater than 8

Hence value of x can be–

12,16,24,32,48,64,96 and 192

Hence, the number of value of x = 8

72. If the number 1005x4 is completely divisible by 8, then the smallest integer in place of x will be:

- (a) 4 (b) 1
(c) 2 (d) 0

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (d) : The given 1005x4 is completely divisible by 8 i.e. its last three digits should be divisible by 8.

5x4 should be divisible by 8.

Possible value of x = 0, 4, 8

But we have to take smallest value.

$$\therefore x = 0$$

73. If the 6-digit number x35624 and 1257y4 are divisible by 11 and 72, respectively, then what is the value of (5x–2y)?

- (a) 13 (b) 12
(c) 10 (d) 14

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) : ∵ x35624 is divisible by 11

$$\therefore \frac{(7+x) \sim 13}{11} = \frac{x-6}{11}$$

$$\therefore x = 6$$

Again, 1257y4 is divisible by 72

Hence this will also be divisible by 8 and 9.

$$\therefore \frac{19+y}{9}$$

$$\therefore y = 8$$

$$5x - 2y = 30 - 16 = 14$$

74. The greatest number which should be replace '*' in the number 146*48 to make it divisible by 8 is:

- (a) 0 (b) 8
(c) 9 (d) 2

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (b) : To be divisible by 8, the last three digits of the number should be divisible by 8
 \therefore 8 will be the greatest possible number in place of *

75. If the nine-digit number $708x6y8z9$ is divisible by 99, then what is the value of $x + y + z$?
 (a) 5 (b) 16
 (c) 9 (d) 27
SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (b) :
 \therefore If $708x6y8z9$ is divisible by 99
 This will be divisible by both 11 and 9 both
 To be divisible by 11,

$$\frac{(x + y + z) - 38}{11}$$

 To be divisible by 9,

$$\frac{38 + x + y + z}{9}$$

 From option if value of $x + y + z$ is taken 5, 9 and 27 then the number will not be divisible by 9. Hence value of $x + y + z$ will be 16.

76. The largest number which should replace * in the number $2365*4$ to make the number divisible by 4 is:
 (a) 8 (b) 9
 (c) 2 (d) 0
SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) :
 To be divisible by 4, the last two digits of a number should be divisible by 4.
 \therefore The greatest possible number in place of * = 8

77. If the number $687x29$ is divisible by 9, then the value of $2x$ is:
 (a) 4 (b) 8
 (c) 2 (d) 3
SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (b) : Form divisibility rule of 9,

$$\frac{6+8+7+x+2+9}{9}$$

$$= \frac{32+x}{9}$$

 $\therefore x = 4$
 Hence, $2x = 8$

78. If the given number $925x85$ is divisible by 11, then the smallest value of x is:
 (a) 1 (b) 2
 (c) 3 (d) 4
SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (d) : Form divisibility rule of 11,

$$(5 + x + 2) - (8 + 5 + 9)$$

$$= \frac{(7 + x) - 22}{11} = \frac{15 - x}{11}$$

 $\therefore x = 4$

79. The greatest number which may replace * in the number $1190*6$ to make the number divisible by 9 is:

- (a) 0 (b) 1
 (c) 3 (d) 9

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (b) : To be divisible by 9, the sum of all digits of given number should be divisible by 9.

$$\Rightarrow \frac{17 + *}{9}$$

 $\therefore * = 1$

80. What is the sum of all natural numbers between 100 and 400 which are divisible by 13?
 (a) 5681 (b) 5334
 (c) 5434 (d) 5761
SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Number divisible by 13 between 100 and 400 are 104, 117, 130,390

$$T_n = \left[\frac{\ell - a}{d} + 1 \right]$$

$$= \left[\frac{390 - 104}{13} + 1 \right]$$

$$= \frac{286}{13} + 1$$

$$= 22 + 1$$

$$n = 23$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$= \frac{23}{2} [2 \times 104 + (23-1) \times 13]$$

$$= \frac{23}{2} \times [208 + 286]$$

$$= \frac{23}{2} \times 494 = 5681$$

81. Which of the following statement(s) is/are TRUE ?
 I. $1^{99} + 2^{99} + 3^{99} + 4^{99} + 5^{99}$ is exactly divisible by 5.
 II. $31^{11} > 17^{14}$
 (a) Only I (b) Only II
 (c) Neither I nor II (d) Both I and II
SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $1^{99} + 2^{99} + 3^{99} + 4^{99} + 5^{99}$
 As cyclicity of 2, 3 is 4 and cyclicity of 4 is 2
 $\therefore 1 + 2^3 + 3^3 + 4^1 + 5$
 $= 1 + 8 + 27 + 4 + 5 = 45$
 Hence this is divisible by 5
 (II). $(31)^{11} > (17)^{14}$
 $(31)^3 \times (31)^3 \times (31)^3 \times (31)^2 > (17)^4 \times (17)^4 \times (17)^4 \times (17)^2$
 $\therefore (31)^3 = 29791$ and $(17)^4 = 83521$
 Almost thrice of $(17)^4$, $(31)^3$
 Hence, it is false.

82. $N = 2^{48} - 1$ and N is exactly divisible by two numbers between 60 and 70. What is the sum of those two numbers?
 (a) 128 (b) 256
 (c) 64 (d) 512
SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $N = 2^{48} - 1 = (2^{24} + 1)(2^{24} - 1)$
 $= (2^{24} + 1)(2^{12} + 1)(2^{12} - 1)$
 $= (2^{24} + 1)(2^{12} + 1)(2^6 + 1)(2^6 - 1)$
 $= (2^{24} + 1)(2^{12} + 1) \times 65 \times 63$
Hence N is exactly divisible by 63 and 65
Sum = $63 + 65 = 128$

- 83. How many perfect cubes are there between 1 and 100000 which are divisible by 7?**
(a) 5 (b) 6
(c) 7 (d) 15

SSC SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let the number divisible by 7 = $7n$
 \therefore To be divisible by 7 and a perfect cube
 $n = 1$ on putting, $7^3 = 343$
 $n = 2$ on putting, $(14)^3 = 2744$
 $n = 3$ on putting, $(21)^3 = 9261$
 $n = 4$ on putting, $(28)^3 = 21952$
 $n = 5$ on putting, $(35)^3 = 42875$
 $n = 6$ on putting, $(42)^3 = 74088$
 $n = 7$ on putting, $(49)^3 = 117649$
(But it is greater than 100000)
Hence there are total 6 required cubes which are divisible by 7.

- 84. Two positive numbers differ by 2001. When the larger number is divided by the smaller number, the quotient is 9 and the remainder is 41. The sum of the digits of the larger number is:**
(a) 5 (b) 11
(c) 14 (d) 10

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Let the larger number be x
 \therefore Smaller number = $(x-2001)$
 \therefore Dividend = Divisor \times Quotient + Remainder
 $x = (x-2001) \times 9 + 41$
 $x = 9x - 18009 + 41$
 $8x = 17968$
 $x = 2246$
Sum of digits of larger number = $2 + 2 + 4 + 6 = 14$

- 85. a, b and c are three fractions such that $a < b < c$. If c is divided by a, the result is $\frac{9}{2}$, which exceeds b by $\frac{23}{6}$. The sum of a, b and c is $\frac{19}{12}$. What is the value of $(2a+b-c)$?**
(a) $\frac{1}{2}$ (b) $\frac{1}{3}$
(c) $\frac{1}{12}$ (d) $\frac{1}{4}$

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : According to question -
 $\frac{c}{a} = \frac{9}{2} = b + \frac{23}{6}$
 $b = \frac{9}{2} - \frac{23}{6} = \frac{4}{6} = \frac{2}{3}$

Now, $c = 9x$, $a = 2x$ (say)

$$a + b + c = \frac{19}{12}$$

$$11x + \frac{2}{3} = \frac{19}{12}$$

$$11x = \frac{11}{12}$$

$$x = \frac{1}{12}$$

$$\therefore c = \frac{3}{4}, \quad a = \frac{1}{6}$$

$$2a + b - c = 2 \times \frac{1}{6} + \frac{2}{3} - \frac{3}{4}$$

$$= 1 - \frac{3}{4} = \frac{1}{4}$$

- 86. If the 11-digit number $5678x43267y$ is divisible by 72, then the value of $\sqrt{5x+8y}$ is:**
(a) 4 (b) 6
(c) 7 (d) 8

SSC CGL (Tier-II) 12-09-2019

Ans. (b) :

$$\frac{5678x43267y}{72} = \frac{5678x43267y}{9 \times 8}$$

To be divisible by 8,

$$y = 2$$

To be divisible by 9,

$$\frac{48 + x + y}{9} = \frac{50 + x}{9}$$

$$\therefore x = 4$$

$$\Rightarrow \sqrt{5x+8y}$$

$$= \sqrt{5 \times 4 + 8 \times 2} = \sqrt{36} = 6$$

- 87. Let a, b and c be the fractions such that $a < b < c$. If c is divided by a, the result is $\frac{5}{2}$, which exceeds b by $\frac{7}{4}$. If $a + b + c = 1\frac{11}{12}$ then $(c-a)$ will be equal to:**

(a) $\frac{1}{6}$

(b) $\frac{1}{2}$

(c) $\frac{1}{3}$

(d) $\frac{2}{3}$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : According to question -

$$\frac{c}{a} = \frac{5}{2} = b + \frac{7}{4}$$

$$b = \frac{5}{2} - \frac{7}{4} = \frac{3}{4}$$

Let $c = 5x$ and $a = 2x$

According to question,

$$a + b + c = 1\frac{11}{12} = \frac{23}{12}$$

$$2x + \frac{3}{4} + 5x = \frac{23}{12}$$

$$7x = \frac{23}{12} - \frac{3}{4} = \frac{14}{12}$$

$$x = \frac{1}{6}$$

$$\therefore c-a = 5x - 2x = 3x$$

$$= 3 \times \frac{1}{6} = \frac{1}{2}$$

88. If a nine-digit number $389x6378y$ is divisible by 72, then the value of $\sqrt{6x+7y}$ will be :

- (a) $\sqrt{13}$ (b) 8
(c) 6 (d) $\sqrt{46}$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : The number $389x6378y$ is divisible by 72 which means

The number is also divisible by the factor of 72 i.e. (8, 9)

To be divisible by 8 $\rightarrow y = 4$

To be divisible by 9,

$$= \frac{3+8+9+x+6+3+7+8+4}{9}$$

$$= \frac{48+x}{9}$$

$$\Rightarrow x = 6$$

$$\therefore \sqrt{6x+7y} = \sqrt{36+28} = \sqrt{64} = 8$$

89. If a 10-digit number $5432y1749x$ is divisible by 72, then what is the value of $(5x - 4y)$?

- (a) 10 (b) 14
(c) 9 (d) 15

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : The number $5432y1749x$ is divisible by 72 Hence the number $5432y1749x$ will be divisible by 8 and 9

To be divisible by 8, $x = 6$

To be divisible by 9,

$$\frac{35+x+y}{9}$$

$$= \frac{41+y}{9}$$

$$\therefore y = 4$$

$$\text{Hence, } 5x - 4y = 30 - 16 = 14$$

90. If $N = 9^9$, then N is divisible by how many positive perfect cubes ?

- (a) 6 (b) 7
(c) 4 (d) 5

SSC CGL (Tier-II) 9-3-2018

$$\text{Ans. (b) : } N = 9^9 = 3^{18} \\ = (3^3)^6$$

Number of positive factors of N which is a cube = $6 + 1 = 7$

Hence N is divisible by $(1^3, 3^3, 9^3, 27^3, 81^3, 243^3$ and $729^3)$

91. If a nine-digit number $785x3678y$ is divisible by 72, then the value of $(x+y)$ is:

- (a) 20 (b) 5
(c) 10 (d) 12

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (c) : Given,

Nine digit number = $785x3678y$

\therefore Number is divisible by 72

It means that is is also divisible by 8 and 9

For number to be divisible by 8,

$$\frac{78y}{8}$$

On putting $y = 4$ then number is divisible by 8

Hence $y = 4$

For number to be divisible by 9, the sum of all digits of the number should be divisible by 9

$$\Rightarrow \frac{7+8+5+x+3+6+7+8+4}{9} \quad \{\therefore y = 4\}$$

$$= \frac{48+x}{9}$$

$$= \frac{48+6}{9} \quad (\text{on taking } x = 6 \text{ it is divisible by } 9)$$

$$\therefore x + y = 6 + 4 = \boxed{10}$$

92. If six-digit number $5x2y6z$ is divisible by 7, 11 and 13, then the value of $(x - y + 3z)$ is:

- (a) 7 (b) 4
(c) 0 (d) 9

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : If any 6 digit number divisible by 7, 11 and 13, then the form of that number will be $xyzxyz$

$\therefore 5x2y6z$; is divisible by 7, 11 & 13

$$\therefore 5x2 \begin{array}{l} | y6z \\ | 5x2 \end{array}$$

then, $y = 5, x = 6, z = 2$

Hence $x - y + 3z$

$$6 - 5 + 3 \times 2 = 7$$

93. If a nine-digit number $785x3678y$ is divisible by 72, then the value of $(x-y)$ is :

- (a) 0 (b) 2
(c) -1 (d) -2

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) : The number which is divisible by 72 is also divisible by 8 and 9.

\Rightarrow To be divisible by 8, the last three digits of the number should be divisible by 8

$785x3678y$

On putting $y = 4$, the number is divisible by 8.

Hence, $\boxed{y = 4}$

\Rightarrow To be divisible by 9, the sum of all digits of the given number should be divisible by 9

$$\Rightarrow 7 + 8 + 5 + x + 3 + 6 + 7 + 8 + 4$$

$$48 + x$$

on putting $x = 6$

$$48 + 6 = 54 \text{ which is divisible by } 9.$$

$$\Rightarrow \boxed{x = 6}$$

$$\text{Hence, } (x-y) = 6 - 4 = 2$$

94. If the 7-digit number $x468y05$ is divisible by 11, then what is the value of $(x + y)$?

- (a) 14 (b) 10
(c) 8 (d) 12

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) : If number $x468y05$ is divisible by 11,

$$\text{Then, } \frac{(x+6+y+5) - (4+8+0)}{11} = \frac{x+y-1}{11}$$

then the value of $x + y$ will be 1 or 12

Hence option (d) is correct

95. If the six-digit number $479xyz$ is exactly divisible by 7, 11 and 13, then the value of $\{(y+z) \div x\}$ is equal to :

- (a) $7/13$ (b) $11/9$
(c) 4 (d) $13/7$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) LCM of 7, 11 and 13 = 1001

Number $479xyz$ is divisible by 7, 11 and 13

Hence it will also be divisible by 1001

Hence number will be in the form of $xyzxyz$

Hence the given six digit number $479xyz = 479479$

$$\therefore x = 4, y = 7, z = 9$$

$$\Rightarrow \{(y+z) \div x\} = \{(7+9) \div 4\} \\ = 16 \div 4 \\ = 4$$

96. Which of the following is exactly divisible by 6?

- (a) 4325672 (b) 5643252
(c) 465466 (d) 96543111

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b) Since the number is divisible by 6 hence it will be divisible by 2 and 3 both

To be divisible by 2, the unit digit of number must be 0, 2, 4, 6 and 8.

To be divisible by 3, the sum of all digits of number should be divisible by 3

Hence 5643252 is divisible by 6.

97. If a 9-digit number $8175x45y2$ is divisible by 72, then the value of $\sqrt{4x+y}$ for the possible greatest value of y :

- (a) 8 (b) 4
(c) 6 (d) 5

SSC CHSL 02/07/2019 (Shift-II)

Ans. (d) : Rule of divisibility for 8 –The last three digits of any number should be divisible by 8

Hence on putting $y = 9$ the number formed will be 592 which is divisible by 8

Rule of divisibility for 9–The sum of all digits of any number should be divisible by 9 then the number will be exactly divisible by 9

$$\Rightarrow \frac{41+x}{9}$$

Hence on putting $x = 4$, The number will be divisible by 9

$$\therefore \sqrt{4x+y} = \sqrt{4 \times 4 + 9} \\ = \sqrt{16+9} \\ = \sqrt{25} \\ = 5$$

98. If a 9-digit number $43x1145y2$ is divisible by 88, then the value of $(3x - 2y)$ for the smallest possible value of y , is :

- (a) 22 (b) 18
(c) 20 (d) 9

SSC CHSL 01/07/2019 (Shift-III)

Ans. (a) : If the number $43x1145y2$ is divisible by 88 then it will also be divisible by its factors i.e. 8 and 11.

To be divisible by 8 and for smallest value of $y = 1$

To be divisible by 11,

$$(4+x+1+5+2) - (3+1+4+y) = 0 \text{ or multiples of } 11$$

$$12+x - (8+1) = 0 \text{ or multiples of } 11$$

$$12+x - 9 = 0 \text{ or multiples of } 11$$

$$3+x = 0 \text{ or multiples of } 11$$

$$x = 8$$

$$\Rightarrow 3x - 2y = 3 \times 8 - 2 \times 1 \\ = 24 - 2 = 22$$

99. If a 8-digit number $342x18y6$ is divisible by 72, then the value of $\sqrt{9x+y}$ for the largest possible value of y , is :

- (a) $4\sqrt{7}$ (b) 6
(c) 8 (d) $2\sqrt{7}$

SSC CHSL 02/07/2019 (Shift-I)

Ans. (b) : $\because 342x18y6$ is divisible by 72

$\therefore 342x18y6$ will also be divisible by 8 and 9

To be divisible by 8,

$$y = 1, 5, 9$$

To be divisible by 9,

$$\frac{3+4+2+x+1+8+y+6}{9}$$

$$= \frac{24+x+y}{9}$$

For maximum value of y ,

$$y = 9$$

$$= \frac{33+x}{9}$$

$$x = 3$$

$$\text{Hence, } \sqrt{9x+y} = \sqrt{9 \times 3 + 9} = 6$$

100. If a 10-digit number $46789x531y$ is divisible by 72, then the value of $(2x + 5y)$ for the largest possible value of x , is :

- (a) 10 (b) 28
(c) 38 (d) 16

SSC CHSL 03/07/2019 (Shift-III)

Ans. (b) : The given number $46789x531y$, is divisible by 72 Hence it will be divisible by 8 and 9

\rightarrow We know that for any number to be exactly divisible by 8, the last three digits of a number must be divisible by 8.

$$\text{Hence, } y = 2$$

\rightarrow Similarly, for any number to be divisible by 9, sum of all the digits of number must be divisible by 9

$$\text{Hence, } 4+6+7+8+9+x+5+3+1+2$$

$$= 45 + x$$

Hence two values of x will be possible that will be either 0 or 9 and on taking largest value of x

$$x = 9$$

$$\therefore 2x + 5y = 2 \times 9 + 5 \times 2 \\ = 18 + 10 = 28$$

101. If a 10-digit number $1220x558y2$ is divisible by 88, then the value of $(x+y)$ is :
 (a) 9 (b) 7
 (c) 15 (d) 11

SSC CHSL 04/07/2019 (Shift-II)

Ans. (a) : $1220x558y2$ is divisible by 88
 Hence $1220x558y2$ will be divisible by both 11 and 8
Rule of divisibility for 8 –The last three digits of the given number should be exactly divisible by 8

$\therefore y = 3$,
 The difference between the sum of digits at even places and sum of digits at odd places should be 0 or multiple of 11 then that number will be exactly divisible by 11

$$\frac{(8+x+y) \sim 17}{11}$$

$$\frac{(x+y) - 9}{11}$$

If $y = 3, x = 6$
 $\therefore x + y = 6 + 3 = 9$

102. If an eleven-digit number $5y5888406x6$ is divisible by 72, then the value of $(9x - 2y)$ for the smallest possible value of x ?
 (a) 4 (b) 3
 (c) 5 (d) 7

SSC CHSL 03/07/2019 (Shift-I)

Ans. (b) : \because The given number $5y5888406x6$ is divisible by 72.

Hence the number will be divisible by both 8 and 9
 We know that for any number to be divisible by 8, the last three digits of that number must be divisible by 8

$\therefore x = 1$ (smallest value)

For any number to be divisible by 9, the sum of digits of that number must be divisible by 9

$$\Rightarrow 5 + y + 5 + 8 + 8 + 8 + 4 + 0 + 6 + x + 6$$

$$\Rightarrow 50 + y + x$$

$$\Rightarrow 50 + y + 1$$

$$\Rightarrow 51 + y$$

On putting $y = 3$,
 $51 + 3 = 54$ which is divisible by 9

$$\Rightarrow 9x - 2y = 9 \times 1 - 2 \times 3 = 9 - 6 = 3$$

103. If a 10-digit number $75y97405x2$ is divisible by 72, then the value of $(2x - y)$ for the greatest value of x , is :
 (a) 18 (b) 21
 (c) 24 (d) 12

SSC CHSL 04/07/2019 (Shift-I)

Ans. (d) : If the number $75y97405x2$ is divisible by 72
 Then it will be divisible by factor of 72 i.e. 8 and 9

To be divisible by 8 and for the highest value of $x = 9$
 To be divisible by 9

$$\rightarrow \frac{7+5+y+9+7+4+0+5+9+2}{9}$$

$$= \frac{48+y}{9}$$

$\therefore y = 6$

$$\therefore (2x - y) = 2 \times 9 - 6 = 12$$

104. If a 10-digit number $7220x558y2$ is divisible by 88, then the value of $(5x + 5y)$ is :
 (a) 10 (b) 15
 (c) 25 (d) 35

SSC CHSL 05/07/2019 (Shift-II)

Ans. (b) : If the number $7220x558y2$ is divisible by 88 then that number will be surely divisible by factor of 88
 Factors of 88 = 8×11

Rule of divisibility for 8 –The last three digits of the given number is completely divisible by 8 then that number will be divisible by 8

$\therefore y = 3$

Rule of divisibility for 11 –if the difference between the sum of digits of even places and sum of digits of odd places in the given number is zero or multiple of 11 then that number is completely divisible by 11.

$\therefore x = 0$

$$\text{Hence, } 5x + 5y = 5 \times 0 + 5 \times 3 = 15$$

105. If an 8-digit number $30x558y2$ is divisible by 88, then the value of $(6x+6y)$ is:
 (a) 30 (b) 66
 (c) 35 (d) 42

SSC CHSL 08/07/2019 (Shift-I)

Ans. (d) : $30x558y2$ is divisible by 88

$\therefore 30x558y2$ is divisible by both 8 and 11

To be divisible by 8,

$$y = 3, 7$$

To be divisible by 11,

On putting $y = 3$

$$\frac{(3+x+5+y) - (0+5+8+2)}{11} = \text{multiple of 0 or 11}$$

$$= \frac{(8+x+3) - 15}{11} = \text{multiple of 0 or 11}$$

$$= \frac{x+3-7}{11} = \text{multiple of 0 or 11}$$

Hence, $x = 4$

$$\therefore 6x + 6y = 24 + 18 = 42$$

106. If the seven digit number $64x29y6$ ($x > y$) is divisible by 72, what is the value of $(2x - 3y)$?
 (a) 3 (b) 7
 (c) 13 (d) 9

SSC CHSL 09/07/2019 (Shift-I)

Ans. (a) : $64x29y6$ ($x > y$)



If the last three digits of a given number is divisible by 8 then that number will be divisible by 8.

Hence, $y = 3$

If the sum of digits of a given number is divisible by 9 then that number is divisible by 9

$$\frac{6+4+x+2+9+3+6}{9}$$

$$\Rightarrow \frac{30+x}{9} (x = 6)$$

$$\Rightarrow (2x - 3y) \Rightarrow 2 \times 6 - 3 \times 3 = 3$$

107. If the seven digit number $64x29y6$ ($x > y$) is divisible by 72, what is the value of $(2x - y)$?

- (a) 13 (b) 3
(c) 9 (d) 7

SSC CHSL 09/07/2019 (Shift-II)

Ans. (c) : If the number $64x29y6$ is divisible by 72 then it is divisible by factors of 72 which means it is divisible by both 8 and 9

To be divisible by 8, the last three digits of given number must be divisible by 8. Hence on putting $y = 3$ the last three digit (936) will be obtained which is divisible by 8.

Similarly, for any number to be divisible by 9, the sum of all the digits must be divisible by 9

$$6 + 4 + x + 2 + 9 + 3 + 6 = 30 + x$$

on putting $x = 6$, number will be divisible by 9

$$\therefore 2x - y = 2 \times 6 - 3 = 9$$

108. The 10 digit number $2x60000y8$ is exactly divisible 24. If $x \neq 0$ and $y \neq 0$, then the least value of $(x+y)$ is

- (a) 2 (b) 5
(c) 8 (d) 9

SSC CHSL 11/07/2019 (Shift-I)

Ans. (b) : $2x60000y8$ is divisible by 24

$\therefore 2x60000y8$ is divisible by both 3 and 8

To be divisible by 8, $y = 4$ (for minimum value and $y \neq 0$)

To be divisible by 3,

$$\frac{2 + x + 6 + y + 8}{3} = \frac{20 + x}{3} \quad (y = 4)$$

For minimum value $x = 1$

Hence, $x + y = 1 + 4 = 5$

109. Which of the following numbers is divisible by 9?

- (a) 346217 (b) 594327
(c) 897342 (d) 734895

SSC CHSL -17/03/2020 (Shift-III)

Ans. (d) : From option (d),

If the sum of all digits of a given number is divisible by 9 then given number is divisible by 9

$$\therefore 734895 = 7 + 3 + 4 + 8 + 9 + 5$$

$$= 36 \text{ which is exactly divisible by 9}$$

Hence, 734895 is divisible by 9

110. The divisor is 24 times the quotient and 8 times the remainder. If the quotient is 18, then the dividend is:

- (a) 7830 (b) 7630
(c) 7840 (d) 7450

SSC CHSL -26/10/2020 (Shift-III)

Ans. (a) : Divisor = $24 \times q$

Quotient = 18

$$\text{Divisor} = 24 \times 18 = 432$$

Divisor = $8(r)$

$$\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

$$= 432 \times 18 + 54$$

$$= 7830$$

111. If 'a' is a natural number, then $(7a^2 + 7a)$ is always divisible by:

- (a) only 7
(b) Both 7 and 14
(c) only 17
(d) only 21

SSC CHSL -16/10/2020 (Shift-I)

Ans. (b) : \because a is a natural number

$$\therefore \text{on taking } a = 1, 7a^2 + 7a = 7 + 7 = 14$$

$$\text{on taking } a = 2, 7a^2 + 7a = 7 \times 4 + 7 \times 2 = 28 + 14 = 42$$

$$\text{on taking } a = 3, 7a^2 + 7a = 7 \times 9 + 7 \times 3 = 63 + 21 = 84$$

$\therefore 14, 42, 84$ all number are divisible by both 7 and 14 Hence $(7a^2 + 7a)$ will always be divisible by both 7 and 14

112. If a positive integer 'n' is divisible by 3, 5 and 7, then what is the next larger integer divisible by all these numbers?

- (a) $n + 105$ (b) $n + 35$
(c) $n + 110$ (d) $n + 21$

SSC CHSL -16/10/2020 (Shift-III)

Ans. (a) : \because Number 'n' is divisible by 3, 5 and 7

\therefore Number 3, 5, 7 are factors of n

Hence the next larger number divisible by these numbers

$$= n + (\text{L.C.M of } 3, 5, 7)$$

$$= n + (3 \times 5 \times 7)$$

$$= n + 105$$

113. If $7129p465$ is divisible by 9, then the value of p is:

- (a) 2 (b) 3
(c) 0 (d) 4

SSC CHSL -15/10/2020 (Shift-I)

Ans. (a) : \because To be divisible by 9 the sum of their digits must be divisible by 9

$$\therefore \frac{7129p465}{9} = \frac{34 + p}{9}$$

On putting $p = 2$

$$\frac{34 + p}{9} = \frac{34 + 2}{9} = \frac{36}{9} = 4$$

Hence, $p = 2$

114. Given that $2^{20} + 1$ is completely divisible by a whole number, which of the following is completely divisible by the same number?

- (a) $2^{15} + 1$ (b) 5×2^{30}
(c) $2^{90} + 1$ (d) $2^{60} + 1$

SSC CHSL -16/10/2020 (Shift-II)

Ans. (d) : From option (d),

$$\frac{2^{60} + 1}{2^{20} + 1}$$

$$= \frac{(2^{20})^3 + (1)^3}{2^{20} + 1}$$

$$= \frac{(2^{20} + 1)(2^{40} - 2^{20} + 1)}{(2^{20} + 1)}$$

Hence, $2^{60} + 1$ will be exactly divisible by the same number as $2^{20} + 1$

115. What is the least 5-digit number that is divisible by 91?

- (a) 10283 (b) 10010
(c) 10101 (d) 10192

SSC CHSL -15/10/2020 (Shift-II)

Ans. (b) : Smallest five digit number = 10000

$$\begin{array}{r} 91 \overline{) 10000} \\ \underline{91} \\ 900 \\ \underline{819} \\ 81 \end{array}$$

The smallest number of five digits which is divisible by 91

$$= 10000 + (91-81) \\ = 10000 + 10 = 10010$$

116. Which are the two nearest numbers to 19596, divisible by 9?

- (a) 19,509; 19,611 (b) 19,564; 19,620
(c) 19,611; 19,575 (d) 19,593; 19,602

SSC CHSL -14/10/2020 (Shift-I)

Ans. (d) : To be divisible by 9, the sum of all digits of numbers must be completely divisible by 9

$$1+9+5+9+6 = 30$$

$$\begin{array}{l} 30 - 3 = 27 \text{ (which is divisible by 9)} \\ 30 + 6 = 36 \text{ (which is divisible by 9)} \end{array}$$

Hence, required number $19596 - 3 = 19593$ and, $19596 + 6 = 19602$

Hence required numbers are 19593 and 19602

117. If the 8-digit number 1a765b12 is to be divisible by 72, the least value of (2a + 3b) is:

- (a) 9 (b) 11
(c) 12 (d) 10

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : As the given number is divisible by 72

Hence this number will be divisible by both 8 and 9.

To be divisible by 8 the last three digits of a given number must be divisible by 8

$\therefore b = 1$ (for minimum value)

To be divisible by 9,

$$= \frac{1+a+7+6+5+1+1+2}{9} \\ = \frac{23+a}{9}$$

$\therefore a = 4$ ($\because 27$ is divisible by 9)

$$\Rightarrow 2a + 3b = (2 \times 4) + (3 \times 1) = 11$$

118. Which of the following numbers is divisible by 6?

- (a) 23,408 (b) 43,923
(c) 1,00,246 (d) 3,49,722

SSC CHSL -13/10/2020 (Shift-I)

Ans. (d): The number which is divisible by 6, is also divisible by 2 and 3.

Now to be divisible by 2, the last digit of given number will be zero or multiple of 2 and to be divisible by 3, the sum of all digits must be divisible by 3.

Hence we will check it from option. In number 3, 49, 722 last digits are divisible by 2 and sum of digits = $3+4+9+7+2+2 = 27$ which is also divisible by 3. Hence the number will be divisible by 6.

119. If the number 59a44b is divisible by 36, then the maximum value of a + b is:

- (a) 14 (b) 16
(c) 10 (d) 12

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) \because 59a44b is divisible by 36.

\therefore It is also divisible by both 4 and 9.

To be divisible by 4, the last two digits must be divisible by 4

$$\frac{4b}{4} = \frac{48}{4} = 12 \quad (b = 8, \text{ on taking maximum value})$$

To be divisible by 9, the sum of all digits must be divisible by 9

$$\frac{22+a+b}{9} = \frac{22+8+a}{9} = \frac{30+a}{9} = \frac{30+6}{9} = \frac{36}{9} = 4$$

(on taking $a = 6$)

$$\therefore a+b = 6+8 = 14$$

120. If 2794p561 is divisible by 9, then the value of p is:

- (a) 2 (b) 4
(c) 0 (d) 3

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) : Rule of divisibility for 9—If the sum of all digits of a number is divisible by 9 then that number will be divisible by 9.

\therefore Given number = 2794p561

$$= 2 + 7 + 9 + 4 + p + 5 + 6 + 1 \\ = 34 + p$$

It is clear on putting value of $p = 2$, number $34 + 2 = 36$ will be exactly divisible by 9.

121. Which of the following options is completely divisible by 11?

- (a) 107611 (b) 809781
(c) 963391 (d) 116571

SSC CHSL -12/10/2020 (Shift-I)

Ans. (c) : Rule of divisibility by 11:

The difference between the sum of digits of even places and sum of digits of odd places must be 0 or multiple of 11.

- (a) $(1+7+1) - (0+6+1) = 2$ (×)
(b) $(8+9+8) - (0+7+1) = 17$ (×)
(c) $(9+3+9) - (6+3+1) = 11$ (✓)
(d) $(1+6+7) - (1+5+1) = 7$ (×)

122. The largest five-digit number that is exactly divisible by 81 is:

- (a) 99991 (b) 99876
(c) 99989 (d) 99954

SSC CHSL -14/10/2020 (Shift-III)

Ans. (d) : Largest number of five digits = 99999

$$81 \overline{) 99999} $$

$$\begin{array}{r} 81 \\ \underline{189} \\ 162 \\ \underline{\times 279} \\ 243 \\ \underline{\times 369} \\ 324 \\ \underline{\times 45} \end{array}$$

$$\text{Required number} = 99999 - 45 = 99954$$

Ans: (b) To be divisible by 8, the last three digits of number must be divisible by 8.

$$\frac{25B}{8} = \frac{256}{8} = 32$$

$$B = 6$$

∴ To be divisible by 9, the sum of digits must be divisible by 9

$$\frac{28+A}{9} = \frac{28+8}{9} = \frac{36}{9} = 4$$

$$\therefore B = 6, A = 8$$

$$\text{Hence } A + B = 8 + 6 = 14$$

132. $2^{18} - 1$ is divisible by:

- (a) 17 (b) 7
(c) 13 (d) 11

SSC CHSL –21/10/2020 (Shift-III)

Ans. (b) ∴ $(a^n - b^n)$ will be divisible by $(a + b)$ and $(a - b)$ if n is an even number.

$$\Rightarrow (2^3)^6 - (1^3)^6$$

$$8^6 - 1^6 \text{ (here } n = 6 \text{ is an even number)}$$

$$n = (8 - 1)(8 + 1)$$

$$n = 7, 9 \text{ (hence, it is divisible by 7)}$$

133. If 8-digit number 4432A43B is divisible by 9 and 5, then the sum of A and B is equal to:

- (a) 8 (b) 7
(c) 5 (d) 12

SSC CHSL –21/10/2020 (Shift-I)

Ans. (b) Rule of divisibility for 5 – If the unit digit of any number is 0 or 5 then that number will be divisible by 5.

Rule of divisibility for 9– if the sum of all digits of any number is exactly divisible by 9, then that number will be divisible by 9.

$$4432A43B = 4 + 4 + 3 + 2 + A + 4 + 3 + B$$

$$= 20 + A + B$$

Hence, we can place number 7 in place of $A + B$

So that $20 + (A + B) = 20 + 7 = 27$ is divisible by 9

Note – (In place of B there will be only 0 or 5)

$$B = 0 \text{ then, } A = 7$$

$$B = 5 \text{ then, } A = 2$$

$$\Rightarrow A + B = 7 + 0 = 7$$

$$\text{or } 2 + 5 = 7$$

134. What should be the value of N to make 396258N divisible by 8?

- (a) 8 (b) 4
(c) 2 (d) 6

SSC CHSL –19/10/2020 (Shift-III)

Ans. (b) : ∴ If the last three digits of a number is divisible by 8 then the number will be divisible by 8.

$$\therefore \frac{58N}{8} = \frac{584}{8} = 73$$

$$\text{Hence, } N = 4$$

135. How many numbers between 800 to 2000 are divisible by 13?

- (a) 92 (b) 90
(c) 91 (d) 93

SSC CHSL –19/10/2020 (Shift-I)

Ans. (a) :

$$\text{Formula, } \ell = a + (n - 1) d$$

where n = Total number of terms

d = common difference

The numbers divisible by 13 between 800 to 2000 are 806, 819, 1989

From the formula,

$$1989 = 806 + (n-1) \times 13$$

$$1183 = 13(n-1)$$

$$91 = (n-1)$$

$$\therefore n = 91+1 = 92$$

Total numbers divisible by 13 between 800 and 2000 = 92

136. Which of the following number is divisible by 11?

- (a) 59609 (b) 45332
(c) 23581 (d) 44433

SSC MTS 9-10-2017 (Shift-I)

Ans : (a) From option (a),

By divisibility rule of 11

$$(5+6+9) - (9+0) = 0 \text{ or multiple of 11.}$$

$$20 - 9 = 11$$

Hence the number 59609 is completely divisible by 11.

137. If 465781P is completely divisible by 12, then what is the value of P?

- (a) 2 (b) 6
(c) 2 or 6 (d) 8

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : For any number to be divisible by 12 that number must be divisible by 3 and 4

Rule of divisibility by 3–For any number to be divisible by 3, the sum of all digits of that number must be divisible by 3.

Rule of divisibility by 4–For any number to be divisible by 4, the number formed from last two digits of that number must be divisible by 4

The number obtained on putting $P = 2$, it is divisible by both 3 and 4.

Hence the number will be also divisible by 12.

$$4 + 6 + 5 + 7 + 8 + 1 + 2 = \frac{33}{3} = 11$$

$$4657812 = 3$$

Hence, $P = 2$ which is the required answer.

138. Which of the following number is divisible by 9.

- (a) 234561 (b) 444123
(c) 555231 (d) 65422

SSC MTS 10-10-2017 (Shift-II)

Ans. (b) : **Rule of divisibility by 9**– If the sum of all digits of any number is divisible by 9 then that number will be divisible by 9.

From options,

$$(a) 234561 \text{ Sum} = 21$$

$$(b) 444123 \text{ Sum} = 18 \text{ (divisible by 9)}$$

$$(c) 555231 \text{ Sum} = 21$$

$$(d) 65422 \text{ Sum} = 19$$

Hence the number 444123 is divisible by 9

139. If 2785P3 is divisible by 11, then what will be the digit in place of P?
 (a) 2 (b) 5
 (c) 8 (d) 6

SSC MTS 10-10-2017 (Shift-I)

Ans : (b) **Rule of divisibility by 11**– When the difference between the sum of digits at odd places and sum of digits at even places of any number is 0 or multiple by 11 then that number will be divisible by 11
 $\Rightarrow (2 + 8 + P) - (7 + 5 + 3)$
 $\Rightarrow (10 + P) - (15)$
 $\Rightarrow P - 5 \dots\dots\dots(i)$
 \therefore On putting value of P = 5, the number is divisible by 11.
 Hence value of P = 5

140. Which of the following number is divisible by 6.
 (a) 23562 (b) 43742
 (c) 53422 (d) 44444

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) : 6 is only divisible by that number which is divisible by both 2 and 3.
 From option (a),
 The number 23562 exactly divisible by 2 and 3.
 Hence, it is also divisible by 6.

141. Which of the following number is not divisible by 4?
 (a) 325752 (b) 111184
 (c) 222264 (d) 444410

SSC MTS 11-10-2017 (Shift-II)

Ans. (d) : **Rule of divisibility by 4**– The number formed from the last two digits of any given number must be divisible by 4 then that number will also be divisible by 4.
 (a) $\frac{3257\ 52}{4} = 13$ (divisible)
 (b) $\frac{1111\ 84}{4} = 21$ (divisible)
 (c) $\frac{2222\ 64}{4} = 16$ (divisible)
 (d) $\frac{4444\ 10}{4} =$ (not divisible)

Hence, number 444410 is not divisible by 4

142. What is the least number added to 700, so that number becomes multiple of 17?
 (a) 3 (b) 12
 (c) 14 (d) 9

SSC MTS 11-10-2017 (Shift-I)

Ans : (c) On dividing 700 by 17, we get 3 as a remainder.
 Hence on adding $(17 - 3)$ 14 to 700 it will become multiple of 17.

143. What least number should be added to 754 so that the number is completely divisible by 59 ?
 (a) 21 (b) 13
 (c) 16 (d) 7

SSC MTS 7-10-2017 (Shift-I)

Ans. (b)

$$\begin{array}{r} 59 \overline{) 754} \text{ (12)} \\ \underline{59} \\ 164 \\ \underline{118} \\ 46 \end{array}$$

On adding $59 - 46 = 13$ to 754 the number will be exactly divisible by 59

144. How many of the following number are divisible by 42 ?
 2646, 1008, 1470, 656, 2478, 1826
 (a) 2 (b) 3
 (c) 4 (d) 5

SSC MTS 7-10-2017 (Shift-I)

Ans. (c) : 2646, 1008, 1470, 656, 2478, 1826
 Numbers divisible by 42– 2646, 1008, 1470 and 2478
 Hence there are 4 numbers which are divisible by 42.

145. If A is the smallest three digit number divisible by both 6 and 7 and B is the largest four digit number divisible by both 6 and 7, then what is the value of B – A?
 (a) 9912 (b) 9870
 (c) 9996 (d) 9954

SSC MTS 08/08/2019 (Shift-III)

Ans. (b) : L.C.M of 6 and 7 = 42
 A is the smallest three digit number divisible by 42
 $\therefore A = 42 \times 3$

$$A = 126$$

Largest 4 digit number divisible by B = 9999 – 3

$$B = 9996 \quad \therefore \frac{9999}{42} \text{ remainder} = 3$$

$$\text{Then, } B - A = 9996 - 126 = 9870$$

146. What is the value of x so that the seven digit number 91876x2 is divisible by 72?
 (a) 2 (b) 3
 (c) 5 (d) 7

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (b) : Seven digit number 91876x2 is divisible by 72, so, that number will be divisible by 9 and 8.

Rule of divisible by 9–if the sum of all the digits of the given number is completely divisible by 9 then the given number will be exactly divisible by 9
 Number = $91876x2 = (9 + 1 + 8 + 7 + 6 + x + 2)$

$$= \frac{33 + x}{9}$$

On putting $x = 3$, the number will be divisible by 9.
 Hence, the value of $x + 3$

Rule of divisible by 8– Any given number will only be divisible by 8 when the number formed by its hundreds, tens and unit digit is completely divisible by 8

\therefore From option (b) on taking $x = 3$
 The number formed from hundred, tens and unit digits = 632

$$\therefore \frac{632}{8} = 0 \text{ remainder}$$

Hence it is clear on putting $x = 3$ the number is divisible by 9187632 by 72.

147. Which of the following is divisible by 88?

- (a) 4987316 (b) 4987136
(c) 4978136 (d) 4897136

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : ∴ The number, which is divisible by 88 is also divisible by both 8 and 11.

∴ from option (b),

4987136

11

$$= (4 + 8 + 1 + 6) - (9 + 7 + 3)$$

$$= 19 - 19 = 0 \text{ or multiple of } 11.$$

By divisibility rule of 8.

$$\frac{136}{8} = 17$$

Hence it is clear that number 4987136 is divisible by 8 and 11 so this number is divisible by 88.

148. Which of the following is divisible by 11?

- (a) 8597314652 (b) 8957314652
(c) 9857136425 (d) 9857314625

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b): Rule of divisibility by 11-

The difference between the sum of digit at even and odd places of any number must be zero or multiple of 11

From option (b),

$$(9 + 7 + 1 + 6 + 2) - (8 + 5 + 3 + 4 + 5)$$

$$= 25 - 25 = 0$$

(II) Problems based on Prime and Composite Numbers

149. What is the sum of digits of a two digit indivisible number whose unit and ten's digit are equal?

- (a) 18 (b) 10
(c) 2 (d) 6

SSC MTS 14/08/2019 (Shift-I)

Ans. (c) : Two digit indivisible number will be 11 in which unit and tens digit number is same.

$$\therefore \text{Sum of digits of number } 11 = 1 + 1 = 2$$

150. Which of the following is not a prime number?

- (a) 41 (b) 47
(c) 91 (d) 73

SSC MTS 9-10-2017 (Shift-III)

Ans : (c) Prime Number—The number which has only two factor i.e. 1 and the number itself.

For example—2, 3, 5, 7, 31, 37 etc.

In the given options 91 has more than two factor (1, 13, 7, 91) Hence, 91 is not a prime number.

151. x, y and z are prime numbers and $x+y+z = 38$. What is maximum value of x?

- (a) 19 (b) 23
(c) 31 (d) 79

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $x + y + z = 38$

For the value of x to be maximum the value of y and z must be 2 and 5 respectively

$$x + 2 + 5 = 38$$

$$x = 31$$

152. How many two digit prime numbers are there between 10 to 100 which remains prime numbers when the order of their digits is reversed?

- (a) 8 (b) 9
(c) 10 (d) 12

SSC CGL 9-3-2018 (Shift-II)

Ans. (b) : Number of prime number between 1 to 100 = 25

Prime number between 1 to 10 = 4

∴ Prime numbers between 10 to 100 = 21

The required numbers are as follows -

11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59,

61, 67, 71, 73, 79, 97, 83, 89,

Hence there are 9 prime numbers which will remain prime numbers after reversing their digits

(III) Problems based on Factors of Numbers

153. If y is an integer, then $(y^3 - y)$ is always multiple of _____.

- (a) 5 (b) 7
(c) 9 (d) 6

SSC MTS 11-10-2017 (Shift-III)

Ans. (d) : If y is an integer, then $(y^3 - y)$ will always be multiple of 6

let y is taken as 2-

$$= (y^3 - y)$$

$$= (2^3 - 2) = 6$$

It is multiple of 6 hence option (d) is correct

Trick:

The product of n consecutive positive numbers will always be divisible by n.

Ex. $15 \times 16 \times 17 \times 18 \times 19$ this number will always be divisible by 5

From the given question,

$$(y^3 - y)$$

$$= y(y^2 - 1) \Rightarrow y(y - 1)(y + 1)$$

$$= (y - 1)(y)(y + 1)$$

This is the product of 3 consecutive numbers which means the number will always be divisible by 3.

$$3! = 3 \times 2 \times 1 = 6$$

Similarly the given number will always be a multiple of 6

154. How many multiples of 7 are there from 1 to 100 which are not multiples of 4?

- (a) 14 (b) 11
(c) 10 (d) 12

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) : Numbers of multiples of 7 from 1 to 100

$$= \frac{100}{7} = 14$$

L.C.M of 7 and 4 = 28

Hence from 1 to 100, number divisible by 7 and 4 =

$$\frac{100}{28} = 3 \text{ number}$$

Hence $(14 - 3 = 11)$ there are 11 numbers which are divisible by 7 but not by 4

155. Find the number of prime factors in the product $(30)^5 \times (24)^5$.

- (a) 45 (b) 10
(c) 35 (d) 30

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : $30^5 \times 24^5 = (2 \times 3 \times 5)^5 \times (2^3 \times 3)^5$
 $= 2^{20} \times 3^{10} \times 5^5$

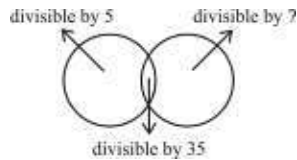
\therefore Number of Prime factors = $20+10+5 = 35$

156. How many natural numbers less than 1000 are divisible by 5 or 7 but NOT by 35?

- (a) 285 (b) 313
(c) 243 (d) 341

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a)



Total natural numbers below 1000 = 999

Total natural numbers which are divisible by 5 = $\frac{999}{5} = 199$

Total natural numbers which are divisible by 7 = $\frac{999}{7} = 142$

Total natural numbers which are divisible by 35 = $\frac{999}{35} = 28$

\therefore Total numbers till 999 which are divisible by 5 and 7 but not divisible by 35 = $(199 + 142 - 2 \times 28) = 285$

157. Which of the following statement(s) is/are TRUE ?

I. The total number of positive factors of 72 is 12

II. The sum of first 20 odd numbers is 400

III. Largest two digit prime number is 97

- (a) Only I and III (b) Only II and III
(c) Only I and III (d) All are true

SSC CGL (Tier-II) 20-02-2018

Ans. (d) I. $72 = 8 \times 9 = 2^3 \times 3^2$

Number of factor = $(3+1)(2+1) = 12$

It is correct

II. Sum of first n odd numbers = n^2 [$\because n = \text{given} = 20$]

Sum of first 20 odd numbers = $20^2 = 400$

It is also correct

III. Largest two digit prime number = 97 (correct)

Thus all the statements are true

158. The number of factors of 3600 is :

- (a) 42 (b) 44
(c) 45 (d) 43

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : \because We know that

If $N = 2^a \times 3^b \times 5^c \times 7^d \dots$

\therefore Total number of factors = $(a+1)(b+1)(c+1)(d+1) \dots$

$\therefore 3600 = 2^4 \times 3^2 \times 5^2$

Hence number of factors of 3600 = $(4+1)(2+1)(2+1) = 5 \times 3 \times 3 = 45$

159. One of the factors of $(8^{2k} + 5^{2k})$, where k is an odd number, is :

- (a) 88 (b) 84
(c) 89 (d) 86

SSC CGL (Tier-II) 11-9-2019

Ans. (c) \because k is an odd number

$\therefore k = 1$

$8^2 + 5^2 = 64 + 25 = 89$

Hence it is divisible by 89.

Formula:

(i) $(a^n + b^n)$, will always be divisible by $(a + b)$
Where 'n' is an odd number

(ii) $(a^n - b^n)$, will always be divisible by $(a - b)$
Where 'n' is an odd number

(iii) $(a^n - b^n)$, will always be divisible by $(a + b)$ and $(a - b)$
Where 'n' is an even number

Now,

$(8^{2k} + 5^{2k}) = (8^2)^k + (5^2)^k = (64^k + 25^k)$

$\therefore k$ is an odd number (given)

\therefore it is clear from formula (i) that number will always be divisible by $(64 + 25) = 89$

160. If $N = 4^{11} + 4^{12} + 4^{13} + 4^{14}$, then how many positive factors of N are there ?

- (a) 92 (b) 48
(c) 50 (d) 51

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $N = 4^{11} + 4^{12} + 4^{13} + 4^{14}$

$N = 4^{11} (1 + 4 + 4^2 + 4^3)$

$= 4^{11} \times 85$

$= 2^{22} \times 5^1 \times 17^1$

Positive factors of N = $(22+1)(1+1)(1+1) = 92$

161. If $N = 3^{14} + 3^{13} - 12$, then what is the largest prime factor of N ?

- (a) 11 (b) 79
(c) 13 (d) 73

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : $N = 3^{14} + 3^{13} - 12$

$= 3^{12} [3^2 + 3] - 12$

$= 3^{12} \times 12 - 12$

$= 12[3^{12} - 1]$

$= 12(3^6 + 1)(3^6 - 1)$

$= 12 \times 730 \times 728$

Hence the largest prime factor = 73

162. How many factors of 420 are prime numbers?

- (a) 3 (b) 15
(c) 7 (d) 4

SSC MTS 10-10-2017 (Shift-II)

Ans. (d) : $420 = 2 \times 2 \times 3 \times 5 \times 7$

Hence prime factors - 2, 3, 5, 7 = 4

Hence there are 4 prime factors of 420

163. The sum of two numbers is 7 and their product is 12. What is the sum of their reciprocals?

- (a) $\frac{7}{12}$ (b) $\frac{8}{15}$
 (c) $\frac{7}{13}$ (d) $\frac{12}{7}$

SSC MTS 10-10-2017 (Shift-II)

Ans. (a) : Let the two number be a and b
 According to question,
 $a + b = 7$
 $a \times b = 12$

$$\begin{aligned} \text{Sum of reciprocals} &= \frac{1}{a} + \frac{1}{b} \\ &= \frac{a+b}{ab} = \frac{7}{12} \end{aligned}$$

164. How many positive factors of 333 are there?

- (a) 5 (b) 8
 (c) 6 (d) 9

SSC MTS 11-10-2017 (Shift-II)

Ans. (c) : Factors of 333 = $3 \times 3 \times 37$
 $= 3^2 \times 37^1$

$$\begin{aligned} \text{Postive factors of 333} &= (2+1)(1+1) \\ &= 3 \times 2 = 6 \end{aligned}$$

165. How many positive factors of 444 are there?

- (a) 6 (b) 8
 (c) 9 (d) 12

SSC MTS 11-10-2017 (Shift-I)

Ans : (d) Positive factors of 444 = $2 \times 2 \times 3 \times 37$
 $= 2^2 \times 3^1 \times 37^1$

$$\begin{aligned} \text{Number of factors} &= (2+1)(1+1)(1+1) \\ &= 3 \times 2 \times 2 = 12 \end{aligned}$$

(IV)

Problems based on Unit Digit of Numbers

166. What is the unit digit of $1^5 + 2^5 + 3^5 + \dots + 20^5$?

- (a) 0 (b) 5
 (c) 2 (d) 4

SSC CGL (Tier-II) 19-02-2018

Ans. (a) :

To obtain unit digit divide the power by 4 and the last remainder is taken as the power of the base number.

So,
 $1^1 + 2^1 + 3^1 + 4^1 + 5^1 + 6^1 + \dots + 20^1$

$$S_{20} = \frac{20(20+1)}{2}$$

$$S_{20} = 210$$

Hence unit digit = 0

167. If the unit digit of $433 \times 456 \times 43N$ is $(N + 2)$, then what is the value of N?

- (a) 1 (b) 8
 (c) 3 (d) 6

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Unit digit of $433 \times 456 \times 43N = (N+2)$

$$3 \times 6 \times N = N + 2$$

$$8 \times N = N + 2$$

From option (d),

$$8 \times N = 8 \times 6 = 48$$

Unit digit = 8

$$8 \times 6 = 6 + 2$$

$$8 = 8$$

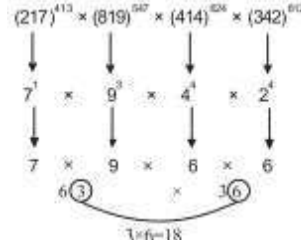
$$\text{Hence, } N = 6$$

168. What is the unit digit of $(217)^{413} \times (819)^{547} \times (414)^{624} \times (342)^{812}$?

- (a) 2 (b) 4 (c) 6 (d) 8

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :



Hence unit digit = 8

169. What percentage of the numbers from 101 to 1000 have 9 in the unit's digit?

- (a) 10% (b) 12%
 (c) 20% (d) 15%

SSC CHSL -19/10/2020 (Shift-I)

Ans. (a) : Required number from 101 to 200 = 10

Hence numbers of such number from 101 to 1000 in which unit digit is 9 = $10 \times 9 = 90$

Total numbers of numbers from 101 to 1000 = 900

$$\text{Required \%} = \frac{90}{900} \times 100 = 10\%$$

170. What is the unit digit of $5^{124} \times 124^5$?

- (a) 5 (b) 1
 (c) 0 (d) 2

SSC MTS 9-10-2017 (Shift-I)

Ans : (c) When any even number is multiplied by 5 then, the unit digit always becomes zero (whatever the power is)

For example-

$$\Rightarrow 5 \times 4 = 20$$

$$\Rightarrow 125 \times 166 = \dots 0$$

$$\Rightarrow 12244 \times 12135 = \dots 0$$

$$\Rightarrow 5^{124} \times 124^5 = \dots 0$$

171. What is the digit at units place in the product $(653 \times 308 \times 402 \times 413)$?

- (a) 4 (b) 3
 (c) 2 (d) 8

SSC MTS 7-10-2017 (Shift-I)

Ans. (a) : $653 \times 308 \times 402 \times 413$

$$\text{Unit's digit} = 3 \times 8 \times 2 \times 3 = 144$$

Unit digit = 4

172. What is the unit digit of the sum of first 111 whole numbers?

- (a) 4 (b) 6
 (c) 5 (d) 0

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : First 111 whole numbers $\rightarrow 0, 1, 2, 3, \dots, 110$

$$\text{Sum of first } n \text{ natural numbers} \Rightarrow \frac{n(n+1)}{2}$$

$$= \frac{110 \times (110 + 1)}{2}$$

$$= \frac{110 \times 111}{2} = 55 \times 111$$

$$= 5 \times 1 = 5$$

Hence unit's digit = 5

173. If $x = (164)^{169} + (333)^{337} - (727)^{726}$, then what is the unit digit of x ?

- (a) 5 (b) 7
(c) 8 (d) 9

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : $x = (164)^{169} + (333)^{337} - (727)^{726}$

For unit digit divide the power over base by 4 and place the remainder as the power of the unit digit of the base number which is left after dividing by 4

$$\therefore x = (4)^1 + (3)^1 - (7)^2 = 4 + 3 - 49$$

on writing unit digit

$$x = 4 + 3 - 9 = -2$$

$$x = 10 - 2 = 8$$

Note- 10 is added to unit digit to make it positive.

174. Let $x = (633)^{24} - (277)^{38} + (266)^{54}$. What is the unit digit of x ?

- (a) 8 (b) 6
(c) 4 (d) 7

SSC CGL (Tier-II) 11-09-2019

Ans. (a) :

$$x = (633)^{24} - (277)^{38} + (266)^{54}$$

$$= 3^{24} - 7^{38} + 6^{54}$$

$$= 3^4 - 7^2 + 6^2$$

$$= 1 - 9 + 6$$

$$= -2$$

$$= -2 + 10 = 8$$

Unit digits is always positive, to make it positive, 10 is added.

(V). Problems based on Remainder Theorem

175. Given n an integer what is the remainder when $(6n + 3)^2$ is divided by 9?

- (a) 2 (b) 3
(c) 1 (d) 0

SSC CHSL 08/07/2019 (Shift-II)

Ans. (d) : $\frac{(6n + 3)^2}{9} = \frac{36n^2 + 9 + 36n}{9}$

$$= \frac{36n^2}{9} + \frac{9}{9} + \frac{36n}{9} = 4n^2 + 1 + 4n$$

In $(6n + 3)^2$ all the three terms are divisible by 9
Hence, the remainder will be zero.

176. When a number is divided by 3, the remainder is 2. Again, when the quotient is divided by 7, the remainder is 5. What will be the remainder when the original number is divided by 21?

- (a) 14 (b) 13
(c) 17 (d) 16

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : Let, the original number be N

According to the question-

$$N = 3q + 2$$

Again, $q = 7 \times 1 + 5$

$$q = 12$$

Then, $N = 3 \times 12 + 2$

$$N = 38$$

Now, when 38 are divided by 21, we get 17 as remainder.

177. If a positive integer n is divided by 7, the remainder is 2. Which of the numbers in the options yields a remainder of 0 when it is divided by 7?

- (a) $n + 5$ (b) $n + 2$
(c) $n + 3$ (d) $n + 1$

SSC CHSL-18/03/2020 (Shift-II)

Ans. (a): According to question,

$$\frac{n}{7} \Rightarrow \text{remainder} = 2$$

From option (a),

$$\frac{n + 5}{7} = \frac{2 + 5}{7} = 1$$

Hence remainder = zero

\therefore Hence option (a) is correct

178. When a number is divided by 14, the remainder is 9. If the square of the same number is divided by 14, then the remainder will be:

- (a) 11 (b) 9
(c) 8 (d) 10

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a) Let the number be 23.

On dividing 23 by 14 the remainder is 9.

Again, on dividing $(23)^2 = 529$ by 14 the remainder is 11.

179. If a number is divided by 3, the remainder will be 2. If the number is added by 5 and then divided by 3, then what will be the remainder?

- (a) 0 (b) 3
(c) 1 (d) 2

SSC CHSL -17/03/2020 (Shift-II)

Ans. (c) : Let quotient be x

$$\text{dividend} = \text{divisor} \times \text{quotient} + \text{remainder}$$

$$= 3x + 2$$

According to question,

$$\frac{(3x + 2) + 5}{3} = \frac{3x + 7}{3}$$

$$= \frac{(3x + 6) + 1}{3}$$

Hence remainder = 1

180. When 3738, 5659 and 9501 are divided by the greatest possible number x , the remainder in each case is y . What is the sum of x and y ?

- (a) 3738 (b) 3673
(c) 3637 (d) 3783

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (a) The remainder left in each case is y

HCF of 1921, 3842 and 5763 = 1921
 The remainder obtained on dividing each by = 1817
 $\therefore x = 1921, y = 1817$
 Hence $x + y = 3738$

181. If x is the remainder when 3^{61284} is divided by 5 and y is the remainder when 4^{96} is divided by 6, then what is the value of $(2x-y)$?
 (a) -4 (b) 2
 (c) -2 (d) 4

SSC CGL (Tier-II) 13-09-2019

Ans. (c) $\frac{3^{61284}}{5} = \frac{(3^4)^{15321}}{5} = \frac{(80+1)^{15321}}{5} = 1$ (remainder)
 $x = 1$
 remainder obtained on dividing 4^n by 4
 Where n is a natural number
 $\frac{4^{96}}{6} = 4$ (remainder)
 $y = 4$
 $\therefore 2x - y = 2 \times 1 - 4 = -2$

182. If $71^{83} + 73^{83}$ is divided by 36, the remainder is:

- (a) 0 (b) 8
 (c) 9 (d) 13

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) : On $a^m + b^m$, if m is an odd number then the sum of $(a+b)$ is divisible by 36

So, $\frac{71+73}{36} = \frac{144}{36} = 4$

Then, remainder = 0

183. When a number M is divided by 7, the remainder is 6. What is the remainder if the square of M is divided by 7?

- (a) 3 (b) 4
 (c) 1 (d) 2

SSC CHSL 19/04/2021 (Shift-III)

Ans. (c) : If M is divided by 7, the remainder is 6 that can be written as,

$M = 7x + 6$ for integer x .

Then, M^2 is divided by 7 that can be written as,

$M^2 = (7x + 6)^2$

$= 49x^2 + 84x + 36$

$= 49x^2 + 84x + 35 + 1$

So, $(49x^2 + 84x + 35)$ is divisible by 7 and leaves remainder 1.

Hence, option (c) is correct.

184. Let x be the least number which when divided by 8, 9, 12, 14 and 36 leaves a remainder of 4 in each case, but x is divisible by 11. The sum of the digits of x is _____.

- (a) 5 (b) 9
 (c) 4 (d) 6

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c) LCM of 8, 9, 12, 14 and 36 = 504

Let the smallest number be $x = 504 \times m + 4$

According to question number,

$(504 \times m + 4)$, is divisible by 11

Hence on putting $m = 2$

$x = 1012$

Sum of digits of 1012 = $1+0+1+2 = 4$

185. If a number is divisible by 624, the remainder will be 53. If the same number is divisible by 16, then the remainder will be:

- (a) 5 (b) 4
 (c) 7 (d) 6

SSC CHSL 13/04/2021 (Shift-II)

Ans. (a) : Formula:

Dividend = Divisor \times Quotient + Remainder

Let the number that divides 624 is N

$\Rightarrow \frac{624}{N}$, Remainder = 53

When it is divisible by 16, it can be written as,

$\frac{(39 \times 16 + 53)}{N}$

$\Rightarrow \frac{(39 \times 16 + 16 \times 3 + 5)}{N}$

\therefore Required remainder = 5

Hence, option (a) is correct.

186. When an integer n is divided by 6, the remainder is 5. What is the remainder if $9n$ is divided by 6?

- (a) 4 (b) 3
 (c) 5 (d) 2

SSC CHSL 15/04/2021 (Shift-II)

Ans. (b) When an integer n is divided by 6, the remainder is 5.

\therefore Number = Divisor \times Quotient + Remainder

$\Rightarrow n = 6q + 5$

According to the question,

If $9n$ is divided by 6,

$\therefore 9n = 9(6q + 5)$

$\Rightarrow 9n = 54q + 45$

$\Rightarrow 9n = 54q + 42 + 3$

$\Rightarrow 9n = 6(9q + 7) + 3$

So, 3 is remainder if $9n$ is divided by 6.

Hence, option (b) is correct.

187. If $31^{47} + 43^{47}$ is divided by 37, the remainder is:

- (a) 2 (b) 3
 (c) 0 (d) 1

SSC CHSL 09/08/2021 (Shift-III)

Ans. (c) : $(a^n + b^n)$ is divisible by $(a + b)$ if n is odd

$\therefore 31^{47} + 43^{47}$ is divisible by $(31 + 43) = 74$

But 74 is the multiple of 37, so $31^{47} + 43^{47}$ is also exactly divisible by 37.

\therefore Remainder = 0

Hence, option (c) is correct.

188. What is the remainder when we divide $4^{50} + 7^{50}$ by 65?

- (a) 1 (b) 2
(c) 0 (d) 3

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (c) : $\frac{4^{50} + 7^{50}}{65} = \frac{(4^2)^{25} + (7^2)^{25}}{65} = \frac{16^{25} + 49^{25}}{65}$

$\therefore (a^n + b^n)$ is always divisible by $(a + b)$

where n is an odd number

$\therefore 16^{25} + 49^{25}$ is always divisible by $(16 + 49) = 65$
Hence remainder = 0

189. The ratio of divisor and remainder is 3 : 2 and ratio of divisor and quotient is 7:12. If remainder is 14 then what is the remainder obtained when the dividend is divided by 9?

- (a) 3 (b) 6
(c) 4 (d) 5

SSC MTS 21/08/2019 (Shift-I)

Ans. (d) : The ratio of divisor and remainder = 3 : 2 = $3x, 2x$

And ratio of divisor and quotient = 7 : 12 = $7y, 12y$

if remainder = 14 then $2x = 14 \Rightarrow x = 7$

Then, divisor $3x = 3 \times 7 = 21$, but divisor is $7y$ then $7y = 21$, $y = 3$

then quotient $12y = 12 \times 3 = 36$

Now, dividend = divisor \times quotient + remainder

dividend = $21 \times 36 + 14 = 770$

Then the remainder obtained on dividing the dividend by 9 =

$$\begin{array}{r} 9 \overline{)770} \text{ (85)} \\ \underline{72} \\ 50 \\ \underline{45} \\ 5 \end{array}$$

remainder = 5

190. What is the remainder when $(127^{97} + 97^{97})$ is divided by 32 ?

- (a) 0 (b) 4
(c) 2 (d) 7

SSC CGL (Tier-II) 13-09-2019

Ans. (a) :

$$= \frac{127^{97} + 97^{97}}{32}$$

$$= \frac{127^{97}}{32} + \frac{97^{97}}{32}$$

$$= \frac{(128-1)^{97}}{32} + \frac{(96+1)^{97}}{32}$$

$$= \frac{(-1)^{97}}{32} + \frac{(1)^{97}}{32} = -1 + 1 = 0$$

191. When an integer n is divided by 7, so the remainder is 3. If $6n$ is divided by 7, what will be the remainder?

- (a) 1 (b) 4
(c) 0 (d) 2

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (b) : In such questions choose such number which when divided the obtained remainder is according to the given question

\therefore Let $n = 10$

$$\therefore \frac{n}{7} = \frac{10}{7} = 3 \text{ (remainder)}$$

$$\text{And, } \frac{6n}{7} = \frac{6 \times 10}{7} = \frac{60}{7} = 4 \text{ (remainder)}$$

192. If 7 divided a positive integer n , the remainder is 2. Which of the following numbers gives a remainder of 0 when divided by 7?

- (a) $n + 5$ (b) $n - 5$
(c) $n + 2$ (d) $n + 1$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (a) : Let $n = 9$

On dividing by 7 remainder found = 2

From option,

$$n + 5 = 14 \text{ is exactly divisible by } 7$$

193. If 5 divided the integer n , the remainder is 2. What will be the remainder if $7n$ is divided by 5?

- (a) 1 (b) 3
(c) 2 (d) 4

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (d) : Let integer $(n) = 7$

Remainder left on dividing 7 by 5 = 2

$$7n = 49$$

Remainder left on dividing $7n$ by 5 = 4

194. M is the largest three digit number which when divided by 6 and 5 leaves remainder 5 and 3 respectively. What will be the remainder when M is divided by 11 ?

- (a) 1 (b) 2
(c) 3 (d) 4

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : The largest 3-digit number which when divided by 6 and 5 leaves remainder as 5 and 3

998, 993, 988, 983

Hence 983 is that number which when divided by 6 and 5 leaves remainder 5 and 3

Respectively

$$\Rightarrow M = 983$$

$$\Rightarrow M \div 11 = 983 \div 11$$

remainder = 4

195. How many natural numbers are there between 1000 to 2000, which when divided by 341 leaves remainder 5 ?

- (a) 3 (b) 2
(c) 4 (d) 1

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Natural numbers between 1000 and 2000 = $1000 < 341K + 5 < 2000$

Where K is taken as 3, 4, 5

$$K = 3 \text{ then } 341K + 5 = 341 \times 3 + 5$$

$$= 1028$$

$$K = 4 \text{ then } 341K + 5 = 341 \times 4 + 5 = 1369$$

$$K = 5 \text{ then } 341K + 5 = 341 \times 5 + 5$$

$$= 1710$$

Hence the numbers of natural numbers between 1000 and 2000 are three which when divided by 341 leaves 5 as a remainder

Trick:

$$\frac{2000}{341} = \text{Integer quotient} = 5$$

And $\frac{1000}{341} = \text{Integer quotient} = 2$

∴ The natural numbers b/w 1000 to 2000 which when divided by 341 leaves 5 as a remainder = $5 - 2 = 3$

- 196. M is the largest 4 digit number, which when divided by 4, 5, 6 and 7 leaves remainder as 2, 3, 4 and 5 respectively. What will be the remainder when M is divided by 9 ?**
- (a) 2 (b) 1
(c) 3 (d) 6

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Largest four digit number = 9999

L.C.M of 4, 5, 6, 7 = 420

∴ The difference between divisor and remainder is same

$$(4-2 = 2, 5-3 = 2, 6-4 = 2, 7-5 = 2)$$

∴ Required number = $420K - 2$

$$= (K = 1, 2, 3 \dots\dots)$$

$$\text{on putting } K = 23$$

$$= 420 \times 23 - 2$$

$$= 9658$$

According to question,

$$\therefore 9658 \div 9$$

Remainder = 1

- 197. N is the smallest three digit prime number. When N is divided by 13, then what will be the remainder?**

- (a) 8 (b) 9
(c) 7 (d) 10

SSC CGL (Tier-II) 19-02-2018

Ans. (d) The smallest three digit prime number (N)=101
Remainder on dividing 101 by 13 = 10

- 198. The sum of the digits of a two-digit number is $\frac{1}{7}$ of the number. The unit digit is 4 less than the tens digit. If the number obtained on a reversing its digits is divided by 7, then remainder will be :**

- (a) 4 (b) 6
(c) 1 (d) 5

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Let number = $10x + y$

According to question -

$$10x + y = 7(x + y) \quad \text{---(i)}$$

$$x = y + 4 \quad \text{---(ii)}$$

$$10y + 40 + y = 7(y + 4 + y)$$

$$10y + 40 + y = 14y + 28$$

$$3y = 12$$

$$y = 4$$

$$\therefore x = 4 + 4 = 8$$

Hence number = 84

Reversing the digits and dividing by = $\frac{48}{7}$

$$= \frac{6 \times 7 + 6}{7}$$

⇒ Remainder = 6

- 199. N is the largest two digit number, which when divided by 3, 4 and 6 leaves the remainder 1, 2 and 4 respectively. What is the remainder when N is divided by 5?**

- (a) 4 (b) 2
(c) 0 (d) 1

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : L.C.M of 3, 4 and 6 = 12

$$[3-1 = 4-2 = 5-3 = 2]$$

$$\text{Required number} = 12k - 2$$

$$\text{on putting } k = 8$$

$$= 94$$

$$\text{Remainder on dividing 94 by 5} = 4$$

- 200. If $14331433 \times 1422 \times 1425$ is divided by 10, then what is the remainder?**

- (a) 0 (b) 8
(c) 9 (d) 3

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : Given-

$$\text{Number} = 14331433 \times 1422 \times 1425$$

∴ Last digit of number = $3 \times 2 \times 5 = 30$

∴ Last digit is 0

Hence on dividing by 10 the remainder obtained will be zero

- 201. When a number is successively divided by 3, 4 and 7, the remainders obtained are 2, 3 and 5, respectively. What will be the remainder when 84 divides the same number?**

- (a) 71 (b) 53
(c) 48 (d) 30

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : When number is divided by 7 then the remainder obtained 5 hence number = $7x + 5$

On dividing the same number by 4 is obtained as remainder 3, hence number = $4(7x + 5) + 3$

On dividing the same number by 3 the remainder obtained is 2

$$\text{Hence number} = 3[4(7x + 5) + 3] + 2$$

$$\therefore \text{Number} = 3[28x + 23] + 2$$

$$= 84x + 69 + 2$$

$$= 84x + 71$$

Hence on dividing the number by 84, 71 is obtained as remainder.

- 202. The remainder when $72 \times 73 \times 78 \times 76$ is divided by 35 is:**

- (a) 12 (b) 15
(c) 22 (d) 8

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : By remainder theorem,

$$\frac{+2 \times +3 \times +6 \times +8 \times +1 \times +8}{72 \times 73 \times 76 \times 78} = \frac{36 \times 8}{35 \times 35}$$

$$= 1 \times 8 = 8$$

- 203. If $14331433 \times 1422 \times 1425$ is divided by 12, then what is the remainder?**

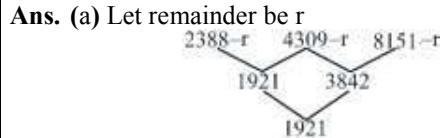
- (a) 9 (b) 3
(c) 6 (d) 8

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c): If $14331433 \times 1422 \times 1425$ is dividing by 12
 $R_1 = 1, R_2 = 6, R_3 = 9$
 $R = R_1 \times R_2 \times R_3$
 $= 1 \times 6 \times 9 = 54$
 $R = \frac{54}{12} = 6$
Hence the remainder obtained = 6

204. When 2388, 4309 and 8151 are divided by a certain 3-digit number, then remainder in each case is the same. The remainder is:
(a) 15 (b) 39
(c) 23 (d) 19

SSC CPO-SI – 09/12/2019 (Shift-II)



Factor of 1921 = 113×17
Hence the three digit number = 113
 $\therefore \frac{2388}{113} \Rightarrow$ remainder = 15

205. When a certain number is divided by 65, then remainder is 56. When the same number is divided by 13, then remainder is x. What is the value of $\sqrt{5x-2}$

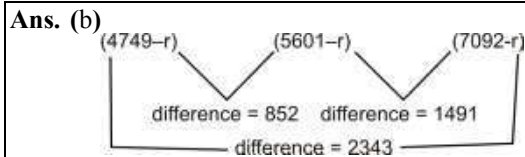
- (a) $\sqrt{13}$ (b) $2\sqrt{7}$
(c) $2\sqrt{2}$ (d) $3\sqrt{2}$

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Remainder obtained on dividing 56 by 13 = 4
 $\therefore x = 4$
 $\sqrt{5x-2} = \sqrt{5 \times 4 - 2} = \sqrt{18} = 3\sqrt{2}$

206. If r is the remainder when each of 4749, 5601 and 7092 is divided by the greatest possible number ($d > 1$), then the value of ($d + r$) will be:
(a) 298 (b) 276
(c) 282 (d) 271

SSC CPO-SI – 11/12/2019 (Shift-I)



H.C.F of 852, 1491 and 2343 = 213
The remainder left on dividing each number by 213 = 63
 $\therefore d = 213, r = 63$
Hence $d + r = 276$

207. The remainder when $75 \times 73 \times 78 \times 76$ is divided by 34 is :
(a) 15 (b) 18
(c) 22 (d) 12

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) : $\frac{75 \times 73 \times 78 \times 76}{34}$
 $= \frac{(68+7) \times (68+5) \times (68+10) \times (68+8)}{34}$

$$= \frac{7 \times 5 \times 10 \times 8}{34} = \frac{6 \times 2}{34} = \frac{12}{34}$$

Hence remainder = 12

208. If $29^{41} + 37^{41}$ is divided by 33, then the remainder is:

- (a) 3 (b) 1
(c) 0 (d) 2

SSC CHSL –19/10/2020 (Shift-II)

Ans.(c) : $(a^n + b^n)$ is divisible by $(a + b)$ when n is odd
 $29^{41} + 37^{41}$ is divisible by $(29 + 37 = 66)$
Hence, $29^{41} + 37^{41}$ 66 divisible by 33
 \therefore Remainder = 0

209. If a number is divided by 899, then remainder is 63. If the same number is divided by 29, then remainder will be:

- (a) 10 (b) 2
(c) 4 (d) 5

SSC CHSL –26/10/2020 (Shift-I)

Ans. (d) : \because 899 is divisible by 29.

$$\therefore \begin{array}{r} 29 \overline{) 63(2} \\ \underline{58} \\ 5 \text{ Remainder} \end{array}$$

210. When an integer n is divided by 5, then remainder is 3. What is the remainder if $8n$ is divided by 5?

- (a) 4 (b) 2
(c) 3 (d) 1

SSC CHSL –12/10/2020 (Shift-III)

Ans. (a) : According to question,
Number in first condition $(n) = 5K + 3$
($\because K =$ quotient)
Number in 2nd condition $(8n) = 40K + 24$
Required remainder = $\frac{24}{5} = 4$

211. When $(77^{77} + 77)$ is divided by 78, the remainder is:

- (a) 77 (b) 75
(c) 76 (d) 74

SSC CHSL –12/10/2020 (Shift-II)

Ans. (c) : $\frac{77^{77} + 77}{78}$
 $= \frac{(-1)^{77} + 77}{78} = \frac{-1 + 77}{78} = \frac{-1 - 1}{78} = \frac{-2}{78} = 78 - 2 = 76$

212. In a question on division, the divisor is 6 times the quotient and 3 times the remainder. If the remainder is 40, then find the dividend.

- (a) 2455 (b) 2440
(c) 2450 (d) 2445

SSC CHSL –19/03/2020 (Shift-II)

Ans. (b) :
 \therefore dividend = divisor \times quotient + remainder
quotient = x, divisor = 6x
 \therefore remainder = 40

$$\begin{aligned} \therefore \text{divisor} &= 3 \text{ times of remainder} \\ &= 40 \times 3 = 120 \\ \therefore 6x &= 120 \Rightarrow x = 20 \\ \text{dividend} &= 120 \times 20 + 40 \\ &= 2400 + 40 = 2440 \end{aligned}$$

213. If a number is divided by 30 then it leaves 17 as a remainder. What will be the remainder when the same number is divided by 10?

- (a) 7 (b) 3
(c) 1 (d) 2

SSC MTS 9-10-2017 (Shift-I)

Ans : (a) Let number be x
and quotient be P
dividend = divisor \times quotient + remainder
 $x = 30 \times P + 17$
on dividing by 10
$$\frac{30P + 17}{10} = 7 \text{ (remainder)}$$

214. A number when divided by 36 leaves remainder 25. What is the remainder when the same number is divided by 6?

- (a) 0 (b) 1
(c) 2 (d) 4

SSC MTS 10-10-2017 (Shift-I)

Ans : (b) Let assume that on dividing number by 36, K is obtained the quotient and 25 is the remainder
 \therefore Dividend = $36 \times K + 25$
 $= 6 \times 6K + 6 \times 4 + 1$
 $= 6(6K + 4) + 1$
Hence on dividing by 6, 1 is left as remainder

215. What is the remainder when 622 is divided by 13?

- (a) 2 (b) 11
(c) 9 (d) 17

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) :

$$\begin{array}{r} 13 \overline{) 622} \quad (47 \\ \underline{52} \\ 102 \\ \underline{91} \\ 11 \end{array}$$

Hence on dividing 622 by 13 will give the remainder 11.

216. What will be the remainder when $(631 \times 632 \times 633)$ is divided by 5?

- (a) 6 (b) 1
(c) 4 (d) 3

SSC MTS 11-10-2017 (Shift-I)

Ans : (b)
$$\frac{631 \times 632 \times 633}{5}$$

$$= \frac{1 \times 2 \times 3}{5} = \frac{6}{5}$$

Remainder = 1

217. A number when divided by 16 leaves a remainder 4. When the square of the number is divided by 16, what will be the remainder ?

- (a) 1 (b) 2
(c) 3 (d) 0

SSC MTS 7-10-2017 (Shift-I)

Ans. (d) : In these type of questions, if first divisor is divisible by second divisor

Then the required remainder = $\frac{(\text{remainder})^2}{\text{second divisor}}$

$$= \frac{(4)^2}{16} = \frac{16}{16} = 1$$

Hence required remainder = 0

218. What is the largest two digit number which when divided by 6 and 7 gives remainder 3 and 4 respectively?

- (a) 81 (b) 94
(c) 83 (d) 84

SSC MTS 08/08/2019 (Shift-I)

Ans. (a) : L.C.M of 6 and 7 = 42

\therefore required number = $42k - 3$
 $k = 2$

\therefore Number = $42 \times 2 - 3 = 81$

219. What will be the remainder when 421 is divided by 11?

- (a) 3 (b) 5
(c) 7 (d) 4

SSC MTS 9-10-2017 (Shift-III)

Ans : (a)

$$\begin{array}{r} 11 \overline{) 421} \quad (38 \\ \underline{33} \\ 91 \\ \underline{88} \\ 3 \text{ remainder} \end{array}$$

220. What will be the remainder when $(401 + 402 + 403 + 404)$ is divided by 4?

- (a) 10 (b) 2
(c) 6 (d) 3

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) $401 + 402 + 403 + 404 = 1610$

on dividing 1610 by 4

$$\begin{array}{r} 4 \overline{) 1610} \quad (402 \\ \underline{16} \\ 10 \\ \underline{8} \\ 2 \text{ remainder} \end{array}$$

221. When an integer n is divided by 8, the remainder is 3. What will be the remainder if $6n - 1$ is divided by 8?

- (a) 4 (b) 1
(c) 0 (d) 2

SSC CGL (TIER-I)-2018 - 13.06.2019 (Shift-III)

Ans. (b) : \therefore On dividing n by 8, the remainder is 3.

\therefore we can take $n = 8 + 3 = 11$

On putting $n = 11$ in $6n - 1$

$$\frac{65}{8} = 1 \text{ (remainder)}$$

222. When 732 is divided by a positive integer x , then remainder is 12. How many values of x are there?

- (a) 19 (b) 18
(c) 16 (d) 20

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d): Number divisible by x = $732 - 12 = 720$
 $= 2^4 \times 3^2 \times 5^1$

The value of x will always be greater than 12
 Number of factors of 720 = $(4+1) \times (2+1) \times (1+1)$
 $= 30$

But in these factors 1, 2, 3, 4, 5, 6, 8, 9, 10 and 12 are included or it is less than 12

Hence, possible values of x = $30 - 10 = 20$

223. When a positive integer is divided by d, then remainder is 15. When ten times of the same number is divided by d, then remainder is 6. The least possible value of d is:

- (a) 12 (b) 16
(c) 18 (d) 9

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (b) : Let positive integer = x

$$\frac{x}{d} = 15 \text{ (remainder)}$$

$$\frac{10x}{d} = 150 = (144 + 6)$$

So, d will be factor of 144 and will be greater than 15
 \therefore minimum value of d = 16

224. What is the remainder when we divide $5^{70} + 7^{70}$ by 74 ?

- (a) 7 (b) 1
(c) 5 (d) 0

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) : $\frac{5^{70} + 7^{70}}{74}$
 $= \frac{(5^2)^{35} + (7^2)^{35}}{74}$
 $= \frac{25^{35} + 49^{35}}{74}$

$\therefore a^n + b^n$ will be only divisible by $(a + b)$ when n is an odd number

as 35 is odd
 Hence $25^{35} + 49^{35}$ will be divisible by $25 + 49 = 74$

\therefore remainder = 0

225. When 200 is divided by a positive integer x, the remainder is 12. How many values of x are possible?

- (a) 2 (b) 3
(c) 6 (d) 8

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (b) : $\therefore \frac{200}{x} \Rightarrow$ remainder = 12

$$\therefore x > 12$$

Then, $\frac{188+12}{x} \Rightarrow$

$$188 = 2^2 \times 47^1$$

Total factors of 188 = $(2 + 1) \times (1 + 1) = 6$
 which means number of total values = 6 (but $x > 12$)

$$\therefore x \neq 1, 2, 4$$

The number of total values = $(6 - 3) = 3$

226. When a certain number is divided by 52, the remainder is 49. When the same number is divided by 13, the remainder is x. What is the value of $\sqrt{5x - 1}$?

- (a) 11 (b) 6
(c) 8 (d) 7

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : dividend = divisor \times quotient + remainder

$$D = Q_1 \times 52 + 49$$

$$D = Q_2 \times 13 + x$$

\therefore 52 is divisible by 13 so we can suppose that D is divisible by 13 and this gives 49 as remainder but again 49 can be divided by 13 ($\because 49 > 13$)

This gives 10 as remainder which is equal to x

$$\therefore \sqrt{5x - 1} = \sqrt{5 \times 10 - 1} = \sqrt{49} = 7$$

227. When $(2^{36} - 1)$ is divided by 9, the remainder is:

- (a) 0 (b) 1
(c) 8 (d) 2

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : $\frac{(2^{36} - 1)}{9}$

$$\frac{(2^3)^{12} - 1}{9}$$

$$\frac{8^{12} - 1}{9}$$

$$\frac{(9 - 1)^{12} - 1}{9}$$

$$\frac{1 - 1}{9} = 0$$

Hence remainder = 0

(VI) Problems based on Progression

228. Evaluate : $\frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} + \frac{1}{143}$.

- (a) $\frac{5}{39}$ (b) $\frac{7}{39}$
(c) $\frac{4}{39}$ (d) $\frac{10}{39}$

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : $\frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} + \frac{1}{143}$
 $= \frac{1}{2} \left[\frac{1}{3} - \frac{1}{5} + \frac{1}{5} - \frac{1}{7} + \frac{1}{7} - \frac{1}{9} + \frac{1}{9} - \frac{1}{11} + \frac{1}{11} - \frac{1}{13} \right]$
 $= \frac{1}{2} \left[\frac{1}{3} - \frac{1}{13} \right] = \frac{1}{2} \times \frac{10}{39} = \frac{5}{39}$

229. If $P = 2^2 + 6^2 + 10^2 + 14^2 + \dots + 94^2$ and $Q = 1^2 + 5^2 + 9^2 + \dots + 81^2$, then what is the value of $P - Q$?

- (a) 24645 (b) 26075
(c) 29317 (d) 31515

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : $P = 2^2 + 6^2 + 10^2 + 14^2 + \dots 94^2$
 $Q = 1^2 + 5^2 + 9^2 + \dots 81^2$
 According to the question,
 $P - Q = [(2^2 - 1^2) + (6^2 - 5^2) + (10^2 - 9^2) + (14^2 - 13^2) + \dots$
 $(82^2 - 81^2) + 86^2 + 90^2 + 94^2]$
 $= [3 + 11 + 19 + 27 + \dots 163] + 86^2 + 90^2 + 94^2$
 $\therefore a = 3, d = 8, l = 163, n = ?$
 $163 = 3 + (n-1)8, n = 21$
 $SOM = \left[\frac{21}{2} (2 \times 3 + (21-1)8) \right] + 86^2 + 90^2 + 94^2$
 $= 1743 + 7396 + 8100 + 8836 = 26075$

230. What is the sum of

$$1\frac{1}{2} + 4\frac{1}{6} + 7\frac{1}{12} + 10\frac{1}{20} + \dots \text{ upto 20 terms ?}$$

- (a) 12410/21 (b) 12412/21
 (c) 12433/21 (d) 1179/2

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $1\frac{1}{2} + 4\frac{1}{6} + 7\frac{1}{12} + 10\frac{1}{20} \dots \text{ upto 20 terms}$
 $= (1+4+7+\dots \text{ upto 20 terms}) + \frac{1}{2} + \frac{1}{6} + \frac{1}{12} \dots \text{ up to 20 terms}$
 $\left(\frac{1}{2} + \frac{1}{6} + \frac{1}{12} \dots \text{ upto 20 terms} \right)$
 $= (1+4+7+\dots \text{ upto 20 terms}) +$
 $\left(1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \dots \frac{1}{20} - \frac{1}{21} \right)$
 $= \frac{20}{2} [2 + 19 \times 3] + \left(1 - \frac{1}{21} \right)$
 $= 10 \times 59 + \frac{20}{21} = 590\frac{20}{21} = \frac{12410}{21}$

231. If $(1/2^1) + (1/2^2) + (1/2^3) + \dots + (1/2^{10}) = 1/k$, then what is the value of k ?

- (a) 512/511 (b) 1024/1023
 (c) 511/512 (d) 1023/1024

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :
 $\frac{1}{2^1} + \frac{1}{2^2} + \frac{1}{2^3} + \dots + \frac{1}{2^{10}} = \frac{1}{k}$
 $\therefore 1 + \frac{1}{r} + \frac{1}{r^2} + \dots + \frac{1}{r^n} = \frac{a(1-r^n)}{1-r}$
 $\frac{1}{2} \left(1 - \frac{1}{2^{10}} \right) = \frac{1}{k}, 1 - \frac{1}{2^{10}} = \frac{1}{k}$
 $\frac{1023}{1024} = \frac{1}{k}$
 $k = \frac{1024}{1023}$

232. What is the value of $14^3 + 16^3 + 18^3 + \dots + 30^3$?

- (a) 134576 (b) 120212
 (c) 115624 (d) 111672

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :
 The sum of cubes of even numbers
 $= 2[n(n+1)]^2$

Where n = Total number of terms
 $14^3 + 16^3 + 18^3 + \dots + 30^3 = 2[15(15+1)]^2 - 2[6(6+1)]^2$
 $2(15^2 \times 16^2) - 2(6^2 \times 7^2)$
 $= 2 \times 6^2 (5^2 \times 8^2 - 7^2) = 2 \times 6^2 (25 \times 64 - 49)$
 $= 72(1600 - 49)$
 $= 72(1551) = 111672$

233. What is the value of $16^2 + 17^2 + 18^2 + \dots 25^2$?

- (a) 4325 (b) 4465
 (c) 4105 (d) 4285

SSC MTS 9-10-2017 (Shift-I)

Ans. (d)
 Sum of square of n numbers $= \frac{n(n+1)(2n+1)}{6}$
 \therefore Required sum =
 $(1^2 + 2^2 + 3^2 + \dots + 25^2) - (1^2 + 2^2 + 3^2 + \dots + 15^2)$
 $\frac{25(25+1)(25 \times 2 + 1)}{6} - \frac{15(15+1)(15 \times 2 + 1)}{6}$
 $= \frac{25 \times 26 \times 51}{6} - \frac{15 \times 16 \times 31}{6} = 5525 - 1240 = 4285$

(VII) Problems based on Arithmetic and Geometric Progression

234. Find the sum of $6 + 8 + 10 + 12 + 14 + \dots + 40$.

- (a) 424 (b) 1600
 (c) 400 (d) 414

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d) : According to question.
 $6 + 8 + 10 + 12 + 14 + \dots + 40$
 $6 + (n-1) \times 2 = 40$
 $2n - 2 = 34$
 $n = 18$

$$= \frac{n}{2} [a + \ell]$$

Hence the sum of AP

$$= \frac{18}{2} (6 + 40)$$

$$\Rightarrow 9 \times 46 = 414$$

Trick:
 $6 + 8 + 10 + 12 + 14 + \dots + 40$
 $2(3+4+5+6+7+\dots+20)$
 $2 \left[\frac{20 \times 21}{2} - 3 \right] = 2(210 - 3)$
 $= 2 \times 207$
 $= 414$

235. The value of $1 + 3 + 5 + 7 + \dots (2n-1)$ is:

- (a) $(2n-1) \times (2n-1)$ (b) $n \times n$
 (c) $\frac{n}{2}$ (d) $\frac{n(n+1)}{2}$

SSC CHSL -18/03/2020 (Shift-III)

Ans. (b) : $1+3+5+7+\dots(2n-1)$
 \therefore the given number series is in AP
 $d = 3 - 1 = 2$
 $\left(\begin{array}{l} \therefore n = \text{number of terms} \\ a = \text{first term} \\ d = \text{common difference} \end{array} \right) \text{ Sum} = \frac{n}{2} [2a + (n-1)d]$
 $= \frac{n}{2} [2 \times 1 + (n-1) \times 2] = \frac{2n}{2} [1 + n - 1] = n \times n$

236. What is the sum of first 40 terms of $1+3+4+5+7+7+10+9+ \dots$?
- (a) 1010 (b) 1115
(c) 1030 (d) 1031

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $1+3+4+5+7+7+10+9+ \dots$ up to 40 terms
 $= (1+4+7+10+13+ \dots$ up to 20 terms) +
 $(3+5+7+9+ \dots$ up to 20 terms)
 $= \frac{20}{2} [2 \times 1 + (20-1) \times 3] + \frac{20}{2} [6 + (20-1) \times 2]$
 $= 10 [2+57] + 10 [6+38] = 590 + 440 = 1030$

237. How many numbers less than 350 are multiples of both 4 and 3?
- (a) 29 (b) 31 (c) 30 (d) 28

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : L.C.M of 3 & 4 = 12
 Numbers less than 350 which are multiples of 3 & 4
 12, 24, 36, 48348
 In AP $a=12$
 $d=12$
 $T_n = 348$
 Number of terms = n
 $\therefore a + (n-1) \cdot d = T_n$
 $12 + (n-1) \cdot 12 = 348$
 $12 + 12n - 12 = 348$
 $12n = 348$

$n = 29$

Hence the number of such terms = 29

Trick:

L.C.M of 4 & 3 = 12

$\frac{350}{12} = \text{quotient} = 29$

Hence required number of numbers = 29

238. What is the sum of all natural numbers between 1 and 200 which are multiples of 5?
- (a) 3900 (b) 4100
(c) 4155 (d) 4235

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : Numbers which are multiples of 5 between between 1 and 200 = 5, 10, 15, 195
 The given series is in A.P
 where, $a = 5$ $n = 39$ $l = 195$

Hence sum = $\frac{n}{2} (a + l)$ (where $l = \text{last term}$)

$= \frac{39}{2} (5 + 195) = \frac{39}{2} \times 200 = 3900$

239. How many multiples of 5 are there from 1 to 200 which are not multiples of 4.
- (a) 40 (b) 30 (c) 25 (d) 35

SSC MTS 10-10-2017 (Shift-II)

Ans. (b) :

Trick:

$\frac{200}{5} = 40$ which denotes the total number of factors of 5 from 1 to 200.
 In 40 numbers, the numbers which are multiples of 4, and 5 both L.C.M of 4 and 5 = 20

$\frac{200}{20} = 10$

Hence required numbers = $(40 - 10) = 30$

240. What is the sum of all 3 digit positive integers divisible by 11 ?
- (a) 44550 (b) 43550
(c) 42550 (d) 45550

SSC MTS 7-10-2017 (Shift-I)

Ans : (a) Three digits numbers which are divisible by 11

110, 121, 132 990

$a = 110, d = 11, l = 990$

from the formula of AP,

$l = a + (n-1)d$

$990 = 110 + (n-1) \times 11$

$\frac{880}{11} = n - 1$

$n = 81$

Sum $S = \frac{n}{2} [a + l]$

$S = \frac{81}{2} [110 + 990]$

$S = \frac{81}{2} \times 1100$

$S = 44550$

241. What is the average of all the natural numbers from 49 to 125?
- (a) 85 (b) 87
(c) 88 (d) 86

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Given 49, 50, 51, 52 125

first terms (a) = 49

common difference (d) = $50 - 49 = 1$

last term (l) = 125

From, $l = a + (n-1) \times d$

$125 = 49 + (n-1) \times 1$

$\Rightarrow (n-1) = 76$

$\Rightarrow n = 77$

Hence sum of natural numbers from 49 to 125

$= \frac{n}{2} (a + l)$

$= \frac{77}{2} (49 + 125)$

$= \frac{77}{2} \times 174$

$= 77 \times 87$

Average of natural number from 49 to 125

$= \frac{77 \times 87}{77} = 87$

242. How many multiples of 6 are there from 1 to 200 which are not multiple of 4 ?
- (a) 16 (b) 17
(c) 19 (d) 15

SSC MTS 11-10-2017 (Shift-I)

Ans : (b)

Multiples of 6 from 1 to 200 (n_6) = $\frac{198-6}{6} + 1$

$= \frac{192}{6} + 1$

$= 32 + 1 = 33$

L.C.M of 6 and 4 which means number of multiples of 12 (n_{12})

$$= \frac{192-12}{12} + 1$$

$$= \frac{180}{12} + 1$$

$$= 15 + 1$$

$$= \boxed{16}$$

Numbers of multiples which are multiples of 6 but not multiple of 4 = $n_6 - n_{12}$

$$= 33 - 16$$

$$= \boxed{17}$$

(VIII) Miscellaneous

243. What is the value of 603×597 ?

- (a) 359991 (b) 359997
(c) 360003 (d) 359996

SSC MTS 11-10-2017 (Shift-II)

Ans. (a) : $603 \times 597 = ?$

$$= (600 + 3) \times (600 - 3)$$

$$= (600)^2 - (3)^2 \quad [\text{From } (a+b)(a-b) = a^2 - b^2],$$

$$= 360000 - 9$$

$$= 359991$$

244. The average of 1088 real numbers is zero. At most how many of them can be negative?

- (a) 544 (b) 1087
(c) 100 (d) 88

SSC CHSL 11/07/2019 (Shift-I)

Ans. (b) : Since the average of 1088 real numbers will be zero. Hence the maximum negative numbers can be 1087 while 1088 number will be such number that the sum becomes zero i.e. positive.

Trick:

According to question,

$$\frac{x_1 + x_2 + x_3 + x_4 + \dots + x_{1088}}{1088} = 0$$

$$\therefore x_1 + x_2 + x_3 + x_4 + \dots + x_{1088} = 0$$

The maximum number of negative real numbers can be 1087 out of 1088 and the value of remaining positive number will be such that it is equal to the sum of 1087 negative real numbers.

245. The number 1563241234351 is:

- (a) divisible by both 3 and 11
(b) neither divisible by 3 nor by 11
(c) divisible by 3 but not by 11
(d) divisible by 11 but not by 3

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) Sum of digits number 1563241234351 = 40
(which is not divisible by 3)

Hence the number will not be divisible by 3

Again, Sum of digits of odd places ~ Sum of digits of even places

$$\Rightarrow (1 + 3 + 3 + 1 + 2 + 6 + 1) \sim (5 + 4 + 2 + 4 + 3 + 5)$$

$$\Rightarrow 17 \sim 23$$

$$\Rightarrow 6 \quad (\text{which is neither divisible by 11 nor zero})$$

Hence the number is not divisible by 11

246. If three numbers are in the ratio 2 : 3 : 5 and the twice of their sum is 200. The square of the largest of three numbers is:

- (a) 2500 (b) 1000
(c) 625 (d) 2250

SSC MTS 13/08/2019 (Shift-III)

Ans. (a): Let numbers be = $2x, 3x$ and $5x$

$$\text{then, } 2(2x + 3x + 5x) = 200$$

$$20x = 200$$

$$x = 10$$

$$\text{then the square of the greatest number} = (5x)^2$$

$$= (5 \times 10)^2$$

$$= 2500$$

247. In a two-digit number, its unit digit exceeds its tens digit by 2 and that the product of the given number and the sum of its digits is equal to 460. The number is:

- (a) 48 (b) 64
(c) 36 (d) 46

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d) : From option (d),

$$\text{Let two digit number} = 46$$

$$\text{Hence } 46 \times 10 = 460$$

$$\therefore \text{number is } 46$$

248. If $56 \times 75 \times 60 \times 84 \times 210 = 2^p \times 3^q \times 5^r \times 7^s$, then what is the value of $[(p+q)/s] + r$?

- (a) 6 (b) 8
(c) 12 (d) 10

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :

$$56 \times 75 \times 60 \times 84 \times 210 = 2^p \times 3^q \times 5^r \times 7^s$$

$$2^8 \times 3^4 \times 5^4 \times 7^3 = 2^p \times 3^q \times 5^r \times 7^s$$

On comparing the powers,

$$p = 8, q = 4, r = 4, s = 3$$

on substituting the value of p, q, r and s in

$$\left[\frac{(p+q)}{s} \right] + r$$

$$\left[\frac{8+4}{3} \right] + 4 = 8$$

249. If $A = 0.abcabc\dots$, then by what number A should be multiplied so as to get an integral value ?

- (a) 2997 (b) 1000
(c) 1998 (d) Both 2997 and 1998

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : $A = 0.abcabc\dots$

$$A = 0.\overline{abc}$$

$$A = \frac{abc}{999}$$

Multiply 999 or a multiple of 999 to A to make it an integer

$$2997 = 999 \times 3$$

$$1998 = 999 \times 2$$

250. The sum of two positive numbers is 14 and difference between their squares is 56. What is the sum of their squares ?

- (a) 106 (b) 196
(c) 53 (d) 68

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Let two positive numbers be x and y

$$\left. \begin{aligned} x + y &= 14 \dots\dots\dots (1) \\ x^2 - y^2 &= 56 \dots\dots\dots (2) \end{aligned} \right\} \dots\dots\dots [\text{Given}]$$

$$(x+y)(x-y) = 56$$

$$x - y = 4 \dots\dots\dots (3)$$

On solving equation (1) and (3),

$$x = 9, y = 5$$

Sum of their squares

$$= 81 + 25 = 106$$

251. A and B are positive integers. If $A + B + AB = 65$, then what is the difference between A and B ($A, B \leq 15$)?

- (a) 3 (b) 4
(c) 5 (d) 6

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : $A + B + AB = 65$

on putting $A = 10, B = 5$

$$10 + 5 + 10 \times 5 = 65$$

$$65 = 65$$

Hence, $A - B = 10 - 5 = 5$

252. When a two-digit number is multiplied by the sum of its digits, the product is 424. When the number obtained by interchanging its digits is multiplied by the sum of the digits, the result is 280. The sum of the digits of the given number is:

- (a) 9 (b) 8
(c) 7 (d) 6

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let the two digit number be $(10x+y)$

According to the first condition,

$$(10x + y) = \frac{424}{(x + y)} \dots\dots\dots (I)$$

According to the second condition,

$$(10y + x) = \frac{280}{(x + y)} \dots\dots\dots (II)$$

By adding Equation (i) and equation (ii),

$$(11x + 11y) = \frac{704}{(x + y)}$$

$$(x + y) = \frac{64}{(x + y)}$$

$$(x+y)^2 = 64$$

$$\therefore (x+y) = 8$$

253. The sum of two numbers is 59 and their product is 840. Find the sum of their squares.

- (a) 1754 (b) 1801
(c) 2961 (d) 1875

SSC CHSL -17/03/2020 (Shift-III)

Ans. (b) : Let the two numbers be a & b respectively then,

$$a + b = 59, ab = 840$$

$$\therefore (a + b)^2 = a^2 + b^2 + 2ab$$
$$(59)^2 = a^2 + b^2 + 2 \times 840$$

$$3481 = a^2 + b^2 + 1680$$

$$a^2 + b^2 = 3481 - 1680$$

Hence $a^2 + b^2 = 1801$

254. If the difference between two numbers is 6 and the difference between their squares is 60, what is the sum of their cubes?

- (a) 945 (b) 678
(c) 894 (d) 520

SSC CHSL -17/03/2020 (Shift-III)

Ans. (d) Let there be two numbers a and b respectively According to question,

$$a - b = 6, \dots\dots\dots (i)$$

$$a^2 - b^2 = 60$$

$$\therefore a^2 - b^2 = (a - b)(a + b)$$

$$60 = 6(a + b)$$

$$a + b = 10 \dots\dots\dots (ii)$$

From eq (i) & (ii),

$$a = 8, b = 2$$

$$\therefore (a + b)^3 = a^3 + b^3 + 3ab(a + b)$$

$$10^3 = a^3 + b^3 + 3 \times 8 \times 2 (10)$$

$$1000 = a^3 + b^3 + 480$$

$$a^3 + b^3 = 1000 - 480$$

$$a^3 + b^3 = 520$$

Hence the sum of cubes of numbers = 520

255. The difference between two numbers is 3 and the difference between their cubes is 999. Find the difference between their square.

- (a) 18 (b) 36
(c) 63 (d) 81

SSC CHSL -15/10/2020 (Shift-II)

Ans. (c) : Let two numbers be a and b respectively According to question,

$$a - b = 3$$

$$a^3 - b^3 = 999$$

$$\therefore (a - b)^3 = a^3 - b^3 - 3ab(a - b)$$

$$3^3 = 999 - 3ab \times 3$$

$$27 = 999 - 9ab$$

$$9ab = 999 - 27$$

$$9ab = 972$$

$$ab = 108$$

$$\therefore (a - b)^2 = (a + b)^2 - 4ab$$

$$3^2 = (a + b)^2 - 4 \times 108$$

$$(a + b)^2 = 9 + 432$$

$$(a + b)^2 = 441$$

$$a + b = 21$$

$$\therefore a^2 - b^2 = (a - b)(a + b) = 3 \times 21 = 63$$

256. The sum of two numbers is 47 and their product is 550. Find the sum of their squares.

- (a) 1109 (b) 876
(c) 986 (d) 1209

SSC CHSL -15/10/2020 (Shift-II)

Ans. (a) : Let two numbers be a and b respectively

$$\therefore a + b = 47, ab = 550$$

$$\therefore (a + b)^2 = a^2 + b^2 + 2ab$$

$$(47)^2 = a^2 + b^2 + 2 \times 550$$

$$2209 = a^2 + b^2 + 1100$$

$$a^2 + b^2 = 2209 - 1100$$

$$\text{Hence } a^2 + b^2 = 1109$$

257. If the sum of two numbers is 11 and the sum of their squares is 65, then the sum of their cubes will be:

- (a) 615 (b) 407
(c) 355 (d) 576

SSC CHSL -12/10/2020 (Shift-III)

Ans. (b) : Let two numbers be x and y
 \therefore According to question
 $x + y = 11$ _____ (i)
 And $x^2 + y^2 = 65$ _____ (ii)
 $x^3 + y^3 = ?$
 $\therefore (x+y)^2 = x^2 + y^2 + 2xy$
 $\Rightarrow (11)^2 = 65 + 2xy$
 $\Rightarrow 121 = 65 + 2xy$
 $\Rightarrow 2xy = 56$
 $\Rightarrow xy = 28$ _____ (iii)
 $(x+y)^3 = x^3 + y^3 + 3xy(x+y)$
 Substituting values from equation (i), (ii) and (iii)
 $\Rightarrow (11)^3 = x^3 + y^3 + 3 \times 28 \times 11$
 $\Rightarrow 1331 = x^3 + y^3 + 924$
 $\Rightarrow x^3 + y^3 = 407$

258. The difference between two numbers is 43 and their product is 50. Find the sum of their squares.

- (a) 1947 (b) 1949
 (c) 1948 (d) 1946

SSC CHSL -17/03/2020 (Shift-I)

Ans. (b) : Let that two number be a and b respectively
 $\therefore a - b = 43$
 $a \times b = 50$
 $(a - b)^2 = (43)^2$
 $\Rightarrow a^2 + b^2 - 2ab = 1849$
 $a^2 + b^2 = 1849 + 2 \times 50 = 1849 + 100 = 1949$

259. There are five stations on a railway line. What is the number of different journey tickets that are required for railway authorities?

- (a) 20 (b) 30
 (c) 25 (d) 35

SSC CHSL -17/03/2020 (Shift-II)

Ans. (a) :
 Required number of journey tickets = $n(n - 1)$
 $= 5 \times 4$
 $= 20$

260. Find the positive number which when decreased by 20 is equal to 2925 times the reciprocal of the number.

- (a) 35 (b) 65 (c) 55 (d) 45

SSC CHSL -15/10/2020 (Shift-II)

Ans. (b) : Let the number be x then
 According to the question
 $x - 20 = \frac{2925}{x}$
 $x^2 - 20x - 2925 = 0$
 $x^2 - 65x + 45x - 2925 = 0$
 $x(x - 65) + 45(x - 65) = 0$
 $(x - 65)(x + 45) = 0$
 $x - 65 = 0, x + 45 = 0$
 $x = 65, x = -45$
 Hence the required number is 65

261. If the difference of squares of two consecutive odd number is 64, then what is the sum?

- (a) 34 (b) 32
 (c) 30 (d) 17

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) Let two consecutive odd numbers be x and $x + 2$.
 According to the question,

$$(x + 2)^2 - x^2 = 64$$

$$(x^2 + 4 + 4x) - x^2 = 64$$

$$x^2 + 4 + 4x - x^2 = 64$$

$$4x = 60$$

$$\boxed{x = 15}$$

Hence, the numbers are $x = 15$ and $x + 2 = 15 + 2 = 17$
 Their sum = $15 + 17 = 32$

262. Which of the following statement/statements is/are true?

I. Odd \times Even = Odd

II. Odd \times Odd = Even

- (a) Only I (b) Only II
 (c) Both I and II (d) Neither I nor II

SSC MTS 11-10-2017 (Shift-II)

Ans. (d) : From statement I,
 odd \times even = odd
 Example— $7 \times 8 = 56$ (even)
 Hence the statement I is false
 From statement II
 odd \times odd = even
 Example $-7 \times 7 = 49$ (odd)
 Hence the statement II is false
 Hence neither statement I nor II is correct

263. Which of the following statement/statements is/are true?

I. (odd)^{odd} = odd

II. (odd)^{even} = even

- (a) Only I (b) Only II
 (c) Both I and II (d) Neither I nor II

SSC MTS 11-10-2017 (Shift-I)

Ans : (a)
 I. (odd)^{odd} = odd (\checkmark) $3^3 = 27$
 $5^3 = 125$ (odd)
 II. (odd)^{even} = even (\times) $3^2 = 9$
 $5^2 = 25$ (odd)

Hence option (a) is correct

264. In an office, there are 216 tables and 264

chairs. If $\frac{1}{6}$ of the tables and $\frac{1}{4}$ of the chairs are broken then how many people can work in the office if each person requires one table and one chair?

- (a) 180 (b) 186
 (c) 100 (d) 198

SSC MTS 13/08/2019 (Shift-III)

Ans. (a) : Number of tables = 216

$$\text{Number of table after broken} = 216 \times \frac{5}{6}$$

$$= 36 \times 5 = 180$$

Number of chairs = 264

$$\text{Number of chair after broken} = 264 \times \frac{3}{4} = 66 \times 3 = 198$$

and after broken, number of tables < number of chairs
 Hence number of persons can work in office = 180

265. The sum of 8 consecutive integers is 4. What is the lowest integer ?

- (a) -3 (b) 0
(c) -2 (d) -1

SSC MTS 7-10-2017 (Shift-I)

Ans : (a) Let 8 consecutive integers
= $x, x+1, x+2, x+3, x+4, x+5, x+6, x+7$
According to the question,
 $x+x+1+x+2+x+3+x+4+x+5+x+6+x+7 = 4$
 $8x + 28 = 4$
 $8x = 4 - 28$
 $8x = -24,$ $x = -3$

266. The product of two numbers is 630. If one of the number is 18, then what is the another number?

- (a) 34 (b) 36
(c) 35 (d) 38

SSC MTS 11-10-2017 (Shift-III)

Ans. (c): Let second number be x
Product of two numbers is 630
One number is 18
First number \times Second number = 630
 $x \times 18 = 630$
 $x = \frac{630}{18}$
 $x = 35$

Hence the second number is 35

267. What is the least number multiplied to 200, so that number obtained becomes multiple of 600?

- (a) 5 (b) 15 (c) 3 (d) 8

SSC MTS 10-10-2017 (Shift-I)

Ans : (c) Let the number be x
 $x \times 200 = 600$
 $x = 3$
On multiplying the number 200 by 3 the number obtained will be the multiple of 600

268. How many zeroes are there in product $4^6 \times 15^{10}$?

- (a) 10 (b) 12
(c) 11 (d) 6

SSC MTS 10-10-2017 (Shift-I)

Ans : (a) The product of $4^6 \times 15^{10}$
Number of 2 in $4^6 = 12$
Number of 5 in $15^{10} = 10$
 \therefore one pair of 2 and 5 combines to form a zero
And the possible number of pairs of 2 and 5 in $4^6 \times 15^{10} = 10$
 \therefore 10 pairs of 2 and 5
Hence number of zeroes = 10

269. How many times digit '5' appears in the number from 1 to 100?

- (a) 20 (b) 21
(c) 19 (d) 18

SSC MTS 9-10-2017 (Shift-I)

Ans : (a) No of repetitions of digit 5 between 1 to 100-
5, 15, 25, 35, 45, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59,
65, 75, 85, 95 means 20 times

270. The ratio of two positive numbers is 9:11. Their product is 6336. What is the smallest number?

- (a) 32 (b) 72
(c) 88 (d) 48

SSC MTS 9-10-2017 (Shift-I)

Ans : (b) Let numbers be $9x$ and $11x$
 $\therefore 9x \times 11x = 6336$
 $99x^2 = 6336$
 $x^2 = \frac{6336}{99}$
 $x^2 = 64$
 $x = 8$
 \therefore Number = $9 \times 8 = 72$ and $11 \times 8 = 88$
 \therefore The smallest number = 72

271. What is the least number multiplied to 300, so that number becomes multiple of 105?

- (a) 35 (b) 7
(c) 21 (d) 3

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) The least number which is multiple of 300 and 105 both = L.C.M. of 300 and 105 = 2100
The number multiplied to 300 so that number become
 $2100 = \frac{2100}{300} = 7$
So, The required answer = 7

272. The product of two numbers is 225. If one of the number is 45, then what is the another number?

- (a) 3 (b) 15
(c) 5 (d) 7

SSC MTS 9-10-2017 (Shift-III)

Ans : (c) If the second number is x
then, $45 \times x = 225$
 $x = \frac{225}{45},$ $x = 5$

273. The mode of the data 26, 32, 26, 28, 26, 24, 31, 24 is:

- (a) 28 (b) 24
(c) 31 (d) 26

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : On writing the data in ascending order
24, 24, 26, 26, 26, 28, 31, 32
Mode = 26

274. What is the mode of the given data?
21, 22, 23, 23, 24, 21, 22, 23, 21, 23, 24, 23, 21, 23

- (a) 23 (b) 21
(c) 22 (d) 24

SSC GD Constable 13/02/2019 (Shift-I)


Ans. (a) : On writing the series in ascending order
= 21, 21, 21, 21, 22, 22, 23, 23, 23, 23, 23, 24, 24
 \therefore In series term (23) come maximum times
So, mode = 23

In series the term which is more frequent is called mode

275. A bowler has taken 0, 3, 2, 1, 5, 3, 4, 5, 5, 2, 2, 0, 0, 1 and 2 wickets in 15 consecutive matches. What is the median of the given data?

- (a) 1 (b) 3
(c) 0 (d) 2

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : On writing in ascending order
 $0, 0, 0, 1, 1, 1, 2, 2, 2, 3, 3, 4, 5, 5, 5$

 If the number of terms is odd then the middle term will be median.

276. If $A = 1 - 10 + 3 - 12 + 5 - 14 + 7 + \dots$ upto 60 terms, then what is the value of A ?
 (a) -360 (b) -310
(c) -240 (d) -270

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Given
 $A = 1 - 10 + 3 - 12 + 5 - 14 + 7 + \dots$ up to 60 terms
 $A = (1-10) + (3-12) + (5-14) + 7 + \dots$ up to 60 terms
 $\Rightarrow A = -9 - 9 - 9 - \dots$ 30 terms
 $\Rightarrow A = -9 \times 30$
 $\Rightarrow A = -270$

277. If x and y are natural numbers such that $x + y = 2017$, then what is the value of $(-1)^x + (-1)^y$?
 (a) 2 (b) -2
(c) 0 (d) 1

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $x + y = 2017$
 If x is even number then y will be odd
 $(-1)^x + (-1)^y = (-1)^{\text{even}} + (-1)^{\text{odd}} = 1 - 1 = 0$

278. If $N = 1+11+111+1111+ \dots + 111111111$, then what is the sum of the digit's of N?
 (a) 45 (b) 18
(c) 36 (d) 5

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : $N = 1+11+111+1111+ \dots + 111111111$
 $N = 123456789$
 Sum of digits of N = $1+2+3+4+5+6+7+8+9 = 45$

279. If $(3^{35} + 3^{35} + 3^{35})(2^{33} + 2^{33}) = 6^x$ then what is the value of ?
 (a) 34 (b) 35
(c) 33 (d) 33.5

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Given, $(3^{35} + 3^{35} + 3^{35})(2^{33} + 2^{33}) = 6^x$
 $\Rightarrow 3^{33}(1+1+1) 2^{33}(1+1) = 6^x$
 $3^{33} \times 3 \times 2^{33} \times 2 = 6^x$
 $3^{34} \times 2^{34} = 6^x$
 $(2 \times 3)^{34} = 6^x$
 On comparing the powers,
 $x = 34$

280. How many three digit numbers are there in which all the digits are odd?
 (a) 100 (b) 125
(c) 500 (d) 250

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : The smallest three digit number in which all digits are odd = 111
 The largest three digit number in which all digits are odd = 999
 Total required no's between 111 and 999 = $5 \times 5 = 25$
 Total required no's between 311 and 399 = $5 \times 5 = 25$

Total required no's between 511 and 599 = $5 \times 5 = 25$
 Total required no's between 711 and 799 = $5 \times 5 = 25$
 Total required no's between 911 and 995 = $5 \times 5 = 25$
 Total numbers = $25 \times 5 = 125$

281. If the sum of ten different positive integers is 100, then what is the greatest possible number among these 10 numbers?
 (a) 45 (b) 91
(c) 55 (d) 64

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Let x be the largest numbers among the positive numbers
 According to question
 $(1 + 2 + 3 + \dots + 9) + x$
 Sum of n numbers = $\frac{n(n+1)}{2}$
 $100 = \left(\frac{9 \times 10}{2}\right) + x$
 $100 = 45 + x$
 $x = 55$

282. The students of a class donated a sum of ₹2,809 to the Fund. Each student donated as many rupees as the number of students in the class. The number of students in the class is:
 (a) 51 (b) 47
(c) 53 (d) 49

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Let the number of students in the class = x
 The amount donated by 1 student = $\frac{2809}{x}$
 According to the question,
 \therefore Amount donated by 1 student = Number of Students.
 $\frac{2809}{x} = x$
 $x^2 = 2809$
 $x = \sqrt{2809}$
 $x = 53$

283. The students of a class donated a sum of ₹2,209. If each student donated a many rupees as the number of students in the class, then the number of students in the class is:
 (a) 47 (b) 49
(c) 53 (d) 51

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : Let the number of students in the class = x
 Then the amount donated by each student = ₹x
 According to the question,
 $x \times x = 2209$
 $x^2 = 2209$
 $x = \sqrt{2209}$
 $x = 47$
 Hence, the number of student in the class = 47

02.

Decimal and Fraction

(I) Problems based on finding smallest and largest fractions

1. Which of the following statement(s) is/are TRUE?

I. $3/71 < 5/91 < 7/99$

II. $11/135 > 12/157 > 13/181$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 21-02-2018

Ans. (c): From statement-I

$$\frac{3}{71} < \frac{5}{91} < \frac{7}{99}$$

On approximating-

$$\frac{3}{72} < \frac{5}{90} < \frac{7}{98}$$

$$\frac{1}{24} < \frac{1}{18} < \frac{1}{14} \quad (\text{true})$$

From statement -II

$$\frac{11}{135} > \frac{12}{157} > \frac{13}{181}$$

On approximating-

$$\frac{11}{132} > \frac{12}{156} > \frac{13}{182}$$

$$\frac{1}{12} > \frac{1}{13} > \frac{1}{14} \quad (\text{true})$$

Hence both statement I and II are true.

2. Which of the following statement(s) is/are TRUE ?

I. $11\frac{1}{2} + 17\frac{3}{4} - 5\frac{1}{5} - 2\frac{1}{10} = \frac{439}{20}$

II. $\frac{9}{1078} > \frac{11}{1127} > \frac{12}{1219}$

III. $\frac{149}{151} > \frac{153}{155} > \frac{157}{159}$

- (a) Only I (b) Only II
(c) Only III (d) None is true

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :

From statement-I

$$11\frac{1}{2} + 17\frac{3}{4} - 5\frac{1}{5} - 2\frac{1}{10} = \frac{439}{20}$$

$$= \frac{23}{2} + \frac{71}{4} - \frac{26}{5} - \frac{21}{10}$$

$$= \frac{117}{4} - \frac{73}{10} = \frac{585 - 146}{20} = \frac{439}{20} \quad (\text{true})$$

From statement-II

$$\frac{9}{1078} > \frac{11}{1127} > \frac{12}{1219}$$

$$\frac{1078}{9} < \frac{1127}{11} < \frac{1219}{12}$$

$$119.7 < 102.4 < 101.58$$

It is false

From statement- III

$$\frac{149}{151} > \frac{153}{155} < \frac{157}{159}$$

$$\frac{149}{151} > \frac{153}{155}$$

On cross multiplying

$$149 \times 155 > 151 \times 153$$

$$23095 > 23103$$

It is also false

Hence only statement I is true.

3. Which of the following statement(s) is/are TRUE ?

I. $\frac{2}{3\sqrt{5}} < \frac{3}{2\sqrt{5}} < \frac{5}{4\sqrt{3}}$

II. $\frac{3}{2\sqrt{5}} < \frac{2}{3\sqrt{3}} < \frac{7}{4\sqrt{5}}$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

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Ans. (a) :

From statement- I

$$\frac{2}{3\sqrt{5}} < \frac{3}{2\sqrt{5}} < \frac{5}{4\sqrt{3}}$$

L.C.M of $3\sqrt{5}, 2\sqrt{5}$ and $4\sqrt{3} = 12\sqrt{15}$

$$8\sqrt{3} < 18\sqrt{3} < 15\sqrt{5} \quad (\text{Hence it is true})$$

From statement- II

$$\frac{3}{2\sqrt{5}} < \frac{2}{3\sqrt{3}} < \frac{7}{4\sqrt{5}}$$

L.C.M of $2\sqrt{5}, 3\sqrt{3}$ and $4\sqrt{5} = 12\sqrt{15}$

$$18\sqrt{3} < 8\sqrt{5} < 21\sqrt{3}$$

$$18 \times 1.7 < 8 \times 2.2 < 21 \times 1.7 \quad (\text{Hence it is false})$$

Hence it is clear that only statement I is correct.

4. Which of the following is TRUE?

I. $\frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt{5}}$

II. $\frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt{5}}$

III. $\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$

IV. $\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}}$

- (a) Only I (b) Only II
(c) Only III (d) Only IV

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Ans. (c) : Given,

$$\frac{1}{\sqrt[3]{12}}, \frac{1}{\sqrt[4]{29}}, \frac{1}{\sqrt{5}}$$

L.C.M of 3, 4 and 2 = 12

$$= \frac{1}{12^{\frac{1}{3} \times 12}}, \frac{1}{29^{\frac{1}{4} \times 12}}, \frac{1}{5^{\frac{1}{2} \times 12}}$$

$$= \frac{1}{12^4}, \frac{1}{29^3}, \frac{1}{5^6} = \frac{1}{20736}, \frac{1}{24389}, \frac{1}{15625}$$

∴ $\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$

5. Which of the following is TRUE?

I. $\sqrt[3]{11} > \sqrt{7} > \sqrt[4]{45}$

II. $\sqrt{7} > \sqrt[3]{11} > \sqrt[4]{45}$

III. $\sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$

IV. $\sqrt[4]{45} > \sqrt{7} > \sqrt[3]{11}$

- (a) Only I (b) Only II
(c) Only III (d) Only IV

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Given that,

$$\sqrt[3]{11}, \sqrt{7}, \sqrt[4]{45}$$

LCM of 3, 2, 4 = 12

$$\Rightarrow 11^{\frac{1}{3} \times 12}, 7^{\frac{1}{2} \times 12}, 45^{\frac{1}{4} \times 12}$$

$$\Rightarrow 11^4, 7^6, 45^3$$

$$\Rightarrow 14641, 117649, 91125$$

$$\Rightarrow \sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$$

6. Which of the following statement(s) is/are TRUE ?

I. $\frac{3}{110} < \frac{9}{308} < \frac{7}{225}$

II. $99\frac{1}{7} + 99\frac{2}{7} + 99\frac{3}{7} + \dots + 99\frac{6}{7} = 279$

- (a) Only I (b) Only II
(c) Neither I nor II (d) Both I and II

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

From statement-I

$$\frac{3}{110} < \frac{9}{308} < \frac{7}{225}$$

$$\frac{3}{110} < \frac{9}{308}$$

On cross multiplying,

$$924 < 990$$

And $\frac{9}{308} < \frac{7}{225}$

$$2025 < 2156$$

From statement- II

$$99\frac{1}{7} + 99\frac{2}{7} + 99\frac{3}{7} + 99\frac{4}{7} + 99\frac{5}{7} + 99\frac{6}{7} \neq 279$$

$$99 \times 6 + \left(\frac{1}{7} + \frac{2}{7} + \frac{3}{7} + \frac{4}{7} + \frac{5}{7} + \frac{6}{7}\right) \neq 279$$

$$594 + 3 \neq 279$$

$$597 \neq 279$$

Hence only statement I is correct.

7. Which of the following is greatest?

11/12, 3/4, 10/11

- (a) 11/12 (b) 3/4
(c) 10/11 (d) All are equal

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) : Given that,

$$\frac{11}{12}, \frac{3}{4}, \frac{10}{11}$$

$$\frac{11}{12} \times 132, \frac{3}{4} \times 132, \frac{10}{11} \times 132 \text{ (LCM of 12, 4 \& 11 = 132)}$$

$$121, 99, 120$$

So, the greatest number is $\frac{11}{12}$.

(II) Problems based on Simplification of fractions

8. If $\frac{1}{4.263} = 0.2346$, find the value of $\frac{1}{0.0004263}$

- (a) 4.263 (b) 2346
(c) 4263 (d) 2.346

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Given that,

$$\frac{1}{4.263} = 0.2346$$

$$\frac{1}{4.263} = \frac{2346}{10000}$$

$$\frac{1}{4263.0} = \frac{2346}{10000000}$$

$$\frac{1}{0.0004263} = 2346$$

9. If $\frac{b}{a} = 0.7$, find the value of $\frac{a-b}{a+b} + \frac{11}{34}$

- (a) 1 (b) 0.5
(c) 0.3 (d) 0.2

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Ans. (b)

$$\frac{b}{a} = \frac{7}{10}$$

We have,

$$\begin{aligned} \therefore \frac{a-b}{a+b} &= \frac{11}{34} \\ &= \frac{10-7}{10+7} + \frac{11}{34} \\ &= \frac{3}{17} + \frac{11}{34} = \frac{17}{34} = 0.5 \end{aligned}$$

10. What is the value of $\frac{1}{0.2} + \frac{1}{0.02} + \frac{1}{0.002} + \dots$ upto 9 terms?

- (a) 222222222
(b) 111111111
(c) 555555555
(d) 525252525

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Ans. (c): $\frac{1}{0.2} + \frac{1}{0.02} + \frac{1}{0.002} + \dots$ 9 terms

$$= 5 + 50 + 500 + \dots$$
 9 terms

$$= 5 [1+10+100+\dots]$$
 9 terms

\therefore It is a geometric series.

We know that sum of geometric series is.

$$\therefore \text{Sum of geometric series} = \frac{a(r^n - 1)}{r - 1}, \text{ when } r > 1$$

$$= 5 \left[\frac{1(10^9 - 1)}{10 - 1} \right] = 5 \times \frac{999999999}{9}$$

$$= 555555555$$

11. If $\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}}} = \frac{5}{8}$, then what is the value of x?

- (a) 2 (b) 3
(c) 1 (d) 4

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Ans. (a) : Given,

$$\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}}} = \frac{5}{8}$$

$$= \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}}$$

$$= \frac{1}{8/5}$$

$$= \frac{1}{1 + \frac{3}{5}}$$

$$= \frac{1}{1 + \frac{1}{5/3}}$$

$$= \frac{1}{1 + \frac{1}{1 + \frac{2}{3}}}$$

$$= \frac{1}{1 + \frac{1}{1 + \frac{1}{3/2}}}$$

$$= \frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}$$

On comparing $x = 2$

12. If $A = \frac{0.216+0.008}{0.36+0.04-0.12}$ and $B = \frac{0.729-0.027}{0.81+0.09+0.27}$ then what is the value of $(A^2 + B^2)$?

- (a) 0.8 (b) 1
(c) 1.4 (d) 2.2

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Ans. (b): Given,

$$A = \frac{0.216+0.008}{0.36+0.04-0.12} = \frac{(0.6)^3 + (0.2)^3}{(0.6)^2 + (0.2)^2 - 0.6 \times 0.2}$$

Just as,

$$\frac{a^3 + b^3}{a^2 + b^2 - ab} = \frac{(a+b)(a^2 + b^2 - ab)}{(a^2 + b^2 - ab)} = (a+b)$$

$$A = (a+b) = 0.6 + 0.2 = 0.8$$

Similarly,

$$B = \frac{(0.9)^3 - (0.3)^3}{(0.9)^2 + (0.3)^2 + 0.9 \times 0.3}$$

$$\frac{a^3 - b^3}{a^2 + b^2 + ab} = \frac{(a-b)(a^2 + b^2 + ab)}{(a^2 + b^2 + ab)} = (a-b)$$

$$B = 0.9 - 0.3 = 0.6$$

$$\text{Hence } (A^2 + B^2) = [(0.8)^2 + (0.6)^2]$$

$$= 1$$

13. If $A = \frac{1}{1 \times 2} + \frac{1}{1 \times 4} + \frac{1}{2 \times 3} + \frac{1}{4 \times 7} + \frac{1}{3 \times 4} + \frac{1}{7 \times 10} \dots$ upto 20 terms, then what is the value of A ?

- (a) 379/308 (b) 171/140
(c) 379/310 (d) 420/341

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Ans. (d):

$$A = \frac{1}{1 \times 2} + \frac{1}{1 \times 4} + \frac{1}{2 \times 3} + \frac{1}{4 \times 7} + \frac{1}{3 \times 4} + \frac{1}{7 \times 10} + \dots 20 \text{ terms}$$

$$A = \left(\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots 10 \text{ terms} \right) +$$

$$\left(\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \dots 10 \text{ terms} \right)$$

$$A = \left(\frac{1}{1} - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \dots + \frac{1}{10} - \frac{1}{11} \right) + \frac{1}{3} \left(\frac{1}{1} - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \frac{1}{7} - \frac{1}{10} + \dots + \frac{1}{28} - \frac{1}{31} \right)$$

$$A = \left(1 - \frac{1}{11} \right) + \frac{1}{3} \left(1 - \frac{1}{31} \right)$$

$$= \frac{10}{11} + \frac{10}{31} = \frac{310 + 110}{341} = \frac{420}{341}$$

14. If $A = 0.142857142857\dots$ and $B = 0.16666\dots$, then what is the value of $(A+B)/AB$?
 (a) 10 (b) 11
 (c) 12 (d) 13

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Ans. (d) : We have,
 $A = 0.142857142857\dots$
 $= 0.142857$
 $= \frac{142857}{999999} = \frac{1}{7}$
 $B = 0.1666\dots = 0.1\bar{6}$
 $= \frac{16-1}{90} = \frac{15}{90} = \frac{1}{6}$
 Hence $\frac{A+B}{AB} = \frac{1}{B} + \frac{1}{A}$
 $= 6 + 7 = 13$

15. What is the value of $S = \frac{1}{1 \times 3 \times 5} + \frac{1}{1 \times 4} + \frac{1}{3 \times 5 \times 7} + \frac{1}{4 \times 7} + \frac{1}{5 \times 7 \times 9} + \frac{1}{7 \times 10} + \dots$ upto 20 terms, then what is the value of S?
 (a) 6179/15275 (b) 6070/14973
 (c) 7191/15174 (d) 5183/16423

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :

$$S = \frac{1}{1 \times 3 \times 5} + \frac{1}{1 \times 4} + \frac{1}{3 \times 5 \times 7} + \frac{1}{4 \times 7} + \frac{1}{5 \times 7 \times 9} + \dots \text{20 terms}$$

$$S = \left[\frac{1}{1 \times 3 \times 5} + \frac{1}{3 \times 5 \times 7} + \frac{1}{5 \times 7 \times 9} + \dots \text{10 terms} \right] + \left[\frac{1}{1 \times 4} + \frac{1}{4 \times 7} + \frac{1}{7 \times 10} + \dots \text{10 terms} \right]$$

$$= \frac{1}{4} \left[\frac{1}{1 \times 3} - \frac{1}{3 \times 5} + \frac{1}{3 \times 5} - \frac{1}{5 \times 7} + \dots + \frac{1}{19 \times 21} - \frac{1}{21 \times 23} \right] + \frac{1}{3} \left[1 - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \dots + \frac{1}{28} - \frac{1}{31} \right]$$

$$= \frac{1}{4} \left[\frac{1}{3} - \frac{1}{483} \right] + \frac{1}{3} \left[1 - \frac{1}{31} \right]$$

$$= \frac{483-3}{4 \times 3 \times 483} + \frac{31-1}{3 \times 31} = \frac{480}{12 \times 483} + \frac{30}{3 \times 31}$$

$$= \frac{40}{483} + \frac{10}{31} = \frac{1240 + 4830}{483 \times 31} = \frac{6070}{14973}$$

16. The value of $22.\bar{4} + 11.5\bar{67} - 33.5\bar{9}$ is :
 (a) $0.\bar{32}$ (b) $0.4\bar{12}$
 (c) $0.4\bar{12}$ (d) $0.3\bar{1}$

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : $22.\bar{4} + 11.5\bar{67} - 33.5\bar{9}$
 $= \frac{(224-22)}{9} + \frac{(11567-115)}{990} - \frac{(3359-335)}{90}$
 $= \frac{202}{9} + \frac{11452}{990} - \frac{3024}{90}$
 $= \frac{22220 + 11452 - 33264}{990}$
 $= \frac{33672 - 33264}{990} = \frac{408}{990} = \frac{412-4}{990} = 0.4\bar{12}$

17. The value of $0.4\bar{7} + 0.50\bar{3} - 0.3\bar{9} \times 0.8$ is :
 (a) $0.6\bar{15}$ (b) $0.6\bar{15}$
 (c) $0.62\bar{5}$ (d) $0.62\bar{5}$

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : $0.4\bar{7} + 0.50\bar{3} - 0.3\bar{9} \times 0.8$
 $= \frac{43}{90} + \frac{498}{990} - \frac{36}{90} \times \frac{8}{9}$
 $= \frac{43}{90} + \frac{498}{990} - \frac{32}{90}$
 $= \frac{11}{90} + \frac{498}{990} = \frac{121+498}{990}$
 $= \frac{619}{990}$
 $= 0.62\bar{5}$

18. If $2 = x + \frac{1}{1 + \frac{1}{5 + \frac{1}{2}}}$ then the value of x is equal to:

- (a) $\frac{15}{13}$ (b) $\frac{14}{13}$
 (c) $\frac{13}{15}$ (d) 1

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (a) : $2 = x + \frac{1}{1 + \frac{1}{5 + \frac{1}{2}}}$

$$2 = x + \frac{1}{1 + \frac{2}{11}}$$

$$2 = x + \frac{11}{13}$$

$$x = 2 - \frac{11}{13}$$

$$\boxed{x = \frac{15}{13}}$$

19. If $A = (1/0.4) + (1/0.04) + (1/0.004) + \dots$ upto 8th terms, then what is the value of A ?
 (a) 27272727.5 (b) 25252525.5
 (c) 27777777.5 (d) 25555555.5

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : Given that,

$$A = \frac{1}{0.4} + \frac{1}{0.04} + \frac{1}{0.004} + \dots \text{8 terms}$$

$$= \frac{10}{4} + \frac{100}{4} + \frac{1000}{4} + \dots \text{8 terms}$$

$$= \frac{10}{4} [1 + 10 + 100 + 1000 + \dots \text{8 terms}]$$

$$= \frac{10}{4} \left[\frac{1(10^8 - 1)}{10 - 1} \right]$$

$$[\because S_n = \frac{a(r^n - 1)}{r - 1}] \text{ when } r > 1$$

$$= \frac{999999990}{9 \times 4}$$

$$= 27777777.5$$

20. What is the value of 0.00010?

- (a) 1/1000 (b) 1/10000
(c) 1/100000 (d) 1/100

SSC MTS 9-10-2017 (Shift-II)

Ans. (b) : Value of 0.00010 = $\frac{10}{100000} = \frac{1}{10000}$

21. The value of $0.5\overline{6} - 0.7\overline{23} + 0.3\overline{9} \times 0.7$ is :

- (a) $0.\overline{158}$ (b) $0.\overline{154}$
(c) 0.154 (d) 0.158

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : $0.5\overline{6} - 0.7\overline{23} + 0.3\overline{9} \times 0.7$

$$= \frac{56-5}{90} - \frac{723-7}{990} + \frac{39-3}{90} \times \frac{7}{9}$$

$$= \frac{51}{90} - \frac{716}{990} + \frac{36}{90} \times \frac{7}{9}$$

$$= \frac{561 - 716 + 308}{990}$$

$$= \frac{153}{990} = 0.154$$

22. If $M = 0.1 + (0.1)^2 + (0.01)^2$ and $N = 0.3 + (0.03)^2 + (0.003)^2$, then what is the value of $M + N$?

- (a) 0.411009 (b) 0.413131
(c) 0.313131 (d) 0.131313

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : $M = 0.1 + (0.1)^2 + (0.01)^2$

$$= 0.1 + 0.01 + 0.0001$$

$$= 0.1101$$

$$N = 0.3 + (0.03)^2 + (0.003)^2$$

$$= 0.3 + 0.0009 + 0.000009$$

$$= 0.300909$$

$$M + N = 0.1101 + 0.300909$$

$$= 0.411009$$

23. If $N = 0.369369369\dots$ and $M = 0.531531531\dots$, then what is the value of $(1/N) + (1/M)$?

- (a) 11100/2419 (b) 111/100
(c) 1897/3162 (d) 2419/11100

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Given,

$$N = 0.369369369\dots$$

$$N = 0.369$$

$$M = 0.531531\dots$$

$$M = 0.531$$

$$N = \frac{369}{999} \text{ \& } M = \frac{531}{999}$$

$$[\text{Note : } 0.\overline{abcabc\dots} = \frac{abc}{999}]$$

According to the question,

$$\frac{1}{N} + \frac{1}{M} = \frac{999}{369} + \frac{999}{531}$$

$$= \frac{11100}{2419}$$

24. If $x = \frac{1}{1 + \frac{1}{1+x}}$ and $y = \frac{2}{2 + \frac{1}{1+y}}$, then which of

the following can be the value of $x+y$?

- (a) $(-\sqrt{5} - \sqrt{17} + 3)/4$ (b) $(2\sqrt{5} + \sqrt{17} - 3)/4$
(c) $(-\sqrt{5} + \sqrt{17} + 1)/4$ (d) $(\sqrt{5} + \sqrt{17} - 1)/4$

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Given that,

$$x = \frac{1}{1 + \frac{1}{1+x}}$$

$$x = \frac{1}{2+x} = \frac{1+x}{2+x}$$

$$2x + x^2 = 1 + x$$

$$x^2 + x - 1 = 0$$

$$\therefore x = \frac{-1 \pm \sqrt{1+4}}{2}$$

$$x = \frac{\sqrt{5} - 1}{2}$$

Similarly,

$$y = \frac{2}{2 + \frac{1}{1+y}}$$

$$y = \frac{2}{3+2y} = \frac{2+2y}{3+2y}$$

$$3y + 2y^2 = 2 + 2y$$

$$2y^2 + y - 2 = 0$$

$$y = \frac{-1 \pm \sqrt{1+16}}{4}$$

$$y = \frac{\sqrt{17} - 1}{4}$$

$$\text{Hence } x + y = \frac{\sqrt{5} - 1}{2} + \frac{\sqrt{17} - 1}{4} = \frac{2\sqrt{5} + \sqrt{17} - 3}{4}$$

(III) Miscellaneous

25. The numerator of a fraction is less than 6 its denominator. If 1 is subtracted from its numerator and 5 is added to its denominator, then its denominator becomes 4 times its numerator. Find the fraction.

- (a) $\frac{4}{11}$ (b) $\frac{5}{11}$
 (c) $\frac{7}{11}$ (d) $\frac{3}{11}$

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Ans. (b) : Let denominator = x

numerator = x - 6

According to the question,

$$4[(x-6)-1] = x+5$$

$$4(x-7) = x+5$$

$$4x - 28 = x + 5$$

$$3x = 33$$

$$x = 11$$

Hence numerator = x - 6 = 11 - 6 = 5

denominator = x = 11

$$\therefore \text{Fraction} = \frac{5}{11}$$

26. If $P = \frac{96}{95 \times 97}$, $Q = \frac{97}{96 \times 98}$ and $R = \frac{1}{97}$, then

which of the following is TRUE?

- (a) $P < Q < R$ (b) $R < Q < P$
 (c) $Q < P < R$ (d) $R < P < Q$

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Ans. (b) : Let 95 = 1, 96 = 2, 97 = 3, 98 = 4

$$P = \frac{2}{1 \times 3} = 0.67$$

$$Q = \frac{3}{2 \times 4} = 0.375$$

$$R = \frac{1}{3} = 0.33$$

Hence option $P > Q > R$ is right

27. Which of the following statement(s) is/are TRUE?

I. $1\frac{2}{3} + 2\frac{3}{4} + 3\frac{4}{5} > 8$

II. $6\frac{1}{2} - 5\frac{3}{4} + 4\frac{1}{4} > 5$

- (a) Only I (b) Only II
 (c) Neither I nor II (d) Both I and II

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

From statement-I

$$1\frac{2}{3} + 2\frac{3}{4} + 3\frac{4}{5}$$

$$= (1+2+3) + \frac{2}{3} + \frac{3}{4} + \frac{4}{5}$$

$$= 6 + 0.66 + 0.75 + 0.8$$

$$= 8.21 > 8 \text{ (correct)}$$

From statement-II

$$6\frac{1}{2} - 5\frac{3}{4} + 4\frac{1}{4}$$

$$= (6-5+4) + \frac{1}{2} - \frac{3}{4} + \frac{1}{4}$$

$$= 5 > 5 \text{ (Incorrect)}$$

Hence, it is clear that only statement I is right.

28. Which of the following statement(s) is/are TRUE?

I. $(0.03/0.2) + (0.003/0.02) + (0.0003/0.002) + (0.00003/0.0002) = 0.6$

II. $(0.01) + (0.01)^2 + (0.001)^2 = 0.010101$

- (a) Only I (b) Only II
 (c) Neither I nor II (d) Both I and II

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Ans. (d) :

(I)

$$\frac{0.03}{0.2} + \frac{0.003}{0.02} + \frac{0.0003}{0.002} + \frac{0.00003}{0.0002} = 0.6$$

$$\frac{3}{2} \times 10^{-1} + \frac{3}{2} \times 10^{-1} + \frac{3}{2} \times 10^{-1} + \frac{3}{2} \times 10^{-1} = 0.6$$

$$4 \times \frac{3}{2} \times 10^{-1} = 0.6$$

$$0.6 = 0.6$$

(II)

$$(0.01) + (0.01)^2 + (0.001)^2 = 0.010101$$

$$0.01 + 0.0001 + 0.000001 = 0.010101$$

$$0.010101 = 0.010101$$

Hence both statement I and II are true.

29. Three fractions, x, y and z, are such that $x > y > z$. When the smallest of them is divided by

the greatest, the result is $\frac{9}{16}$ which exceeds y by

0.0625. If $x + y + z = 1\frac{13}{24}$, then the value of x+z

is ?

- (a) $\frac{7}{6}$ (b) $\frac{7}{8}$
 (c) $\frac{25}{24}$ (d) 1

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Ans. (c) : \therefore Greatest number = x

Smallest number = z

According to the question,

$$\frac{z}{x} = y + 0.0625 = \frac{9}{16}$$

$$y = 0.5625 - 0.0625$$

$$= 0.5 = \frac{1}{2}$$

$$\therefore x + y + z = 1\frac{13}{24} = \frac{37}{24}$$

$$x + z = \frac{37}{24} - \frac{1}{2} = \frac{37-12}{24} = \frac{25}{24}$$

30. By adding 3 and 5 in numerator and denominator of a fraction it becomes $\frac{2}{3}$. If 1 and 3 are subtracted and added from numerator and denominator respectively it becomes $\frac{2}{5}$, find the fraction?

- (a) $\frac{7}{5}$
 (b) $\frac{7}{6}$
 (c) $\frac{6}{7}$
 (d) $\frac{5}{7}$

SSC CHSL -19/10/2020 (Shift-I)

Ans. (d): Method – I

From option (d)–

$$\frac{5}{7} \Rightarrow \frac{5+3}{7+5} = \frac{8}{12} = \frac{2}{3}$$

Again $\frac{5-1}{7-3} = \frac{4}{10} = \frac{2}{5}$

Method – II

Let fraction = $\frac{a}{b}$

$$\frac{a+3}{b+5} = \frac{2}{3} \Rightarrow 3a-2b = 1 \quad \text{--- (i)}$$

Again

$$\frac{a-1}{b-3} = \frac{2}{5} \Rightarrow 5a-2b = 11 \quad \text{--- (ii)}$$

From eqⁿ (i) and (ii)

$$a = 5, \quad b = 7$$

$$\therefore \text{Fraction} = \frac{a}{b} = \frac{5}{7}$$

31. What is the value of 0.001040?

- (a) 104/1000
 (b) 104/1000000
 (c) 104/100000
 (d) 104/10000

SSC MTS 10-10-2017 (Shift-III)

$$\text{Ans. (c) : } 0.001040 = \frac{0.00104 \times 100000}{100000} = \frac{104}{100000}$$

32. What number should be subtracted from the numerator and denominator of fraction $\frac{4}{9}$ so that fraction becomes $\frac{1}{6}$?

- (a) 3
 (b) 7
 (c) 2
 (d) 5

SSC MTS 20/08/2019 (Shift-III)

Ans. (a): Let x number be subtracted from numerator and denominator.

$$\frac{4-x}{9-x} = \frac{1}{6}$$

$$24 - 6x = 9 - x$$

$$24 - 9 = 6x - x$$

$$5x = 15$$

$$x = 3$$

33. x and y together have ₹ 1300. If ₹ 10 less than three-fifth of the amount of x is equal to half of the amount of y, then how much does x have?

- (a) ₹ 700
 (b) ₹ 600
 (c) ₹ 550
 (d) ₹ 650

SSC MTS 16/08/2019 (Shift-I)

Ans. (b) : $x + y = 1300$ ——— (i)

According to the question,

$$\frac{3}{5}x - 10 = y \times \frac{1}{2}$$

$$\frac{3}{5}x - \frac{y}{2} = 10$$

$$\frac{6x - 5y}{10} = 10$$

$$6x - 5y = 100 \quad \text{--- (ii)}$$

From eqⁿ (i) & (ii)

$$5x + 5y = 1300 \times 5$$

$$5x + 5y = 6500$$

$$\Rightarrow 6x - 5y = 100$$

$$11x = 6600$$

$$x = 600$$

34. A fraction is such that the numerator is five less than the denominator. Also four times the numerator is one more than the denominator. the fraction is

- (a) 4/7
 (b) 3/8
 (c) 7/12
 (d) 2/7

SSC MTS 09/08/2019 (Shift-II)

Ans. (d) : Let fraction = $\frac{x}{y}$

According to the question,

$$x = y - 5$$

$$x + 5 = y \quad \text{--- (i)}$$

Again,

$$4x = y + 1 \quad \text{--- (ii)}$$

From eqⁿ (i) & (ii)

$$4x = x + 5 + 1$$

$$3x = 6$$

$$x = 2$$

From eqⁿ (i)

$$y = 7$$

$$\text{Hence fraction} = \frac{x}{y} = \frac{2}{7}$$

(I) Problems based on Square Root of Numbers

1. If $x = \sqrt{-\sqrt{3} + \sqrt{3+8\sqrt{7+4\sqrt{3}}}}$ where $x > 0$, then the value of x is equal to :
- (a) 2 (b) 4
(c) 1 (d) 3

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : $x = \sqrt{-\sqrt{3} + \sqrt{3+8\sqrt{7+4\sqrt{3}}}}$, $x > 0$

$$= \sqrt{-\sqrt{3} + \sqrt{3+8\sqrt{(2+\sqrt{3})^2}}}$$

$$= \sqrt{-\sqrt{3} + \sqrt{3+16+8\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3} + \sqrt{19+8\sqrt{3}}}$$

$$= \sqrt{-\sqrt{3} + 4 + \sqrt{3}}$$

$$= \sqrt{4} = 2$$

2. What is the value of $\sqrt{269} - \sqrt{169}$
- (a) 17 (b) 15
(c) 22 (d) 16

SSC MTS 10/10/2017 (Shift-III)

Ans. (d) : $\sqrt{269} - \sqrt{169} = ?$ [$\because (13)^2 = 169$]

$$\sqrt{269} - 13 = \sqrt{256} = 16$$

3. What is the value of $\sqrt{18 - 2\sqrt{77}}$
- (a) $\sqrt{11} + \sqrt{7}$ (b) $\sqrt{12} - \sqrt{5}$
(c) $\sqrt{11} - \sqrt{7}$ (d) $\sqrt{13} - \sqrt{4}$

SSC MTS 10-10-2017 (Shift-II)

Ans. (c) : $\sqrt{18 - 2\sqrt{77}}$

$$\Rightarrow \sqrt{11+7-2\times\sqrt{11}\times\sqrt{7}}$$

$$\Rightarrow \sqrt{(\sqrt{11})^2 + (\sqrt{7})^2 - 2\sqrt{11}\times\sqrt{7}}$$

$$\Rightarrow \sqrt{(\sqrt{11}-\sqrt{7})^2} = \sqrt{11} - \sqrt{7}$$

4. In the given equation $(5)^2 + (6)^2 + (30)^2 = (x)^2$ What is the value of x ?
- (a) 53 (b) 37
(c) 41 (d) 31

SSC MTS 21/08/2019 (Shift-I)

Ans. (d) : $5^2 + 6^2 + 30^2 = x^2$

$$25 + 36 + 900 = x^2$$

$$961 = x^2$$

$$x = 31$$

5. The value of x in the given equation $23^2 + \sqrt{x} = 625$
- (a) 9576 (b) 9124
(c) 9216 (d) 9028

SSC MTS 13/08/2019 (Shift-I)

Ans. (c) : $23^2 + \sqrt{x} = 625$

$$\sqrt{x} = 625 - 529$$

$$\sqrt{x} = 96$$

$$x = 9216$$

6. What is the value of the square root of : $\{[(100 \text{ of } 0.9 \times 0.8 - 7 \times 1.2 \div 0.2 + 5 \times 4 - 3 \times 2)] \div 10 + 1.85\} = ?$
- (a) 12.25 (b) 2.5
(c) 6.25 (d) 3.5

SSC MTS 16/08/2019 (Shift-I)

Ans. (b) :

$$\sqrt{\left\{ \left[\frac{(100 \text{ of } 0.9 \times 0.8 - 7 \times 1.2 \div 0.2 + 5 \times 4 - 3 \times 2)}{10} + 1.85 \right] \right\}}$$

$$\Rightarrow \sqrt{\left\{ \left[\frac{(90 \times 0.8 - 7 \times 6 + 20 - 6)}{10} + 1.85 \right] \right\}}$$

$$\Rightarrow \sqrt{\left\{ \left[\frac{(72 - 42 + 20 - 6)}{10} + 1.85 \right] \right\}}$$

$$\Rightarrow \sqrt{\left\{ \left[\frac{(72 - 42 + 14)}{10} + 1.85 \right] \right\}}$$

$$\Rightarrow \sqrt{\left\{ \left[\frac{(44)}{10} + 1.85 \right] \right\}}$$

$$\Rightarrow \sqrt{[4.4 + 1.85]}$$

$$\Rightarrow \sqrt{6.25}$$

$$\Rightarrow 2.5$$

7. The value of $\frac{1}{\sqrt{17+12\sqrt{2}}}$ is closest to:

- (a) 0.17 (b) 1.2
(c) 1.4 (d) 0.14

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)

$$\frac{1}{\sqrt{17+12\sqrt{2}}} = \frac{1}{\sqrt{9+8+2\times 3\times 2\sqrt{2}}}$$

$$= \frac{1}{\sqrt{(3+2\sqrt{2})^2}} = \frac{1}{3+2\sqrt{2}}$$

$$= \frac{3-2\sqrt{2}}{(3+2\sqrt{2})(3-2\sqrt{2})}$$

$$= \frac{3-2 \times 1.414}{3^2 - (2\sqrt{2})^2} = \frac{3-2.828}{9-8} = 0.17$$

8. $\sqrt{\frac{25.60}{72.90}} + \sqrt{\frac{0.10}{8.10}} = ?$

- (a) $\frac{27}{30}$ (b) $\frac{27}{20}$
 (c) $\frac{19}{27}$ (d) $\frac{27}{28}$

SSC MTS 13/08/2019 (Shift-III)

Ans. (c) : $\sqrt{\frac{25.60}{72.90}} + \sqrt{\frac{0.10}{8.10}}$

$$\Rightarrow \sqrt{\frac{256}{729}} + \sqrt{\frac{10}{810}}$$

$$\Rightarrow \frac{16}{27} + \sqrt{\frac{1}{81}}$$

$$\Rightarrow \frac{16}{27} + \frac{1}{9}$$

$$\Rightarrow \frac{16+3}{27}$$

$$\Rightarrow \frac{19}{27}$$

9. If $l : m : n = 1 : 2 : 4$, then $\sqrt{5l^2 + m^2 + n^2}$ is equal to:

- (a) $4n$ (b) $5l$
 (c) $2m$ (d) 5

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) : $\because l : m : n = 1 : 2 : 4 = k : 2k : 4k$

Let $l = k$
 $m = 2k$
 $n = 4k$

Then, $\sqrt{5l^2 + m^2 + n^2}$
 $= \sqrt{5(k)^2 + (2k)^2 + (4k)^2}$
 $= \sqrt{5k^2 + 4k^2 + 16k^2}$
 $= \sqrt{25k^2} = 5k = 5 \times k = 5l$

(II) Problems based on Exponents

10. The value of $(0.3)^{\frac{[(200-146)/(3 \times 3 \times 3)]-3}{3}}$ is:

- (a) $\frac{10}{3}$ (b) $\frac{5}{3}$
 (c) $\frac{7}{3}$ (d) $\frac{8}{3}$

SSC CGL (Tier-II) 03/02/2022

Ans : (a) $(0.3)^{\frac{[(200-146)/(3 \times 3 \times 3)]-3}{3}}$

$$= (0.3)^{\frac{[54/27]-3}{3}}$$

$$= (0.3)^{2-3}$$

$$= (0.3)^{-1}$$

$$= \frac{1}{0.3}$$

$$= \frac{10}{3}$$

11. If $A = 2^{32}$, $B = 2^{31} + 2^{30} + 2^{29} + \dots + 2^0$ and $C = 3^{15} + 3^{14} + 3^{13} + \dots + 3^0$, then which of the following option is TRUE ?

- (a) $C > B > A$ (b) $C > A > B$
 (c) $A > B > C$ (d) $A > C > B$

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Ans. (c) : Given

$$A = 2^{32} = 4^{16} \dots \dots (i)$$

$$B = 2^{31} + 2^{30} + 2^{29} + \dots + 2^0$$

$$B = 2^0 + 2^1 + \dots + 2^{29} + 2^{30} + 2^{31}$$

\therefore It is in G.P

$$a = 2^0 = 1$$

$$r = 2, n = 32$$

$$\therefore B = S_{32} = \frac{1(2^{32}-1)}{2-1} \left\{ \because S_n = \frac{a(r^n-1)}{r-1} \right\} \text{ When } r > 1$$

$$B = (2^{32}-1) = 4^{16}-1 \dots \dots (ii)$$

$$\therefore C = 3^{15} + 3^{14} + 3^{13} + \dots + 3^0$$

$$C = 3^0 + 3^1 + \dots + 3^{13} + 3^{14} + 3^{15}$$

\therefore It is in G.P

$$a = 3^0 = 1, r = 3, n = 16$$

$$\therefore C = S_{16} = \frac{1(3^{16}-1)}{3-1}$$

$$C = \frac{3^{16}-1}{2} \dots \dots (iii)$$

From Equation (i), (ii) and equation (iii)

$$\boxed{A > B > C}$$

12. Which of the following statement(s) is/are TRUE ?

I. $33^3 > 3^{33}$

II. $333 > (3^3)^3$

- (a) Only I (b) Only II
 (c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : (I) $33^3 > 3^{33}$

$$33 \times 33 \times 33 > 3^{11} \times 3^{11} \times 3^{11}$$

$$\therefore 3^{11} > 33$$

Hence, it is false
 (II) $333 > (3^3)^3$
 $333 > (27)^3$
 $333 > 27 \times 27 \times 27$
 Hence, this is also false

13. If $x^{y^z} = 1$, $y^{z^x} = 125$ and $z^{x^y} = 243$ (x, y and z are natural numbers), then what is the value of $9x + 10y - 18z$?

- (a) 18 (b) 15
 (c) 12 (d) 5

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : $x^{y^z} = 1$

For any value of $y^z = x^{y^z} = 1$

If $x = 1$

$$y^{z^x} = 125$$

$$\therefore x = 1$$

$$\text{So, } y = 5, z = 3$$

$$z^{y^x} = 243$$

$$\therefore 3^5 = 243$$

$$\therefore x = 1, y = 5, z = 3$$

$$\text{So, } 9x + 10y - 18z = 9 + 50 - 54 = 5$$

14. If $x^{y+z} = 1$, $y^{z+x} = 1024$ and $z^{x+y} = 729$ (x, y and z are natural numbers), then what is the value of $(z+1)^{y+x+1}$?

- (a) 6561 (b) 10000
 (c) 4096 (d) 14641

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :

$$x^{y+z} = 1 \dots\dots (i)$$

$$y^{z+x} = 1024$$

$$z^{x+y} = 2^{10} \dots\dots (ii)$$

From equation (i) and (ii)

$$x = 1, y = 2, z = 9$$

$$\therefore z^{x+y} = 9^3$$

$$(z+1)^{y+x+1} = 10^4 = 10000$$

15. If $5^{\sqrt{x}} + 12^{\sqrt{x}} = 13^{\sqrt{x}}$, then find the value of x.

- (a) 4 (b) 8
 (c) 1 (d) 2

SSC CHSL 05/07/2019 (Shift-II)

Ans. (b) : $5^{\sqrt{x}} + 12^{\sqrt{x}} = 13^{\sqrt{x}}$

From option (b)

On putting $x = 8$,

$$5^2 + 12^2 = 13^2$$

$$25 + 144 = 169$$

$$169 = 169$$

Hence the value of x will be 8.

16. If $3^{\sqrt{x}} + 4^{\sqrt{x}} = 5^{\sqrt{x}}$, then find the value of x.

- (a) 8 (b) 2
 (c) 1 (d) 4

SSC CHSL (Tier-I) 05/07/2019 (Shift-III)

Ans. (a) : $3^{\sqrt{x}} + 4^{\sqrt{x}} = 5^{\sqrt{x}}$

From option (a)

On putting, $x = 8$

$$3^{\sqrt{8}} + 4^{\sqrt{8}} = 5^{\sqrt{8}}$$

$$3^2 + 4^2 = 5^2$$

$$9 + 16 = 25$$

$$25 = 25$$

Hence the value of x will be 8.

17. If $6^{\sqrt{x}} + 8^{\sqrt{x}} = 10^{\sqrt{x}}$ find the value of x.

- (a) 8 (b) 2
 (c) 16 (d) 4

SSC CHSL (Tier-I) 08/07/2019 (Shift-II)

Ans. (c) : From option (c)

On putting $x = 16$

$$6^{\sqrt{16}} + 8^{\sqrt{16}} = 10^{\sqrt{16}}$$

$$6^2 + 8^2 = 10^2$$

$$36 + 64 = 100$$

$$100 = 100$$

Hence the value of x will be 16.

18. If $3^{\sqrt{x}} + 4^{\sqrt{x}} = 5^{\sqrt{x}}$, then find the value of x :

- (a) 16 (b) 8
 (c) 2 (d) 4

SSC CHSL (Tier-I) 08/07/2019 (Shift-I)

Ans. (a) : $3^{\sqrt{x}} + 4^{\sqrt{x}} = 5^{\sqrt{x}}$

From option (a),

On putting, $x = 16$

$$3^{\sqrt{16}} + 4^{\sqrt{16}} = 5^{\sqrt{16}}$$

$$3^2 + 4^2 = 5^2$$

$$9 + 16 = 25$$

$$25 = 25$$

Hence the value of x will be 16.

19. If $\frac{3^{a+3} \times 4^{a+6} \times 25^{a+1}}{27^{a-1} \times 8^{a-2} \times 125^{a+4}} = \frac{4}{15^{26}}$, then the value of $\sqrt{a+9}$ is:

- (a) 6 (b) 5
 (c) 8 (d) 4

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : $\frac{3^{a+3} \times 4^{a+6} \times 25^{a+1}}{27^{a-1} \times 8^{a-2} \times 125^{a+4}} = \frac{4}{15^{26}}$

$$\frac{3^{a+3} \times 2^{2a+12} \times 5^{2a+2}}{3^{3a-3} \times 2^{3a-6} \times 5^{3a+12}} = \frac{4}{15^{26}}$$

$$3^{-2a+6} \times 2^{-a+18} \times 5^{-a-10} = 2^2 \times 3^{-26} \times 5^{-26}$$

On comparing the both sides

$$-a + 18 = 2$$

$$a = 16$$

$$\text{So, } \sqrt{a+9} = \sqrt{25} = 5$$

20. If $2^{x+y-2z} = 8^{8z-5-y}$; $5^{4y-6z} = 25^{y+z}$; $3^{4x-3z} = 9^{x+z}$

then the value of $2x + 3y + 5z$ is :

- (a) 32 (b) 56
 (c) 44 (d) 28

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) : $2^{x+y-2z} = 8^{8z-5-y}$
 $2^{x+y-2z} = 2^{24z-15-3y}$
 $x+y-2z = 24z - 15 - 3y$
 $x + 4y - 26z = -15$ _____ (i)
 $5^{4y-6z} = 25^{y+z}$
 $5^{4y-6z} = 5^{2y+2z}$
 $4y-6z = 2y+2z$
 $y = 4z$ _____ (ii)
 $3^{4x-3z} = 9^{x+z}$
 $3^{4x-3z} = 3^{2x+2z}$
 $4x-3z = 2x+2z$
 $2x = 5z$ _____ (iii)
 $x = 5z/2$
 Putting the value of y and x from equation (ii) and (iii) in equation (i)
 $x + 4y - 26z = -15$
 $\frac{5z}{2} + 16z - 26z = -15$
 $-7.5z = -15$
 $z = 2$ _____ (iv)
 Now Putting the value of y and x from equation (ii) and (iii) in $2x + 3y + 5z$
 $5z + 12z + 5z = 22z$
 Putting the value of z from equation (iv)
 $= 22 \times 2 = 44$

21. If $\left[\left\{ \left(\frac{2}{3} \right)^3 \right\}^{(2x+3)} \right]^{\frac{-3}{4}} = \left[\left\{ \left(\frac{2}{3} \right)^2 \right\}^{(3x+7)} \right]^{\frac{-6}{5}}$, then the value of $\sqrt{2-42x}$ is:
 (a) 5 (b) 3
 (c) 4 (d) 6

SSC CHSL -18/03/2020 (Shift-I)

Ans. (a) : $\left[\left\{ \left(\frac{2}{3} \right)^3 \right\}^{(2x+3)} \right]^{\frac{-3}{4}} = \left[\left\{ \left(\frac{2}{3} \right)^2 \right\}^{(3x+7)} \right]^{\frac{-6}{5}}$

If $a^b = a^c$, and $(a^m)^n = a^{mn}$

Then, $b = c$

Same as, $3(2x+3)\left(\frac{-3}{4}\right) = \frac{2}{3}(3x+7)\left(\frac{-6}{5}\right)$

$\frac{9}{4}(2x+3) = \frac{4}{5}(3x+7)$

$45(2x+3) = 16(3x+7)$

$90x + 135 = 48x + 112$

$42x = -23$

$x = \frac{-23}{42}$

$\therefore \sqrt{2-42x} = \sqrt{2-42 \times \left(\frac{-23}{42}\right)}$
 $= \sqrt{25} = 5$

22. Find the value of x, if $21^{\sqrt{x}} + 20^{\sqrt{x}} = 29^{\sqrt{x}}$.

- (a) 3 (b) 2
 (c) 4 (d) 0

SSC CHSL -18/03/2020 (Shift-III)

Ans. (c) : $21^{\sqrt{x}} + 20^{\sqrt{x}} = 29^{\sqrt{x}}$

From option (c)

On taking, $x = 4$

$(21)^2 + (20)^2 = 29^2$

$441 + 400 = 841$

$841 = 841$

Hence the value of x will be 4

23. What is the value of 2^{2^4} .

- (a) 256 (b) 1024
 (c) 65536 (d) 8192

SSC MTS 9-10-2017 (Shift-II)

Ans. (c) : $2^{2^4} = 2^{2 \times 2 \times 2 \times 2} = 2^{16} = 65536$

24. $(x^5 \div x^4)^3 \div x^2 = ?$

- (a) x^2 (b) x^3
 (c) x^{-1} (d) x

SSC MTS 09/08/2019 (Shift-III)

Ans. (d) : $(x^5 \div x^4)^3 \div x^2 = ?$

$= (x)^3 \div x^2$

$= x^3 \div x^2$

$= x$

(III) Problems based on Surds

25. If $\sqrt{1 + \frac{\sqrt{3}}{2}} - \sqrt{1 - \frac{\sqrt{3}}{2}} = C$, then the value of C is:

- (a) 1 (b) 4
 (c) 3 (d) 2

SSC CGL (Tier-II) 03/02/2022

Ans : (a)

$\sqrt{1 + \frac{\sqrt{3}}{2}} - \sqrt{1 - \frac{\sqrt{3}}{2}} = C$

$\sqrt{\frac{2 + \sqrt{3}}{2}} - \sqrt{\frac{2 - \sqrt{3}}{2}} = C$

On squaring both sides

$\frac{2 + \sqrt{3}}{2} + \frac{2 - \sqrt{3}}{2} - 2\sqrt{\frac{2 + \sqrt{3}}{2}} \sqrt{\frac{2 - \sqrt{3}}{2}} = C^2$

$\frac{2 + \sqrt{3} + 2 - \sqrt{3}}{2} - 2 \frac{(2)^2 - (\sqrt{3})^2}{2} = C^2$

$2 - 1 = C^2$

$C^2 = 1$

$C = \pm 1$

$C = 1$ [taking '+ve value]

26. If $\frac{8+2\sqrt{3}}{3\sqrt{3}+5} = a\sqrt{3} - b$, then find the value of $a + b$:

b:

- (a) 16 (b) 18
(c) 15 (d) 24

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : $\frac{8+2\sqrt{3}}{3\sqrt{3}+5} \times \frac{3\sqrt{3}-5}{3\sqrt{3}-5} = a\sqrt{3} - b$

$$= \frac{24\sqrt{3} - 40 + 6 \times 3 - 10\sqrt{3}}{27 - 15\sqrt{3} + 15\sqrt{3} - 25}$$

$$= \frac{24\sqrt{3} - 40 + 18 - 10\sqrt{3}}{2} = \frac{14\sqrt{3} - 22}{2} = 7\sqrt{3} - 11$$

$$\Rightarrow 7\sqrt{3} - 11 = a\sqrt{3} - b$$

On comparing the both sides

$$a = 7$$

$$b = 11$$

$$\Rightarrow a + b = 7 + 11 = 18$$

27. Which of the following statement(s) is/are TRUE ?

I. $\sqrt{5} + \sqrt{5} > \sqrt{7} + \sqrt{3}$

II. $\sqrt{6} + \sqrt{7} > \sqrt{8} + \sqrt{5}$

III. $\sqrt{3} + \sqrt{9} > \sqrt{6} + \sqrt{6}$

- (a) Only I (b) Only I and II
(c) Only II and III (d) Only I and III

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : From statement (I)

$$\sqrt{5} + \sqrt{5} > \sqrt{7} + \sqrt{3}$$

On squaring both sides,

$$(\sqrt{5} + \sqrt{5})^2 > (\sqrt{7} + \sqrt{3})^2$$

$$\Rightarrow 10 + 2\sqrt{25} > 10 + 2\sqrt{21} \text{ (True)}$$

From statement II

$$\sqrt{6} + \sqrt{7} > \sqrt{8} + \sqrt{5}$$

On squaring both sides

$$(\sqrt{6} + \sqrt{7})^2 > (\sqrt{8} + \sqrt{5})^2$$

$$\Rightarrow (13 + 2\sqrt{42}) > (13 + 2\sqrt{40}) \text{ (True)}$$

From statement III

$$(\sqrt{3} + \sqrt{9}) > (\sqrt{6} + \sqrt{6})$$

On squaring both sides

$$(\sqrt{3} + \sqrt{9})^2 > (\sqrt{6} + \sqrt{6})^2$$

$$(12 + 2\sqrt{27}) > (12 + 2\sqrt{36}) \text{ (False)}$$

Hence only statement I and II is true.

28. If $a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $b = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$, then what is the value of $a^2 + b^2 - ab$?

- (a) 97 (b) $(2\sqrt{3}) + 2$
(c) $(4\sqrt{6}) + 1$ (d) 98

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Given,

$$a = \frac{(\sqrt{3} + \sqrt{2})}{(\sqrt{3} - \sqrt{2})}, \quad b = \frac{(\sqrt{3} - \sqrt{2})}{(\sqrt{3} + \sqrt{2})}$$

$$\Rightarrow a = \frac{(\sqrt{3} + \sqrt{2}) \times (\sqrt{3} + \sqrt{2})}{(\sqrt{3} - \sqrt{2}) \times (\sqrt{3} + \sqrt{2})}, \quad b = \frac{(\sqrt{3} - \sqrt{2}) \times (\sqrt{3} - \sqrt{2})}{(\sqrt{3} + \sqrt{2}) \times (\sqrt{3} - \sqrt{2})}$$

$$\Rightarrow a = \frac{5 + 2\sqrt{6}}{3 - 2}, \quad b = \frac{5 - 2\sqrt{6}}{3 - 2}$$

$$\Rightarrow a = 5 + 2\sqrt{6}, \quad b = 5 - 2\sqrt{6}$$

$$\Rightarrow a + b = 10 \text{ (i)}$$

$$\text{and } ab = (5 + 2\sqrt{6}) \times (5 - 2\sqrt{6})$$

$$ab = 25 - 24$$

$$\Rightarrow ab = 1 \text{ (ii)}$$

$$\therefore a^2 + b^2 - ab = [(a+b)^2 - 2ab] - ab$$

$$= [(10)^2 - 2 \times 1] - 1$$

$$= [100 - 2] - 1$$

$$= \boxed{97}$$

29. Which of the following statement(s) is/are TRUE ?

I.

$$\sqrt{(64)} + \sqrt{(0.0064)} + \sqrt{(0.81)} + \sqrt{(0.0081)} = 9.07$$

II. $\sqrt{(0.010201)} + \sqrt{(98.01)} + \sqrt{(0.25)} = 11.51$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : From statement (I)

$$\text{L.H.S.} = \sqrt{64} + \sqrt{0.0064} + \sqrt{0.81} + \sqrt{0.0081}$$

$$= 8 + 0.08 + 0.9 + 0.09$$

$$= 9.07$$

$$= \text{R.H.S. (True)}$$

From statement II

$$\text{L.H.S.} = \sqrt{0.010201} + \sqrt{98.01} + \sqrt{0.25}$$

$$= 0.101 + 9.9 + 0.5$$

$$= 10.501 \neq \text{R.H.S. (False)}$$

So only statement I is correct.

30. Which of the following statement(s) is/are TRUE ?

I. $\sqrt{11} + \sqrt{7} < \sqrt{10} + \sqrt{8}$

II. $\sqrt{17} + \sqrt{11} > \sqrt{15} + \sqrt{13}$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :
From statement I
 $\sqrt{11} + \sqrt{7} < \sqrt{10} + \sqrt{8}$
On squaring both sides
 $18 + 2\sqrt{77} < 18 + 2\sqrt{80}$
This statement is true
From statement II
 $\sqrt{17} + \sqrt{11} > \sqrt{15} + \sqrt{13}$
On squaring both sides
 $28 + 2\sqrt{187} > 28 + 2\sqrt{195}$
So this statement is false
So only statement I is correct.

31. Which of the following statement(s) is/are TRUE ?

- I. $\sqrt{12} > \sqrt[3]{16} > \sqrt[4]{24}$
II. $\sqrt[3]{25} > \sqrt[4]{32} > \sqrt[6]{48}$
III. $\sqrt[4]{9} > \sqrt[3]{15} > \sqrt[6]{24}$

- (a) Only I and II (b) Only I and III
(c) Only I (d) All are true

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :
From statement I
 $\sqrt{12} > \sqrt[3]{16} > \sqrt[4]{24}$
or $12^{\frac{1}{2}} > 16^{\frac{1}{3}} > 24^{\frac{1}{4}}$
L.C.M of 2, 3 and 4 = 12
 $12^6 > 16^4 > 24^3$
 $144 \times 144 \times 144 > 256 \times 256 > 24 \times 24 \times 24$
So it is clear that statement I is true.
From statement II
 $\sqrt[3]{25} > \sqrt[4]{32} > \sqrt[6]{48}$
or $25^{\frac{1}{3}} > 32^{\frac{1}{4}} > 48^{\frac{1}{6}}$
L.C.M of 3, 4 and 6 = 12
 $25^4 > 32^3 > 48^2$
So it is clear that statement II is true.
From statement III
 $\sqrt[4]{9} > \sqrt[3]{15} > \sqrt[6]{24}$
or $9^{\frac{1}{4}} > 15^{\frac{1}{3}} > 24^{\frac{1}{6}}$
L.C.M of 3, 4 and 6 = 12
 $9^3 > 15^4 > 24^2$
Statement III is false.
So it is clear that only statement I and II is true.

32. How many natural numbers are between $\sqrt{261}$ and $\sqrt{45109}$?

- (a) 144 (b) 196
(c) 168 (d) 195

SSC CGL (Tier-II) 19-02-2018

Ans. (b) : $\sqrt{261} = 16.15$, $\sqrt{45109} = 212.38$
17, 18, 19, 20.....212

$$n = \frac{\ell - a}{d} + 1$$

$$= \frac{212 - 17}{1} + 1 = 196$$

33. What is the value of

$$\sqrt{121} + \sqrt{12321} + \sqrt{1234321} + \sqrt{123454321}$$

- (a) 12345 (b) 123456
(c) 12344 (d) 123454

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $\sqrt{121} + \sqrt{12321} + \sqrt{1234321} + \sqrt{123454321}$
 $= 11 + 111 + 1111 + 11111$
 $= 12344$

34. Which of the following statement(s) is/are TRUE ?

- I. $\sqrt{625} + \sqrt[4]{1296} + \sqrt{1024} > 90$
II. $\sqrt[3]{(\sqrt{729})} + \sqrt[4]{(\sqrt{256})} = 5$

- (a) Only I (b) Only II
(c) Neither I nor II (d) Both I and II

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : (I). $\sqrt{625} + \sqrt[4]{1296} + \sqrt{1024}$
 $= 25 + 6 + 32$
 $= 63 \neq 90$ (False)

(II). $\sqrt[3]{\sqrt{729}} + \sqrt[4]{\sqrt{256}}$
 $= \sqrt[3]{27} + \sqrt[4]{16}$
 $= 3 + 2 = 5$

Hence it is clear that only statement II is true.

35. If $N = (12345)^2 + 12345 + 12346$, then what is the value of \sqrt{N} ?

- (a) 12346 (b) 12345
(c) 12344 (d) 12347

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $N = (12345)^2 + 12345 + 12346$
Let $x = 12345$
 $N = x^2 + x + (x+1)$
 $= x^2 + 2x + 1$
 $= (x+1)^2$
 $\sqrt{N} = 12345 + 1 = 12346$

36. Which of the following statement(s) is/are TRUE ?

- I. $\sqrt{121} + \sqrt{12321} + \sqrt{1234321} = 1233$
II. $\sqrt{0.64} + \sqrt{64} + \sqrt{36} + \sqrt{0.36} > 15$

- (a) Only I (b) Only II
(c) Neither I nor II (d) Both I and II

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : From statement I

$$\sqrt{121} + \sqrt{12321} + \sqrt{1234321} = 1233$$

$$11 + 111 + 1111 = 1233$$

$$1233 = 1233$$

From statement II

$$\sqrt{0.64} + \sqrt{64} + \sqrt{36} + \sqrt{0.36} > 15$$

$$= 0.8 + 8 + 6 + 0.6 > 15$$

$$= 15.4 > 15$$

So both statement I and II is true.

37. If $\sqrt{(1-p^2)(1-q^2)} = \frac{\sqrt{3}}{2}$, then what is the value of $\sqrt{2p^2 + 2q^2 + 2pq} + \sqrt{2p^2 + 2q^2 - 2pq}$?

- (a) 2 (b) $\sqrt{2}$
 (c) 1 (d) None of these

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Method-I

$$\sqrt{(1-p^2)(1-q^2)} = \frac{\sqrt{3}}{2}$$

On squaring both sides

$$1 - q^2 - p^2 + p^2q^2 = \frac{3}{4}$$

$$p^2 + q^2 = \frac{1}{4} + p^2q^2$$

$$p^2 + q^2 + pq = \frac{1}{4} + p^2q^2 + pq$$

$$= \left(\frac{1}{2} + pq\right)^2$$

$$\sqrt{p^2 + q^2 + pq} = \frac{1}{2} + pq$$

$$\text{Same as } \sqrt{p^2 + q^2 - pq} = \frac{1}{2} - pq$$

$$\text{Hence } \sqrt{2p^2 + 2q^2 + 2pq} + \sqrt{2p^2 + 2q^2 - 2pq}$$

$$\sqrt{2} \left[\frac{1}{2} + pq + \frac{1}{2} - pq \right]$$

$$= \sqrt{2}$$

Method-II

There is 2 variable and 1 equation.

∴ From value putting,

$$p = 0$$

$$\sqrt{(1-0)(1-q^2)} = \frac{\sqrt{3}}{2}$$

$$1 - q^2 = \frac{3}{4}$$

$$q = \frac{1}{2}$$

$$\begin{aligned} \text{So, } & \sqrt{0 + 2 \times \frac{1}{4} + 0} + \sqrt{0 + 2 \times \frac{1}{4} - 0} \\ & = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2} \end{aligned}$$

38. What is the value of

$$\sqrt{4600 + \sqrt{540 + \sqrt{1280 + \sqrt{250 + \sqrt{36}}}}}$$

- (a) 69 (b) 68
 (c) 70 (d) 72

SSC CGL (Tier-II) 17-2-2018

$$\begin{aligned} \text{Ans. (b) : } & \sqrt{4600 + \sqrt{540 + \sqrt{1280 + \sqrt{250 + \sqrt{36}}}}} \\ & = \sqrt{4600 + \sqrt{540 + \sqrt{1280 + \sqrt{256}}}} \\ & = \sqrt{4600 + \sqrt{540 + \sqrt{1280 + 16}}} \\ & = \sqrt{4600 + \sqrt{540 + 36}} \\ & = \sqrt{4600 + \sqrt{(24)^2}} \\ & = \sqrt{4600 + 24} \\ & = \sqrt{4624} \\ & = 68 \end{aligned}$$

39. If $P = 7 + 4\sqrt{3}$ and $PQ = 1$, then what is the value of $1/P^2 + 1/Q^2$?

- (a) 196 (b) 194
 (c) 206 (d) 182

SSC CGL (Tier-II) 17-2-2018

SSC CGL (Tier-II) 18-02-2018

$$\text{Ans. (b) : } P = 7 + 4\sqrt{3}$$

$$\frac{1}{P} = \frac{1}{7 + 4\sqrt{3}} \times \frac{7 - 4\sqrt{3}}{7 - 4\sqrt{3}} = 7 - 4\sqrt{3}$$

$$\text{and } PQ = 1$$

$$P = \frac{1}{Q}$$

$$\therefore \frac{1}{P^2} + \frac{1}{Q^2} = \left(\frac{1}{P}\right)^2 + P^2$$

$$= (7 - 4\sqrt{3})^2 + (7 + 4\sqrt{3})^2$$

$$= 49 + 48 - 56\sqrt{3} + 49 + 48 + 56\sqrt{3}$$

$$= 194$$

40. The value of $\sqrt{28 + 10\sqrt{3}} - \sqrt{7 - 4\sqrt{3}}$ is closest to.

- (a) 7.2 (b) 5.8
 (c) 6.1 (d) 6.5

SSC CGL (Tier-II) 13-09-2019

Ans. (d)

$$\begin{aligned}
&= \sqrt{28+10\sqrt{3}} - \sqrt{7-4\sqrt{3}} \\
&= \sqrt{25+3+10\sqrt{3}} - \sqrt{4+3-4\sqrt{3}} \\
&= \sqrt{(5+\sqrt{3})^2} - \sqrt{(2-\sqrt{3})^2} \\
&= 5+\sqrt{3} - (2-\sqrt{3}) \\
&= 5+\sqrt{3} - 2 + \sqrt{3} = 3+2\sqrt{3} \\
&= 3 + 2 \times 1.732 = 6.464 \approx 6.5
\end{aligned}$$

41. The expression $\sqrt{10+2(\sqrt{6}-\sqrt{15}-\sqrt{10})}$ is equal to :

- (a) $\sqrt{3}-\sqrt{2}-\sqrt{5}$ (b) $\sqrt{2}-\sqrt{3}-\sqrt{5}$
(c) $\sqrt{3}-\sqrt{2}+\sqrt{5}$ (d) $\sqrt{3}+\sqrt{2}-\sqrt{5}$

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :

$$\begin{aligned}
\sqrt{10+2(\sqrt{6}-\sqrt{15}-\sqrt{10})} &= \sqrt{10+2\sqrt{6}-2\sqrt{15}-2\sqrt{10}} \\
&= \sqrt{(\sqrt{3})^2+(\sqrt{2})^2+(\sqrt{5})^2+2\times\sqrt{3}\times\sqrt{2}-2\times\sqrt{3}\times\sqrt{5}-2\times\sqrt{2}\times\sqrt{5}} \\
&= \sqrt{(\sqrt{3}+\sqrt{2}-\sqrt{5})^2} \\
&= (\sqrt{3}+\sqrt{2}-\sqrt{5})
\end{aligned}$$

42. If $\sqrt{10-2\sqrt{21}} + \sqrt{8+2\sqrt{15}} = \sqrt{a} + \sqrt{b}$, where a and b are positive integers, then the value of \sqrt{ab} is closest to :

- (a) 7.2 (b) 4.6
(c) 5.9 (d) 6.8

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : $\sqrt{10-2\sqrt{21}} + \sqrt{8+2\sqrt{15}} = \sqrt{a} + \sqrt{b}$

$$\sqrt{(\sqrt{7}-\sqrt{3})^2} + \sqrt{(\sqrt{5}+\sqrt{3})^2} = \sqrt{a} + \sqrt{b}$$

$$(\sqrt{7}-\sqrt{3}) + (\sqrt{5}+\sqrt{3}) = \sqrt{a} + \sqrt{b}$$

$$\sqrt{7} + \sqrt{5} = \sqrt{a} + \sqrt{b}$$

On comparison both sides

$$\therefore a = 7, b = 5$$

$$\sqrt{ab} = \sqrt{7 \times 5} = \sqrt{35}$$

$$\sqrt{ab} = \sqrt{35} = 5.9$$

43. If $(\sqrt{2} + \sqrt{5} - \sqrt{3}) \times k = -12$, then what will be the value of k ?

- (a) $\sqrt{2} + \sqrt{5} + \sqrt{3}$
(b) $(\sqrt{2} + \sqrt{5} - \sqrt{3})(2 + \sqrt{5})$
(c) $(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{5})$
(d) $(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})$

SSC CGL (Tier-II) 11-9-2019

Ans. (d) :

$$(\sqrt{2} + \sqrt{5} - \sqrt{3}) \times k = -12$$

$$\begin{aligned}
k &= \frac{-12}{\sqrt{2} + \sqrt{5} - \sqrt{3}} \times \frac{\sqrt{2} + \sqrt{5} + \sqrt{3}}{\sqrt{2} + \sqrt{5} + \sqrt{3}} \\
&= \frac{-12(\sqrt{2} + \sqrt{5} + \sqrt{3})}{(\sqrt{2} + \sqrt{5})^2 - (\sqrt{3})^2} \\
&= \frac{-12(\sqrt{2} + \sqrt{5} + \sqrt{3})}{2 + 5 + 2\sqrt{10} - 3} \\
&= \frac{-12(\sqrt{2} + \sqrt{5} + \sqrt{3})}{2(2 + \sqrt{10})} \times \frac{2 - \sqrt{10}}{2 - \sqrt{10}} \\
&= \frac{-12(\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})}{2(4 - 10)} \\
&= (\sqrt{2} + \sqrt{5} + \sqrt{3})(2 - \sqrt{10})
\end{aligned}$$

44. If $x = \sqrt{1 + \frac{\sqrt{3}}{2}} - \sqrt{1 - \frac{\sqrt{3}}{2}}$ then the value of

$\frac{\sqrt{2}-x}{\sqrt{2}+x}$ will be closest to :

- (a) 0.12 (b) 1.4
(c) 1.2 (d) 0.17

SSC CGL (Tier-II) 11-9-2019

Ans. (d) :

$$x = \sqrt{1 + \frac{\sqrt{3}}{2}} - \sqrt{1 - \frac{\sqrt{3}}{2}}$$

On squaring both sides

$$x^2 = 1 + \frac{\sqrt{3}}{2} + 1 - \frac{\sqrt{3}}{2} - 2 \times \sqrt{\left(1 + \frac{\sqrt{3}}{2}\right)\left(1 - \frac{\sqrt{3}}{2}\right)}$$

$$= 2 - 2 \times \sqrt{1^2 - \left(\frac{\sqrt{3}}{2}\right)^2} = 2 - 2 \times \sqrt{1 - \frac{3}{4}}$$

$$= 2 - 2 \times \frac{1}{2} = 1$$

Hence $x = 1$

$$\therefore \frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{1.414-1}{1.414+1} = \frac{0.414}{2.414} = 0.17$$

45. If $\sqrt{86 - 60\sqrt{2}} = a - b\sqrt{2}$ then what will be the value of $\sqrt{a^2 + b^2}$ correct to one decimal place?

- (a) 7.8 (b) 8.2
(c) 7.2 (d) 8.4

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : $\sqrt{86 - 60\sqrt{2}} = \sqrt{36 + 50 - 60\sqrt{2}}$

$$= \sqrt{6^2 + (5\sqrt{2})^2 - 2 \times 6 \times 5\sqrt{2}}$$

$$= \sqrt{(6-5\sqrt{2})^2} = 6-5\sqrt{2} = a-b\sqrt{2}$$

On comparing both sides

$$a = 6, b = 5$$

$$\therefore \sqrt{a^2 + b^2} = \sqrt{36 + 25} = \sqrt{61} = 7.8$$

46. The value of $\frac{1}{\sqrt{7-4\sqrt{3}}}$ is closest to:

- (a) 4.1 (b) 3.7
(c) 1.2 (d) 4.2

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) $\frac{1}{\sqrt{7-4\sqrt{3}}} = \frac{1}{\sqrt{4+3-4\sqrt{3}}} = \frac{1}{\sqrt{(2-\sqrt{3})^2}}$

$$= \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

$$= \frac{2+\sqrt{3}}{4-3} = 2+1.73 = 3.73 \approx 3.7$$

47. Which one among the following is the smallest?

- (a) $\sqrt{301} - \sqrt{299}$ (b) $\sqrt{401} - \sqrt{399}$
(c) $\sqrt{101} - \sqrt{99}$ (d) $\sqrt{201} - \sqrt{199}$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b)

$$\sqrt{301} - \sqrt{299} = 17.349 - 17.291 = 0.058$$

$$\sqrt{401} - \sqrt{399} = 20.024 - 19.974 = 0.05$$

$$\sqrt{101} - \sqrt{99} = 10.049 - 9.949 = 0.1$$

$$\sqrt{201} - \sqrt{199} = 14.177 - 14.106 = 0.071$$

So smallest number is $\sqrt{401} - \sqrt{399}$

48. The value of $\sqrt{11+2\sqrt{18}}$ is closest to:

- (a) 3.8 (b) 4.1
(c) 4.4 (d) 4.8

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c)

$$= \sqrt{11+2\sqrt{18}}$$

$$= \sqrt{9+2+2 \times 3\sqrt{2}}$$

$$= \sqrt{(3+\sqrt{2})^2}$$

$$= 3 + \sqrt{2} = 3 + 1.4 = 4.4 \quad (\sqrt{2} = 1.414)$$

49. The value of $\frac{\sqrt{0.6912} + \sqrt{0.5292}}{\sqrt{0.6912} - \sqrt{0.5292}}$ is:

- (a) 1.5 (b) 9
(c) 15 (d) 0.9

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c):

$$\frac{\sqrt{0.6912} + \sqrt{0.5292}}{\sqrt{0.6912} - \sqrt{0.5292}}$$

Approximately

$$= \frac{0.83 + 0.73}{0.83 - 0.73}$$

$$= \frac{1.56}{0.1} = 15.6 \approx 15$$

50. If $\sqrt{0.00576 \times y} = 2.4$, then y is equal to:

- (a) 2400 (b) 3600
(c) 1200 (d) 1000

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d)

$$\sqrt{0.00576 \times y} = 2.4$$

On squaring both sides

$$0.00576 \times y = (2.4)^2$$

$$y = \frac{5.76}{0.00576}$$

$$y = 1000$$

51. The value of $\sqrt{6 - \sqrt{17 - 2\sqrt{72}}}$ is closest to:

- (a) 2.1 (b) 2.7
(c) 1.7 (d) 2.4

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d)

$$\sqrt{6 - \sqrt{17 - 2\sqrt{72}}} = \sqrt{6 - \sqrt{(\sqrt{9})^2 + (\sqrt{8})^2 - 2\sqrt{9} \times \sqrt{8}}}$$

$$= \sqrt{6 - \sqrt{(\sqrt{9} - \sqrt{8})^2}} = \sqrt{6 - 3 + \sqrt{8}}$$

$$= \sqrt{3 + \sqrt{8}} = \sqrt{(\sqrt{2})^2 + 1 + 2\sqrt{2}} = \sqrt{(\sqrt{2} + 1)^2}$$

$$= (\sqrt{2} + 1) = 1.41 + 1 = 2.41 \approx 2.4$$

52. The value of $\sqrt{9 - 2\sqrt{11 - 6\sqrt{2}}}$ is closest to:

- (a) 2.4 (b) 2.7
(c) 2.9 (d) 2.1

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a)

$$\sqrt{9 - 2\sqrt{11 - 6\sqrt{2}}}$$

$$= \sqrt{9 - 2\sqrt{9 + 2 - 6\sqrt{2}}}$$

$$= \sqrt{9 - 2\sqrt{(3 - \sqrt{2})^2}}$$

$$= \sqrt{9 - 2(3 - \sqrt{2})}$$

$$= \sqrt{3 + 2\sqrt{2}}$$

$$= \sqrt{2 + 1 + 2\sqrt{2}}$$

$$= \sqrt{(\sqrt{2} + 1)^2}$$

$$= (\sqrt{2} + 1)$$

$$= 1.414 + 1 = 2.414 \approx 2.4$$

53. If $a = \frac{2 + \sqrt{3}}{2 - \sqrt{3}}$ and $b = \frac{2 - \sqrt{3}}{2 + \sqrt{3}}$, then the value of $a^2 + b^2 + ab$ is:

- (a) 195 (b) 185
(c) 196 (d) 186

SSC CHSL -26/10/2020 (Shift-III)

Ans. (a) : Given

$$a = \frac{2+\sqrt{3}}{2-\sqrt{3}} \quad b = \frac{2-\sqrt{3}}{2+\sqrt{3}}$$

$$a = \frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} \quad b = \frac{2-\sqrt{3}}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}}$$

$$a = 7+4\sqrt{3} \quad b = 7-4\sqrt{3}$$

According to the question,
 $a^2 + b^2 + ab$

$$(7+4\sqrt{3})^2 + (7-4\sqrt{3})^2 + (7+4\sqrt{3})(7-4\sqrt{3})$$

$$= 49 + 48 + 2 \times 7 \times 4\sqrt{3} + 49 + 48 - 2 \times 7 \times 4\sqrt{3} + 1$$

$$= 97 + 97 + 1$$

$$= 195$$

54. The value of $5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23}{\sqrt{2} + \sqrt{3} + \sqrt{6}}$ is:
(a) 0 (b) 10
(c) 12 (d) 16

SSC CHSL -14/10/2020 (Shift-II)

Ans. (c) : $5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23}{\sqrt{2} + \sqrt{3} + \sqrt{6}}$

$$= 5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23}{(\sqrt{2} + \sqrt{3}) + \sqrt{6}} \times \frac{(\sqrt{2} + \sqrt{3}) - \sqrt{6}}{(\sqrt{2} + \sqrt{3}) - \sqrt{6}}$$

$$= 5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23(\sqrt{2} + \sqrt{3} - \sqrt{6})}{(\sqrt{2} + \sqrt{3})^2 - 6}$$

$$= 5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23(\sqrt{2} + \sqrt{3} - \sqrt{6})}{2\sqrt{6} - 1} \times \frac{(2\sqrt{6} + 1)}{(2\sqrt{6} + 1)}$$

$$= 5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - \frac{23(4\sqrt{3} + 6\sqrt{2} - 12 + \sqrt{2} + \sqrt{3} - \sqrt{6})}{23}$$

$$= 5\sqrt{3} + 7\sqrt{2} - \sqrt{6} - 5\sqrt{3} - 7\sqrt{2} + 12 + \sqrt{6}$$

$$= 12$$

55. The value of $\frac{1}{(9-4\sqrt{5})^2} + \frac{1}{(9+4\sqrt{5})^2}$ is:
(a) 289 (b) 322
(c) 424 (d) 246

SSC CHSL -13/10/2020 (Shift-I)

Ans. (b) : $\frac{1}{(9-4\sqrt{5})^2} + \frac{1}{(9+4\sqrt{5})^2}$

$$= \frac{(9-4\sqrt{5})^2 + (9+4\sqrt{5})^2}{[(9)^2 - (4\sqrt{5})^2]^2}$$

$$= \frac{(9)^2 + (4\sqrt{5})^2 - 2 \times 9 \times 4\sqrt{5} + 9^2 + (4\sqrt{5})^2 + 2 \times 9 \times 4\sqrt{5}}{[81 - 16 \times 5]^2}$$

$$= \frac{81 + 80 + 81 + 80}{[81 - 80]^2} = 322$$

56. Find the value of x in $\sqrt[3]{15625} - \sqrt{x} = 4$.
(a) 81 (b) 441
(c) 625 (d) 343

SSC CHSL -14/10/2020 (Shift-III)

Ans. (b) : $\sqrt[3]{15625} - \sqrt{x} = 4$

$$25 - 4 = \sqrt{x}$$

$$\sqrt{x} = 21$$

$$x = 441$$

57. What is the value of $\sqrt[3]{340 + \sqrt{9}}$?
(a) 9 (b) 7
(c) 5 (d) 19

SSC MTS 10-10-2017 (Shift-I)

Ans. (b) : $\sqrt[3]{340 + \sqrt{9}}$

$$= \sqrt[3]{340 + 3}$$

$$= \sqrt[3]{343}$$

$$= \sqrt[3]{7 \times 7 \times 7}$$

$$= 7$$

58. If $\frac{4}{1 + \sqrt{2} + \sqrt{3}} = a + b\sqrt{2} + c\sqrt{3} - d\sqrt{6}$, where a, b, c, d are natural numbers, then the value of a + b + c + d is:
(a) 4 (b) 1
(c) 2 (d) 0

SSC CHSL -18/03/2020 (Shift-I)

Ans. (a) : $\frac{4}{1 + \sqrt{2} + \sqrt{3}} = a + b\sqrt{2} + c\sqrt{3} - d\sqrt{6}$

$$= \frac{4}{1 + (\sqrt{2} + \sqrt{3})} \times \frac{1 - (\sqrt{2} + \sqrt{3})}{1 - (\sqrt{2} + \sqrt{3})}$$

$$= \frac{4[1 - (\sqrt{2} + \sqrt{3})]}{1 - (\sqrt{2} + \sqrt{3})^2}$$

$$= \frac{4[1 - \sqrt{2} - \sqrt{3}]}{1 - (2 + 3 + 2\sqrt{6})}$$

$$= \frac{4(1 - \sqrt{2} - \sqrt{3})}{-(4 + 2\sqrt{6})} \times \frac{(4 - 2\sqrt{6})}{(4 - 2\sqrt{6})}$$

$$= \frac{4(1-\sqrt{2}-\sqrt{3})(4-2\sqrt{6})}{-(16-24)}$$

$$= (1-\sqrt{2}-\sqrt{3})(2-\sqrt{6})$$

$$= 2-2\sqrt{2}-2\sqrt{3}-\sqrt{6}+2\sqrt{3}+3\sqrt{2}$$

$$\Rightarrow 2+\sqrt{2}-\sqrt{6}=a+b\sqrt{2}+c\sqrt{3}-d\sqrt{6}$$

On comparing both sides
 $a=2, b=1, c=0, d=1$
 $\therefore a+b+c+d=2+1+0+1=4$

59. If the value of $\frac{3x\sqrt{y}+2y\sqrt{x}}{3x\sqrt{y}-2y\sqrt{x}} - \frac{3x\sqrt{y}-2y\sqrt{x}}{3x\sqrt{y}+2y\sqrt{x}}$ is same as that of $\sqrt{x}\sqrt{y}$, then which of the following relations between x and y is correct?
- (a) $9x+4y=36$ (b) $9x+4y=24$
(c) $9x-4y=36$ (d) $9x-4y=24$

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d) : $\because \frac{a+b}{a-b} - \frac{a-b}{a+b} = \frac{4ab}{a^2-b^2}$

$$\therefore \frac{3x\sqrt{y}+2y\sqrt{x}}{3x\sqrt{y}-2y\sqrt{x}} - \frac{3x\sqrt{y}-2y\sqrt{x}}{3x\sqrt{y}+2y\sqrt{x}} = \frac{4 \times 3x\sqrt{y} \times 2y\sqrt{x}}{(3x\sqrt{y})^2 - (2y\sqrt{x})^2}$$

According to the question, $\frac{24xy\sqrt{x}\cdot\sqrt{y}}{9x^2y-4y^2x} = \sqrt{x}\cdot\sqrt{y}$

$$\Rightarrow \frac{24xy}{xy(9x-4y)} = 1$$

$$\Rightarrow 24 = 9x - 4y$$

$$\Rightarrow 9x - 4y = 24$$

60. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is:
- (a) -2 (b) 2
(c) 0 (d) 4

SSC CHSL -21/10/2020 (Shift-II)

Ans. (b) $\sqrt{x} = \sqrt{3} - \sqrt{5}$
On squaring both sides
 $x = 3 + 5 - 2\sqrt{15}$
 $x - 8 = -2\sqrt{15}$
Again, on squaring both sides
 $(x-8)^2 = (-2\sqrt{15})^2$
 $x^2 + 64 - 16x = 60$
 $x^2 - 16x + 4 = 0$
On adding 2 both sides
 $x^2 - 16x + 4 + 2 = 2$
 $x^2 - 16x + 6 = 2$

61. What is the value of $(\sqrt{5}-\sqrt{3}) \div (\sqrt{5}+\sqrt{3}) = ?$
- (a) $4-\sqrt{15}$ (b) $6-2\sqrt{15}$
(c) $8-2\sqrt{15}$ (d) $4+\sqrt{15}$

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : $(\sqrt{5}-\sqrt{3}) \div (\sqrt{5}+\sqrt{3}) = ?$

$$= \frac{(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})}$$

On rationalization

$$= \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$= \frac{(\sqrt{5}-\sqrt{3})^2}{(\sqrt{5})^2 - (\sqrt{3})^2}$$

$$= \frac{5+3-2\sqrt{15}}{5-3}$$

$$= \frac{8-2\sqrt{15}}{2} = 4-\sqrt{15}$$

(IV) Miscellaneous

62. Which of the following statement(s) is/are TRUE ?

I. $(0.7)^2 + (0.07)^2 + (11.1)^2 > 123.8$

II. $(1.12)^2 + (10.3)^2 + (1.05)^2 > 108.3$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : From statement I
 $(0.7)^2 + (0.07)^2 + (11.1)^2 > 123.8$
 $0.49 + 0.0049 + 123.21 > 123.8$
 $\Rightarrow 123.7049 > 123.8$ (False)

From statement II
 $(1.12)^2 + (10.3)^2 + (1.05)^2 > 108.3$
 $\Rightarrow 1.2544 + 106.09 + 1.1025 > 108.3$
 $\Rightarrow 108.4469 > 108.3$ (True)

So only statement II is true.

63. If $P = 2^{29} \times 3^{21} \times 5^8$, $Q = 2^{27} \times 3^{21} \times 5^8$, $R = 2^{26} \times 3^{22} \times 5^8$ and $S = 2^{25} \times 3^{22} \times 5^9$, then which of the following is TRUE ?

- (a) $P > S > R > Q$ (b) $S > P > R > Q$
(c) $P > R > S > Q$ (d) $S > P > Q > R$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $P = 2^{29} \times 3^{21} \times 5^8 = 2^{25} \times 3^{21} \times 5^8 \times \boxed{16}$

$$Q = 2^{27} \times 3^{21} \times 5^8 = 2^{25} \times 3^{21} \times 5^8 \times \boxed{4}$$

$$R = 2^{26} \times 3^{22} \times 5^8 = 2^{25} \times 3^{21} \times 5^8 \times \boxed{6}$$

$$S = 2^{25} \times 3^{22} \times 5^9 = 2^{25} \times 3^{21} \times 5^8 \times \boxed{15}$$

$\therefore P > S > R > Q$

04.

LCM and HCF

(I) Problems based on L.C.M.

1. Which is the largest six digit number, which when divided by 12, 15, 20, 24 and 30 leaves the remainder 8, 11, 16, 20 and 26 respectively:

- (a) 999960 (b) 999964
(c) 999982 (d) 999956

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d)

$$12 - 8 = 4, 15 - 11 = 4, 20 - 16 = 4, 24 - 20 = 4, 30 - 26 = 4$$

$$\text{LCM of } 12, 15, 20, 24 \text{ and } 30 = 120$$

$$\text{The required number} = 120k - 4$$

For the largest six digit number

$$= 120 \times 8333 - 4$$

$$= 999956$$

2. Find the smallest number which should be added to the smallest number divisible by 6, 9 and 15 to make it a perfect square.

- (a) 10 (b) 9
(c) 19 (d) 21

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (a) LCM of 6, 9 and 15 = 90

From given number 10 is only smallest number

Which should be added to make it a perfect square.

Then,

$$90 + 10 = 100$$

Number 100 is a perfect square number.

3. What is the LCM of 3.6, 1.8 and 0.144?

- (a) 3.6 (b) 36
(c) 3600 (d) 360

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (a) LCM of 3.6, 1.8 and 0.144

$$\Rightarrow \text{LCM}(3600, 1800, 144)/1000$$

$$\Rightarrow \text{LCM of } 3600, 1800, 144 = 3600$$

$$\therefore \text{LCM of } 3.6, 1.8 \text{ and } 0.144 = \frac{3600}{1000} = 3.6$$

4. A and B are two prime numbers such that A > B and their LCM is 209. The value of A² - B is:

- (a) 350 (b) 372
(c) 361 (d) 339

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(a) Given that –

Two prime number = A, B

LCM of number = 209

According to the question,

\therefore HCF of two prime number = 1

\therefore Product of number = LCM \times HCF

$$\Rightarrow A \times B = 209 \times 1$$

$$\Rightarrow A \times B = 19 \times 11$$

Where, A = 19 { \because A > B }

$$B = 11$$

$$\therefore A^2 - B = 19^2 - 11$$

$$= 361 - 11$$

$$= 350$$

Hence, option (a) is correct.

5. The sum of two number is 50 and their product is 525. The LCM of the two numbers is:

- (a) 85 (b) 105
(c) 115 (d) 125

SSC MTS 18/10/2021 (Shift-I)

Ans. (b) : Let the numbers be x and y respectively.

According to the question,

$$x + y = 50 \dots\dots\dots(i)$$

$$xy = 525$$

$$(x + y)^2 - 4xy = (x - y)^2$$

$$(50)^2 - 4 \times 525 = (x - y)^2$$

$$2500 - 2100 = (x - y)^2$$

$$(x - y)^2 = 400$$

$$x - y = 20 \dots\dots\dots(ii)$$

From equation (i) and (ii),

$$x + y = 50$$

$$\underline{x - y = 20}$$

$$2x = 70$$

$$x = 35$$

On putting the x = 35 value of x in equation (i),

$$y = 50 - 35$$

$$y = 15$$

LCM of 15 and 35

$$\begin{array}{r|l} 3 & 15, 35 \\ \hline 5 & 5, 35 \\ \hline 7 & 1, 7 \\ \hline & 1, 1 \end{array}$$

$$= 3 \times 5 \times 7$$

$$= 105$$

6. The LCM of $\frac{18}{5}$, $\frac{6}{5}$ and $\frac{18}{125}$ is:

- (a) 8.3 (b) 3.6
(c) 4.8 (d) 5.2

SSC MTS 22/10/2021 (Shift-I)

$$\begin{aligned} \text{Ans. (b) : Intended LCM} &= \frac{\text{L.C.M of } 18, 6, 18}{\text{H.C.F of } 5, 5, 125} \\ &= \frac{18}{5} \\ &= 3.6 \end{aligned}$$

7. Find the smallest number such that when it is divided by 5, 6 and 8 it leaves a remainder 3 in each case.

- (a) 243 (b) 123
(c) 117 (d) 792

SSC MTS 02/11/2021 (Shift-I)

$$\begin{aligned} \text{Ans. (b) : LCM of } 5, 6 \text{ and } 8 &= 5 \times 2 \times 3 \times 2 \times 2 \\ &= 120 \\ \text{Required number} &= 120 + 3 \\ &= 123 \end{aligned}$$

8. Find the least number which when divided by 12, 18, 24 and 30 leave 4 as remainder in each case, but when divided by 7 leave no remainder?

- (a) 366 (b) 634
(c) 384 (d) 364

SSC CGL (Tier-II)-2019 – 18/11/2020

$$\begin{aligned} \text{Ans. (d) : The numbers are } 12, 18, 24 \text{ and } 30 \\ \text{Their LCM} &= 360 \\ \text{Hence, the number} &= 360 + 4 = 364 \end{aligned}$$

9. What is the smallest integer that is divisible by 3, 7 and 18?

- (a) 72 (b) 126
(c) 252 (d) 63

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

$$\begin{aligned} \text{Ans. (b) : LCM of } 3, 7 \text{ and } 18 &= 126 \\ \therefore 126 \text{ is the smallest integer that is divisible by } 3, 7 \\ \text{and } 18. \end{aligned}$$

10. What is the smallest integer that is a multiple of 5, 8 and 15?

- (a) 40 (b) 60
(c) 600 (d) 120

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (d) : LCM of } 5, 8, 15 &= 120 \\ \therefore 120 \text{ is the smallest integer that is divisible by } 5, 8 \\ \text{and } 15. \end{aligned}$$

11. When 12, 16, 18, 20 and 25 divide the least number x, the remainder in each case is 4 but x is divisible by 7. What is the digit at the thousands' place in x?

- (a) 4 (b) 3
(c) 5 (d) 8

SSC CGL (Tier-II) 11-9-2019

$$\begin{aligned} \text{Ans. (d) : L.C.M of } 12, 16, 18, 20 \text{ and } 25 &= 3600 \\ \therefore x &= 3600k + 4 \\ \text{For } k &= 5, \text{ the number will be divisible by } x = 7 \\ x &= 18004 \\ \text{Hence, the digit at the thousand's place will be } &8. \end{aligned}$$

12. Let x be the least number which when divided by 15, 18, 20 and 27, the remainder in each case is 10 and x is a multiple of 31. What least number should be added to x to make it a perfect square?

- (a) 36 (b) 39
(c) 37 (d) 43

SSC CGL (Tier-II) 12-09-2019

$$\text{Ans. (b) } \therefore \text{LCM of } 15, 18, 20, 27 = 540$$

$$\therefore x = (540K + 10)$$

$$\text{On putting } K = 4,$$

$$x = 540 \times 4 + 10 = 2170$$

$$\text{Hence, it's nearest square} = 47 \times 47 = 2209$$

$$\begin{aligned} \therefore \text{The number to be added to make } x \text{ a perfect square} \\ &= 2209 - 2170 \\ &= 39 \end{aligned}$$

13. Five bells ring together at the intervals of 3, 5, 8, 9 and 10 seconds. All the bells ring simultaneously at the same time. They will again ring simultaneously after:

- (a) 8 minutes (b) 9 minutes
(c) 6 minutes (d) 4 minutes

SSC CPO-SI 25/11/2020 (Shift-II)

$$\begin{aligned} \text{Ans. (c) : Again the bells ring simultaneously after} &= \\ \text{(L.C.M of } 3, 5, 8, 9 \text{ and } 10) & \\ &= 360 \text{ seconds} \\ &= \frac{360}{60} \text{ minutes} \\ &= 6 \text{ minutes} \end{aligned}$$

14. How many numbers between 300 and 700 are divisible by 5, 6 and 8?

- (a) 5 (b) 2
(c) 20 (d) 3

SSC CPO-SI 25/11/2020 (Shift-II)

$$\begin{aligned} \text{Ans. (d) : The number divisible by } 5, 6 \text{ and } 8 \\ &= (\text{L.C.M of } 5, 6 \text{ and } 8) \times k \\ &= 120k \end{aligned}$$

$$\text{The numbers between } 300 \text{ and } 700 = (120 \times 3), (120 \times 4), (120 \times 5)$$

$$= 360, 480, 600$$

$$\text{Hence, there are three numbers } (360, 480, 600) \text{ between } 300 \text{ and } 700 \text{ which is divisible by } 5, 6 \text{ and } 8.$$

15. What is the sum of the digits of the least number which when divided by 15, 18 and 36 leaves the same remainder 9 in each case and is divisible by 11?

- (a) 17 (b) 16
(c) 18 (d) 15

SSC CPO-SI 25/11/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (c) : The least number} \\ &= (\text{L.C.M of } 15, 18, 36) \times x + 9 \\ &= 180x + 9 \end{aligned}$$

$$\therefore (180x + 9) \text{ is divisible by } 11.$$

$$\therefore \text{On taking } x = 6,$$

$$\text{Number} = 180 \times 6 + 9$$

$$= 1089$$

$$\text{Sum of the digits of the number} = 1 + 0 + 8 + 9$$

$$= \boxed{18}$$

16. How many numbers between 400 and 700 are divisible by 5, 6 and 7?

- (a) 5 (b) 20
(c) 2 (d) 10

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : L.C.M of 5, 6, 7 = 210

Multiple of 210 = 210, 420, 630, 840

Hence there are only two such numbers which are lies between 400 and 700 which are divisible by 5, 6, 7

17. The least number which is exactly divisible by 4, 5, 8, 10 and 12 is:

- (a) 150 (b) 180
(c) 120 (d) 240

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : L.C.M of 4, 5, 8, 10 and 12

$$4 = 2 \times 2$$

$$8 = 2 \times 2 \times 2$$

$$10 = 2 \times 5$$

$$12 = 2 \times 2 \times 3$$

$$\text{L.C.M} = 2 \times 2 \times 2 \times 3 \times 5 = 120$$

Hence it is clear that 120 is the least number which is exactly divisible by 4, 5, 8, 10 and 12.

18. The least number which is exactly divisible by 5, 6, 8, 10 and 12 is:

- (a) 180 (b) 240
(c) 120 (d) 150

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : The least number which is exactly divisible by 5, 6, 8, 10 and 12 will be the L.C.M of the given number.

$$\text{LCM} = 8 \times 5 \times 3 = 120$$

19. What is the least number which when divided by 15, 18 and 36 leaves the same remainder 9 in each case and is divisible by 11 ?

- (a) 1089 (b) 1080
(c) 1071 (d) 1269

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : L.C.M of 15, 18 and 36

$$15 = 3 \times 5$$

$$18 = 2 \times 3 \times 3$$

$$36 = 2 \times 2 \times 3 \times 3$$

$$\text{LCM} = 180$$

$$\text{Required number} = 180k + 9$$

↓

$$180 \times 6 + 9 = 1089$$

Hence, on putting $k = 6$, the number is divisible by 11.

20. Let x be the least 4-digit number which divided by 2, 3, 4, 5, 6 and 7 leave a remainder of 1 in each case. If x lies between 2800 and 3000, then what is the sum of the digits of x ?

- (a) 13 (b) 16
(c) 12 (d) 15

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) L.C.M of 2, 3, 4, 5, 6 and 7 = 420

$$\text{Hence } x = 420 \times k + 1$$

$$x = 420 \times 7 + 1 = 2941 \quad (\text{On putting } k=7)$$

$$\text{Hence the sum of the digits of } x = 2 + 9 + 4 + 1 = 16$$

21. Let x be the least number of 4 digits that when divided by 2, 3, 4, 5, 6 and 7 leave a remainder of 1 in each case. If x lies between 2000 and 2500, then what is the sum of the digits of x ?

- (a) 9 (b) 15
(c) 10 (d) 4

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) L.C.M of 2, 3, 4, 5, 6 and 7 = 420

$$\text{Hence } x = 420k + 1$$

According to the condition

The value of x lies between 2000 and 2500

On putting $k = 5$

$$\therefore x = 420 \times 5 + 1$$

$$\boxed{x = 2101}$$

$$\therefore \text{The sum of the digit of } x = 2 + 1 + 0 + 1 = 4$$

22. Let x be the least number divisible by 13, such that when x is divided by 4,5,6,7,8 and 12, the remainder in each case is 2. The sum of the digits of x is:

- (a) 8 (b) 10
(c) 11 (d) 9

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) L.C.M of 4, 5, 6, 7, 8 and 12 = 840

$$\text{Hence, } x = 840k + 2$$

\therefore The number is exactly divisible by 13.

On putting $k = 3$,

$$\text{So the required number} = 840 \times 3 + 2 = 2522$$

$$\therefore \text{Sum of digits} = 2+5+2+2 = 11$$

23. If the 5-digit number 538xy is divisible by 3, 7 and 11, then the value of $(x^2 + y^2)$ is:

- (a) 25 (b) 13
(c) 17 (d) 10

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b) Given,

$$5 \text{ digit number} = 538xy$$

This number is divisible by 3, 7 and 11

Hence, the number will be a multiple of (L.C.M) 3,7 and 11.

$$\therefore \text{L.C.M of 3, 7 and 11} = 231$$

$$538xy = 53823$$

$$\therefore x = 2 \quad y = 3$$

$$\therefore x^2 + y^2 = 2^2 + 3^2$$

$$x^2 + y^2 = 13$$

24. Which of the following number is a completely divisible by 11, 13 and 7 ?

- (a) 624613 (b) 624624
(c) 624635 (d) 624646

SSC CHSL 10/07/2019 (Shift-II)

Ans. (b): L.C.M of 11, 13 and 7 = 1001
From option (b),

$$\begin{array}{r} 1001)624624(624 \\ \underline{6006} \\ \times 2402 \\ \underline{2002} \\ \times 4004 \\ \underline{4004} \\ \times \end{array}$$

Hence, the number 624624 is completely divisible by 11, 13 and 7.

25. Which of the following number is/are divisible by 7, 11 and 13 ?

- (a) 15004 (b) 14993
(c) 14982 (d) 15015

SSC CHSL 10/07/2019 (Shift-I)

Ans. (d) : L.C.M of 7, 11 and 13 = 1001
From option (d),

$$\frac{15015}{1001} = 15$$

Hence the number 15015 is completely divisible by 7, 11 and 13

26. The proportion among three numbers is 3:4:5 and their LCM is 1800. Then the second number is:

- (a) 150 (b) 120
(c) 30 (d) 90

SSC CHSL -16/10/2020 (Shift-I)

Ans. (b) : Let the three numbers be 3x, 4x and 5x respectively.

$$\text{LCM of all three numbers} = 3 \times 4 \times 5 \times x = 60x$$

$$\text{LCM} = 1800$$

$$\therefore 60x = 1800 \Rightarrow x = 30$$

$$\begin{aligned} \therefore \text{Second number} &= 4x \\ &= 4 \times 30 \\ &= 120 \end{aligned}$$

27. What is the least number which leaves 1 as a remainder when divided by 6 and 7?

- (a) 85 (b) 43
(c) 37 (d) 29

SSC MTS 10-10-2017 (Shift-III)

Ans. (b) : The least number which leaves 1 as a remainder when divided by 6 and 7 = L.C.M of 6 and 7 + 1

$$= 42 + 1 = 43$$

28. If the Least Common Multiple of 56, 57 and 58 is K, then what will be the Least Common multiple of 56, 57, 58 and 59?

- (a) 177 K (b) 59 K
(c) 56 K (d) 57 K

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) : \therefore The LCM of 56, 57 and 58 is K.

\therefore 59 is a prime number.

$$\begin{aligned} \text{L.C.M of } 56, 57, 58 \text{ and } 59 &= 59 \times K \\ &= 59K \end{aligned}$$

29. What is the greatest number of 4 digits which is divisible by 32, 40, 36 and 48?

- (a) 9220 (b) 8820
(c) 8640 (d) 9120

SSC MTS 05/08/2019 (Shift-III)

Ans. (c) : LCM of 32, 40, 36 and 48
 $= 32 \times 9 \times 5 = 1440$

The greatest number of 4-digits = 1440 k

Putting k = 6,

Note:- If the value of k is taken as the integer greater than 6, the 5 digits number will be obtained.

$$\begin{aligned} \therefore \text{The greatest number of 4-digits} &= 1440 \times 6 \\ &= 8640 \end{aligned}$$

30. The largest three digit number that is exactly divisible by 6, 7 and 8 is:

- (a) 999 (b) 168
(c) 358 (d) 840

SSC MTS 13/08/2019 (Shift-II)

Ans. (d) : LCM of the number 6, 7 and 8 = 168

The largest number of three digits = 999

$$\begin{array}{r} 168 \overline{) 999} \left(5 \right. \\ \underline{840} \\ 159 \end{array}$$

$$\therefore 999 - 159 = 840$$

The number 840 is completely divisible by 168.

31. What is the least number which when divided by 12, 18, 24 and 28 we obtain 5 as the remainder in each case?

- (a) 89 (b) 504
(c) 84 (d) 509

SSC MTS 20/08/2019 (Shift-III)

Ans. (d) : On taking L.C.M of 12, 18, 24 and 28

$$\text{LCM} = 2 \times 2 \times 2 \times 3 \times 3 \times 7$$

$$\text{LCM} = 8 \times 9 \times 7$$

$$= 72 \times 7$$

$$= 504$$

$$\begin{aligned} \therefore \text{The required number} &= 504 + 5 \\ &= 509 \end{aligned}$$

32. Suppose that x is the largest four digit number which when divided by 7, 8 and 11 leaves 4, 5 and 8 as remainder respectively. when x is divided by (7 + 8 + 11) then what is the remainder?

- (a) 23 (b) 25
(c) 21 (d) 19

SSC MTS 21/08/2019 (Shift-III)

$$\begin{array}{r} \text{Ans. (b) : } \therefore \quad 7 \qquad 8 \qquad 11 \\ \underline{-4} \qquad \underline{-5} \qquad \underline{-8} \\ \underline{3} \qquad \underline{3} \qquad \underline{3} \end{array}$$

$$\therefore \text{Required number} = (\text{LCM of } 7, 8 \text{ and } 11) k - 3$$

$$\Rightarrow 616 k - 3$$

$$\Rightarrow 9856 - 3$$

$$[\therefore \text{Four digit number} = \frac{9999}{616}]$$

$$\begin{aligned}
 \text{(II). } 4^{84} - 1 &= (4^{42} + 1)(4^{42} - 1) \\
 &= (4^{42} + 1)(4^{14} - 1)(4^{28} + 1 + 4^{14}) \\
 &= (4^{42} + 1)(4^{28} + 1 + 4^{14})(4^7 + 1)(4^7 - 1) \\
 &= (4^{42} + 1)(4^{28} + 1 + 4^{14})(4^7 - 1) \times 16385 \\
 (4^{84} - 1), &\text{ is exactly divisible by 5.}
 \end{aligned}$$

40. In finding the HCF of two numbers by division method, the last divisor is 17 and the quotients are 1, 11 and 2, respectively. What is sum of the two numbers ?

- (a) 833 (b) 867
(c) 816 (d) 901

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : To solve this question, the procedure starts from the bottom.

$$\begin{array}{r}
 391 \overline{)425} \left(1 \right. \\
 \underline{391} \\
 \times 34 391 \left(11 \right. \\
 \underline{374} \\
 \times 17 34 \left(2 \right. \\
 \underline{34} \\
 \times \times
 \end{array}$$

Sum of the two numbers = 391 + 425 = 816

41. Two numbers are in the ratio 7:11. If their HCF is 28, then find the sum of the two numbers :

- (a) 308 (b) 196
(c) 112 (d) 504

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : Given-

Highest Common Factor (HCF) = 28

Hence, the number = $7 \times 28, 11 \times 28$
= 196, 308

Sum of the numbers = (196+308)
= 504

42. What is the HCF of 4/5, 6/8, 8/25

- (a) 1/5 (b) 1/50
(c) 1/100 (d) 1/200

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (c)

$$\begin{aligned}
 \text{HCF of } \frac{4}{5}, \frac{6}{8} \text{ and } \frac{8}{25} &= \frac{\text{H.C.F of 4, 6 and 8}}{\text{L.C.M of 5, 8 and 25}} \\
 &= \frac{2}{200} = \frac{1}{100}
 \end{aligned}$$

43. In finding the HCF of two numbers by division method, the quotients are 1, 8 and 2 respectively, and the last divisor is 105. What is the sum of the numbers?

- (a) 3570 (b) 3675
(c) 3885 (d) 3780

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (d) To solve this question, the procedure starts from the bottom.

$$\begin{array}{r}
 1785 \overline{)1995} \left(1 \right. \\
 \underline{1785} \\
 210 \overline{)1785} \left(8 \right. \\
 \underline{1680} \\
 105 \overline{)210} \left(2 \right. \\
 \underline{210} \\
 \times \times \times
 \end{array}$$

Sum of the numbers = 1785 + 1995 = 3780

44. If r is the remainder when each of 6454, 7306 and 8797 is divided by the greatest number d (d > 1), then (d-r) is equal to:

- (a) 64 (b) 137
(c) 126 (d) 149

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) In each case r is remainder

$$\begin{array}{ccc}
 (6454-r) & & (7306-r) & & (8797-r) \\
 & \swarrow & & \searrow & \\
 & \text{Difference} = 852 & & \text{Difference} = 1491 & \\
 & & & & \\
 & \swarrow & & \searrow & \\
 & \text{Difference} = 2343 & & &
 \end{array}$$

HCF of all three differences = 213

The remainder on dividing each by 213 = 64

$\therefore d = 213, r = 64$
 $d - r = 213 - 64 = 149$

45. Which of the following number is/are divisible by 11, 13 and 7 ?

- (a) 259270 (b) 259248
(c) 259259 (d) 259237

SSC CHSL 10/07/2019 (Shift-III)

Ans. (c) : HCF of 13, 11 and 7 = 1001

\therefore Only 259259 will be divisible by 1001.

46. What is the Highest Common Factor of 42, 168 and 210?

- (a) 14 (b) 21
(c) 42 (d) 7

SSC MTS 08/08/2019 (Shift-II)

Ans. (c) : HCF of 42, 168 and 210.

$$\begin{aligned}
 42 &= 2 \times 3 \times 7 \\
 168 &= 2 \times 2 \times 2 \times 3 \times 7 \\
 210 &= 2 \times 3 \times 5 \times 7 \\
 \text{Then HCF} &= 2 \times 3 \times 7 \\
 &= 42
 \end{aligned}$$

47. What is the HCF of $2^3 \times 3^4$ and $2^5 \times 3^2$?

- (a) $2^5 \times 3^3$ (b) $2^3 \times 3^4$
(c) $2^3 \times 3^2$ (d) $2^5 \times 3^4$

SSC MTS 02/08/2019 (Shift-I)

Ans. (c) : In these types of questions, the number with the lowest power is taken to find the H.C.F

H.C.F of $2^3 \times 3^4$ and $2^5 \times 3^2$

H.C.F = $2^3 \times 3^2$

48. The product of two numbers is 6845, if the HCF of the number is 37, then the greater number is:

- (a) 111 (b) 37
(c) 148 (d) 185

SSC MTS 09/08/2019 (Shift-I)

Ans. (d) \therefore H.C.F = 37
 Then let the numbers = 37x, 37y
 $\therefore 37x \times 37y = 6845$
 $xy = 5$
 $xy = 1 \times 5$
 If x = 1 then y = 5
 greater number = 37y = 37 \times 5 = 185

49. **What is the greatest number which can exactly divide 192, 1056 and 1584 ?**
 (a) 48 (b) 56
 (c) 44 (d) 36

SSC MTS 19/08/2019 (Shift-I)

Ans. (a): The greatest number which can exactly divide 192, 1056 and 1584 will be their HCF.
 Hence the HCF of 192, 1056 and 1584 = 48
 \therefore The greatest number = 48

50. **What is the HCF of 20, 250 and 120?**
 (a) 15 (b) 10
 (c) 25 (d) 20

SSC MTS 19/08/2019 (Shift-II)

Ans. (b) :
 HCF of 20, 250, 120

$$\begin{array}{l} 20 = 2 \times 2 \times 5 \\ 250 = 2 \times 5 \times 5 \times 5 \\ 120 = 2 \times 2 \times 5 \times 2 \times 3 \\ \hline \text{H.C.F} = 2 \times 5 \\ \text{H.C.F} = 10 \end{array}$$

51. **What is the least number of soldiers that can be drawn up in troops of 10, 12, 15 and 20 soldiers, and also in form of a solid square?**
 (a) 900 (b) 180
 (c) 625 (d) 400

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) :

$$\begin{array}{r|rrrrr} 2 & 10 & 12 & 15 & 18 & 20 \\ 2 & 5 & 6 & 15 & 9 & 10 \\ 3 & 5 & 3 & 15 & 9 & 5 \\ 3 & 5 & 1 & 5 & 3 & 5 \\ 5 & 5 & 1 & 5 & 1 & 5 \\ \hline & 1 & 1 & 1 & 1 & 1 \end{array}$$

Hence, LCM (12, 10, 15, 18, 20) = 180
 Since LCM = 180 is not a perfect square, we make it a perfect square by multiplying 5 (which is the least value to be multiplied)
 Then, $180 \times 5 = 900 = 30^2$
 Therefore, 900 soldier can be drawn up in the form of a square.

(III) Mixed Problems based on H.C.F. and L.C.M.

52. **The sum and difference between the LCM and HCF of two numbers are 512 and 496 respectively. If one number is 72, then the other number is:**

- (a) 56 (b) 64
 (c) 40 (d) 80

SSC CGL (Tier-II) 29/01/2022

Ans. (a) : Given,
 LCM + HCF = 512 _____ (i)
 LCM - HCF = 496 _____ (ii)
 On solving equation (i) & (ii) we get,
 LCM = 504, HCF = 8
 \therefore Product of two numbers (I \times II) = Product of their LCM and HCF
 $\Rightarrow I \times II = \text{LCM} \times \text{HCF}$
 $\Rightarrow 72 \times II = 504 \times 8$
 $II = \frac{504 \times 8}{72}$
 $II = 56$
 Hence, the other number is 56.

53. **LCM and HCF of two numbers are 90 and 15, respectively. If the sum of the two numbers is 75, then find the greater number.**
 (a) 45 (b) 90
 (c) 75 (d) 60

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (a) Let the number be x and y.

According to the question,
 Product of the number = LCM \times HCF
 $xy = 90 \times 15 = 1350$ (Given)

And

$$x + y = 75 \quad \text{(Given) (i)}$$

$$\therefore x - y = \sqrt{(x + y)^2 - 4xy}$$

$$\Rightarrow x - y = \sqrt{(75)^2 - 4 \times 1350}$$

$$\Rightarrow x - y = \sqrt{5625 - 5400}$$

$$\Rightarrow x - y = \sqrt{225}$$

From equation (i) and equation (ii),

$$x + y = 75$$

$$\frac{x - y = 15}{x = 45}$$

And

$$y = 30$$

Hence, the greater number is 45.

54. **Three numbers are in the proportion of 3 : 8 : 15 and their LCM is 8280. What is their HCF?**
 (a) 60 (b) 69
 (c) 75 (d) 57

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (b) Let the numbers be 3x, 8x and 15x respectively.
 Then their L.C.M = 120x
 $\therefore 120x = 8280$
 $\Rightarrow x = \frac{8280}{120} = 69$
 \therefore Numbers are (3 \times 69), (8 \times 69) and (15 \times 69)
 Then H.C.F = 69

55. LCM of two numbers is 22 times their HCF. If one of the numbers is 132 and the sum of LCM and HCF is 276, then what is the other number?

- (a) 24 (b) 30
(c) 25 (d) 20

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (a) Let, second number = b
Given that—
LCM = 22 HCF _____(i)
First number (a) = 132
LCM + HCF = 276 _____(ii)
According to the question,
On putting the value of eqⁿ (i) in eqⁿ (ii),
 $22\text{HCF} + \text{HCF} = 276$
 $\Rightarrow 23\text{HCF} = 276$
 $\Rightarrow \boxed{\text{HCF} = 12}$
 $\therefore \boxed{\text{LCM} = 22 \times 12}$
 \therefore Product of two number = LCM \times HCF
 $\Rightarrow a \times b = 22 \times 12 \times 12$
 $\Rightarrow 132 \times b = 22 \times 12 \times 12$
 $\therefore \boxed{b = 24}$
Hence, option (a) is correct.

56. If the HCF of two numbers is 12 and LCM of the same two numbers is 48, then the square root of the product of these numbers is:

- (a) 16 (b) 24
(c) 48 (d) 12

SSC MTS 26/10/2021 (Shift-I)

Ans. (b) : Let, the two numbers are a, b.
HCF of two numbers = 12
LCM of two numbers = 48
According to the question,
Product of two numbers = HCF \times LCM
 $\Rightarrow a \times b = 12 \times 48$
 $\Rightarrow a \times b = 576$
On taking square root of both sides,
 $\sqrt{a \times b} = \sqrt{576}$
 $\therefore \sqrt{a \times b} = 24$

57. The LCM of two numbers is 90, whereas their HCF is 6. If one number is 12 more than the other, then the greater number is:

- (a) 12 (b) 45
(c) 30 (d) 51

SSC MTS 27/10/2021 (Shift-I)

Ans. (c) : Given that—
LCM of two numbers = 90
HCF of two numbers = 6
One number (a) = 12 + other number (b)
According to the question,
Product of two number = LCM \times HCF
 $\Rightarrow a \times b = 90 \times 6$
 $\Rightarrow a(a - 12) = 540$
 $\Rightarrow a^2 - 12a - 540 = 0$

$$\Rightarrow a^2 - (30-18)a - 540 = 0$$

$$\Rightarrow a^2 - 30a + 18a - 540 = 0$$

$$\Rightarrow a(a - 30) + 18(a - 30) = 0$$

$$(a - 30)(a + 18) = 0$$

$\therefore a + 18 = 0$
 $\Rightarrow a = -18$ (Invalid)
 $\therefore a - 30 = 0$
 $\Rightarrow \boxed{a = 30}$
So, the greater number is 30.
Hence, option (c) is correct.

58. The LCM of two numbers x and y is 204 times their HCF. If their HCF is 12 and the difference between the numbers is 60, then $x + y = ?$

- (a) 852 (b) 426
(c) 348 (d) 660

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : LCM of x and y = 204×12
LCM \times HCF = Product of the numbers
 $204 \times 12 \times 12 = xy$
 $\therefore x - y = 60$
 $(x+y)^2 = (x-y)^2 + 4xy$
 $= 3600 + 4 \times 204 \times 144$
 $= 3600 + 117504 = 121104$
 $x + y = (\sqrt{121104}) = 348$

59. The HCF of two numbers is 21 and their LCM is 221 times the HCF. If one of the numbers lies between 200 and 300, then the sum of the digits of the other number is :

- (a) 17 (b) 15
(c) 18 (d) 14

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let those two numbers = a = 21x
b = 21y
LCM = 21×221
 $21xy = 21 \times 221$
 $xy = 221 = 13 \times 17$
 $\therefore a = 21x = 21 \times 13 = 273$
 $b = 21 \times 17 = 357$
Hence the sum of the digits of the other number = $3 + 5 + 7 = 15$

60. The HCF of two number is 29 and the other two factors of their LCM are 15 and 13. The smaller of the two number is?

- (a) 464 (b) 377
(c) 406 (d) 435

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : Smaller of the two numbers = 29×13
= 377

61. The HCF of two numbers is 29, and the other two factors of their LCM are 15 and 13. The larger of the two numbers is:

- (a) 435 (b) 464
(c) 406 (d) 377

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : Larger of the two numbers = $29 \times 15 = 435$

62. The ratio of two numbers is 7:13 and their HCF is 8. Their LCM is:

- (a) 628 (b) 782
(c) 872 (d) 728

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) : LCM = HCF \times ab

$$\text{LCM} = 8 \times 7 \times 13$$

$$\text{LCM} = 728$$

63. The HCF and LCM of two numbers are 8 and 48 respectively. If the ratio of the two numbers is 2:3, then the larger of the two numbers is:

- (a) 16 (b) 48
(c) 18 (d) 24

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d) : Let the numbers be 2x and 3x respectively.

Formula – Product of the numbers = HCF \times LCM

$$2x \times 3x = 8 \times 48$$

$$x^2 = 8 \times 8$$

$$x = 8$$

The larger of the two number = $3x = 3 \times 8 = 24$

64. The LCM of 165, 176, 385 and 495 is k. When k is divided by the HCF of the numbers, the quotient is p. What is the value of p?

- (a) 2520 (b) 3360
(c) 5040 (d) 6720

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c) $165 = 3 \times 5 \times 11$

$$176 = 2 \times 2 \times 2 \times 2 \times 11$$

$$385 = 5 \times 7 \times 11$$

$$495 = 3 \times 3 \times 5 \times 11$$

$$\text{LCM} = k = 3 \times 3 \times 5 \times 11 \times 7 \times 2 \times 2 \times 2 \times 2 \dots (i)$$

$$\text{HCF} = 11 \dots (ii)$$

According to the question

$$\therefore p = \text{equation (i)} \div \text{equation (ii)}$$

$$p = 5040$$

65. What is the L.C.M. of H.C.F. of $\frac{2}{3}, \frac{3}{4}$ and

L.C.M. of $\frac{5}{6}, \frac{7}{8}$?

- (a) $\frac{1}{2}$ (b) $\frac{35}{2}$
(c) $\frac{1}{12}$ (d) $\frac{33}{12}$

SSC MTS 20/08/2019 (Shift-III)

Ans. (b) : HCF of $\frac{2}{3}, \frac{3}{4} = \frac{\text{HCF of } 2, 3}{\text{LCM of } 3, 4}$

$$= \frac{1}{12}$$

$$\text{LCM of } \frac{5}{6}, \frac{7}{8} = \frac{\text{LCM of } 5, 7}{\text{HCF of } 6, 8}$$

$$= \frac{35}{2}$$

Then LCM of $\left(\frac{1}{12}, \frac{35}{2}\right) = \frac{\text{LCM of } 1, 35}{\text{HCF of } 12, 2}$

$$= \frac{35}{2}$$

66. If the ratio of two numbers is 7 : 11 and their HCF is 13 then their L.C.M. is:

- (a) 101 (b) 1001
(c) 143 (d) 234

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Let the two numbers be 7x and 11x.

HCF of two numbers \times LCM of two numbers = Product of numbers

$$13 \times \text{LCM} = 7x \times 11x$$

$$(\text{HCF} = x, \text{ then } x = 13)$$

$$13 \times \text{LCM} = 7 \times 13 \times 11 \times 13$$

$$\text{LCM} = 1001$$

IInd Method :

$$\text{LCM} = \text{HCF } ab$$

$$= 13 \times 7 \times 11$$

$$= 1001$$

67. The difference of two numbers is 15 and H.C.F and L.C.M. of two numbers is 3 and 108 respectively. Find the difference between their reciprocals.

- (a) $\frac{5}{54}$ (b) $\frac{5}{108}$
(c) $\frac{5}{81}$ (d) $\frac{5}{112}$

SSC MTS 16/08/2019 (Shift-III)

Ans. (b) : Let the number be x and y respectively.

According to the question,

$$x - y = 15 \text{ --- (i)}$$

$$\text{LCM} \times \text{HCF} = x \times y$$

$$108 \times 3 = x \times y$$

$$xy = 108 \times 3 \text{ --- (ii)}$$

By dividing equation (i) from equation (ii)

$$\frac{x - y}{xy} = \frac{15}{108 \times 3}$$

$$\frac{1}{y} - \frac{1}{x} = \frac{5}{108}$$

68. The H.C.F. and L.C.M of two numbers is 20 and 120 respectively. If a number is 50% more than the second number, the smaller number is?

- (a) 20 (b) 60
(c) 40 (d) 80

SSC MTS 14/08/2019 (Shift-I)

Ans. (c) : Let the smaller number is $2x$.

$$\therefore \text{Larger number} = 2x \times \frac{150}{100} = 3x$$

LCM \times HCF = Smaller number \times Larger number

$$120 \times 20 = 2x \times 3x$$

$$6x^2 = 20 \times 120$$

$$x^2 = 400$$

$$x = 20$$

$$\text{Smaller number} = 2 \times 20 = 40$$

69. If $x \times y$ denotes H.C.F. of x and y and $x @ y$ denotes LCM of x and y , then the value of $(72 \times 84) @ 144$ is:

- (a) 144 (b) 504
(c) 210 (d) 420

SSC MTS 09/08/2019 (Shift-II)

Ans. (a) : Given,

$x \times y$ denotes, HCF of x and y

$x @ y$ denotes, LCM of x and y .

According to the question,

$$\text{Factor of } 72 = 2^3 \times 3^2$$

$$\text{Factor of } 84 = 2^2 \times 3 \times 7$$

$$\text{Factor of } 144 = 2^4 \times 3^2$$

$$\text{H.C.F of } 72 \text{ and } 84 = 2^2 \times 3 = 12$$

Now we have to find the L.C.M of 12 and 144

$$\text{Factor of } 12 = 2^2 \times 3$$

$$\text{So, the L.C.M of } 12 \text{ and } 144 = 2^4 \times 3^2$$

\therefore The value of $[72 \times 84] @ 144$ is 144.

70. If LCM of two numbers 390 and 420 is 5460, then the HCF of two numbers is:

- (a) 35 (b) 45
(c) 30 (d) 42

SSC MTS 14/08/2019 (Shift-III)

Ans. (c) : First number \times Second number = LCM \times HCF

$$390 \times 420 = 5460 \times \text{HCF.}$$

$$\text{HCF} = \frac{390 \times 420}{5460} = 30$$

71. If LCM of two numbers is 231, HCF of two numbers is 11 and one number is 77, the other number is:

- (a) 47 (b) 37
(c) 57 (d) 33

SSC MTS 13/08/2019 (Shift-I)

Ans. (d) : LCM \times HCF = First number \times Second number

$$231 \times 11 = 77 \times \text{Second number}$$

$$\text{Second number} = \frac{231 \times 11}{77}$$

$$\text{Second number} = 33$$

72. The H.C.F. and L.C.M. of two numbers are 37 and 444 respectively. If the first number is 111 then the other number is?

- (a) 333 (b) 74
(c) 148 (d) 111

SSC MTS 21/08/2019 (Shift-II)

Ans. (c) : First number \times Second number = HCF \times LCM

$$111 \times \text{Second number} = 37 \times 444$$

$$\text{Second number} = \frac{37 \times 444}{111}$$

$$= 148$$

73. If the HCF of two numbers is 6 and their LCM is 120, one such pair of numbers is:

- (a) 24, 30 (b) 18, 40
(c) 12, 60 (d) 12, 40

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (a) : Product of two numbers = LCM \times HCF

$$\therefore \text{LCM} \times \text{HCF} = 120 \times 6 = 720$$

\therefore 720 = Product of two numbers

From option (a) $24 \times 30 = 720$

Hence, option (a) is correct.

74. If Highest Common Factor of two numbers is 8, then which of the following cannot be their Least Common Multiple?

- (a) 72 (b) 24
(c) 68 (d) 48

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (c) : The L.C.M of two numbers is always divisible by H.C.F. The number 72, 24, 48 are divisible by 8, while 68 is not divisible. Hence 68 can not be the L.C.M of these two numbers.

75. The Least Common Multiple and Highest Common Factor of two numbers are 60 and 3 respectively. If their difference is 3, then what will be the sum of these two numbers?

- (a) 24 (b) 35
(c) 27 (d) 21

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : LCM of two number = 60

HCF of two numbers = 3

Difference of both numbers = 3

Let the numbers be $3x$ and $3x + 3$.

$$3x(3x+3) = 60 \times 3$$

$$9(x^2+x) = 60 \times 3$$

$$x^2+x-20 = 0$$

$$x^2+5x-4x-20=0$$

$$(x-4)(x+5)=0$$

$$x = 4$$

Sum of the numbers = $3x+3x+3$

$$= 6x+3$$

$$= 24+3 = 27$$

(IV) Miscellaneous

76. Suppose that x and y be such 3 digit numbers such that their difference is 729 and H.C.F. is 81 then what is the value of $x + y$?

- (a) 1053 (b) 891
(c) 1539 (d) 1377

SSC MTS 20/08/2019 (Shift-I)

Ans. (a) : $x - y = 729$
 $x - y = 81 \times 9$ (81 HCF) ———(1)

Let
 $x = 81 \times A$
 $y = 81 \times B$
 $x - y = 81 \times 9$
 $81A - 81 \times B = 81 \times 9$
 $81(A - B) = 81 \times 9$
 $A - B = 9$

For the 3-digit number
 Case : 1 $81A < 1000$

$A < \frac{1000}{81}$
 $A < 12.34$
 $A = 12, 11, 10$

Case : 2 $81B > 100$

$B > \frac{100}{81}$
 $B > 1.23$
 $B > 2, 3$
 On putting $A = 11$
 $81A = 81 \times 11 = 891$
 On putting $B = 2$
 $81B = 81 \times 2 = 162$
 $(x + y) = (891 + 162)$

$x + y = 1053$

77. Let x be the number divisible by 16,24,30,36 and 45, and x is also a perfect square. What is the remainder when x is divided by 123?

- (a) 100 (b) 40
 (c) 33 (d) 103

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c)

2	16, 24, 30, 36, 45
2	8, 12, 15, 18, 45
2	4, 6, 15, 9, 45
2	2, 3, 15, 9, 45
3	1, 3, 15, 9, 45
3	1, 1, 5, 3, 15
5	1, 1, 5, 1, 5
	1, 1, 1, 1, 1

Perfect square number $(x) = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 3600$

The remainder obtained after dividing 3600 by 123 = 33

78. The sum of two positive number is 240 and their HCF is 15. Find the number of pairs of numbers satisfying the given condition.

- (a) 4 (b) 8
 (c) 2 (d) 5

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let the numbers be $15x$ and $15y$.

According to the question,

$$15x + 15y = 240$$

$$x + y = 16$$

Hence, the possible pairs of both the numbers = (1, 15), (3, 13), (5, 11), (7, 9)

\therefore Possible number of pairs = 4

79. Two numbers are in the ratio 7:11. If their HCF is 28, then the difference between the two numbers is :

- (a) 112 (b) 28
 (c) 196 (d) 308

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : Let the numbers be x and y .

The ratio of the numbers is 7 : 11

Hence, $x : y = 7 : 11$

The HCF of x and y is 28

Hence, the first number = 28×7

$$= 196$$

Second number = 28×11

$$= 308$$

Difference between both numbers = $308 - 196 = 112$

80. What is the sum of the greatest three digit number and the smallest four digit number such that their HCF is 23?

- (a) 1998 (b) 1984
 (c) 2002 (d) 2001

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d) : The H.C.F of both the numbers is 23 So, both the numbers will be divisible by 23.

The greatest 3-digits number which is divisible by 23
 $= 989$

The smallest 4-digits number which is divisible by 23
 $= 1012$

Sum of both numbers = $989 + 1012$
 $= 2001$

81. If the least common multiple of two numbers, 1728 and K is 5184, then how many values of K are possible?

- (a) 11 (b) 8
 (c) 6 (d) 7

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : The given first number is 1728 and the second number is K .

$$\text{LCM}(K, 1728) = 5184$$

$$\text{LCM}(K, 3^3 \times 2^6) = 2^6 \times 3^4$$

The possible value of $K = 3^4, 3^4 \times 2, 3^4 \times 2^2, 3^4 \times 2^3, 3^4 \times 2^4, 3^4 \times 2^5, 3^4 \times 2^6$

Hence, it is clear that the total possible value of K is 7.

82. The sum of two numbers is 1215 and their HCF is 81. If the numbers lie between 500 and 700, then the sum of the reciprocals of the numbers is?

- (a) $\frac{5}{1512}$ (b) $\frac{5}{378}$
 (c) $\frac{5}{1188}$ (d) $\frac{5}{702}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) HCF of the numbers = 81
 Hence, the number divisible by 81 between 500 and 700
 = 567 and 648
 $\Rightarrow 567 + 648 = 1215$
 Sum of the reciprocals of the number = $\frac{1}{567} + \frac{1}{648}$

$$= \frac{648 + 567}{567 \times 648}$$

$$= \frac{1215}{367416} = \frac{5}{1512}$$

83. The HCF and LCM of two numbers p and q are A and B respectively. If $A + B = p + q$, then the value of $A^3 + B^3$ is :

- (a) p^3 (b) q^3
 (c) $p^3 + q^3$ (d) $p^3 - q^3$

SSC MTS 09/08/2019 (Shift-III)

Ans. (c) : $A \cdot B = p \cdot q$
 $A + B = p + q$
 On cubing both sides,
 $A^3 + B^3 + 3AB(A+B) = p^3 + q^3 + 3pq(p+q)$
 $A^3 + B^3 + 3pq(p+q) = p^3 + q^3 + 3pq(p+q)$
 $A^3 + B^3 = p^3 + q^3$

84. What is the largest two digit number which when divided by 6 and 5 leaves remainder 1 in each case?

- (a) 61 (b) 93
 (c) 91 (d) 97

SSC MTS 05/08/2019 (Shift-I)

Ans. (c) : Largest two digit number = $n \times (\text{LCM of 5 and 6}) + 1$
 (Where $n = 1, 2, 3 \dots n$)
 on taking $n = 3$,
 $= 30n + 1$
 $= 30 \times 3 + 1$
 $= 91$

85. A temple has five bells which ring at the intervals of 12, 15, 16, 20 and 25 minutes respectively. If they ring together at midnight, then at what time next will they ring together?

- (a) 8:00 P.M. (b) 7:00 P.M.
 (c) 7:30 P.M. (d) 8:30 P.M.

SSC MTS 16/08/2019 (Shift-I)

Ans. (a) : LCM of 12, 15, 16, 20, 25,
 LCM = $16 \times 3 \times 5 \times 5$ min

$$= 48 \times 25$$

$$= 1200 \text{ min}$$

$$\Rightarrow \frac{1200}{60} \text{ hr} = 20 \text{ hr}$$

Time of next ring = 12 : 00 : 00 AM (mid night) + 20 hr
 = 8:00 PM

86. What is the highest number which when divides the number 1026, 2052 and 4102, leave remainders 2, 4 and 6 respectively.

- (a) 512 (b) 1024
 (c) 128 (d) 256

SSC MTS 14/08/2019 (Shift-II)

Ans. (b) : Difference between the dividend and remainder

$$(1026 - 2) = 1024$$

$$(2052 - 4) = 2048$$

$$(4102 - 6) = 4096$$

Now, the HCF of the numbers 1024, 2048 and 4096 will be that highest required number.

HCF = 1024

87. What is the H.C.F. of $\frac{7}{16}$, $\frac{21}{32}$ and $\frac{49}{8}$?

- (a) $\frac{7}{64}$ (b) $\frac{147}{32}$
 (c) $\frac{147}{8}$ (d) $\frac{7}{32}$

SSC MTS 06/08/2019 (Shift-I)

Ans. (d) : HCF of $\frac{7}{16}$, $\frac{21}{32}$, $\frac{49}{8}$

$$\text{HCF} = \frac{\text{HCF of numerators}}{\text{LCM of denominators}} = \frac{7}{32}$$

88. The least common multiple and highest common factor of two numbers are 30 and 5 respectively. If their sum is 25, then what will be the difference of these two numbers?

- (a) 15 (b) 10
 (c) 25 (d) 5

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : The HCF of both the numbers be 5.

\therefore Then, the both numbers will be 5a & 5b

According to the question,

$$5ab = 30$$

$$ab = 6$$

And $5a + 5b = 25$ (i)

$$a + b = 5$$

\therefore $(a - b)^2 = (a + b)^2 - 4ab$ (ii)

$$(a - b)^2 = (5)^2 - 4 \times 6$$

$$(a - b)^2 = 1$$

$$a - b = 1$$
 (iii)

$$5a - 5b = 5$$

05.

Simplification

(I) Problem based on BODMAS Rule

1. $24 - [52 - \{4 + 10 \times (-3)\}] = ?$
 (a) 54 (b) -54
 (c) -44 (d) 44

SSC CHSL 25/05/2022 (Shift-III)

Ans. (b) : $24 - [52 - \{4 + 10 \times (-3)\}]$
 $= 24 - [52 - \{4 - 30\}]$
 $= 24 - [52 + 26]$
 $= 24 - 78$
 $= -54$

2. The value of $3.8 - (4.2 \div 0.7 \times 3) + 5 \times 2 \div 0.5$ is:
 (a) 21.8 (b) 18.4
 (c) 5.8 (d) 15.6

SSC CGL (TIER-I)-2018 - 10.06.2019 (Shift-III)

Ans. (c) : $3.8 - (4.2 \div 0.7 \times 3) + 5 \times 2 \div 0.5$
 $= 3.8 - (6 \times 3) + 5 \times 4$
 $= 3.8 - 18 + 20$
 $= 5.8$

3. The value of :
 $108 \div 36 \times 4 + 2.5 \times 4 \div 0.5 - 10$
 (a) 22 (b) 16
 (c) 20 (d) 18

SSC CGL (TIER-I)-2018 - 12.06.2019 (Shift-III)

Ans. (a) : $108 \div 36 \times 4 + 2.5 \times 4 \div 0.5 - 10$
 $= \frac{108}{36} \times 4 + 2.5 \times \frac{4}{0.5} - 10$
 $= 3 \times 4 + 2.5 \times 8 - 10$
 $= 12 + 20 - 10$
 $= 22$

4. Simplify
 $\left[\left(5\frac{1}{4} \div 3\frac{1}{2} \times \frac{5}{12} \right) - \frac{3}{16} \right] \div \left(3\frac{4}{7} \div \frac{5}{14} \text{ of } 6\frac{2}{3} \right) \text{ of } 1\frac{1}{3}$

- (a) $\frac{5}{32}$ (b) $-\frac{7}{32}$
 (c) $\frac{3}{32}$ (d) $\frac{7}{32}$

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (d) Simplify—
 $\left[\left(5\frac{1}{4} \div 3\frac{1}{2} \times \frac{5}{12} \right) - \frac{3}{16} \right] \div \left(3\frac{4}{7} \div \frac{5}{14} \text{ of } 6\frac{2}{3} \right) \text{ of } 1\frac{1}{3} = ?$
 $= \left[\left(\frac{21}{4} \times \frac{2}{7} \times \frac{5}{12} \right) - \frac{3}{16} \right] \div \left(\frac{25}{7} \div \frac{50}{21} \right) \times \frac{4}{3}$

$$= \left[\frac{5}{8} - \frac{3}{16} \right] \div \left(\frac{25}{7} \times \frac{21}{50} \times \frac{4}{3} \right)$$

$$= \frac{7}{16} \div \frac{2}{1}$$

$$= \frac{7}{16} \times \frac{1}{2}$$

$$= \frac{7}{32}$$

5. What should come in place of the question mark (?) in the following questions?

$6 \div 6 \times 9 + 6 - 9 \times 6 - 6 + 6 \times 9 = ?$

- (a) 7 (b) 8
 (c) 10 (d) 9

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : $6 \div 6 \times 9 + 6 - 9 \times 6 - 6 + 6 \times 9$
 $= 1 \times 9 + 6 - 54 - 6 + 54$
 $= 9 + 6 - 6 - 54 + 54$
 $= 9$

6. Find the value of the following expression:

$$\frac{(7.03)^3 - 0.027}{(7.03)^2 + 2.109 + (0.3)^2}$$

- (a) 7.06 (b) 7
 (c) 7.33 (d) 6.73

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

- Ans : (d)** Find the value of—

$$= \frac{(7.03)^3 - (0.027)}{(7.03)^2 + 2.109 + (0.3)^2}$$

$$= \frac{(7.03)^3 - (0.3)^3}{(7.03)^2 + 2.109 + (0.3)^2}$$

$$= \frac{(7.03 - 0.3) [(7.03)^2 + 2.109 + (0.3)^2]}{[(7.03)^2 + 2.109 + (0.3)^2]}$$

$$= 6.73$$

7. What is the value of p, if $25(3+4P) \div 12$ of $5 - 3 \times 8 = 6$

- (a) 72 (b) 69
 (c) $15\frac{1}{3}$ (d) $17\frac{1}{4}$

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (d) $25(3 + 4P) \div 12$ of $5 - 3 \times 8 = 6$
 $25(3 + 4P) \div 60 - 24 = 6$
 $\frac{25(3 + 4P)}{60} = 30$

$$\frac{15+20P}{12} = 30$$

$$15+20P = 360$$

$$P = \frac{345}{20} = 17\frac{1}{4}$$

8. Find the value of the following expression:

$$\frac{1\frac{2}{3} \div \frac{5}{6} \times 6 + \frac{4}{5} \times \frac{1}{2} + \frac{2}{3}}{2 - \left[1\frac{1}{3} \times \left(-\frac{3}{5} \right) - 6 \left\{ \frac{3}{5} - \left(3 - \frac{3}{10} \right) \right\} \right]}$$

- (a) $-\frac{4}{3}$ (b) $\frac{4}{3}$
(c) $\frac{1}{7}$ (d) $-\frac{1}{7}$

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (a)

$$\frac{1\frac{2}{3} \div \frac{5}{6} \times 6 + \frac{4}{5} \times \frac{1}{2} + \frac{2}{3}}{2 - \left[1\frac{1}{3} \times \left(-\frac{3}{5} \right) - 6 \left\{ \frac{3}{5} - \left(3 - \frac{3}{10} \right) \right\} \right]}$$

$$\Rightarrow \frac{\frac{5}{3} \times \frac{6}{5} \times 6 + \frac{2}{5} + \frac{2}{3}}{2 - \left[\frac{4}{3} \times \left(-\frac{3}{5} \right) - 6 \left\{ \frac{3}{5} - \frac{27}{10} \right\} \right]}$$

$$\Rightarrow \frac{180+6+10}{15}$$

$$\Rightarrow \frac{196}{15}$$

$$\Rightarrow \frac{196/15}{-49/5}$$

$$\Rightarrow -\frac{4}{3}$$

9. The value of

$$\frac{\left[\frac{3}{8} - \left\{ \frac{3}{8} - \left(\frac{5}{8} - \frac{3}{8} \right) \right\} \right] \text{ of } 4.8 - 0.9}{4\frac{1}{6} \div 2.5 \times 0.2 \div \frac{1}{5} \text{ of } 50 + \left(\frac{3}{4} - \frac{1}{8} \right)} \text{ is:}$$

- (a) $\frac{30}{79}$ (b) $\frac{42}{79}$
(c) $\frac{36}{79}$ (d) $\frac{24}{79}$

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (c) The given expression is –

$$\frac{\left[\frac{3}{8} - \left\{ \frac{3}{8} - \left(\frac{5}{8} - \frac{3}{8} \right) \right\} \right] \text{ of } 4.8 - 0.9}{4\frac{1}{6} \div 2.5 \times 0.2 \div \frac{1}{5} \text{ of } 50 + \left(\frac{3}{4} - \frac{1}{8} \right)}$$

$$\Rightarrow \frac{\left[\frac{3}{8} - \left\{ \frac{3}{8} - \frac{2}{8} \right\} \right] \text{ of } 4.8 - 0.9}{\frac{25}{6} \div 2.5 \times 0.2 \div \frac{1}{5} \text{ of } 50 + \frac{5}{8}}$$

$$\Rightarrow \frac{\left[\frac{3}{8} - \frac{1}{8} \right] \text{ of } 4.8 - 0.9}{\frac{25}{6} \times \frac{1}{2.5} \times 0.2 \div \frac{50}{5} + \frac{5}{8}}$$

$$\Rightarrow \frac{\frac{1}{4} \times 4.8 - 0.9}{\frac{25}{6} \times \frac{1}{2.5} \times 0.2 \times \frac{5}{50} + \frac{5}{8}}$$

$$\Rightarrow \frac{1.2 - 0.9}{\frac{1}{30} + \frac{5}{8}}$$

$$\Rightarrow \frac{1.2 - 0.9}{\frac{79}{120}}$$

$$\Rightarrow \frac{0.3 \times 120}{79}$$

$$\Rightarrow \frac{36}{79}$$

10. Find the value of the following expression:

$$\frac{3 \div 1 \times 2 + 5 - 2}{3 \times 3 - 2}$$

- (a) $\frac{9}{7}$ (b) $\frac{19}{3}$
(c) $\frac{4}{7}$ (d) $\frac{4}{3}$

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (a) From question,

$$\frac{3 \div 1 \times 2 + 5 - 2}{3 \times 3 - 2} = \frac{3 \times 2 + 5 - 2}{9 - 2}$$

$$= \frac{6 + 5 - 2}{7}$$

$$= \frac{9}{7}$$

Hence, option (a) is correct.

11. The value of $15 + 6.3 \div 7 - 3 \times 1.3 - 2$ is:

- (a) 9 (b) -10
(c) 10 (d) 7

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

$$\text{Ans. (c) } 15 + 6.3 \div 7 - 3 \times 1.3 - 2$$

$$= 15 + 0.9 - 3.9 - 2$$

$$= 15 - 3 - 2$$

$$= 10$$

12. The value of $\frac{46 + \frac{3}{4} \text{ of } 32 - 6}{37 - \frac{3}{4} \text{ of } (34 + 6)}$ is:

- (a) $\frac{64}{7}$ (b) $\frac{54}{7}$
 (c) $\frac{44}{7}$ (d) $\frac{34}{7}$

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (a) $\frac{46 + \frac{3}{4} \text{ of } 32 - 6}{37 - \frac{3}{4} \text{ of } (34 + 6)} = \frac{46 + 24 - 6}{37 - 30} = \frac{64}{7}$

13. The value of

$$\frac{2}{7} - \frac{3}{8} - \left[2\frac{1}{4} \div 3\frac{1}{2} \text{ of } 1\frac{1}{3} + \left\{ 1\frac{17}{40} - \left(3 - 1\frac{1}{5} - \frac{3}{8} \right) \right\} \right] \text{ is}$$

- (a) $\frac{2}{7}$ (b) $-\frac{4}{7}$
 (c) $-\frac{2}{7}$ (d) $\frac{4}{7}$

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans. (b) From question,

$$\begin{aligned} & \frac{2}{7} - \frac{3}{8} - \left[2\frac{1}{4} \div 3\frac{1}{2} \text{ of } 1\frac{1}{3} + \left\{ 1\frac{17}{40} - \left(3 - 1\frac{1}{5} - \frac{3}{8} \right) \right\} \right] \\ \Rightarrow & \frac{2}{7} - \frac{3}{8} - \left[\frac{9}{4} \div \frac{7}{2} \times \frac{4}{3} + \left\{ \frac{57}{40} - \left(3 - \frac{6}{5} - \frac{3}{8} \right) \right\} \right] \\ \Rightarrow & \frac{2}{7} - \frac{3}{8} - \left[\frac{9}{4} \div \frac{7}{3} \times 2 + \left\{ \frac{57}{40} - \left(\frac{120 - 48 - 15}{40} \right) \right\} \right] \\ \Rightarrow & \frac{2}{7} - \frac{3}{8} - \left[\frac{9}{4} \times \frac{3}{14} + \left\{ \frac{57}{40} - \left(\frac{120 - 63}{40} \right) \right\} \right] \\ \Rightarrow & \frac{2}{7} - \frac{3}{8} - \left[\frac{27}{56} + \left\{ \frac{57}{40} - \frac{57}{40} \right\} \right] \\ \Rightarrow & \frac{2}{7} - \frac{3}{8} - \frac{27}{56} + 0 = \frac{16 - 21 - 27}{56} \\ \Rightarrow & -\frac{32}{56} \\ \Rightarrow & -\frac{4}{7} \end{aligned}$$

Hence, option (b) is correct.

14. Simplify the following expression:

$$\frac{3\frac{1}{2} + 5\frac{1}{3} \div 1\frac{1}{3} \times 5\frac{1}{4} - 5\frac{1}{2}}{1\frac{1}{2} \times 1\frac{2}{3} - 6\frac{1}{2}} \div 7 \times 2$$

- (a) $\frac{13}{147}$ (b) $29\frac{9}{32}$
 (c) $-1\frac{5}{14}$ (d) $-\frac{5}{28}$

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (c)

$$\begin{aligned} & \frac{3\frac{1}{2} + 5\frac{1}{3} \div 1\frac{1}{3} \times 5\frac{1}{4} - 5\frac{1}{2}}{1\frac{1}{2} \times 1\frac{2}{3} - 6\frac{1}{2}} \div 7 \times 2 \\ & = \frac{\frac{7}{2} + \frac{16}{3} \times \frac{3}{4} \times \frac{21}{4} - \frac{11}{2}}{\frac{3}{2} \times \frac{5}{3} - \frac{13}{2}} \div 7 \times 2 \\ & = \frac{\frac{7}{2} + 21 - \frac{11}{2}}{-\frac{8}{2}} \div 7 \times 2 \\ & = \frac{7 + 42 - 11}{-4} \div 7 \times 2 \\ & = \frac{38}{-8} \times \frac{1}{7} \times 2 \\ & = -\frac{38}{28} \\ & = -\frac{19}{14} \\ & = -1\frac{5}{14} \end{aligned}$$

15. The value of $\frac{1}{4} \div \frac{1}{2} \left(\frac{2}{5} - \frac{1}{3} \right)$ is:

- (a) $\frac{7}{65}$ (b) $\frac{7}{65}$
 (c) $\frac{4}{65}$ (d) $\frac{2}{65}$

SSC MTS 18/10/2021 (Shift-I)

Ans. (d) :

$$\begin{aligned} & \frac{1}{4} \div \frac{1}{2} \left(\frac{2}{5} - \frac{1}{3} \right) \\ & = \frac{1}{3} \text{ of } \frac{3}{4} - \frac{1}{4} \text{ of } \frac{2}{3} \\ & = \frac{1}{4} \times 2 \times \frac{1}{15} \\ & = \frac{5}{3} \times \frac{3}{4} - \frac{1}{4} \times \frac{2}{3} \\ & = \frac{1}{4} - \frac{1}{6} \\ & = \frac{30}{12} = \frac{1}{30} \times \frac{12}{13} = \frac{2}{65} \end{aligned}$$

16. The value of $\frac{\frac{1}{6} + \left[4\frac{3}{4} - \left(3\frac{1}{6} - 2\frac{1}{3} \right) \right]}{\left(\frac{1}{5} \text{ of } \frac{1}{5} \div \frac{1}{5} \right) \div \left(\frac{1}{5} \div \frac{1}{5} \times \frac{1}{5} \right)}$ lies

between:

- (a) 4.2 and 4.3 (b) 4.0 and 4.1
(c) 4.3 and 4.4 (d) 4.6 and 4.8

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) :

$$\begin{aligned} & \frac{\frac{1}{6} + \left[4\frac{3}{4} - \left(3\frac{1}{6} - 2\frac{1}{3} \right) \right]}{\left(\frac{1}{5} \text{ of } \frac{1}{5} \div \frac{1}{5} \right) \div \left(\frac{1}{5} \div \frac{1}{5} \times \frac{1}{5} \right)} \\ &= \frac{\frac{1}{6} + \left[\frac{19}{4} - \left(\frac{19}{6} - \frac{7}{3} \right) \right]}{\left(\frac{1}{25} \times \frac{5}{1} \right) \div \left(\frac{1}{5} \times \frac{5}{1} \times \frac{1}{5} \right)} \\ &= \frac{\frac{1}{6} + \left[\frac{19}{4} - \left(\frac{19-14}{6} \right) \right]}{\frac{1}{5} \div \frac{1}{5}} \\ &= \frac{\frac{1}{6} + \left[\frac{19}{4} - \frac{5}{6} \right]}{1} \\ &= \frac{1}{6} + \frac{47}{12} \\ &= \frac{2+47}{12} = 4.083 \end{aligned}$$

So, 4.083 lies between 4.0 & 4.1

17. What is the simplified value of

$$\left(8.5 - 2\frac{1}{2} \right) \text{ of } 16.5 - \left[27.4 - \left\{ 10\frac{1}{4} \text{ of } 2.5 - \left(1\frac{1}{2} - 1\frac{1}{5} \right) \right\} \right]$$

- (a) 97.075 (b) 99.925
(c) 96.925 (d) 101.075

SSC MTS 08/10/2021 (Shift-I)

Ans. (c) :

$$\begin{aligned} & \left(8.5 - 2\frac{1}{2} \right) \text{ of } 16.5 - \left[27.4 - \left\{ 10\frac{1}{4} \text{ of } 2.5 - \left(1\frac{1}{2} - 1\frac{1}{5} \right) \right\} \right] \\ &= \left(8.5 - \frac{5}{2} \right) \text{ of } 16.5 - \left[27.4 - \left\{ \frac{41}{4} \text{ of } 2.5 - \left(\frac{3}{2} - \frac{6}{5} \right) \right\} \right] \\ &= 6 \text{ of } 16.5 - \left[27.4 - \left\{ 25.625 - \left(\frac{15-12}{10} \right) \right\} \right] \\ &= 99 - \left[27.4 - \left\{ 25.625 - \frac{3}{10} \right\} \right] \\ &= 99 - [27.4 - 25.325] \\ &= 99 - 2.075 \\ &= 96.925 \end{aligned}$$

18. The value of

$$5\frac{1}{4} + \frac{1}{4} \div \frac{1}{4} \text{ of } \frac{1}{8} - \frac{9}{4} + 1\frac{1}{3} \div 1\frac{1}{4} \text{ of } \left[2\frac{3}{5} - 2\frac{1}{3} \right] \text{ is:}$$

- (a) 12 (b) 10
(c) 15 (d) 5

SSC MTS 14/10/2021 (Shift-I)

Ans. (c) :

$$\begin{aligned} & 5\frac{1}{4} + \frac{1}{4} \div \frac{1}{4} \text{ of } \frac{1}{8} - \frac{9}{4} + 1\frac{1}{3} \div 1\frac{1}{4} \text{ of } \left[2\frac{3}{5} - 2\frac{1}{3} \right] \\ &= \frac{21}{4} + \frac{1}{4} \div \frac{1}{4} \text{ of } \frac{1}{8} - \frac{9}{4} + \frac{4}{3} \div \frac{5}{4} \text{ of } \left[\frac{13}{5} - \frac{7}{3} \right] \\ &= \frac{21}{4} + \frac{1}{4} \div \frac{1}{32} - \frac{9}{4} + \frac{4}{3} \div \frac{5}{4} \text{ of } \left[\frac{39-35}{15} \right] \\ &= \frac{21}{4} + \frac{1}{4} \div \frac{1}{32} - \frac{9}{4} + \frac{4}{3} \div \frac{5}{4} \text{ of } \frac{4}{15} \\ &= \frac{21}{4} + \frac{1}{4} \times \frac{32}{1} - \frac{9}{4} + \frac{4}{3} \times 3 \\ &= \frac{21}{4} + 8 - \frac{9}{4} + 4 \\ &= \frac{21}{4} - \frac{9}{4} + 12 \\ &\Rightarrow \frac{12}{4} + 12 = 15 \end{aligned}$$

19. Simplify $\frac{\left(3 + \frac{3}{2} \div 6\frac{1}{2} \times \frac{1}{3} \right) \text{ of } 4\frac{1}{3}}{\left(-\frac{8}{3} \div 2 \right)}$

- (a) 10 (b) $-\frac{30}{13}$
(c) -10 (d) $\frac{40}{3}$

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) :

$$\begin{aligned} & \frac{\left(3 + \frac{3}{2} \div 6\frac{1}{2} \times \frac{1}{3} \right) \text{ of } 4\frac{1}{3}}{\left(-\frac{8}{3} \div 2 \right)} \\ &= \frac{\left(3 + \frac{3}{2} \div \frac{13}{2} \times \frac{1}{3} \right) \text{ of } \frac{13}{3}}{-\frac{4}{3}} \\ &= \frac{\left(3 + \frac{3}{2} \times \frac{2}{13} \times \frac{1}{3} \right) \text{ of } \frac{13}{3}}{-\frac{4}{3}} \\ &= \frac{\left(3 + \frac{1}{13} \right) \times \frac{13}{3}}{-\frac{4}{3}} \end{aligned}$$

$$\begin{aligned} & \frac{40}{13} \times \frac{13}{3} \\ &= \frac{40}{3} \\ &= -\frac{40}{3} \times \frac{3}{4} = -10 \end{aligned}$$

20. The value of

$$1\frac{4}{11} \div \left\{ \left[\frac{11}{80} \div \frac{3}{4} \left(\frac{1}{4} - \frac{1}{3} \times \frac{1}{5} \right) \div 1\frac{5}{6} \right] + \frac{9}{11} \right\} \text{ is :}$$

- (a) 1 (b) 5
(c) 4 (d) 10

SSC MTS 05/10/2021 (Shift-I)

Ans. (a) :

$$\begin{aligned} & 1\frac{4}{11} \div \left\{ \left[\frac{11}{80} \div \frac{3}{4} \left(\frac{1}{4} - \frac{1}{3} \times \frac{1}{5} \right) \div 1\frac{5}{6} \right] + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \left\{ \left[\frac{11}{80} \div \frac{3}{4} \left(\frac{15-4}{60} \right) \div \frac{11}{6} \right] + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \left\{ \left[\frac{11}{80} \div \frac{3}{4} \times \frac{11}{60} \div \frac{11}{6} \right] + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \left\{ \left[\frac{11}{80} \times \frac{4 \times 60}{3 \times 11} \div \frac{11}{6} \right] + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \left\{ 1 \div \frac{11}{6} + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \left\{ \frac{6}{11} + \frac{9}{11} \right\} \\ &= \frac{15}{11} \div \frac{15}{11} = 1 \end{aligned}$$

21. The value of $\frac{2 - \left(\frac{6}{7} \text{ of } 21 + 5.25 \right)}{\frac{3}{4} \text{ of } (15.8 - 3.4) + 5 \times 2.39}$ is:

- (a) $\frac{11}{5}$ (b) -1
(c) $\frac{17}{5}$ (d) 1

SSC MTS 06/10/2021 (Shift-I)

Ans. (b) :

$$\begin{aligned} & \frac{2 - \left(\frac{6}{7} \text{ of } 21 + 5.25 \right)}{\frac{3}{4} \text{ of } (15.8 - 3.4) + 5 \times 2.39} \\ &= \frac{2 - (18 + 5.25)}{\frac{3}{4} \times (15.8 - 3.4) + 5 \times 2.39} \\ &= \frac{(2 - 23.25)}{\frac{3}{4} \times (15.8 - 3.4) + 11.95} \end{aligned}$$

$$\begin{aligned} &= \frac{2 - 23.25}{\frac{3}{4} \times 12.4 + 11.95} \\ &= \frac{-21.25}{9.3 + 11.95} \\ &= \frac{-21.25}{21.25} = -1 \end{aligned}$$

22. The value of

$$500 \div \frac{3}{8} \text{ of } \frac{2}{3} \div \left[\frac{5}{3} \text{ of } 300 + 7\frac{1}{2} \div 5\frac{1}{2} \times 1100 \right] \text{ is:}$$

- (a) 5 (b) 10
(c) 4 (d) 1

SSC MTS 26/10/2021 (Shift-I)

Ans. (d) : From question,

$$\begin{aligned} & 500 \div \frac{3}{8} \text{ of } \frac{2}{3} \div \left[\frac{5}{3} \text{ of } 300 + 7\frac{1}{2} \div 5\frac{1}{2} \times 1100 \right] \\ &= 500 \div \frac{3}{8} \times \frac{2}{3} \div \left[\frac{5}{3} \times 300 + \frac{15}{2} \div \frac{11}{2} \times 1100 \right] \\ &= 500 \div \frac{1}{4} \div \left[\frac{5}{3} \times 300 + \frac{15}{2} \times \frac{2}{11} \times 1100 \right] \\ &= 500 \times 4 \div \left[500 + \frac{15}{11} \times 1100 \right] \\ &= 2000 \div [500 + 1500] \\ &= 2000 \div 2000 \\ &= 1 \end{aligned}$$

23. What is the simplified value of

$$\left\{ \left[\left(3 - \frac{2}{1 + \frac{1}{4 + \frac{2}{3}}} \right) \text{ of } 1\frac{13}{21} \div 3\frac{2}{7} \right] - \frac{1}{3} \right\} \times \frac{9}{10} = ?$$

(a) 1 (b) 2
(c) $\frac{1}{5}$ (d) $\frac{3}{10}$

SSC MTS 26/10/2021 (Shift-I)

$$\begin{aligned} \text{Ans. (d) : } & \left\{ \left[\left(3 - \frac{2}{1 + \frac{1}{4 + \frac{2}{3}}} \right) \text{ of } 1\frac{13}{21} \div 3\frac{2}{7} \right] - \frac{1}{3} \right\} \times \frac{9}{10} \\ &= \left\{ \left[\left(3 - \frac{2}{1 + \frac{3}{14}} \right) \times \frac{34}{21} \div \frac{23}{7} \right] - \frac{1}{3} \right\} \times \frac{9}{10} \\ &= \left\{ \left[\left(3 - \frac{2 \times 14}{17} \right) \times \frac{34}{21} \times \frac{7}{23} \right] - \frac{1}{3} \right\} \times \frac{9}{10} \end{aligned}$$

$$= \frac{10}{3} \times \frac{3}{2} + \frac{2}{6} \times \frac{3}{2}$$

$$= 5 + \frac{1}{2} = 5\frac{1}{2}$$

29. The value of $25+184 \div [150-\{9 \times 9+(83-4 \times 15)\}]$ is:
 (a) 26 (b) 29
 (c) 28 (d) 27

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : $25+184 \div [150-\{9 \times 9+(83-4 \times 15)\}]$
 $= 25+184 \div [150-\{81+23\}]$
 $= 25+184 \div [150-104]$
 $= 25+184 \times \frac{1}{46}$
 $= 25+4=29$

30. The simplified value of

$$1 \div \frac{3}{7} \text{ of } (6+8 \times 3-2) + \left[\frac{1}{5} \div \frac{7}{25} - \left\{ \frac{3}{7} + \frac{8}{14} \right\} \right]$$

is

$$\frac{18 \div 10 - 4 + 32 \div (4+10 \div 2-1)}{18 \div 10 - 4 + 32 \div (4+10 \div 2-1)}$$

- (a) $-\frac{5}{42}$ (b) $\frac{5}{42}$
 (c) $-\frac{5}{294}$ (d) $\frac{5}{294}$

SSC MTS 27/10/2021 (Shift-I)

Ans. (c) : Given that,

$$1 \div \frac{3}{7} \text{ of } (6+8 \times 3-2) + \left[\frac{1}{5} \div \frac{7}{25} - \left\{ \frac{3}{7} + \frac{8}{14} \right\} \right]$$

$$\frac{18 \div 10 - 4 + 32 \div (4+10 \div 2-1)}{18 \div 10 - 4 + 32 \div (4+10 \div 2-1)}$$

$$= \frac{1 \div \frac{3}{7} \text{ of } (14) + \left[\frac{1}{5} \div \frac{7}{25} - \left\{ \frac{14}{14} \right\} \right]}{18 \div 6 + 32 \div (8)}$$

$$= \frac{\frac{1}{6} + \left[\frac{1}{5} \times \frac{25}{7} - 1 \right]}{3+4}$$

$$= \frac{\frac{1}{6} - \frac{2}{7} - \frac{5}{7}}{7} = \frac{42}{7} = -\frac{5}{294}$$

31. The value of $4\frac{1}{3} + \left[7\frac{2}{3} - \frac{4}{3} \left(\frac{25}{3} - \frac{1}{6} - \frac{2}{3} \right) \right]$ is :

- (a) 5 (b) 8
 (c) 2 (d) 10

SSC MTS 27/10/2021 (Shift-I)

Ans. (c) : $4\frac{1}{3} + \left[7\frac{2}{3} - \frac{4}{3} \left(\frac{25}{3} - \frac{1}{6} - \frac{2}{3} \right) \right]$
 $= \frac{13}{3} + \left[\frac{23}{3} - \frac{4}{3} \times \frac{45}{6} \right]$
 $= \frac{13}{3} + \left[\frac{23}{3} - 10 \right]$

$$= \frac{13}{3} + \left[-\frac{7}{3} \right]$$

$$= \frac{13}{3} - \frac{7}{3}$$

$$= \frac{6}{3} = 2$$

32. The simplified value of

$$\left[\frac{5}{8} - \left\{ \frac{5}{8} - \left(\frac{5}{8} - \frac{3}{8} \right) \right\} \right] \text{ of } 3.6 - 0.8 \div 10 \text{ is:}$$

- (a) 0.88 (b) -0.82
 (c) -0.88 (d) 0.82

SSC MTS 22/10/2021 (Shift-I)

Ans. (d) : $\left[\frac{5}{8} - \left\{ \frac{5}{8} - \left(\frac{5}{8} - \frac{3}{8} \right) \right\} \right] \text{ of } 3.6 - 0.8 \div 10$
 $= \left[\frac{5}{8} - \left\{ \frac{5}{8} - \frac{2}{8} \right\} \right] \text{ of } 3.6 - 0.8 \div 10$
 $= \left[\frac{5}{8} - \frac{3}{8} \right] \text{ of } 3.6 - 0.8 \div 10$
 $= \frac{2}{8} \text{ of } 3.6 - 0.8 \div 10$
 $= \frac{7.2}{8} - 0.8 \div 10$
 $= 0.9 - \frac{0.8}{10}$
 $= 0.9 - 0.08 = 0.82$

33. The value of $0.04 \div 0.002 + 0.5 \times 0.002 \div 0.0004$ is:

- (a) 20 (b) 22.5
 (c) 22 (d) 21.5

SSC MTS 20/10/2021 (Shift-I)

Ans. (b) : $0.04 \div 0.002 + 0.5 \times 0.002 \div 0.0004$
 $= \frac{0.04}{0.002} + 0.5 \times \frac{0.002}{0.0004}$
 $= 20 + 0.5 \times 5$
 $= 20 + 2.5$
 $= 22.5$

34. Simplify the following expression.

$$\frac{135 \div \frac{1}{3} \text{ of } 5 - 2\frac{2}{3} \div 1\frac{1}{3} + 6}{(15^2 + 9 \div 3) - \left(10 - 5 \times \frac{2}{5} \right)}$$

- (a) $\frac{17}{10}$ (b) $\frac{217}{226}$
 (c) $\frac{17}{44}$ (d) $\frac{73}{26}$

SSC MTS 20/10/2021 (Shift-I)

Ans. (c) : $\frac{135 \div \frac{1}{3} \text{ of } 5 - 2\frac{2}{3} \div 1\frac{1}{3} + 6}{(15^2 + 9 \div 3) - \left(10 - 5 \times \frac{2}{5} \right)}$

$$\begin{aligned} &= \frac{135 \times \frac{3}{5} - \frac{8}{3} \times \frac{3}{4} + 6}{225 + 3 - 8} \\ &= \frac{81 - 2 + 6}{220} = \frac{87 - 2}{220} = \frac{85}{220} \\ &= \frac{17}{44} \end{aligned}$$

35. The value of $5 \frac{5}{29} - \left[\frac{15}{4} \div \left\{ \frac{3}{4} \times \left(\frac{3}{2} - \frac{1}{5} - \frac{1}{3} \right) \right\} \right]$ is:
- (a) 5 (b) 1
(c) 0 (d) 10

SSC MTS 12/10/2021 (Shift-I)

Ans. (c) : $5 \frac{5}{29} - \left[\frac{15}{4} \div \left\{ \frac{3}{4} \times \left(\frac{3}{2} - \frac{1}{5} - \frac{1}{3} \right) \right\} \right]$

$$\begin{aligned} &= \frac{150}{29} - \left[\frac{15}{4} \div \left\{ \frac{3}{4} \times \frac{29}{30} \right\} \right] \\ &= \frac{150}{29} - \left[\frac{15}{4} \times \frac{40}{29} \right] \\ &= \frac{150}{29} - \frac{150}{29} \\ &= 0 \end{aligned}$$

36. The value of $90 \div 20$ of $6 \times [11 \div 4$ of $\{3 \times 2 - (3-8)\}] \div (9 \div 3 \times 2)$ is :
- (a) $\frac{9}{8}$ (b) $\frac{3}{8}$
(c) $\frac{1}{36}$ (d) $\frac{1}{32}$

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (d) : From question,

$$\begin{aligned} &90 \div 20 \text{ of } 6 \times [11 \div 4 \text{ of } \{3 \times 2 - (3-8)\}] \div (9 \div 3 \times 2) \\ \Rightarrow &90 \div 120 \times [11 \div 4 \times \{6 + 5\}] \div (3 \times 2) \\ \Rightarrow &\frac{90}{120} \times [11 \div 4 \times 11] \div 6 \\ \Rightarrow &\frac{3}{4} \times [11 \div 44] \div 6 \\ \Rightarrow &\frac{3}{4} \times \frac{1}{4} \times \frac{1}{6}, \quad \Rightarrow \frac{1}{4} \times \frac{1}{4} \times \frac{1}{2} \\ \Rightarrow &\frac{1}{32} \end{aligned}$$

Hence, option (d) is correct answer.

37. The value of $3 \frac{1}{5} \div 4 \frac{1}{2}$ of $5 \frac{1}{3} - \frac{1}{8} \div \frac{1}{2}$ of $\frac{1}{4} + \frac{1}{4} \left(\frac{1}{2} \div \frac{1}{8} \times \frac{1}{4} \right)$ is:
- (a) $-\frac{37}{60}$ (b) $-\frac{17}{60}$
(c) $\frac{17}{60}$ (d) $\frac{37}{60}$

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (a) :

$$\begin{aligned} &3 \frac{1}{5} \div 4 \frac{1}{2} \text{ of } 5 \frac{1}{3} - \frac{1}{8} \div \frac{1}{2} \text{ of } \frac{1}{4} + \frac{1}{4} \left(\frac{1}{2} \div \frac{1}{8} \times \frac{1}{4} \right) \\ &= \frac{16}{5} \div \frac{9}{2} \text{ of } \frac{16}{3} - \frac{1}{8} \div \frac{1}{8} + \frac{1}{4} \left(\frac{1}{2} \times 8 \times \frac{1}{4} \right) \\ &= \frac{16}{5} \times \frac{1}{24} - 1 + \frac{1}{4} \\ &= \frac{2}{15} - \frac{3}{4} \\ &= \frac{8 - 45}{60} = \frac{-37}{60} \end{aligned}$$

38. The value of $32 \div 12$ of $3 \times [5 - (15 - 12) \div 9]$ of $\frac{3}{7} + 4 - 8 \div 2$ of 4 is:
- (a) $3 \frac{1}{3}$ (b) $4 \frac{7}{9}$
(c) $3 \frac{1}{6}$ (d) $1 \frac{7}{9}$

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (b) :

$$\begin{aligned} &32 \div 12 \text{ of } 3 \times [5 - (15 - 12) \div 9] \text{ of } \frac{3}{7} + 4 - 8 \div 2 \text{ of } 4 \\ &= 32 \div 36 \left[5 - 3 \times \frac{1}{9} \right] \text{ of } \frac{3}{7} + 4 - 8 \div 8 \\ &= 32 \div 36 \times \left[5 - \frac{1}{3} \right] \text{ of } \frac{3}{7} + 4 - 1 \\ &= 32 \div 36 \times \frac{14}{7} + 3 \\ &= \frac{8}{9} \times \frac{14}{7} + 3 \\ &= \frac{16}{9} + 3 \\ &= 4 \frac{7}{9} \end{aligned}$$

39. The value of $3 \div 18$ of $3 \times 6 - 22 \times 6 \div 18 - 3 \div 2 + 10 - 3 \div 9$ of 3×9 is :
- (a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $-\frac{1}{3}$ (d) $-\frac{1}{2}$

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (b) : $3 \div 18$ of $3 \times 6 - 22 \times 6 \div 18 - 3 \div 2 + 10 - 3 \div 9$ of 3×9

$$\begin{aligned} &= 3 \div 54 \times 6 - 22 \times 6 \div 18 - 3 \div 2 + 10 - 3 \div 27 \times 9 \\ &= \frac{3}{54} \times 6 - 22 \times \frac{6}{18} - \frac{3}{2} + 10 - \frac{3}{27} \times 9 \\ &= \frac{1}{3} - \frac{22}{3} - \frac{3}{2} + 9 \end{aligned}$$

$$\begin{aligned}
 &= -\frac{21}{3} - \frac{3}{2} + 9 \\
 &= -7 - \frac{3}{2} + 9 \\
 &= \frac{4-3}{2} \\
 &= \frac{1}{2}
 \end{aligned}$$

40. The value of $3\frac{5}{6} + \left[3\frac{2}{3} + \left\{ \frac{15}{4} \left(5\frac{4}{5} \div 14\frac{1}{2} \right) \right\} \right]$ is

equal to :

- (a) 6 (b) 7
(c) 9 (d) 8

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

$$\begin{aligned}
 \text{Ans. (c) : } & 3\frac{5}{6} + \left[3\frac{2}{3} + \left\{ \frac{15}{4} \left(5\frac{4}{5} \div 14\frac{1}{2} \right) \right\} \right] \\
 &= 3\frac{5}{6} + \left[3\frac{2}{3} + \left\{ \frac{15}{4} \left(\frac{29}{5} \div \frac{29}{2} \right) \right\} \right] \\
 &= 3\frac{5}{6} + \left[3\frac{2}{3} + \left\{ \frac{15}{4} \left(\frac{29}{5} \times \frac{2}{29} \right) \right\} \right] \\
 &= \frac{23}{6} + \left[\frac{11}{3} + \left\{ \frac{15}{4} \times \frac{2}{5} \right\} \right] \\
 &= \frac{23}{6} + \left[\frac{11}{3} + \frac{3}{2} \right] = \frac{23}{6} + \left[\frac{22+9}{6} \right] \\
 &= \frac{23}{6} + \frac{31}{6} = \frac{54}{6} = 9
 \end{aligned}$$

41. Simplify the following expression :

$$6 \div 4 \text{ of } 3 - 4 \div 6 \times (13 - 10) - 2 \times 15 \div 6 \times 6$$

- (a) $-27\frac{1}{2}$ (b) $-19\frac{1}{2}$
(c) $-29\frac{14}{17}$ (d) $-31\frac{1}{2}$

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

$$\begin{aligned}
 \text{Ans. (d) } & 6 \div 4 \text{ of } 3 - 4 \div 6 \times (13 - 10) - 2 \times 15 \div 6 \times 6 \\
 &= 6 \div 12 - 4 \div 6 \times 3 - 2 \times \frac{15}{6} \times 6 \\
 &= \frac{6}{12} - \frac{4}{6} \times 3 - 30 \\
 &= \frac{1}{2} - 2 - 30 \\
 &= \frac{1}{2} - 32 \\
 &= -\frac{63}{2} \\
 &= -31\frac{1}{2}
 \end{aligned}$$

42. Simplify the following expression.

$$8 \div 4 \text{ of } 2 - 15 \div 2 \text{ of } 5 - 6 \div 5 \times (-7 + 5) \text{ of } 2$$

- (a) $-\frac{1}{5}$ (b) $31\frac{7}{10}$
(c) $7\frac{3}{10}$ (d) $4\frac{3}{10}$

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (d)

$$\begin{aligned}
 & 8 \div 4 \text{ of } 2 - 15 \div 2 \text{ of } 5 - 6 \div 5 \times (-7 + 5) \text{ of } 2 \\
 &= 8 \div 8 - 15 \div 10 - 6 \div 5 \times (-4) \\
 &= 1 - \frac{15}{10} - \frac{6}{5} \times (-4) \\
 &= 1 - \frac{3}{2} + \frac{24}{5} \\
 &= \frac{10-15+48}{10} \\
 &= \frac{43}{10} \\
 &= 4\frac{3}{10}
 \end{aligned}$$

43. The value of $\frac{52-1170 \div 26+13 \times 2}{2+1\frac{1}{8} \text{ of } 2-1\frac{1}{4}}$ is:

- (a) 12 (b) 41
(c) 27 (d) 11

SSC CGL (Tier-I) 16/08/2021 (Shift I)

$$\begin{aligned}
 \text{Ans. (d) : } & \frac{52-1170 \div 26+13 \times 2}{2+1\frac{1}{8} \text{ of } 2-1\frac{1}{4}} \\
 &= \frac{52-45+26}{2+\frac{9}{8} \times 2 - \frac{5}{4}} \\
 &= \frac{33}{3} \\
 &= 11
 \end{aligned}$$

44. The value of $20 \div 5 \text{ of } 8 \times [9 \div 6 \times (6-3)] - (10 \div 2 \text{ of } 20)$ is :

- (a) 1 (b) 2
(c) 0 (d) 6

SSC CGL-(Tier-I) 13/08/2021 (Shift I)

$$\begin{aligned}
 \text{Ans. (b) : } & 20 \div 5 \text{ of } 8 \times [9 \div 6 \times (6-3)] - (10 \div 2 \text{ of } 20) \\
 &= \frac{20}{5 \times 8} \times \left[\frac{9}{6} \times 3 \right] - \left(\frac{10}{2 \times 20} \right) \\
 &= \frac{1}{2} \times \frac{9}{2} - \frac{1}{4} \\
 &= \frac{9}{4} - \frac{1}{4} \\
 &= \frac{8}{4} \\
 &= 2
 \end{aligned}$$

45. The value of $6 \times 3 \div 8$ of $6 - 6 \div 4 \times (5 - 7) + 5 - 3 \times 4 \div 6$ of 3 is:

- (a) $7\frac{17}{24}$ (b) $4\frac{1}{3}$
 (c) $5\frac{5}{8}$ (d) $5\frac{11}{24}$

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : $6 \times 3 \div 8$ of $6 - 6 \div 4 \times (5 - 7) + 5 - 3 \times 4 \div 6$ of 3
 $= 6 \times 3 \div 8 \times 6 - 6 \div 4 \times (-2) + 5 - 3 \times 4 \div 6 \times 3$
 $= 6 \times 3 \div 48 - 6 \div 4 (-2) + 5 - 3 \times 4 \div 18$
 $= 6 \times \frac{3}{48} + \frac{6}{4} \times 2 + 5 - \frac{2}{3}$
 $= \frac{3}{8} + 3 + 5 - \frac{2}{3}$
 $= \frac{3}{8} - \frac{2}{3} + 8$
 $= \frac{9 - 16 + 192}{24}$
 $= \frac{201 - 16}{24}$
 $= \frac{185}{24} = 7\frac{17}{24}$

46. $16\frac{1}{4} \div \left[2\frac{1}{6} + \left\{ 4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4} \right) \right\} \right]$ is equal to:

- (a) 6 (b) 4
 (c) 5 (d) 3

SSC CHSL 10/08/2021 (Shift-I)

Ans. (c) : $16\frac{1}{4} \div \left[2\frac{1}{6} + \left\{ 4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4} \right) \right\} \right]$
 $= \frac{65}{4} \div \left[\frac{13}{6} + \left\{ \frac{13}{3} - \left(\frac{5}{2} + \frac{3}{4} \right) \right\} \right]$
 $= \frac{65}{4} \div \left[\frac{13}{6} + \left\{ \frac{13}{3} - \frac{13}{4} \right\} \right]$
 $= \frac{65}{4} \div \left[\frac{13}{6} + \frac{13}{12} \right]$
 $= \frac{65}{4} \div \frac{39}{12}$
 $= \frac{65}{4} \times \frac{12}{39} = 5$

47. Simplify the following expression.

$\frac{3}{5} + 2\frac{2}{5} \div \left[\left(\frac{7}{8} - \frac{3}{4} \right) \times 4 - 6\frac{2}{3} \div \frac{4}{3} \right] \times \frac{1}{3}$

(a) $\frac{19}{45}$ (b) $-\frac{2}{9}$
 (c) $-\frac{13}{5}$ (d) $\frac{17}{15}$

SSC CHSL 06/08/2021 (Shift-I)

Ans. (a) : $\frac{3}{5} + 2\frac{2}{5} \div \left[\left(\frac{7}{8} - \frac{3}{4} \right) \times 4 - 6\frac{2}{3} \div \frac{4}{3} \right] \times \frac{1}{3}$
 $= \frac{3}{5} + \frac{12}{5} \div \left[\frac{1}{8} \times 4 - \frac{20}{3} \div \frac{4}{3} \right] \times \frac{1}{3}$
 $= \frac{3}{5} + \frac{12}{5} \div \left[\frac{1}{2} - 5 \right] \times \frac{1}{3}$
 $= \frac{3}{5} + \frac{12}{5} \times \left(-\frac{2}{9} \right) \times \frac{1}{3}$
 $= \frac{3}{5} - \frac{8}{45} = \frac{19}{45}$

48. The value of

$\left(2\frac{1}{2} \div 1\frac{7}{8} \right) \div \left(9\frac{4}{9} \div 11\frac{1}{3} \text{ of } \frac{1}{8} \right) \text{ of } \frac{4}{3} \times 5\frac{1}{3} - \frac{9}{8} \div \frac{3}{4}$ is

(a) $-\frac{4}{5}$ (b) $-\frac{7}{10}$
 (c) $\frac{1}{5}$ (d) $\frac{23}{10}$

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Ans : (b)

$\left(2\frac{1}{2} \div 1\frac{7}{8} \right) \div \left(9\frac{4}{9} \div 11\frac{1}{3} \text{ of } \frac{1}{8} \right) \text{ of } \frac{4}{3} \times 5\frac{1}{3} - \frac{9}{8} \div \frac{3}{4}$
 $= \left(\frac{5}{2} \times \frac{8}{15} \right) \div \left(\frac{85}{9} \div \frac{34}{3} \times \frac{1}{8} \right) \text{ of } \frac{4}{3} \times \frac{16}{3} - \frac{9}{8} \times \frac{4}{3}$
 $= \frac{4}{3} \div \left(\frac{85}{9} \times \frac{12}{17} \right) \text{ of } \frac{4}{3} \times \frac{16}{3} - \frac{3}{2}$
 $= \frac{4}{3} \div \left(\frac{80}{9} \right) \times \frac{16}{3} - \frac{3}{2}$
 $= \frac{4}{3} \times \frac{9}{80} \times \frac{16}{3} - \frac{3}{2}$
 $= \frac{4}{5} - \frac{3}{2}$
 $= \frac{8 - 15}{10} = -\frac{7}{10}$

49. The value of $\left[\left\{ (232 \div 29 \text{ of } 2) + 77 \times 10 \right\} \div 18 \right] - \frac{18 \times 8 \div 4 \text{ of } 3 - 4}{2}$ is:

- $2 \times (8 - 6) + 1 - 2 \times 3 \div 4 \text{ of } \frac{1}{2}$
- (a) 39 (b) 44
 (c) 33 (d) 47

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) : $\left[\left\{ (232 \div 29 \text{ of } 2) + 77 \times 10 \right\} \div 18 \right] - \frac{18 \times 8 \div 4 \text{ of } 3 - 4}{2}$
 $2 \times (8 - 6) + 1 - 2 \times 3 \div 4 \text{ of } \frac{1}{2}$
 $= \left[\left\{ \left(\frac{232}{58} \right) + 770 \right\} \div 18 \right] - \frac{\frac{18 \times 8}{4 \times 3} - 4}{2 \times 2 + 1 - 2 \times 3 \div \left(4 \times \frac{1}{2} \right)}$

$$= \left[\{4 + 770\} \div 18 \right] - \frac{12 - 4}{4 + 1 - \frac{2 \times 3}{2}}$$

$$= \left[\frac{774}{18} \right] - \frac{8}{2} = 43 - 4 = 39$$

50. The value of $\frac{87 + \frac{2}{5} \text{ of } 115}{25 - \frac{2}{3} \times \{45 \text{ of } 2 \div (19 - 4)\}}$ is:

- (a) $-4\frac{17}{29}$ (b) $6\frac{1}{3}$
 (c) $-6\frac{1}{3}$ (d) $4\frac{17}{29}$

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) :
$$\frac{87 + \frac{2}{5} \text{ of } 115}{25 - \frac{2}{3} \times \{45 \text{ of } 2 \div (19 - 4)\}}$$

$$= \frac{87 + 46}{25 - \frac{2}{3} \times (90 \div 15)}$$

$$= \frac{133}{25 - 4} = \frac{133}{21} = \frac{19}{3} = 6\frac{1}{3}$$

51. Simplify the following expression.

$$13\frac{7}{9} \div \frac{2}{3} \text{ of } \frac{1}{3} + \frac{2}{3} \times 3$$

$$\frac{7}{5} \text{ of } 325 - 20 + 7$$

- (a) $\frac{32}{221}$ (b) $\frac{33}{217}$
 (c) $\frac{31}{2210}$ (d) $\frac{40}{1989}$

SSC CHSL 12/08/2021 (Shift-I)

Ans. (a) :
$$\frac{13\frac{7}{9} \div \frac{2}{3} \text{ of } \frac{1}{3} + \frac{2}{3} \times 3}{\frac{7}{5} \text{ of } 325 - 20 + 7} = \frac{\frac{124}{9} \times \frac{9}{2} + 2}{7 \times 65 - 20 + 7}$$

$$= \frac{\frac{124}{9} + 2}{455 - 13} = \frac{\frac{128}{9}}{442}$$

$$= \frac{64}{442} = \frac{32}{221}$$

52. The value of

$$\left(1\frac{1}{8} \div \frac{3}{4}\right) \div \left[\left(\frac{1}{2} \text{ of } 1\frac{1}{2}\right) \div \left(3\frac{1}{2} - 1\frac{1}{4}\right) \text{ of } \frac{3}{4} - \frac{3}{4} \div 2\frac{1}{4}\right] \text{ of } \frac{3}{4}$$

is:

- (a) 9 (b) 18
 (c) 12 (d) 6

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Ans. (b) :

$$\left(1\frac{1}{8} \div \frac{3}{4}\right) \div \left[\left(\frac{1}{2} \text{ of } 1\frac{1}{2}\right) \div \left(3\frac{1}{2} - 1\frac{1}{4}\right) \text{ of } \frac{3}{4} - \frac{3}{4} \div 2\frac{1}{4}\right] \text{ of } \frac{3}{4}$$

$$= \left(\frac{9}{8} \div \frac{3}{4}\right) \div \left[\frac{3}{4} \div \frac{9}{4} \text{ of } \frac{3}{4} - \frac{3}{4} \div \frac{9}{4}\right] \text{ of } \frac{3}{4}$$

$$= \frac{3}{2} \div \left[\frac{4}{9} - \frac{1}{3}\right] \text{ of } \frac{3}{4}$$

$$= \frac{3}{2} \div \frac{1}{9} \text{ of } \frac{3}{4}$$

$$= \frac{3}{2} \div \frac{1}{12} = 18$$

53. The value of

$$4 \times 3 \div 2 \text{ of } 3 \times 2 \div (4 + 5 \times 4 \div 4 \text{ of } 5 - 4 \div 4 \times 4) \text{ is:}$$

- (a) 4 (b) 3
 (c) 6 (d) 2

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Ans. (a) : $4 \times 3 \div 2 \text{ of } 3 \times 2 \div (4 + 5 \times 4 \div 4 \text{ of } 5 - 4 \div 4 \times 4)$

$$= 4 \times 3 \div 6 \times 2 \div (4 + 5 \times 4 \div 20 - 4 \div 4 \times 4)$$

$$= 4 \times \frac{1}{2} \times 2 \div (4 + 5 \times 4 \div 20 - 4 \div 4 \times 4)$$

$$= 4 \times 1 \div (5 - 4) = 4 \div 1$$

$$= 4$$

54. The value of

$$31\frac{2}{5} \div \left[168 \div \frac{3}{7} \text{ of } 28 + \left(33 \div \frac{5}{2}\right) + \left(7\frac{3}{5} - 3\frac{2}{5}\right)\right] \text{ is:}$$

- (a) 10 (b) 3
 (c) 1 (d) 5

SSC CHSL 04/08/2021 (Shift-II)

Ans. (c) :

$$31\frac{2}{5} \div \left[168 \div \frac{3}{7} \text{ of } 28 + \left(33 \div \frac{5}{2}\right) + \left(7\frac{3}{5} - 3\frac{2}{5}\right)\right]$$

$$\frac{157}{5} \div \left[168 \div \frac{3}{7} \times 28 + 33 \times \frac{2}{5} + \frac{38}{5} - \frac{17}{5}\right]$$

$$\frac{157}{5} \div \left[168 \div 12 + \frac{87}{5}\right] = \frac{157}{5} \div \left[14 + \frac{87}{5}\right]$$

$$\frac{157}{5} \times \frac{5}{157} = 1$$

55. The value of $\frac{284}{5} \div \left[\left(\frac{4}{5}\right) \times (15 + 35) - 11\frac{3}{5}\right]$ is:

- (a) 1 (b) 0
 (c) 3 (d) 2

SSC CHSL 10/08/2021 (Shift-II)

Ans. (d) : $\frac{284}{5} \div \left[\left(\frac{4}{5}\right) \times (15 + 35) - 11\frac{3}{5}\right]$

$$\Rightarrow \frac{284}{5} \div \left[\frac{4}{5} \times 50 - \frac{58}{5}\right]$$

$$\begin{aligned} &\Rightarrow \frac{284}{5} \div \left[40 - \frac{58}{5} \right] \\ &= \frac{284}{5} \div \left[\frac{200 - 58}{5} \right] \\ &= \frac{284}{5} \div \frac{142}{5} \\ &= \frac{284}{5} \times \frac{5}{142} \\ &= 2 \end{aligned}$$

56. The value of

$$441 \div \left[270 \div \frac{3}{7} \text{ of } 35 + \left(17 \div \frac{1}{3} \right) - \left(8 \frac{1}{2} - \frac{5}{2} \right) \right] \text{ is:}$$

- (a) 21 (b) 11
(c) 14 (d) 7

SSC CHSL 11/08/2021 (Shift-II)

Ans. (d) :

$$\begin{aligned} &441 \div \left[270 \div \frac{3}{7} \text{ of } 35 + \left(17 \div \frac{1}{3} \right) - \left(8 \frac{1}{2} - \frac{5}{2} \right) \right] \\ &= 441 \div \left[270 \div \frac{3}{7} \times 35 + (17 \times 3) - \left(\frac{17}{2} - \frac{5}{2} \right) \right] \\ &= 441 \div \left[270 \div 15 + 51 - \frac{12}{2} \right] \\ &= 441 \div [18 + 51 - 6] \\ &= 441 \div 63 \\ &= 7 \end{aligned}$$

57. Simplify the following expression.

$$3 \frac{2}{3} - 5 \frac{7}{9} \div \frac{1}{3} \times 1 \frac{2}{13}$$

$$\frac{2}{3} \text{ of } 1 \frac{1}{3} \div \frac{1}{3}$$

- (a) $-2 \frac{77}{104}$ (b) $-29 \frac{2}{5}$
(c) $-6 \frac{1}{8}$ (d) $-14 \frac{1}{4}$

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Ans. (c) :

$$\begin{aligned} &3 \frac{2}{3} - 5 \frac{7}{9} \div \frac{1}{3} \times 1 \frac{2}{13} \\ &\frac{2}{3} \text{ of } 1 \frac{1}{3} \div \frac{1}{3} \\ &= \frac{11}{3} - \frac{52}{9} \div \frac{1}{3} \times \frac{15}{13} \\ &= \frac{2}{3} \times \frac{4}{3} \div \frac{1}{3} \\ &= \frac{11}{3} - \frac{52}{9} \times \frac{3}{1} \times \frac{15}{13} \\ &= \frac{2}{3} \times \frac{4}{3} \times \frac{3}{1} \end{aligned}$$

$$\begin{aligned} &= \frac{11}{3} - 20 \\ &= \frac{8}{3} \\ &= \frac{11 - 60}{3} \times \frac{3}{8} \\ &= -\frac{49}{3} \times \frac{3}{8} \\ &= -\frac{49}{8} \\ &= -6 \frac{1}{8} \end{aligned}$$

58. The value of $8 \div 2$ of $3 - [56 \div 4$ of $\{4 \times 3 - (9 - 11) \div (2 \div 4$ of $4)\}$ is:

- (a) $\frac{11}{6}$ (b) $\frac{5}{6}$
(c) $\frac{4}{3}$ (d) $\frac{1}{2}$

SSC CHSL 04/08/2021 (Shift-III)

Ans. (b) : $8 \div 2$ of $3 - [56 \div 4$ of $\{4 \times 3 - (9 - 11) \div (2 \div 4$ of $4)\}$

$$\begin{aligned} &= 8 \div 6 - [56 \div 4 \text{ of } \{12 + 2 \times 8\}] \\ &= 8 \div 6 - [56 \div 4 \text{ of } 28] \\ &= \frac{8}{6} - \frac{56}{4 \times 28} \\ &= \frac{4}{3} - \frac{1}{2} \\ &= \frac{5}{6} \end{aligned}$$

59. The value of

$$18 \frac{2}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{3}{11} \times \left(5 \frac{1}{6} - 3 \frac{1}{3} \right) \right\} \right] \text{ is:}$$

- (a) 4 (b) 5
(c) 2 (d) 8

SSC CHSL 05/08/2021 (Shift-III)

$$\text{Ans. (a) : } 18 \frac{2}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{3}{11} \times \left(5 \frac{1}{6} - 3 \frac{1}{3} \right) \right\} \right]$$

$$\begin{aligned} &= \frac{200}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{3}{11} \times \left(\frac{31}{6} - \frac{10}{3} \right) \right\} \right] \\ &= \frac{200}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{3}{11} \times \left(\frac{31 - 20}{6} \right) \right\} \right] \\ &= \frac{200}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{3}{11} \times \frac{11}{6} \right\} \right] \\ &= \frac{200}{11} \div \left[\frac{7}{33} + \left\{ \frac{29}{6} - \frac{1}{2} \right\} \right] \end{aligned}$$

$$\begin{aligned}
&= \frac{200}{11} \div \left[\frac{7}{33} + \left\{ \frac{29-3}{6} \right\} \right] \\
&= \frac{200}{11} \div \left[\frac{7}{33} + \frac{26}{6} \right] \\
&= \frac{200}{11} \div \left[\frac{7}{33} + \frac{13}{3} \right] = \frac{200}{11} \div \left[\frac{7+143}{33} \right] \\
&= \frac{200}{11} \times \frac{33}{150} = 4
\end{aligned}$$

60. The value of $(86 \div 20) - \frac{13}{8}$ of $\left(\frac{1}{3} - \frac{2}{13}\right) +$

$$\left(\frac{1}{8} \div \frac{3}{7}\right) + \left(2 - \frac{3}{10}\right) \text{ is:}$$

- (a) 10 (b) 1
(c) 5 (d) 6

SSC CHSL 19/04/2021 (Shift-III)

Ans. (d) :

$$\begin{aligned}
&(86 \div 20) - \frac{13}{8} \text{ of } \left(\frac{1}{3} - \frac{2}{13}\right) + \left(\frac{1}{8} \div \frac{3}{7}\right) + \left(2 - \frac{3}{10}\right) \\
&= \frac{86}{20} - \frac{13}{8} \times \left(\frac{13-6}{39}\right) + \left(\frac{1}{8} \times \frac{7}{3}\right) + \left(\frac{20-3}{10}\right) \\
&= \frac{43}{10} - \frac{13}{8} \times \frac{7}{39} + \frac{7}{24} + \frac{17}{10} \\
&= \frac{43}{10} - \frac{7}{24} + \frac{7}{24} + \frac{17}{10} \\
&= \frac{43}{10} + \frac{17}{10} = \frac{60}{10} = 6
\end{aligned}$$

61. The value of

$$7 \frac{4}{13} \div \frac{5}{26} \text{ of } \left(4 \frac{3}{5} + 7 \frac{2}{5}\right) + \left(7 \frac{1}{6} - 2 \frac{1}{3}\right) \text{ is:}$$

- (a) 6 (b) 5
(c) 4 (d) 8

SSC CHSL 12/04/2021 (Shift-III)

$$\begin{aligned}
\text{Ans : (d) } &7 \frac{4}{13} \div \frac{5}{26} \text{ of } \left(4 \frac{3}{5} + 7 \frac{2}{5}\right) + \left(7 \frac{1}{6} - 2 \frac{1}{3}\right) \\
&= \frac{95}{13} \div \frac{5}{26} \text{ of } \left(\frac{23}{5} + \frac{37}{5}\right) + \left(\frac{43}{6} - \frac{7}{3}\right) \\
&= \frac{95}{13} \div \frac{5}{26} \text{ of } \frac{60}{5} + \left(\frac{43-14}{6}\right) \\
&= \frac{95}{13} \div \frac{30}{13} + \frac{29}{6} = \frac{95}{13} \times \frac{13}{30} + \frac{29}{6} \\
&= \frac{19}{6} + \frac{29}{6} \\
&= \frac{48}{6} \\
&= 8
\end{aligned}$$

62. The value of

$$61 \frac{3}{5} \div \left[40 \div 2 \text{ of } 5 + 27 \div \frac{1}{3} - \left(78 \div 3 \frac{1}{3}\right) \right] \text{ is:}$$

- (a) -5 (b) $\frac{11}{25}$
(c) 1 (d) $\frac{41}{25}$

SSC CHSL 05/08/2021 (Shift-II)

$$\text{Ans. (c) : } 61 \frac{3}{5} \div \left[40 \div 2 \text{ of } 5 + 27 \div \frac{1}{3} - \left(78 \div 3 \frac{1}{3}\right) \right]$$

$$= \frac{308}{5} \div \left[40 \div 2 \text{ of } 5 + 27 \times \frac{3}{1} - \left(78 \div \frac{10}{3}\right) \right]$$

$$= \frac{308}{5} \div \left[40 \div 10 + 81 - \left(78 \times \frac{3}{10}\right) \right]$$

$$= \frac{308}{5} \div \left[4 + 81 - \left\{ \frac{117}{5} \right\} \right]$$

$$= \frac{308}{5} \div \left[85 - \frac{117}{5} \right]$$

$$= \frac{308}{5} \div \left[\frac{425-117}{5} \right]$$

$$= \frac{308}{5} \div \frac{308}{5}$$

$$= \frac{308}{5} \times \frac{5}{308}$$

$$= 1$$

63. The value of $18 \div 6$ of $9 \times [12 \div 3$ of $\{16 \times 2 \div (11 - 8)\}$ of $(4 \div 2$ of $8)$ is:

- (a) $\frac{9}{16}$ (b) $\frac{3}{8}$
(c) $\frac{81}{32}$ (d) $\frac{1}{32}$

SSC CHSL 19/08/2021 (Shift-II)

Ans. (d) :

$$18 \div 6 \text{ of } 9 \times [12 \div 3 \text{ of } \{16 \times 2 \div (11 - 8)\}] \text{ of } (4 \div 2 \text{ of } 8)$$

$$= 18 \div 6 \text{ of } 9 \times [12 \div 3 \text{ of } \{16 \times 2 \div 3\}] \text{ of } (4 \div 2 \text{ of } 8)$$

$$= 18 \div 54 \times [12 \div 3 \text{ of } \left\{ 16 \times \frac{2}{3} \right\}] \text{ of } \left(\frac{4}{16} \right)$$

$$= 18 \div 54 \times [12 \div 3 \text{ of } \frac{32}{3}] \text{ of } \frac{1}{4}$$

$$= \frac{18}{54} \times \frac{12}{32} \times \frac{1}{4}$$

$$= \frac{1}{32}$$

64. The value of

$$364 - \left[142 - \left\{ 75 + \left(38 - \frac{5}{4} + \frac{14}{8} \right) \right\} \right]$$

- (a) 331 (b) 334
(c) 332 (d) 330

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : $364 - \left[142 - \left\{ 75 + \left(38 - \frac{5}{4} + \frac{14}{8} \right) \right\} \right]$

$$= 364 - \left[142 - \left\{ 75 + \left(38 - \frac{10+14}{8} \right) \right\} \right]$$

$$= 364 - \left[142 - \left\{ 75 + \left(38 - \frac{24}{8} \right) \right\} \right]$$

$$= 364 - [142 - \{75 + (38 - 3)\}]$$

$$= 364 - [142 - \{75 + 35\}]$$

$$= 364 - [142 - 110]$$

$$= 364 - 32$$

$$= 332$$

65. The value of $28 \div [25 + 8 \div 4 - \{25 + (25 \text{ of } 8 \div 20) - (125 \div 5 \text{ of } 25)\}] + (25 \times 5)$ is:

- (a) 129 (b) -121
(c) -4 (d) 121

SSC CHSL 09/08/2021 (Shift-III)

Ans. (d) :

$$28 \div [25 + 8 \div 4 - \{25 + (25 \text{ of } 8 \div 20) - (125 \div 5 \text{ of } 25)\}] + (25 \times 5)$$

$$= 28 \div [25 + 2 - \{25 + (25 \times 8 \div 20) - (125 \div 5 \times 25)\}] + (25 \times 5)$$

$$= 28 \div [25 + 2 - \{25 + (25 \times \frac{8}{20}) - (125 \div 125)\}] + 125$$

$$= 28 \div [25 + 2 - \{25 + (10) - 1\}] + 125$$

$$= 28 \div [25 + 2 - \{25 + 10 - 1\}] + 125$$

$$= 28 \div [25 + 2 - 34] + 125$$

$$= 28 \div (-7) + 125$$

$$= -4 + 125$$

$$= 121$$

66. Simplify the following expression.

$$\frac{52 + 1170 \div 26 + 13 \times 2}{2 + 1\frac{1}{8} \text{ of } 2 - 1\frac{1}{4}}$$

- (a) $61\frac{1}{2}$ (b) $24\frac{5}{6}$

- (c) $37\frac{1}{3}$ (d) 41

SSC CHSL 09/08/2021 (Shift-II)

Ans. (d) : $\frac{52 + 1170 \div 26 + 13 \times 2}{2 + 1\frac{1}{8} \text{ of } 2 - 1\frac{1}{4}}$

$$= \frac{52 + 45 + 26}{2 + \frac{9}{8} \times 2 - \frac{5}{4}}$$

$$= \frac{123}{2 + \frac{9}{4} - \frac{5}{4}}$$

$$= \frac{123}{2 + \frac{4}{4}}$$

$$= \frac{123}{2 + 1}$$

$$= \frac{123}{3}$$

$$= 41$$

67. The value of $56 \div [12 + 9 \div 3 - \{8 + (18 \text{ of } 2 \div 9) - (40 \div 5 \text{ of } 2)\}] + \frac{27 + \frac{2}{5} \text{ of } 75}{5 + \frac{2}{3} \times (58 - 37)}$ is:

$$(40 \div 5 \text{ of } 2)\} + \frac{27 + \frac{2}{5} \text{ of } 75}{5 + \frac{2}{3} \times (58 - 37)}$$

- (a) 8 (b) 11
(c) -11 (d) -8

SSC CHSL 12/08/2021 (Shift-II)

Ans. (b) :

$$56 \div [12 + 9 \div 3 - \{8 + (18 \text{ of } 2 \div 9) - (40 \div 5 \text{ of } 2)\}] + \frac{27 + \frac{2}{5} \text{ of } 75}{5 + \frac{2}{3} \times (58 - 37)}$$

$$= 56 \div [12 + 3 - \{8 + (18 \text{ of } 2 \div 9) - (40 \div 5 \text{ of } 2)\}] + \frac{27 + \frac{2}{5} \times 75}{5 + \frac{2}{3} \times 21}$$

$$= 56 \div [12 + 3 - \{8 + (36 \div 9) - (40 \div 10)\}] + \frac{27 + 2 \times 15}{5 + 2 \times 7}$$

$$= 56 \div [12 + 3 - \{8 + 4 - 4\}] + \frac{27 + 30}{5 + 14}$$

$$= 56 \div [12 + 3 - 8] + \frac{57}{19}$$

$$= 56 \div 7 + 3$$

$$= 8 + 3$$

$$= 11$$

68. What is the value of:

$$\left[\frac{1}{9} \div \frac{1}{9} \text{ of } \frac{1}{9} \right] \times \frac{1}{9}$$

$$\frac{1}{9} + \frac{1}{9} \text{ of } \frac{1}{9}$$

(a) $8\frac{1}{81}$
 (c) $9\frac{1}{10}$

(b) $8\frac{1}{10}$
 (d) $9\frac{1}{81}$

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b) $\frac{\left[\frac{1}{9} \div \frac{1}{9} \text{ of } \frac{1}{9}\right] \times \frac{1}{9}}{\frac{1}{9} + \frac{1}{9} \text{ of } \frac{1}{9}}$

$$= \frac{\left[\frac{1}{9} \div \frac{1}{9} \times \frac{1}{9}\right] \times \frac{1}{9}}{\frac{1}{9} + \frac{1}{9} \times \frac{1}{9}}$$

$$= \frac{\left[\frac{1}{9} \div \frac{1}{81}\right] \times \frac{1}{9}}{\frac{1}{9} + \frac{1}{81}}$$

$$= \frac{\left[\frac{1}{9} \times 81\right] \times \frac{1}{9}}{\frac{9+1}{81}}$$

$$= \frac{9 \times \frac{1}{9}}{\frac{10}{81}}$$

$$= \frac{1}{\frac{10}{81}}$$

$$= \frac{81}{10}$$

$$= 8\frac{1}{10}$$

69. The value of

$\frac{96 \div 16 \text{ of } 2 - 128 \times 2 \div 32 + 15 \text{ of } 4}{\frac{5}{6} \text{ of } \frac{2}{3} \left(\frac{1}{3} - \frac{1}{4} + \frac{1}{6}\right)}$ is:

- (a) 396
 (b) $\frac{55}{36}$
 (c) $-\frac{5}{36}$
 (d) 216

SSC CHSL 13/04/2021 (Shift-II)

Ans. (a) : $\frac{96 \div 16 \text{ of } 2 - 128 \times 2 \div 32 + 15 \text{ of } 4}{\frac{5}{6} \text{ of } \frac{2}{3} \left(\frac{1}{3} - \frac{1}{4} + \frac{1}{6}\right)}$

$$= \frac{96 \div 32 - 128 \times \frac{1}{16} + 60}{\frac{5}{9} \left(\frac{4-3+2}{12}\right)}$$

$$= \frac{3-8+60}{\frac{5}{9} \times \left(\frac{3}{12}\right)}$$

$$= \frac{63-8}{\frac{5}{36}}$$

$$= \frac{55 \times 36}{5}$$

$$= 11 \times 36$$

$$= 396$$

70. Simplify the expression

$45 - [36 - \{29 - (25 - \overline{7+4})\}]$.

- (a) 22
 (b) 26
 (c) 24
 (d) 28

SSC CHSL 15/04/2021 (Shift-III)

Ans.(c) : $45 - [36 - \{29 - (25 - \overline{7+4})\}]$

$$= 45 - [36 - \{29 - (25 - 11)\}]$$

$$= 45 - [36 - \{29 - 14\}]$$

$$= 45 - [36 - 15]$$

$$= 45 - 21$$

$$= 24$$

71. Simplify the following expression.

$5\frac{1}{3} \div [7 - 3 \div (1 - \frac{1}{4}) \times \frac{2}{3} + 1] - 3 \div 1 + 2$

- (a) 0
 (b) -4
 (c) $\frac{7}{14}$
 (d) 15

SSC CHSL 12/08/2021 (Shift-III)

Ans. (a) : $5\frac{1}{3} \div [7 - 3 \div (1 - \frac{1}{4}) \times \frac{2}{3} + 1] - 3 \div 1 + 2$

$$= \frac{16}{3} \div [7 - 3 \div \frac{3}{4} \times \frac{2}{3} + 1] - \frac{3}{1} + 2$$

$$= \frac{16}{3} \div [7 - 3 \times \frac{4}{3} \times \frac{2}{3} + 1] - 3 + 2$$

$$= \frac{16}{3} \div [7 - \frac{8}{3} + 1] - 1$$

$$= \frac{16}{3} \div [8 - \frac{8}{3}] - 1$$

$$= \frac{16}{3} \div \left[\frac{24-8}{3}\right] - 1$$

$$= \frac{16}{3} \div \frac{16}{3} - 1$$

$$= 1 - 1$$

$$= 0$$

72. Simplify the following expression.

$$\left(3\frac{2}{3}\text{ of } \frac{3}{4} - \frac{1}{4}\text{ of } \frac{4}{3}\right) \div \left(\frac{1}{4} \div \frac{3}{2}\right) + 1\frac{1}{2}$$

(a) $\frac{143}{18}$ (b) $\frac{32}{3}$
(c) $\frac{29}{2}$ (d) 16

SSC CHSL 16/04/2021 (Shift-III)

Ans.(d) :

$$\begin{aligned} & \left(3\frac{2}{3}\text{ of } \frac{3}{4} - \frac{1}{4}\text{ of } \frac{4}{3}\right) \div \left(\frac{1}{4} \div \frac{3}{2}\right) + 1\frac{1}{2} \\ & = \left(\frac{11}{3}\text{ of } \frac{3}{4} - \frac{1}{4} \times \frac{4}{3}\right) \div \left(\frac{1}{4} \times \frac{2}{3}\right) + \frac{3}{2} \\ & = \left(\frac{11}{3} \times \frac{3}{4} - \frac{1}{3}\right) \div \left(\frac{1}{6}\right) + \frac{3}{2} \\ & = \left(\frac{11}{4} - \frac{1}{3}\right) \times \frac{6}{1} + \frac{3}{2} \\ & = \frac{33-4}{12} \times \frac{6}{1} + \frac{3}{2} \\ & = \frac{29}{12} \times 6 + \frac{3}{2} \\ & = \frac{29}{2} + \frac{3}{2} \\ & = \frac{32}{2} = 16 \end{aligned}$$

73. The value of $16 + [0.2 \div 0.004 + 5.2 \text{ of } 2 \div (0.7 \times 2 + 0.84 \div 0.7)]$ is :

- (a) 75 (b) 65
(c) 60 (d) 70

SSC MTS 02/11/2021 (Shift-I)

Ans. (d) :

$$\begin{aligned} & 16 + [0.2 \div 0.004 + 5.2 \text{ of } 2 \div (0.7 \times 2 + 0.84 \div 0.7)] \\ & \Rightarrow 16 + [0.2 \div 0.004 + 10.4 \div (1.4 + 1.2)] \\ & \Rightarrow 16 + [0.2 \div 0.004 + 10.4 \div 2.6] \\ & \Rightarrow 16 + \left[\frac{0.2}{0.004} + \frac{10.4}{2.6}\right] \\ & \Rightarrow 16 + [50 + 4] \\ & \Rightarrow 16 + 54 = 70 \end{aligned}$$

74. What is the value of the following expression?

$$108 \div 18 \times 3 - 64 \times 2 \div 32 + 80 \div 5 \text{ of } 4$$

- (a) 78 (b) 62
(c) 2 (d) 18

SSC MTS 02/11/2021 (Shift-I)

Ans. (d) : $108 \div 18 \times 3 - 64 \times 2 \div 32 + 80 \div 5 \text{ of } 4$

$$\begin{aligned} & \Rightarrow \frac{108}{18} \times 3 - 64 \times \frac{2}{32} + \frac{80}{5} \\ & \Rightarrow 6 \times 3 - 4 + 4 \\ & \Rightarrow 18 - 4 + 4 \\ & \Rightarrow 18 \end{aligned}$$

75. Evaluate the following:

$$5 - [96 \div 4 \text{ of } 3 - (16 - 55 \div 5)]$$

- (a) 0 (b) 4
(c) 3 (d) 2

SSC CGL (Tier-II)- 18/11/2020 (Shift-I)

Ans. (d) : $5 - [96 \div 4 \text{ of } 3 - (16 - 55 \div 5)]$

$$\begin{aligned} & 5 - [96 \div 4 \times 3 - (16 - 55 \div 5)] \\ & 5 - [8 - (5)] \\ & 5 - 3 = 2 \end{aligned}$$

76. The value of $7.2 + (8.4 \div 0.12 \times 0.2) - 5 \times 3 \div 0.05 + 3$ is:

- (a) 21.2 (b) -75.8
(c) -275.8 (d) -175.8

SSC CGL (TIER-I)- 11.06.2019

Ans. (c) :

$$7.2 + (8.4 \div 0.12 \times 0.2) - 5 \times 3 \div 0.05 + 3 = ?$$

$$? = 7.2 + \left(\frac{8.4}{0.12} \times 0.2\right) - 5 \times \frac{3}{0.05} + 3$$

$$? = 7.2 + 70 \times 0.2 - 5 \times 60 + 3$$

$$? = 7.2 + 14 - 300 + 3$$

$$? = 24.2 - 300$$

$$? = -275.8$$

77. $9\frac{3}{4} \div \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$ is equal to:

- (a) $\frac{15}{4}$ (b) 3
(c) $\frac{39}{8}$ (d) 4

SSC CGL (TIER-I)- 13.06.2019 (Shift-III)

$$\text{Ans. (c) : } 9\frac{3}{4} \div \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \left\{\frac{13}{3} - \left(\frac{5}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \left\{\frac{13}{3} - \frac{13}{4}\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \frac{13}{12}\right]$$

$$= \frac{39}{4} \div 2$$

$$= \frac{39}{8}$$

78. The value of $16 \div 4 \text{ of } 4 \times [3 \div \{4 \times 3 \div (3 + 3)\} \text{ of } 4] \div (2 \div 4 \text{ of } 8)$ is:

- (a) 9 (b) 48
(c) 6 (d) 16

SSC CGL (TIER-I) - 06.06.2019 (Shift-III)

Ans. (c) : $16 \div 4$ of $4 \times [3 \div \{4 \times 3 \div (3 + 3)\}$ of $4] \div (2 \div 4$ of $8)$

$$= 16 \div 16 \times [3 \div 2 \text{ of } 4] \div \frac{1}{16}$$

$$= 1 \times \frac{3}{8} \div \frac{1}{16}$$

$$= 6$$

79. The value of $\left(\frac{2}{3} \div \frac{3}{2} \text{ of } \frac{2}{3}\right) \frac{9}{15} \div \left(\frac{5}{4} \div \frac{5}{2} \times \frac{4}{5} \text{ of } \frac{2}{5}\right)$ of $\left(\frac{3}{4} \times \frac{3}{4} \div \frac{4}{3} \text{ of } \frac{3}{4}\right)$ is:

- (a) $\frac{20}{9}$ (b) $\frac{40}{9}$
 (c) $\frac{4}{25}$ (d) $\frac{18}{125}$

SSC CGL (TIER-I) – 06.06.2019 (Shift-II)

Ans. (b) :

$$\left(\frac{2}{3} \div \frac{3}{2} \text{ of } \frac{2}{3}\right) \frac{9}{15} \div \left(\frac{5}{4} \div \frac{5}{2} \times \frac{4}{5} \text{ of } \frac{2}{5}\right) \text{ of } \left(\frac{3}{4} \times \frac{3}{4} \div \frac{4}{3} \text{ of } \frac{3}{4}\right)$$

$$= \frac{2}{3} \times \frac{9}{15} \div \left(\frac{5}{4} \div \frac{5}{2} \times \frac{8}{25}\right) \text{ of } \left(\frac{3}{4} \times \frac{3}{4} \div 1\right)$$

$$= \frac{2}{5} \div \left(\frac{4}{25}\right) \text{ of } \frac{9}{16}$$

$$= \frac{2}{5} \div \frac{9}{100} = \frac{40}{9}$$

80. The value of $5.8 + (7.4 \div 3.7 \times 5) - 6 \times 2 \div 2.5$ is:

- (a) 11 (b) 9
 (c) 10 (d) 12

SSC CGL (TIER-I) – 11.06.2019 (Shift-III)

Ans. (a) : $5.8 + (7.4 \div 3.7 \times 5) - 6 \times 2 \div 2.5$

$$= 5.8 + \left(\frac{7.4}{3.7} \times 5\right) - 6 \times \frac{2}{2.5}$$

$$= 5.8 + 10 - 4.8$$

$$= 15.8 - 4.8$$

$$= 11$$

81. The value of $3.8 + (8.2 \div 4.1 \times 2) - 4 \times 3 \div 1.2$ is:

- (a) -1.2 (b) -2.2
 (c) 2.2 (d) 1.2

SSC CGL (TIER-I) – 2018 – 12.06.2019 (Shift-I)

Ans. (b): Given expression is.

$$3.8 + (8.2 \div 4.1 \times 2) - 4 \times 3 \div 1.2$$

$$= 3.8 + \left(\frac{8.2}{4.1} \times 2\right) - 4 \times \frac{3}{1.2} \text{ (According to BODMAS rule)}$$

$$= 3.8 + (2 \times 2) - 10$$

$$= 3.8 + 4 - 10$$

$$= 7.8 - 10$$

$$= -2.2$$

82. The value of-

$$\frac{36 \div 42 \text{ of } 6 \times 7 + 24 \times 6 \div 18 + 3 \div (2 - 6) - (4 + 3 \times 2) \div 8}{21 \div 3 \text{ of } 7} \text{ is}$$

- (a) $\frac{1}{7}$ (b) $8\frac{1}{2}$
 (c) $7\frac{1}{2}$ (d) 7

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (d) :

$$\frac{36 \div 42 \text{ of } 6 \times 7 + 24 \times 6 \div 18 + 3 \div (2 - 6) - (4 + 3 \times 2) \div 8}{21 \div 3 \text{ of } 7}$$

$$= \frac{36}{252} \times 7 + 24 \times \frac{1}{3} + 3 \div (-4) - \frac{10}{8}$$

$$= 1 + 8 - \frac{3}{4} - \frac{5}{4}$$

$$= 9 - 2 = 7$$

83. The value of $\frac{-5}{2} + \frac{3}{2} \div 6 \times \frac{1}{2}$ is equal to:

- (a) $-\frac{19}{8}$ (b) $-\frac{9}{8}$
 (c) $-\frac{1}{12}$ (d) $-\frac{1}{3}$

SSC CGL (Tier-I) – 03/03/2020 (Shift-III)

Ans. (a) :

$$\frac{-5}{2} + \frac{3}{2} \div 6 \times \frac{1}{2}$$

$$= \frac{-5}{2} + \frac{3}{2} \times \frac{1}{6} \times \frac{1}{2}$$

$$= \frac{-5}{2} + \frac{1}{8} = -\frac{19}{8}$$

84. If '+' means '-', '-' means '+', 'x' means '÷' and '÷' means 'x', then the value of

$$\frac{42 - 12 \times 3 + 8 \div 2 + 15}{8 \times 2 - 4 + 9 \div 3} \text{ is:}$$

- (a) $-\frac{15}{19}$ (b) $\frac{15}{19}$
 (c) $\frac{5}{3}$ (d) $-\frac{5}{3}$

SSC CGL (Tier-I) – 03/03/2020 (Shift-I)

$$\text{Ans. (a) : } \frac{42 - 12 \times 3 + 8 \div 2 + 15}{8 \times 2 - 4 + 9 \div 3}$$

As per the question, changing the symbol,

$$\frac{42 + 12 \div 3 - 8 \times 2 - 15}{4 + 4 - 27}$$

$$= \frac{8 \div 2 + 4 - 9 \times 3}{4 + 4 - 27}$$

$$= \frac{42 + 4 - 16 - 15}{4 + 4 - 27}$$

$$= \frac{46 - 31}{8 - 27}$$

$$= -\frac{15}{19}$$

85. The value of $\frac{7 - [4 + 3(2 - 2 \times 2 + 5) - 8] \div 5}{2 \div 2 \text{ of } (4 + 4 \div 4 \text{ of } 4)}$ is:

(a) $8\frac{1}{2}$ (b) 26

(c) 24 (d) $25\frac{1}{2}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d) :

$$\frac{7 - [4 + 3(2 - 2 \times 2 + 5) - 8] \div 5}{2 \div 2 \text{ of } (4 + 4 \div 4 \text{ of } 4)}$$
$$= \frac{7 - [4 + 9 - 8] \div 5}{2 \div 2 \text{ of } \frac{17}{4}}$$
$$= \frac{7 - 1}{2 \times \frac{2}{17}} = \frac{6 \times 17}{4} = 25\frac{1}{2}$$

86. The value of $-1 + \frac{1}{4} \div \frac{1}{2} \times 2 + 5$ is:

(a) 5 (b) $\frac{17}{4}$

(c) 2 (d) $-\frac{7}{2}$

SSC CGL (Tier-I) – 05/03/2020 (Shift-III)

Ans. (a) : $-1 + \frac{1}{4} \div \frac{1}{2} \times 2 + 5$

$$= -1 + \frac{1}{2} \times 2 + 5$$
$$= 5$$

87. The value of $\frac{[54 - (5 \div 2) \times 8] + 13}{48 - 4 \div 3 \times 8 - 2}$ is:

(a) $\frac{141}{127}$ (b) $\frac{89}{127}$

(c) $\frac{141}{106}$ (d) $\frac{89}{106}$

SSC CGL (Tier-I) – 06/03/2020 (Shift-III)

Ans. (c):

$$\frac{[54 - (5 \div 2) \times 8] + 13}{48 - 4 \div 3 \times 8 - 2}$$
$$= \frac{34 + 13}{48 - \frac{32}{3} - 2} = \frac{47 \times 3}{106} = \frac{141}{106}$$

88. Solve the following :

$$\frac{4}{3} \div \frac{1}{6} \times 2 - 1 = ?$$

(a) 15 (b) -2

(c) 8 (d) 3

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) : $\frac{4}{3} \div \frac{1}{6} \times 2 - 1$

$$\frac{4}{3} \times 6 \times 2 - 1$$
$$= 15$$

89. Solve the following expression : $5.6 - \{2 + 0.6 \text{ of } (2.1 - 2.6 \times 1.12)\}$

(a) 4.0871 (b) 7.7113

(c) 4.0872 (d) 7.7112

SSC CGL (Tier-I) – 07/03/2020 (Shift-III)

Ans. (c) : $5.6 - \{2 + 0.6 \text{ of } (2.1 - 2.6 \times 1.12)\}$

$$= 5.6 - \{2 + 0.6 \text{ of } (-0.812)\}$$
$$= 5.6 - \{2 - 0.4872\} = 5.6 - 1.5128 = 4.0872$$

90. If '+' means '-', '-' means '+', 'x' means '÷' and '÷' means 'x' then the value of

$$\frac{[(30 \times 5) + (84 \times 6) \div 5]}{\left[\frac{2}{3} \div 18\right] - [4 \div 2]}$$
 is:

(a) 2 (b) 1

(c) -2 (d) -1

SSC CGL (Tier-I) – 06/03/2020 (Shift-I)

Ans. (c) :

$$\frac{[(30 \times 5) + (84 \times 6) \div 5]}{\left[\frac{2}{3} \div 18\right] - [4 \div 2]}$$

As per the question on substituting the symbol.

$$= \frac{[(30 \div 5) - (84 \div 6)] \times 5}{\left(\frac{2}{3} \times 18\right) + (4 \times 2)}$$
$$= \frac{(6 - 14) \times 5}{12 + 8}$$
$$= \frac{-40}{20} = -2$$

91. Solve the following expression.

$$11 + 11 \times 11 - 11 \div 11$$

(a) 22 (b) 131

(c) 121 (d) 11

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (b) : $11 + 11 \times 11 - 11 \div 11$

$$= 11 + 121 - 1$$
$$= 131$$

92. The value of $1800 \div 20 \times \{(12 - 6) + (24 - 12)\}$ is:

(a) 2720 (b) 840

(c) 1720 (d) 1620

SSC CGL (Tier-I) – 09/03/2020 (Shift-I)

Ans. (d) : $1800 \div 20 \times \{(12 - 6) + (24 - 12)\}$

$$= 90 \times 18 = 1620$$

93. If $M = (3/7) \div (6/5) \times (2/3) + (1/5) \times (3/2)$ and $N = (2/5) \times (5/6) \div (1/3) + (3/5) \times (2/3) \div (3/5)$, then what is the value of M/N ?

(a) 207/560 (b) 339/1120

(c) 113/350 (d) 69/175

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :

$$M = \left(\frac{3}{7}\right) \div \left(\frac{6}{5}\right) \times \left(\frac{2}{3}\right) + \left(\frac{1}{5}\right) \times \frac{3}{2}$$
$$= \frac{3}{7} \times \frac{5}{6} \times \frac{2}{3} + \frac{3}{10}$$
$$= \frac{5}{21} + \frac{3}{10} = \frac{113}{210}$$

$$N = \left(\frac{2}{5}\right) \times \left(\frac{5}{6}\right) \div \left(\frac{1}{3}\right) + \left(\frac{3}{5}\right) \times \left(\frac{2}{3}\right) \div \left(\frac{3}{5}\right)$$

$$= \frac{2}{5} \times \frac{5}{6} \times \frac{3}{1} + \frac{3}{5} \times \frac{2}{3} \times \frac{5}{3}$$

$$= 1 + \frac{2}{3}$$

$$= \frac{5}{3}$$

According to question

$$\frac{M}{N} = \frac{\frac{113}{3}}{\frac{210}{5}}$$

$$= \frac{113 \times 5}{210 \times 3} = \frac{113}{350}$$

94. The value of $9 \times 6 \div 24 + 8 \div 2$ of $5 - 30 \div 4$ of $4 + 27 \times 5 \div 9$ is :

- (a) $\frac{493}{8}$ (b) $\frac{243}{8}$
 (c) $\frac{259}{8}$ (d) $\frac{647}{40}$

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : $9 \times 6 \div 24 + 8 \div 2$ of $5 - 30 \div 4$ of $4 + 27 \times 5 \div 9$

$$= 9 \times \frac{6}{24} + 8 \div 10 - 30 \div 16 + 27 \times \frac{5}{9}$$

$$= \frac{9}{4} + \frac{4}{5} - \frac{15}{8} + 15$$

$$= \frac{90 + 32 - 75 + 600}{40}$$

$$= \frac{647}{40}$$

95. The value of $\frac{2}{3} \div \frac{3}{10}$ of $\frac{4}{9} - \frac{4}{5} \times 1$ of $\frac{1}{9} \div \frac{8}{15} + \frac{3}{4} \div \frac{1}{2}$ is:

- (a) $\frac{29}{6}$ (b) $\frac{14}{3}$
 (c) $\frac{49}{12}$ (d) $\frac{17}{9}$

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : $\frac{2}{3} \div \frac{3}{10}$ of $\frac{4}{9} - \frac{4}{5} \times 1$ of $\frac{1}{9} \div \frac{8}{15} + \frac{3}{4} \div \frac{1}{2}$

$$= \frac{2}{3} \div \frac{3}{15} - \frac{4}{5} \times \frac{10}{9} \times \frac{15}{8} + \frac{3}{4} \times \frac{2}{1}$$

$$= 5 - \frac{10}{6} + \frac{3}{2}$$

$$= \frac{13}{2} - \frac{10}{6}$$

$$= \frac{39 - 10}{6}$$

$$= \frac{29}{6}$$

96. The value of $7 \div [5 + 1 \div 2 - \{4 + (4 \text{ of } 2 \div 4) + (5 \div 5 \text{ of } 2)\}]$ is:

- (a) $-\frac{7}{2}$ (b) 7
 (c) -7 (d) $\frac{7}{2}$

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) :

$$7 \div [5 + 1 \div 2 - \{4 + (4 \text{ of } 2 \div 4) + (5 \div 5 \text{ of } 2)\}]$$

$$= 7 \div \left[5 + \frac{1}{2} - \left\{4 + 2 + \frac{1}{2}\right\}\right]$$

$$= 7 \div \left[5 + \frac{1}{2} - 6 - \frac{1}{2}\right]$$

$$= -7$$

97. The value of $1 - 3 \div 6$ of $2 + (4 \div 4)$ of $\frac{1}{4} \div 8 + \left(4 \times 8 \div \frac{1}{4}\right) \times \frac{1}{8}$ is:

- (a) $\frac{69}{4}$ (b) $\frac{7}{4}$
 (c) $-\frac{69}{4}$ (d) $-\frac{7}{4}$

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : $1 - 3 \div 6$ of $2 + (4 \div 4)$ of $\frac{1}{4} \div 8 + (4 \times 8 \div \frac{1}{4}) \times \frac{1}{8}$

$$= 1 - 3 \div 12 + 4 \div 8 + (4 \times 32) \times \frac{1}{8}$$

$$= 1 - \frac{1}{4} + \frac{1}{2} + 16$$

$$= \frac{3}{4} + \frac{1}{2} + 16$$

$$= \frac{3 + 2 + 64}{4}$$

$$= \frac{69}{4}$$

98. The value of

$$-7 \div [5 + 1 \div 2 - \{4 + (4 \text{ of } 2 \div 4) + (4 \div 4 \text{ of } 2)\}]$$

is:

(a) -7 (b) 7
 (c) $-\frac{7}{2}$ (d) $\frac{7}{2}$

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : $-7 \div [5 + 1 \div 2 - \{4 + (4 \text{ of } 2 \div 4) + (4 \div 4 \text{ of } 2)\}]$

$$= -7 \div \left[5 + \frac{1}{2} - \left\{6 + \frac{1}{2}\right\}\right]$$

$$= -7 \div [5 - 6]$$

$$= 7$$

99. The value of

$$\frac{2}{3} \div \frac{3}{10}$$
 of $\frac{4}{9} - \frac{4}{5} \times 1$ of $\frac{1}{9} \div \frac{8}{15} - \frac{3}{4} + \frac{3}{4} \div \frac{1}{2}$ is:

- (a) $\frac{49}{12}$ (b) $\frac{25}{6}$
 (c) $\frac{14}{3}$ (d) $\frac{17}{9}$

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : $\frac{2}{3} \div \frac{3}{10}$ of $\frac{4}{9} - \frac{4}{5} \times 1 \frac{1}{9} \div \frac{8}{15} - \frac{3}{4} + \frac{3}{4} \div \frac{1}{2}$
 $= \frac{2}{3} \div \frac{3}{15} - \frac{4}{5} \times \frac{10}{9} \times \frac{15}{8} - \frac{3}{4} + \frac{3}{2}$
 $= 5 - \frac{5}{3} - \frac{3}{4} + \frac{3}{2}$
 $= \frac{60 - 20 - 9 + 18}{12} = \frac{49}{12}$

100. The value of $3 \frac{1}{3} \div 2 \frac{1}{2}$ of $1 \frac{3}{5} + \left(\frac{3}{8} + \frac{1}{7} \times 1 \frac{3}{4} \right)$ is :

- (a) $\frac{55}{24}$ (b) $\frac{35}{24}$
 (c) $\frac{25}{24}$ (d) $\frac{5}{24}$

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : $3 \frac{1}{3} \div 2 \frac{1}{2}$ of $1 \frac{3}{5} + \left(\frac{3}{8} + \frac{1}{7} \times 1 \frac{3}{4} \right)$
 $= \frac{10}{3} \div \left(\frac{5}{2} \times \frac{8}{5} \right) + \left(\frac{3}{8} + \frac{1}{4} \right)$
 $= \frac{10}{3} \div 4 + \frac{5}{8}$
 $= \frac{5}{6} + \frac{5}{8}$
 $= \frac{20 + 15}{24} = \frac{35}{24}$

101. The value of

$$\left(5 \frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{2} \right) \div \left(5 \frac{1}{9} - 7 \frac{7}{8} \div 9 \frac{9}{20} \right) \times \frac{11}{21} - \left(5 \div 2 \text{ of } \frac{1}{2} \right)$$

is :

- (a) $\frac{15}{28}$ (b) -2
 (c) $\frac{35}{24}$ (d) 0

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Ans. (b) :
 $\left(5 \frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{2} \right) \div \left(5 \frac{1}{9} - 7 \frac{7}{8} \div 9 \frac{9}{20} \right) \times \frac{11}{21} - \left(5 \div 2 \text{ of } \frac{1}{2} \right)$
 $\left(\frac{21}{4} \div \frac{3}{14} \right) \div \left(\frac{46}{9} - \frac{63}{8} \div \frac{189}{20} \right) \times \frac{11}{21} - (5 \div 1)$
 $\left(\frac{21}{4} \times \frac{14}{3} \right) \div \left(\frac{46}{9} - \frac{63}{8} \times \frac{20}{189} \right) \times \frac{11}{21} - 5$
 $\left(\frac{7 \times 7}{2} \right) \div \left(\frac{46}{9} - \frac{1}{3} \times \frac{5}{2} \right) \times \frac{11}{21} - 5$

$$\left(\frac{49}{2} \right) \div \left(\frac{46}{9} - \frac{5}{6} \right) \times \frac{11}{21} - 5$$

$$\frac{49}{2} \div \frac{77}{18} \times \frac{11}{21} - 5$$

$$\frac{49}{2} \times \frac{18}{77} \times \frac{11}{21} - 5 = -2$$

102. The value of $\frac{40 - \frac{3}{4} \text{ of } 32}{37 - \frac{3}{4} \text{ of } (34 - 6)}$ is :

- (a) $\frac{1}{2}$ (b) 0
 (c) 1 (d) $-\frac{1}{2}$

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Ans. (c) : $\frac{40 - \frac{3}{4} \times 32}{37 - \frac{3}{4} \times (34 - 6)}$
 $= \frac{40 - 3 \times 8}{37 - 3 \times 7} = \frac{16}{37 - 21} = \frac{16}{16} = 1$

103. A student was asked to find the value of

$$\left[\frac{4}{9} \div \left(\frac{3}{5} \div \frac{3}{2} \right) \times \frac{9}{25} \right] \times \frac{\left[\frac{2}{3} \text{ of } \frac{4}{9} \div \left(3 \times \frac{3}{5} \text{ of } \frac{4}{5} \right) \right]}{\frac{2}{3} \div \frac{3}{4} \text{ of } \frac{5}{6}}$$

His answer was $\frac{2}{9}$. What is the difference between his answer and the correct answer?

- (a) $\frac{1}{6}$ (b) $\frac{1}{24}$
 (c) $\frac{1}{4}$ (d) $\frac{47}{324}$

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Ans. (d) From question,

$$\left[\frac{4}{9} \div \left(\frac{3}{5} \div \frac{3}{2} \right) \times \frac{9}{25} \right] \times \frac{\left[\frac{2}{3} \text{ of } \frac{4}{9} \div \left(3 \times \frac{3}{5} \text{ of } \frac{4}{5} \right) \right]}{\frac{2}{3} \div \frac{3}{4} \text{ of } \frac{5}{6}}$$

$$= \frac{4}{9} \div \left(\frac{3}{5} \times \frac{2}{3} \right) \times \frac{9}{25} \times \frac{\frac{8}{27} \div \left(\frac{36}{25} \right)}{\frac{2}{3} \div \frac{5}{8}}$$

$$= \frac{4}{9} \times \frac{5}{2} \times \frac{9}{25} \times \frac{\frac{8}{27} \times \frac{25}{36}}{\frac{2}{3} \times \frac{8}{5}} = \frac{2}{5} \times \frac{50}{243} \times \frac{15}{16} = \frac{25}{324}$$

$$= \text{Answer of Student} = \frac{2}{9}$$

$$\therefore \text{Intended difference} = \frac{2}{9} - \frac{25}{324} = \frac{72 - 25}{324} = \frac{47}{324}$$

104. The value of $9 \times [(9-4) \div \{(8 \div 8 \text{ of } 4) + (4 \div 4 \text{ of } 2)\}]$ is:
 (a) 20 (b) 15/4
 (c) 15/2 (d) 60

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Ans. (d) $9 \times [(9-4) \div \{(8 \div 8 \text{ of } 4) + (4 \div 4 \text{ of } 2)\}]$
 $= 9 \times [5 \div \{1/4 + 1/2\}]$
 $= 9 \times [5 \div \frac{3}{4}]$
 $= 9 \times 5 \times \frac{4}{3} = 60$

105. The value of $\frac{5 - [2 + 3(2 - 2 \times 2 + 5) - 5] \div 5}{4 \times 4 \div 4 \text{ of } (4 + 4 \div 4 \text{ of } 4)}$ is:

- (a) $\frac{2}{5}$ (b) $7\frac{3}{5}$
 (c) $4\frac{3}{80}$ (d) $3\frac{3}{16}$

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Ans. (c) $\frac{5 - [2 + 3(2 - 2 \times 2 + 5) - 5] \div 5}{4 \times 4 \div 4 \text{ of } (4 + 4 \div 4 \text{ of } 4)} = \frac{5 - 6 \div 5}{4 \times 4 \div 17}$
 $= \frac{19/5}{16/17} = \frac{19}{5} \times \frac{17}{16}$
 $= 4\frac{3}{80}$

106. The value of $\frac{56 + \frac{2}{3} \text{ of } 27 - 8}{15 - \frac{3}{5} \text{ of } (29 - 14)}$ is:

- (a) 12 (b) 11
 (c) 10 (d) 15

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Ans. (b) $\frac{56 + \frac{2}{3} \text{ of } 27 - 8}{15 - \frac{3}{5} \text{ of } (29 - 14)} = \frac{56 + 18 - 8}{15 - \frac{3}{5} \text{ of } 15}$
 $= \frac{66}{6} = 11$

107. The value of

$\frac{17.35 + \frac{7}{5} \text{ of } 55 - 7}{(42 \div 6 \times 8.35) - \frac{3}{7} \text{ of } \left(\frac{2}{3} - \frac{1}{5}\right) + [291 \div (80 \div 8)]}$ is:

- (a) 1 (b) 3
 (c) 2 (d) 4

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Ans. (a) $\frac{17.35 + \frac{7}{5} \text{ of } 55 - 7}{(42 \div 6 \times 8.35) - \frac{3}{7} \text{ of } \left(\frac{2}{3} - \frac{1}{5}\right) + [291 \div (80 \div 8)]}$

$= \frac{17.35 + 77 - 7}{(7 \times 8.35) - \frac{3}{7} \text{ of } \frac{7}{15} + 29.1}$
 $= \frac{87.35}{58.45 - \frac{1}{5} + 29.1} = \frac{87.35}{87.35}$
 $= 1$

108. The value of $8 \div [(9 - 5) \div \{(4 \div 2 \text{ of } 4) - (8 \div 8 \text{ of } 16) + (4 \times 2 \div 8)\}]$ is:

- (a) $\frac{12}{23}$ (b) $\frac{32}{23}$
 (c) $\frac{21}{8}$ (d) $\frac{23}{8}$

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Ans. (d) $= 8 \div [(9 - 5) \div \{(4 \div 2 \text{ of } 4) - (8 \div 8 \text{ of } 16) + (4 \times 2 \div 8)\}]$
 $= 8 \div \left[4 \div \left\{\frac{1}{2} - \frac{1}{16} + \frac{1}{1}\right\}\right]$
 $= 8 \div \left[4 \div \frac{23}{16}\right]$
 $= 8 \div \frac{64}{23}$
 $= 8 \times \frac{23}{64} = \frac{23}{8}$

109. The value of $\frac{4 - 3 \div 2 \times (4 - 2) - 3 + 4 \times 3 \div 2 + 4}{4 + 3 \div 4 \times (2 - 4) \times 4 + 3 \div 4 \text{ of } 3}$

is:

- (a) $-\frac{32}{7}$ (b) $\frac{32}{7}$
 (c) -32 (d) 32

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Ans. (a) $\frac{4 - 3 \div 2 \times (4 - 2) - 3 + 4 \times 3 \div 2 + 4}{4 + 3 \div 4 \times (2 - 4) \times 4 + 3 \div 4 \text{ of } 3}$
 $= \frac{4 - \frac{3}{2} \times 2 - 3 + 4 \times \frac{3}{2} + 4}{4 + \frac{3}{4} \times (-2) \times 4 + 3 \div 12}$
 $= \frac{4 - 3 - 3 + 6 + 4}{4 - 6 + \frac{3}{12}} = \frac{8}{\frac{3}{12} - 2}$
 $= \frac{8 \times 12}{-21}$
 $= -\frac{32}{7}$

110. The value of :

$$\left(1\frac{1}{9} \times 1\frac{1}{20} \div \frac{21}{38} - \frac{1}{3}\right) \div \left(2\frac{4}{9} \div 1\frac{7}{15} \text{ of } \frac{3}{5}\right) \text{ lies between } \underline{\hspace{2cm}}$$

- (a) 0.2 & 0.25 (b) 0.1 & 0.15
(c) 0.15 & 0.2 (d) 0.25 & 0.3

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Ans. (c)

$$\begin{aligned} &= \left(1\frac{1}{9} \times 1\frac{1}{20} \div \frac{21}{38} - \frac{1}{3}\right) \div \left(2\frac{4}{9} \div 1\frac{7}{15} \text{ of } \frac{3}{5}\right) \\ &= \frac{\frac{1}{5} \text{ of } \frac{1}{5} \div \frac{1}{125} - \frac{1}{25} \div \frac{1}{5} \text{ of } \frac{1}{5}}{\frac{10}{9} \times \frac{21}{20} \times \frac{38}{21} - \frac{1}{3}} \div \left(\frac{22}{9} \div \frac{22}{15} \text{ of } \frac{3}{5}\right) \\ &= \frac{\frac{1}{25} \times \frac{125}{1} - \frac{1}{25} \div \frac{1}{25}}{\frac{38}{18} - \frac{1}{3}} \div \left(\frac{22}{9} \times \frac{25}{22}\right) \\ &= \frac{5 - \frac{1}{25} \times \frac{25}{1}}{5 - \frac{1}{25} \times \frac{25}{1}} \\ &= \frac{32 \times 9}{18 \times 25} = \frac{32}{5 \times 1} = \frac{50}{4} \\ &= \frac{4}{25} = 0.16 \\ \Rightarrow & 0.15 < 0.16 < 0.2 \end{aligned}$$

111. The value of

$$\frac{5 - 2 \div 4 \times [5 - (3 - 4)] + 5 \times 4 \div 2 \text{ of } 4}{4 + 4 \div 8 \text{ of } 2 \times (8 - 5) \times 2 \div 3 - 8 \div 2 \text{ of } 8} \text{ is:}$$

- (a) $\frac{89}{4}$ (b) $\frac{15}{32}$
(c) $\frac{9}{4}$ (d) $\frac{9}{8}$

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$$\begin{aligned} \text{Ans. (d)} &= \frac{5 - 2 \div 4 \times [5 - (3 - 4)] + 5 \times 4 \div 2 \text{ of } 4}{4 + 4 \div 8 \text{ of } 2 \times (8 - 5) \times 2 \div 3 - 8 \div 2 \text{ of } 8} \\ &= \frac{5 - 2 \div 4 \times [6] + 5 \times 4 \div 8}{4 + 4 \div 16 \times 3 \times 2 \div 3 - 8 \div 16} \\ &= \frac{5 - 3 + 2.5}{4 + \frac{1}{4} \times 3 \times \frac{2}{3} - 0.5} = \frac{4.5}{4} = \frac{9}{8} \end{aligned}$$

112. What is the simplified value of :

$$\left(1 - \frac{1}{4 - \frac{2}{1 + \frac{1}{\frac{1}{3} + 2}}}\right) \times \frac{15}{16} \div \frac{2}{3} \text{ of } 2\frac{1}{4} - \frac{3+4}{3^3 + 4^3}$$

- (a) $\frac{5}{13}$ (b) $\frac{4}{13}$
(c) $\frac{8}{13}$ (d) $\frac{6}{13}$

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Ans. (b)

$$\begin{aligned} &\left(1 - \frac{1}{4 - \frac{2}{1 + \frac{1}{\frac{1}{3} + 2}}}\right) \times \frac{15}{16} \div \frac{2}{3} \text{ of } 2\frac{1}{4} - \frac{3+4}{3^3 + 4^3} \\ &\left(1 - \frac{1}{4 - \frac{2}{1 + \frac{1}{\frac{1}{3} + 2}}}\right) \times \frac{15}{16} \div \frac{2}{3} \text{ of } \frac{9}{4} - \frac{7}{27 + 64} \\ &\left(1 - \frac{1}{4 - \frac{14}{10}}\right) \times \frac{15}{16} \times \frac{2}{3} - \frac{7}{91} \\ &\left(1 - \frac{10}{26}\right) \times \frac{5}{8} - \frac{7}{91} \\ &\frac{16}{26} \times \frac{5}{8} - \frac{7}{91} \\ &\frac{5}{13} - \frac{1}{13} = \frac{4}{13} \end{aligned}$$

113. What is the value of (0.08% of 0.008% of 8)^{1/9}?

- (a) 0.08 (b) 0.64
(c) 0.2 (d) 0.8

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Ans. (c)

$$\begin{aligned} &(8 \text{ of } 0.008\% \text{ of } 0.08\%)^{1/9} \\ &= \left(8 \times \frac{0.008}{100} \times \frac{0.08}{100}\right)^{1/9} \\ &= (8 \times 8 \times 8 \times 10^{-9})^{1/9} \\ &= (2^9 \times 10^{-9})^{1/9} \\ &= 2 \times 10^{-1} \\ &= 0.2 \end{aligned}$$

114. Find the value of $5 \div [5 + 8 - \{4 + (4 \text{ of } 2 \div 4) - (2 \div 4 \text{ of } 2)\}]$?

- (a) $\frac{5}{7}$ (b) $\frac{5}{8}$
(c) $\frac{20}{23}$ (d) $\frac{20}{29}$

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Ans. (d) $5 \div [5 + 8 - \{4 + (4 \text{ of } 2 \div 4) - (2 \div 4 \text{ of } 2)\}]$
 $= 5 \div [13 - \{4 + (8 \div 4) - (2 \div 8)\}]$
 $= 5 \div [13 - \{4 + 2 - 1/4\}]$
 $= 5 \div \left[13 - \frac{23}{4}\right]$
 $= 5 \div \left[\frac{52 - 23}{4}\right]$
 $= 5 \times \frac{4}{29} = \frac{20}{29}$

115. Find the simplified value of :

$$\left[1\frac{1}{5} \text{ of } \left\{\frac{3}{7} - \left(1\frac{4}{15} - \frac{13}{15}\right) \times \frac{5}{7}\right\}\right] \div \left(\frac{6}{7} \div 5\right)$$

(a) $\frac{4}{15}$ (b) $\frac{2}{15}$
(c) $\frac{1}{5}$ (d) 1

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Ans. (d) : $\left[1\frac{1}{5} \text{ of } \left\{\frac{3}{7} - \left(1\frac{4}{15} - \frac{13}{15}\right) \times \frac{5}{7}\right\}\right] \div \left(\frac{6}{7} \div 5\right)$
 $= \left[\frac{6}{5} \times \left\{\frac{3}{7} - \left(\frac{19}{15} - \frac{13}{15}\right) \times \frac{5}{7}\right\}\right] \div \frac{6}{7 \times 5}$
 $= \left[\frac{6}{5} \times \left\{\frac{3}{7} - \frac{6}{15} \times \frac{5}{7}\right\}\right] \div \frac{6}{35} = \left[\frac{6}{5} \times \left\{\frac{3}{7} - \frac{2}{7}\right\}\right] \div \frac{6}{35}$
 $= \left[\frac{6}{5} \times \frac{1}{7}\right] \div \frac{6}{35} = \frac{6}{35} \times \frac{35}{6} = 1$

116. What is the simplified value of remove and put?

$$\frac{8}{5} \text{ of } \frac{1}{2} \div \left\{2\frac{1}{5} - \left(\frac{5}{16} + \frac{3}{5} \times 1\frac{7}{8} \div \frac{2}{3}\right)\right\}$$

(a) $\frac{2}{5}$ (b) 1
(c) $\frac{1}{5}$ (d) 4

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Ans. (d) : $\frac{8}{5} \text{ of } \frac{1}{2} \div \left\{2\frac{1}{5} - \left(\frac{5}{16} + \frac{3}{5} \times 1\frac{7}{8} \div \frac{2}{3}\right)\right\}$
 $= \frac{8}{5} \times \frac{1}{2} \div \left\{\frac{11}{5} - \left(\frac{5}{16} + \frac{27}{16}\right)\right\}$
 $= \frac{4}{5} \div \left\{\frac{11}{5} - \frac{32}{16}\right\}$
 $= \frac{4}{5} \div \frac{1}{5} = 4$

117. Find is the simplified value of :

$$\left\{1\frac{1}{4} \text{ of } \left(2\frac{1}{3} \div 1\frac{2}{5}\right) - 1\frac{5}{12}\right\} + \frac{1}{9} \div 2\frac{1}{3} + \frac{2}{7} + \frac{1}{6}$$

(a) 1 (b) $\frac{7}{3}$
(c) $\frac{7}{6}$ (d) $\frac{3}{2}$

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Ans. (c) : $\left\{1\frac{1}{4} \text{ of } \left(2\frac{1}{3} \div 1\frac{2}{5}\right) - 1\frac{5}{12}\right\} + \frac{1}{9} \div 2\frac{1}{3} + \frac{2}{7} + \frac{1}{6}$
 $= \left\{\frac{5}{4} \text{ of } \left(\frac{7}{3} \div \frac{7}{5}\right) - \frac{17}{12}\right\} + \frac{1}{9} \div \frac{7}{3} + \frac{2}{7} + \frac{1}{6}$
 $= \left\{\frac{5}{4} \text{ of } \frac{5}{3} - \frac{17}{12}\right\} + \frac{1}{21} + \frac{2}{7} + \frac{1}{6}$
 $= \frac{2}{3} + \frac{1}{21} + \frac{2}{7} + \frac{1}{6}$
 $= \frac{28 + 2 + 12 + 7}{42}$
 $= \frac{49}{42} = \frac{7}{6}$

118. Find the value of $225 - [42 - \{25 - (18 - 18 + 13)\}]$.

(a) 222 (b) 221
(c) 244 (d) 223

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Ans. (b) : $225 - [42 - \{25 - (18 - 18 + 13)\}]$
 $= 225 - [42 - \{25 - (18 - 31)\}]$
 $= 225 - [42 - \{25 + 13\}]$
 $= 225 - [42 - 38]$
 $= 225 - 4$
 $= 221$

119. The value of $3\frac{1}{3} - \left[\frac{9}{4} + \left\{\frac{5}{4} - \frac{1}{13} \times \left(\frac{5}{2} - \frac{1}{3}\right)\right\}\right]$ is:

(a) 10 (b) 0
(c) 5 (d) 1

SSC CHSL -26/10/2020 (Shift-III)

Ans. (b) : $3\frac{1}{3} - \left[\frac{9}{4} + \left\{\frac{5}{4} - \frac{1}{13} \times \left(\frac{5}{2} - \frac{1}{3}\right)\right\}\right]$

$$\frac{10}{3} - \left[\frac{9}{4} + \left\{\frac{5}{4} - \frac{1}{13} \times \frac{13}{6}\right\}\right]$$

$$\frac{10}{3} - \left[\frac{9}{4} + \frac{5}{4} - \frac{1}{6}\right]$$

$$\frac{10}{3} - \frac{14}{4} + \frac{1}{6}$$

$$\frac{40 - 42 + 2}{12} = \frac{42 - 42}{12} = 0$$

120. The value of $[(3 + 5 - 4) + (17 - 3 \times 4)] + [4 \div 2 - 16 \div 4 + 3]$ is:

(a) 16 (b) 10
(c) 12 (d) 14

SSC CHSL -26/10/2020 (Shift-II)

Ans. (b) :

$$\begin{aligned} & [(3 + 5 - 4) + (17 - 3 \times 4)] + [4 \div 2 - 16 \div 4 + 3] \\ & = [(8 - 4) + (17 - 12)] + [4 \times \frac{1}{2} - 16 \times \frac{1}{4} + 3] \\ & = [4 + 5] + [2 - 4 + 3] \\ & = 9 + 2 - 4 + 3 \\ & = 10 \end{aligned}$$

121. Simplify the following.

$$4\frac{4}{5} \div \left[2\frac{1}{5} - \frac{1}{2} \left\{ 1\frac{1}{4} - \left(\frac{1}{4} - \frac{1}{5} \right) \right\} \right]$$

(a) 1 (b) 4
(c) 2 (d) 3

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Ans. (d) :

$$\begin{aligned} & 4\frac{4}{5} \div \left[2\frac{1}{5} - \frac{1}{2} \left\{ 1\frac{1}{4} - \left(\frac{1}{4} - \frac{1}{5} \right) \right\} \right] \\ & = \frac{24}{5} \div \left[\frac{11}{5} - \frac{1}{2} \left\{ \frac{5}{4} - \frac{1}{20} \right\} \right] \\ & = \frac{24}{5} \div \left[\frac{11}{5} - \frac{1}{2} \times \frac{6}{5} \right] = \frac{24}{5} \div \left[\frac{11}{5} - \frac{3}{5} \right] \\ & = \frac{24}{5} \div \frac{8}{5} = 3 \end{aligned}$$

122. The value of $1\frac{3}{4} - \left[3\frac{1}{8} \div \left\{ 6 - \left(2\frac{3}{4} - \frac{11}{12} \right) \right\} \right]$ is:

- (a) 1 (b) 0
(c) 3 (d) 2

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Ans. (a) :

$$\begin{aligned} & 1\frac{3}{4} - \left[3\frac{1}{8} \div \left\{ 6 - \left(2\frac{3}{4} - \frac{11}{12} \right) \right\} \right] \\ & = \frac{7}{4} - \left[\frac{25}{8} \div \left\{ 6 - \left(\frac{11}{4} - \frac{11}{12} \right) \right\} \right] \\ & = \frac{7}{4} - \left[\frac{25}{8} \div \left\{ 6 - \frac{22}{12} \right\} \right] \\ & = \frac{7}{4} - \left[\frac{25}{8} \div \left\{ 6 - \frac{11}{6} \right\} \right] = \frac{7}{4} - \left[\frac{25}{8} \div \left\{ \frac{36-11}{6} \right\} \right] \\ & = \frac{7}{4} - \left[\frac{25}{8} \div \frac{25}{6} \right] = \frac{7}{4} - \frac{3}{4} = \frac{4}{4} = 1 \end{aligned}$$

123. Find the value of $309 \div \left[\left(\frac{3}{2} \right) \text{ of } (25 + 35) - 12\frac{3}{4} \right]$.

- (a) 4 (b) 12
(c) 8 (d) 16

SSC CHSL -19/10/2020 (Shift-II)

Ans. (a) :

$$\begin{aligned} & 309 \div \left[\left(\frac{3}{2} \right) \text{ of } (25 + 35) - 12\frac{3}{4} \right] \\ & = 309 \div \left[\frac{3}{2} \times 60 - \frac{51}{4} \right] \end{aligned}$$

$$\begin{aligned} & = 309 \div \left[90 - \frac{51}{4} \right] = 309 \div \left[\frac{360-51}{4} \right] \\ & = 309 \div \frac{309}{4} = 4 \end{aligned}$$

124. The value of $72 - 3(2 + 24 \div 4 \times 3 - 2 \times 2) + 8$ is:

- (a) 32 (b) 72
(c) 24 (d) 36

SSC CHSL -16/10/2020 (Shift-I)

Ans. (a) :

$$\begin{aligned} & 72 - 3(2 + 24 \div 4 \times 3 - 2 \times 2) + 8 \\ & = 72 - 3(2 + 6 \times 3 - 2 \times 2) + 8 \\ & = 72 - 3(2 + 18 - 4) + 8 \\ & = 72 - 3 \times 16 + 8 \\ & = 80 - 48 \\ & = 32 \end{aligned}$$

125. What is the value of :

$$(9 + 3 - 16 \div 4 + 10) + \left\{ (3 + 5 \times 2 \div 10) \right\} \times (18 - 4 \text{ of } 5) ?$$

- (a) 10 (b) 15
(c) 5 (d) 8

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Ans. (a):

$$\begin{aligned} & (9 + 3 - 16 \div 4 + 10) + \left\{ (3 + 5 \times 2 \div 10) \right\} \times (18 - 4 \text{ of } 5) \\ & = (9 + 3 - 16 \div 4 + 10) + \left\{ \left(3 + 5 \times \frac{1}{5} \right) \right\} \times (18 - 4 \text{ of } 5) \\ & = (9 + 3 - 4 + 10) + \left\{ (3 + 1) \right\} \times (18 - 20) \\ & = (22 - 4) + 4 \times (-2) \\ & = 18 - 8 = 10 \end{aligned}$$

126. The value of $10 - [121 \div (11 \times 11) - (-4) - \{3 - (8 - 1)\}]$ is:

- (a) 0 (b) 1
(c) 19 (d) -1

SSC CHSL -16/10/2020 (Shift-II)

Ans. (b) :

$$\begin{aligned} & 10 - [121 \div (11 \times 11) - (-4) - \{3 - (8 - 1)\}] \\ & = 10 - [121 \div 121 + 4 - \{3 - 7\}] \text{ [From BODMAS Rule]} \\ & = 10 - [121 \div 121 + 4 + 4] \\ & = 10 - 9 \\ & = 1 \end{aligned}$$

127. The value of $27 + [3(50 - 20) + 168 \div 4 + 2 - 11 \times 2]$ is:

- (a) 149 (b) 139
(c) 245 (d) 239

SSC CHSL -15/10/2020 (Shift-I)

Ans. (b) :

$$\begin{aligned} & 27 + [3(50 - 20) + 168 \div 4 + 2 - 11 \times 2] \\ & = 27 + [90 + 42 + 2 - 22] \\ & = 27 + [134 - 22] \\ & = 27 + 112 \\ & = 139 \end{aligned}$$

128. The value of

$$\left[5\frac{4}{9} \div \left(\frac{11}{4} - \frac{13}{6} \right)^2 \right] \div \left[7\frac{3}{11} \text{ of } 8\frac{4}{5} \div 1\frac{5}{7} - \frac{4}{3} \right]^2 \text{ is:}$$

- (a) $\frac{1}{61}$ (b) $\frac{1}{81}$
 (c) $\frac{1}{71}$ (d) $\frac{1}{91}$

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : $\left[5\frac{4}{9} \div \left(\frac{11}{4} - \frac{13}{6} \right)^2 \right] \div \left[7\frac{3}{11} \text{ of } 8\frac{4}{5} \div 1\frac{5}{7} - \frac{4}{3} \right]^2$
 $= \left[\frac{49}{9} \div \left(\frac{7}{12} \right)^2 \right] \div \left[\frac{80}{11} \text{ of } \frac{44}{5} \div \frac{12}{7} - \frac{4}{3} \right]^2$
 $= \left[\frac{49}{9} \times \frac{144}{49} \right] \div \left[64 \times \frac{7}{12} - \frac{4}{3} \right]^2$
 $= 16 \div \left[\frac{112}{3} - \frac{4}{3} \right]^2$
 $= 16 \div (36)^2$
 $= 16 \div 1296 = \frac{1}{81}$

129. The value of $4 + [3 \{35 + (42 + 10 \div 2 \times 3 - 40)\} + 7]$ is :

- (a) 185 (b) 167
 (c) 163 (d) 157

SSC CHSL -14/10/2020 (Shift-I)

Ans. (b) : $4 + [3 \{35 + (42 + 10 \div 2 \times 3 - 40)\} + 7]$
 $= 4 + [3 \{35 + (42 + 15 - 40)\} + 7]$
 $= 4 + [3 \{35 + 17\} + 7]$
 $= 4 + [156 + 7]$
 $= 167$

130. The value of $2\frac{1}{36} \div \frac{5}{9}$ of $\left(5\frac{1}{10} + 2\frac{1}{5} \right) + \frac{2}{5} \div 3\frac{1}{5}$ is:

- (a) $\frac{3}{7}$ (b) $\frac{5}{12}$
 (c) $\frac{3}{8}$ (d) $\frac{5}{8}$

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Ans. (d) : $2\frac{1}{36} \div \frac{5}{9}$ of $\left(5\frac{1}{10} + 2\frac{1}{5} \right) + \frac{2}{5} \div 3\frac{1}{5} = ?$
 $\frac{73}{36} \div \frac{5}{9} \times \left(\frac{51}{10} + \frac{11}{5} \right) + \frac{2}{5} \div \frac{16}{5} = ?$
 $\frac{73}{36} \div \frac{5}{9} \times \left(\frac{51}{10} + \frac{11}{5} \right) + \frac{2}{5} \times \frac{5}{16} = ?$
 $\frac{73}{36} \div \frac{5}{9} \times \left(\frac{51+22}{10} \right) + \frac{1}{8} = ?$
 $\frac{73}{36} \div \frac{5}{9} \times \frac{73}{10} + \frac{1}{8} = ?$

$$\frac{73}{36} \div \frac{5}{9} + \frac{1}{8} = ?$$

$$\frac{73}{36} \times \frac{18}{73} + \frac{1}{8} = ?$$

$$\frac{1}{2} + \frac{1}{8} = ?$$

$$\frac{4+1}{8} = \frac{5}{8} = ?$$

131. If $A = \left[\frac{3}{7} \text{ of } 4\frac{1}{5} \div \frac{18}{25} + \frac{17}{24} \right]$ of $\left[\frac{289}{16} \div \left(\frac{3}{4} + \frac{2}{3} \right)^2 \right]$

then the value of $8A$ is:

- (a) 132 (b) 321
 (c) 213 (d) 231

SSC CHSL -13/10/2020 (Shift-I)

Ans. (d) : $A =$

$$\left[\frac{3}{7} \text{ of } 4\frac{1}{5} \div \frac{18}{25} + \frac{17}{24} \right] \text{ of } \left[\frac{289}{16} \div \left(\frac{3}{4} + \frac{2}{3} \right)^2 \right]$$

$$A = \left[\frac{3}{7} \times \frac{21}{5} \div \frac{18}{25} + \frac{17}{24} \right] \times \left[\frac{289}{16} \div \frac{289}{144} \right]$$

$$A = \left[\frac{9}{5} \times \frac{25}{18} + \frac{17}{24} \right] \times \left[\frac{289}{16} \times \frac{144}{289} \right]$$

$$A = \left[\frac{5}{2} + \frac{17}{24} \right] \times \left[\frac{144}{16} \right]$$

$$A = \left[\frac{77}{24} \right] \times [9]$$

$$\text{Value of } 8A = 8 \times \frac{77}{24} \times 9$$

$$= 77 \times 3$$

$$8A = 231$$

132. The value of $(72 + 34) \div 2 + \{[(75 \div 15) + 6] \times 2\}$ is:

- (a) 75 (b) 78
 (c) 74 (d) 86

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) : $(72 + 34) \div 2 + \{[(75 \div 15) + 6] \times 2\}$

$$= \frac{106}{2} + \{[5 + 6] \times 2\}$$

$$= 53 + 22 = 75$$

133. Evaluate $45 - 5$ of $(6.3 \div 9) + 7 \times 0.5$.

- (a) 42 (b) 50
 (c) 45 (d) 40

SSC CHSL -13/10/2020 (Shift-II)

Ans. (c) : $45 - 5$ of $(6.3 \div 9) + 7 \times 0.5$

$$= 45 - 5 \text{ of } 0.7 + 7 \times 0.5$$

$$= 45 - 3.5 + 3.5 = 45$$

134. The value of $[0.9 - \{2.3 - 3.2 - (7.1 - 5.4 - 3.5)\}]$ is :

- (a) 2.6 (b) 1.8
 (c) 0 (d) 0.18

SSC CHSL -12/10/2020 (Shift-III)

Ans. (c) : $[0.9 - \{2.3 - 3.2 - (7.1 - 5.4 - 3.5)\}]$
 Solving by the BODMAS rule.
 $= [0.9 - \{2.3 - 3.2 - (-1.8)\}]$
 $= [0.9 - \{2.3 - 3.2 + 1.8\}]$
 $= [0.9 - 0.9] = 0$

135. Find the value of $2.1 + 2.25 \div [63 - \{7.5 \times 8 + (13 - 2.5 \times 5)\}]$.
 (a) 3.0 (b) 2.8
 (c) 2.9 (d) 3.1

SSC CHSL -12/10/2020 (Shift-II)

Ans. (a) : $2.1 + 2.25 \div [63 - \{7.5 \times 8 + (13 - 2.5 \times 5)\}]$
 Solving by the BODMAS rule
 $= 2.1 + 2.25 \div [63 - \{7.5 \times 8 + (0.5)\}]$
 $= 2.1 + 2.25 \div [63 - \{7.5 \times 8 + 0.5\}]$
 $= 2.1 + 2.25 \div 2.5$
 $= 2.1 + 0.9$
 $= 3.0$

136. What is the value of the following?

$-15 + 90 \div [89 - \{9 \times 8 + (33 - 3 \times 7)\}]$
 (a) 3 (b) 2
 (c) 4 (d) 5

SSC CHSL -12/10/2020 (Shift-I)

Ans. (a) : $-15 + 90 \div [89 - \{9 \times 8 + (33 - 3 \times 7)\}]$
 Solving by the BODMAS rule,
 $= -15 + 90 \div [89 - \{9 \times 8 + 12\}]$
 $= -15 + 90 \div [89 - 84]$
 $= -15 + 90 \div 5$
 $= -15 + 18 = 3$

137. The value of $8 - [8 - (5 + 8) - \{8 - (8 - 5 + 8)\} + 10]$ is:

(a) 5 (b) 20
 (c) 0 (d) 10

SSC CHSL -19/03/2020 (Shift-I)

Ans. (c) : $8 - [8 - (5 + 8) - \{8 - (8 - 5 + 8)\} + 10]$
 $= 8 - [8 - 13 - \{8 - 11\} + 10]$
 $= 8 - [-5 - \{-3\} + 10]$
 $= 8 - [-5 + 3 + 10]$
 $= 8 - [8]$
 $= 8 - 8 = 0$

138. Simplify the expression $25 - [16 - \{14 - (18 - (8 + 3))\}]$.

(a) 15 (b) 16
 (c) 17 (d) 14

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) : $25 - [16 - \{14 - (18 - (8 + 3))\}]$
 $= 25 - [16 - \{14 - (18 - 11)\}]$,
 [According to BODMAS Rule]
 $= 25 - [16 - \{14 - 7\}]$
 $= 25 - [16 - 7] \Rightarrow 25 - 9 = 16$

139. If x is the square of the number when $(\frac{2}{5} \text{ of } 6\frac{1}{4} \div \frac{3}{7})$ of $1\frac{2}{7}$ is divided by $11\frac{1}{4}$, then the

value of 81x is:

(a) 4 (b) 16
 (c) 36 (d) 9

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Ans. (c) : $(\frac{2}{5} \text{ of } 6\frac{1}{4} \div \frac{3}{7})$ of $1\frac{2}{7}$

$$= \frac{2}{5} \times \frac{25}{4} \times \frac{7}{3} \times \frac{9}{7}$$

$$= \frac{5}{2} \times 3 = \frac{15}{2}$$

According to the question,

$$\frac{15/2}{45/4} = \frac{60}{90} = \frac{2}{3}$$

$\therefore x = (2/3)^2 = \frac{4}{9}$ (According to the question square of x)

$$\therefore 81x = 81 \times \frac{4}{9}$$

$$x = 9 \times 4 = 36$$

140. The value of

$7 + [44 \div 4 + \{9 \times 2 - 14 \div 7\} + 5 \times 2]$ **is:**

(a) 67 (b) 44
 (c) 55 (d) 33

SSC CHSL -19/03/2020 (Shift-III)

Ans. (b) : $7 + [44 \div 4 + \{9 \times 2 - 14 \div 7\} + 5 \times 2]$

$$= 7 + [11 + \{18 - 2\} + 10]$$

$$= 7 + [11 + 16 + 10]$$

$$= 7 + [37]$$

$$= 44$$

141. What will come at place of x, ($x < 10$) for

$$\frac{(132 \div 12 \times x - 3 \times 3)}{(5^2 - 6 \times 4 + x^2)} = 1 ?$$

(a) 1 (b) 3
 (c) 4 (d) 2

SSC CHSL -17/03/2020 (Shift-I)

Ans. (a) : $\frac{(132 \div 12 \times x - 3 \times 3)}{(5^2 - 6 \times 4 + x^2)} = 1$

$$\frac{11 \times x - 9}{25 - 24 + x^2} = 1 \Rightarrow 11x - 9 = 25 - 24 + x^2$$

$$x^2 - 11x + 10 = 0$$

$$x^2 - 10x - x + 10 = 0$$

$$x(x - 10) - 1(x - 10) = 0$$

$$(x - 10)(x - 1) = 0$$

$$x = 1, 10$$

But $x < 10$

Hence $x = 1$

142. What is the value of :

$$-77+800 \div [83-\{8 \times 9+(18-3 \times 5)\}]$$

(a) 25 (b) 24
(c) 26 (d) 23

SSC CHSL -20/10/2020 (Shift-III)

Ans : (d) $-77+800 \div [83-\{8 \times 9+(18-3 \times 5)\}]$
 $= -77+800 \div [83-\{72+(18-15)\}]$
 $= -77+800 \div [83-\{72+3\}]$
 $= -77+800 \div [83-75]$
 $= -77+800 \div 8$
 $= -77+100 = 23$

143. The value of $\frac{4}{5} \div 3 \frac{1}{4}$ of $\frac{8}{13} - \frac{5}{1} - \frac{1}{8} \times 5 \frac{1}{5} + \frac{5}{6}$ is:

- (a) 2/15 (b) 1/30
(c) 1/15 (d) 7/30

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Ans : (b) $\frac{4}{5} \div 3 \frac{1}{4}$ of $\frac{8}{13} - \frac{5}{1} - \frac{1}{8} \times 5 \frac{1}{5} + \frac{5}{6}$

$$\frac{4}{5} \div \frac{13}{4} \times \frac{8}{13} - \frac{3}{13} \times \frac{26}{5} + \frac{5}{6}$$

$$\frac{4}{5} \div 2 - \frac{6}{5} + \frac{5}{6}$$

$$\frac{2}{5} - \frac{6}{5} + \frac{5}{6}$$

$$-\frac{4}{5} + \frac{5}{6} = \frac{1}{30}$$

144. Evaluate: $[7 + 7 \times (7 + 7 \div 7)] + 7 \div 7$.

- (a) 10 (b) 5
(c) 64 (d) 63

SSC CHSL -20/10/2020 (Shift-I)

Ans : (c) $[7 + 7 \times (7 + 7 \div 7)] + 7 \div 7$
 $= [7 + 7 \times 8] + 1$
 $= [7 + 56] + 1$
 $= [63] + 1$
 $= 64$

145. The value of

$$75 \frac{3}{5} \div \left[15 \div 3 \text{ of } 5 + 7 \div \frac{1}{14} - \left(78 \div 3 \frac{1}{3} \right) \right] \text{ is:}$$

(a) 0 (b) 1
(c) 2 (d) 5

SSC CHSL -21/10/2020 (Shift-III)

Ans. (b)

$$= 75 \frac{3}{5} \div \left[15 \div 3 \text{ of } 5 + 7 \div \frac{1}{14} - \left(78 \div 3 \frac{1}{3} \right) \right]$$

$$= 75 \frac{3}{5} \div \left[\left(15 \div 3 \text{ of } 5 + 7 \div \frac{1}{14} - \frac{78 \times 3}{10} \right) \right]$$

$$= 75 \frac{3}{5} \div \left[\left(15 \div 15 + 7 \times \frac{14}{1} - 7.8 \times 3 \right) \right]$$

$$= 75 \frac{3}{5} \div [1 + 98 - 23.4]$$

$$= \frac{75 \times 5 + 3}{5} \div 75.6$$

$$= \frac{375 + 3}{5} \div 75.6$$

$$= \frac{378}{5 \times 75.6} = \frac{378}{378} = 1$$

146. The value of $\frac{33}{40} + \frac{1}{5} \left[\frac{4}{5} - \frac{1}{5} \times \left(\frac{7}{8} - \frac{5}{4} \right) \right]$ is:

- (a) 0 (b) 10
(c) 5 (d) 1

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Ans. (d)

$$\frac{33}{40} + \frac{1}{5} \left[\frac{4}{5} - \frac{1}{5} \times \left(\frac{7}{8} - \frac{5}{4} \right) \right]$$

$$\frac{33}{40} + \frac{1}{5} \left[\frac{4}{5} - \frac{1}{5} \times \left(\frac{7-10}{8} \right) \right]$$

$$\frac{33}{40} + \frac{1}{5} \left[\frac{4}{5} - \frac{1}{5} \times \frac{-3}{8} \right]$$

$$\frac{33}{40} + \frac{1}{5} \left[\frac{4}{5} + \frac{3}{40} \right]$$

$$\frac{33}{40} + \frac{1}{5} \left[\frac{32+3}{40} \right]$$

$$\frac{33}{40} + \frac{1}{5} \times \frac{35}{40}$$

$$\frac{33}{40} + \frac{7}{40} = 1$$

147. The value of $\frac{1}{5} \div \frac{1}{5} \times \frac{1}{5} - 4 \frac{1}{5} \div 105$ is:

- (a) 10 (b) 2
(c) 5 (d) 0

SSC CHSL -21/10/2020 (Shift-I)

Ans. (d)

$$\frac{1}{5} \div \frac{1}{5} \times \frac{1}{5} - 4 \frac{1}{5} \div 105$$

$$\frac{1}{5} \div \frac{1}{5} \text{ of } \frac{1}{5}$$

$$= \frac{1 \times \frac{1}{5}}{\frac{1}{5} \times \frac{1}{5}} - \frac{21}{5} \times \frac{1}{105}$$

$$= \frac{1}{5} \times \frac{1}{5} - \frac{1}{5} \times \frac{1}{5}$$

$$= \frac{1}{25} - \frac{1}{25}$$

$$= 0$$

148. The simplified value of

$$\frac{46 + 32 \text{ of } \frac{3}{4} - 6}{11 + (34 - 6) \text{ of } \frac{3}{4}} \text{ is :}$$

- (a) $\frac{1}{4}$ (b) $\frac{1}{2}$
 (c) 1 (d) 2

SSC CHSL 09/07/2019 (Shift-II)

Ans. (d):
$$\frac{46 + 32 \text{ of } \frac{3}{4} - 6}{11 + (34 - 6) \text{ of } \frac{3}{4}} = \frac{46 + 32 \times \frac{3}{4} - 6}{11 + (34 - 6) \times \frac{3}{4}}$$

$$= \frac{46 + 24 - 6}{11 + 21}$$

$$= \frac{64}{32}$$

$$= 2$$

149. The simplified value of :

$$2\frac{1}{3} \text{ of } \left(\frac{3}{5} \div \frac{2}{9} \right) - \left(4\frac{2}{5} + \frac{19}{20} \div \frac{1}{2} \right)$$

- (a) $\frac{1}{2}$ (b) 1
 (c) $\frac{1}{4}$ (d) 0

SSC CHSL 09/07/2019 (Shift-III)

Ans. (d) :
$$2\frac{1}{3} \text{ of } \left(\frac{3}{5} \div \frac{2}{9} \right) - \left(4\frac{2}{5} + \frac{19}{20} \div \frac{1}{2} \right)$$

$$= \frac{7}{3} \times \left(\frac{3}{5} \times \frac{9}{2} \right) - \left(\frac{22}{5} + \frac{19}{20} \times \frac{2}{1} \right)$$

$$= \frac{7}{3} \times \frac{27}{10} - \left(\frac{22}{5} + \frac{19}{10} \right)$$

$$= \frac{63}{10} - \frac{63}{10} = 0$$

150. The simplified value of :

$$\frac{\left(3\frac{1}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{1\frac{1}{7} \div \left\{ \frac{5}{7} + \left(\frac{1}{7} \div \frac{1}{3} \right) \right\}}$$

- (a) $\frac{19}{16}$ (b) $\frac{19}{64}$
 (c) $\frac{19}{7}$ (d) $\frac{19}{8}$

SSC CHSL 08/07/2019 (Shift-I)

Ans. (d) :
$$\frac{\left(3\frac{1}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{1\frac{1}{7} \div \left\{ \frac{5}{7} + \left(\frac{1}{7} \div \frac{1}{3} \right) \right\}}$$

$$\frac{\left(\frac{16}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{\frac{8}{7} \div \left\{ \frac{5}{7} + \left(\frac{1}{7} \times \frac{3}{1} \right) \right\}}$$

$$= \frac{\frac{19}{5} \times \frac{5}{8}}{\frac{8}{7} \div \left\{ \frac{5}{7} + \frac{3}{7} \right\}} = \frac{\frac{19}{8}}{\frac{8}{7} \times \frac{7}{8}} = \frac{19}{8}$$

151. The value of :

$$\frac{\left(3\frac{1}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{1\frac{1}{8} \div \left\{ \frac{5}{8} + \left(\frac{1}{8} \div \frac{1}{3} \right) \right\}}$$

- (a) $\frac{19}{16}$ (b) $\frac{19}{7}$
 (c) $\frac{19}{64}$ (d) $\frac{19}{9}$

SSC CHSL 08/07/2019 (Shift-II)

Ans. (d) :
$$\frac{\left(3\frac{1}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{1\frac{1}{8} \div \left\{ \frac{5}{8} + \left(\frac{1}{8} \div \frac{1}{3} \right) \right\}} = \frac{\left(\frac{16}{5} + \frac{3}{5} \right) \div \frac{8}{5}}{\frac{9}{8} \div \left\{ \frac{5}{8} + \left(\frac{1}{8} \times \frac{3}{1} \right) \right\}}$$

$$= \frac{\frac{19}{5} \times \frac{5}{8}}{\frac{9}{8} \div \left\{ \frac{5}{8} + \frac{3}{8} \right\}}$$

$$= \frac{\frac{19}{8}}{\frac{9}{8} \div \frac{8}{8}}$$

$$= \frac{\frac{19}{8}}{\frac{9}{8}}$$

$$= \frac{19}{9}$$

152. The simplified value of :

$$46 - \frac{3}{4} \text{ of } 32 - 6$$

$$37 - \frac{3}{4} \text{ of } (34 - 6)$$

- (a) 1 (b) $\frac{19}{16}$
 (c) $\frac{19}{64}$ (d) 2

SSC CHSL 08/07/2019 (Shift-III)

Ans. (a) :
$$\frac{46 - \frac{3}{4} \text{ of } 32 - 6}{37 - \frac{3}{4} \text{ of } (34 - 6)}$$

$$= \frac{(46-24-6)}{37-\frac{3}{4}\times 28}$$

$$= \frac{(46-30)}{37-21}$$

$$= \frac{16}{16} = 1$$

153. The simplified value of :

8 of $15 + 6 + [(27 - 3) \div 6 + 4]$

- (a) 18 (b) 130
(c) 134 (d) 136

SSC CHSL 05/07/2019 (Shift-I)

Ans. (c) : $8 \text{ of } 15 + 6 + [(27 - 3) \div 6 + 4]$

$$= 15 \times 8 + 6 + [24 \div 6 + 4]$$

$$= 120 + 6 + [4 + 4]$$

$$= 120 + 6 + 8$$

$$= 134$$

154. The simplified value of :

$$\left(3\frac{1}{5} - \frac{3}{5}\right) \div \frac{8}{5}$$

$$1\frac{1}{7} \div \left\{ \frac{6}{7} - \left(\frac{1}{7} \div \frac{1}{5}\right) \right\}$$

- (a) $\frac{13}{8}$ (b) $\frac{13}{64}$
(c) $\frac{13}{7}$ (d) $\frac{13}{16}$

SSC CHSL 05/07/2019 (Shift-II)

Ans. (b) :

$$\left(3\frac{1}{5} - \frac{3}{5}\right) \div \frac{8}{5}$$

$$1\frac{1}{7} \div \left\{ \frac{6}{7} - \left(\frac{1}{7} \div \frac{1}{5}\right) \right\}$$

$$= \frac{\left(\frac{16}{5} - \frac{3}{5}\right) \times \frac{5}{8}}$$

$$= \frac{8}{7} \div \left\{ \frac{6}{7} - \frac{1}{7} \right\}$$

$$= \frac{13}{5} \times \frac{5}{8}$$

$$= \frac{8}{7} \times \frac{7}{1}$$

$$= \frac{13}{8}$$

$$= \frac{13}{64}$$

155. The simplified value of :

$$\left(\frac{7}{5} \div \frac{3}{4} \text{ of } \frac{7}{10}\right) \div \frac{4}{9} - \left(\frac{7}{16} \div 10\frac{1}{2} \times 7\frac{1}{5}\right) \times \frac{5}{12}$$

- (a) $\frac{41}{4}$ (b) $\frac{47}{8}$
(c) $\frac{49}{8}$ (d) $\frac{39}{4}$

SSC CHSL 03/07/2019 (Shift-II)

Ans. (b) :

$$\left(\frac{7}{5} \div \frac{3}{4} \text{ of } \frac{7}{10}\right) \div \frac{4}{9} - \left(\frac{7}{16} \div 10\frac{1}{2} \times 7\frac{1}{5}\right) \times \frac{5}{12}$$

$$= \left(\frac{7}{5} \div \frac{3}{4} \text{ of } \frac{7}{10}\right) \div \frac{4}{9} - \left(\frac{7}{16} \div \frac{21}{2} \times \frac{36}{5}\right) \times \frac{5}{12}$$

$$= \left(\frac{7}{5} \div \frac{21}{40}\right) \div \frac{4}{9} - \left(\frac{7}{16} \times \frac{2}{21} \times \frac{36}{5}\right) \times \frac{5}{12}$$

$$= \left(\frac{7}{5} \times \frac{40}{21}\right) \div \frac{4}{9} - \left(\frac{1}{4} \times \frac{2}{3} \times \frac{9}{5}\right) \times \frac{5}{12}$$

$$= \left(\frac{8}{3} \times \frac{9}{4}\right) - \frac{9}{72}$$

$$= 6 - \frac{1}{8} = \frac{47}{8}$$

156. What is the simplified value of :

$5 \div 10 \text{ of } 10 \times 4 + 4 \div 4 \text{ of } 4 \times 10 - (10 - 4) \div 16 \times 4$

- (a) 2.5 (b) 1.2
(c) 58.5 (d) 21

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Ans. (b) : $5 \div 10 \text{ of } 10 \times 4 + 4 \div 4 \text{ of } 4 \times 10 - (10 - 4) \div 16 \times 4$
[According to BODMAS rule]

$$5 \div 100 \times 4 + 4 \div 16 \times 10 - 6 \div 16 \times 4$$

$$\frac{5}{100} \times 4 + \frac{4}{16} \times 10 - \frac{6}{16} \times 4$$

$$\frac{1}{5} + \frac{5}{2} - \frac{6}{4}$$

$$\frac{1}{5} + \frac{5}{2} - \frac{3}{2}$$

$$\frac{2 + 25 - 15}{10} = \frac{12}{10} = 1.2$$

157. Evaluate $\frac{3 \div \{5 - 5 \div (6 - 7) \times 8 + 9\}}{4 + 4 \times 4 \div 4 \text{ of } 4}$:

- (a) $\frac{1}{45}$ (b) $\frac{1}{18}$
(c) $\frac{1}{90}$ (d) $\frac{1}{3}$

SSC CHSL 02/07/2019 (Shift-I)

Ans. (c) :

$$\frac{3 \div \{5 - 5 \div (6 - 7) \times 8 + 9\}}{4 + 4 \times 4 \div 4 \text{ of } 4}$$

$$= \frac{3 \div \{5 + 5 \times 8 + 9\}}{4 + 4 \times 4 \div 16}$$

$$= \frac{3 \div 54}{4 + 1}$$

$$= \frac{1}{90}$$

158. The value of $3 \times 2 \div 12$ of $3 - 3 \div 2 \times (2 - 3) \times 2 + 3 \div 3$ of 2 is :

- (a) $2\frac{1}{3}$ (b) $-3\frac{2}{3}$
 (c) $3\frac{2}{3}$ (d) $-2\frac{1}{3}$

SSC CHSL 02/07/2019 (Shift-II)

Ans. (c): $3 \times 2 \div 12$ of $3 - 3 \div 2 \times (2 - 3) \times 2 + 3 \div 3$ of 2

$$\begin{aligned} &= 3 \times 2 \div 36 - 3 \div 2 \times (-1) \times 2 + 3 \div 6 \\ &= 3 \times \frac{2}{36} - 3 \div 2 \times (-1) \times 2 + \frac{3}{6} \\ &= \frac{1}{6} - \frac{3}{2} \times -2 + \frac{3}{6} \\ &= \frac{1}{6} + 3 + \frac{3}{6} \\ &= \frac{1+18+3}{6} = \frac{22}{6} = \frac{11}{3} = 3\frac{2}{3} \end{aligned}$$

159. The value of $\frac{3}{4} \div \frac{3}{4}$ of $\frac{3}{4} \times \frac{4}{3} + \frac{5}{2} \div \frac{2}{5}$ of $\frac{5}{4} - \left(\frac{2}{3} + \frac{2}{3} \text{ of } \frac{5}{6}\right)$ is :

- (a) $\frac{14}{3}$ (b) $\frac{41}{9}$
 (c) $\frac{22}{3}$ (d) $\frac{50}{9}$

SSC CHSL 01/07/2019 (Shift-III)

Ans. (d) :

$$\begin{aligned} &\frac{3}{4} \div \frac{3}{4} \text{ of } \frac{3}{4} \times \frac{4}{3} + \frac{5}{2} \div \frac{2}{5} \text{ of } \frac{5}{4} - \left(\frac{2}{3} + \frac{2}{3} \text{ of } \frac{5}{6}\right) \\ &= \frac{3}{4} \div \frac{9}{16} \times \frac{4}{3} + \frac{5}{2} \div \frac{10}{20} - \left(\frac{2}{3} + \frac{10}{18}\right) \\ &= \frac{3}{4} \times \frac{16}{9} \times \frac{4}{3} + \frac{5}{2} \times \frac{20}{10} - \frac{22}{18} \\ &= \frac{16}{9} + 5 - \frac{11}{9} \\ &= 5 + \frac{5}{9} \\ &= \frac{50}{9} \end{aligned}$$

160. Find the value of $(4488 \div 11.01 - 7.98) \div 15.99$

- (a) 2.5 (b) 26
 (c) 25 (d) 2.6

SSC MTS 21/08/2019 (Shift-II)

Ans. (c) : $(4488 \div 11.01 - 7.98) \div 15.99$

(The approximate value)

$$\begin{aligned} &(4488 \div 11 - 8) \div 16 \\ &= (408 - 8) \div 16 \\ &= 25 \end{aligned}$$

161. Following has the value.

$$6\frac{1}{8} \div \left(5\frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{2}\right) - 8 \times \frac{2}{3} \div \frac{4}{5} \text{ of } 1\frac{2}{3}$$

(a) $\frac{15}{4}$ (b) 3
 (c) -3 (d) $-\frac{15}{4}$

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Ans. (d): $6\frac{1}{8} \div \left(5\frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{2}\right) - 8 \times \frac{2}{3} \div \frac{4}{5} \text{ of } 1\frac{2}{3}$

$$\begin{aligned} &= \frac{49}{8} \div \left(\frac{21}{4} \div \frac{3}{7} \text{ of } \frac{1}{2}\right) - 8 \times \frac{2}{3} \div \frac{4}{5} \text{ of } \frac{5}{3} \\ &= \frac{49}{8} \div \left(\frac{21}{4} \times \frac{3}{14}\right) - 8 \times \frac{2}{3} \div \frac{4}{3} \\ &= \frac{49}{8} \div \left(\frac{21}{4} \times \frac{14}{3}\right) - 8 \times \frac{2}{3} \times \frac{3}{4} \\ &= \frac{49}{8} \div \left(\frac{49}{2}\right) - 4 \\ &= \frac{49}{8} \times \frac{2}{49} - 4 \\ &= \frac{1}{4} - 4 \\ &= -\frac{15}{4} \end{aligned}$$

162. What is the value of :

$$26 - \{(2 \text{ of } 6 \div 3) - 93 - \{17 - (14 - 2)\}\}$$

(a) 100 (b) 120
 (c) 110 (d) 90

SSC MTS 20/08/2019 (Shift-III)

Ans. (b) : $26 - \{(2 \text{ of } 6 \div 3) - 93 - \{17 - (14 - 2)\}\}$

$$\begin{aligned} &26 - \{(12 \div 3) - 93 - \{17 - 12\}\} \\ &26 - \{4 - 93 - \{5\}\} \\ &26 - [4 - 93 - 5] \\ &26 - [4 - 98] \\ &26 - [-94] \\ &26 + 94 = 120 \end{aligned}$$

163. What is the value of $56 + (4)^3 - 3 \times (3)^2$

- (a) 93 (b) 79
 (c) 76 (d) 88

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) : $56 + (4)^3 - 3 \times (3)^2$

$$\begin{aligned} &= 56 + 64 - 3 \times 9 \\ &= 120 - 27 \\ &= 93 \end{aligned}$$

164. What is the value of :

$$\frac{1}{7} \text{ of } 1\frac{2}{5} \div \left\{5\frac{1}{2} - \left(\frac{5}{32} + \frac{3}{5} \times 1\frac{7}{8} \div 1\frac{1}{3} \text{ of } \frac{3}{16}\right)\right\}$$

(a) $\frac{32}{135}$ (b) $\frac{27}{32}$

(c) $\frac{27}{160}$

(d) $\frac{6}{27}$

SSC MTS 20/08/2019 (Shift-I)

Ans. (a) : $\frac{1}{7}$ of $1\frac{2}{5} \div \left\{ 5\frac{1}{2} - \left(\frac{5}{32} + \frac{3}{5} \times 1\frac{7}{8} \div 1\frac{1}{3} \text{ of } \frac{3}{16} \right) \right\}$
 $= \frac{1}{7} \times \frac{7}{5} \div \left\{ \frac{11}{2} - \left(\frac{5}{32} + \frac{3}{5} \times \frac{15}{8} \div \frac{4}{3} \times \frac{3}{16} \right) \right\}$
 $= \frac{1}{7} \times \frac{7}{5} \div \left\{ \frac{11}{2} - \left(\frac{5}{32} + \frac{3}{5} \times \frac{15}{8} \times \frac{4}{1} \right) \right\}$
 $= \frac{1}{7} \times \frac{7}{5} \div \left\{ \frac{11}{2} - \left(\frac{5}{32} + \frac{9}{2} \right) \right\}$
 $= \frac{1}{5} \div \left\{ \frac{11}{2} - \left(\frac{5+144}{32} \right) \right\}$
 $= \frac{1}{5} \div \left\{ \frac{11}{2} - \frac{149}{32} \right\}$
 $= \frac{1}{5} \div \left\{ \frac{176-149}{32} \right\}$
 $= \frac{1}{5} \div \left\{ \frac{27}{32} \right\} = \frac{1}{5} \times \frac{32}{27} = \frac{32}{135}$

165. What is the value of 2 of $16 \div 48 \times 12 + 4 \div 8 \times 16 + (7-2) \times 25 \div 15$?

- (a) $73/3$ (b) $59/3$
(c) $49/3$ (d) $56/3$

SSC MTS 08/08/2019 (Shift-I)

Ans. (a) :
 2 of $16 \div 48 \times 12 + 4 \div 8 \times 16 + (7-2) \times 25 \div 15$
 $= 32 \div 48 \times 12 + 4 \div 8 \times 16 + 5 \times 25 \div 15$
 $= \frac{2}{3} \times 12 + \frac{1}{2} \times 16 + 5 \times \frac{25}{15}$
 $= 8 + 8 + \frac{25}{3}$
 $= \frac{24+24+25}{3} = \frac{73}{3}$

166. What is the value of

$\left(\frac{1}{2} \div \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} - \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \div \frac{1}{2} \right)$ of $\left(\frac{1}{2} + \frac{1}{2} \right) = ?$
(a) $3/2$ (b) $1/2$
(c) 1 (d) $5/2$

SSC MTS 08/08/2019 (Shift-I)

Ans. (c) :
 $\left(\frac{1}{2} \div \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} - \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \div \frac{1}{2} \right)$ of $\left(\frac{1}{2} + \frac{1}{2} \right) = ?$
 $= \left(1 \times \frac{1}{2} + 0 + \frac{1}{2} \times 1 \right) \times \left(\frac{2}{2} \right)$
 $= \left(\frac{2}{2} \right) \times \left(\frac{2}{2} \right)$
 $= 1$

167. If $A = 2 \div 3 \times 4$, $B = 3$ of $4 + (7 - 2)$ and $C = 4 + 5 - 6$, then what is the value of $A + B + C$?

- (a) $\frac{85}{3}$ (b) $\frac{79}{3}$
(c) $\frac{59}{3}$ (d) $\frac{68}{3}$

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : $A = 2 \div 3 \times 4 = \frac{2}{3} \times 4 = \frac{8}{3}$
 $B = 3$ of $4 + (7 - 2) = 12 + 5 = 17$
 $C = 4 + 5 - 6 = 3$
 $\therefore A + B + C = \frac{8}{3} + 17 + 3 = \frac{8}{3} + 20 = \frac{68}{3}$

168. The value of $(3576 + 4286 + 6593) \div (201 + 105 + 107)$ is :

- (a) 35 (b) 31
(c) 22 (d) 18

SSC MTS 09/08/2019 (Shift-II)

Ans. (a) : $(3576 + 4286 + 6593) \div (201 + 105 + 107)$
 $14455 \div 413 = ?$
 $\frac{14455}{413} = \boxed{35}$

169. The value of $[12 \times 5 - \{200 - (501 + 247 - 386)\}] \div 2$ is:

- (a) 162 (b) 161
(c) 111 (d) 82

SSC MTS 13/08/2019 (Shift-II)

Ans. (c) : $[12 \times 5 - \{200 - (501 + 247 - 386)\}] \div 2 = ?$
 $[60 - \{200 - (748 - 386)\}] \div 2 = ?$
 $[60 - \{200 - 362\}] \div 2 = ?$
 $[60 + 162] \div 2 = ?$
 $222 \div 2 = 111$

170. What is the value of $2 - 2 \div 2 \times 2 + 2(2 \text{ of } 2 - 2 - 2 \div 2)$?

- (a) 4 (b) 0
(c) 2 (d) 1

SSC MTS 19/08/2019 (Shift-I)

Ans. (c) : $2 - 2 \div 2 \times 2 + 2(2 \times 2 - 2 - 2 \div 2)$
 $= 2 - 1 \times 2 + 2 \times (2 \times 2 - 2 - 1)$
 $= 0 + 2 \times (4 - 3) = 2$

171. What is the value of

$3\frac{3}{4} - \frac{61}{122} + \frac{9}{2} \div \frac{1}{2}$ of $\frac{4}{3} \left(1 + \frac{1}{3} \right) + \frac{1}{2} \times \frac{4}{3} ?$:
(a) $\frac{155}{12}$ (b) 3
(c) $\frac{200}{11}$ (d) 9

SSC MTS 19/08/2019 (Shift-I)

$$\begin{aligned} \text{Ans. (a)} &= 3\frac{3}{4} - \frac{61}{122} + \frac{9}{2} \div \left(\frac{1}{2} \times \frac{4}{3}\right) \left(1 + \frac{1}{3}\right) + \frac{1}{2} \times \frac{4}{3} \\ &= \frac{15}{4} - \frac{1}{2} + \frac{9}{2} \div \frac{2}{3} \times \frac{4}{3} + \frac{2}{3} \\ &= \frac{15}{4} - \frac{1}{2} + \frac{9}{2} \times \frac{3}{2} \times \frac{4}{3} + \frac{2}{3} \\ &= \frac{13}{4} + 9 + \frac{2}{3} \\ &= \frac{39+108+8}{12} = \frac{155}{12} \end{aligned}$$

172. What is the value of $90 \times 3 \div 9 + 4 \div 2 \times 3$ of $4 \times 8 \div (18 \times 2 - 4)$:

- (a) 48 (b) 40
(c) 36 (d) 42

SSC MTS 05/08/2019 (Shift-I)

$$\begin{aligned} \text{Ans. (c)} &: 90 \times 3 \div 9 + 4 \div 2 \times 3 \text{ of } 4 \times 8 \div (18 \times 2 - 4) \\ &= 90 \times \frac{1}{3} + 2 \times 12 \times 8 \div 32 \\ &= 30 + 6 = 36 \end{aligned}$$

173. Find the value of $\frac{3 \text{ of } 24 \div 8 \times 3 + 4 \div 2 - 4 \times 5}{36 \div 12 \times 4 \div 2 + 5 \times (6 - 4)}$:

- (a) $\frac{8}{15}$ (b) $\frac{9}{16}$
(c) $\frac{3}{10}$ (d) $\frac{3}{4}$

SSC MTS 05/08/2019 (Shift-III)

$$\begin{aligned} \text{Ans. (b)} &: \frac{3 \text{ of } 24 \div 8 \times 3 + 4 \div 2 - 4 \times 5}{36 \div 12 \times 4 \div 2 + 5 \times (6 - 4)} = ? \\ &= \frac{72 \div 8 \times 3 + 2 - 20}{3 \times 2 + 5 \times 2} \\ &= \frac{27 + 2 - 20}{6 + 10} \\ &= \frac{9}{16} \end{aligned}$$

174. Find the value of $\frac{\frac{3}{4} \div \frac{9}{32} + \frac{4}{3} \times \frac{2}{3} \text{ of } \frac{27}{16}}{\frac{1}{2} \times \left(\frac{8}{3} - 2\right) \div \frac{4}{9} + \left(\frac{1}{3} + \frac{1}{6}\right)}$:

- (a) $\frac{13}{2}$ (b) $\frac{10}{3}$
(c) $\frac{25}{2}$ (d) $\frac{31}{2}$

SSC MTS 05/08/2019 (Shift-III)

$$\begin{aligned} \text{Ans. (b)} &: \frac{\frac{3}{4} \div \frac{9}{32} + \frac{4}{3} \times \frac{2}{3} \text{ of } \frac{27}{16}}{\frac{1}{2} \times \left(\frac{8}{3} - 2\right) \div \frac{4}{9} + \left(\frac{1}{3} + \frac{1}{6}\right)} \end{aligned}$$

$$\begin{aligned} &= \frac{\frac{3}{4} \times \frac{32}{9} + \frac{4}{3} \times \frac{2}{3} \times \frac{27}{16}}{\frac{1}{2} \times \frac{2}{3} \div \frac{4}{9} + \frac{1}{2}} \\ &= \frac{\frac{8}{3} + \frac{3}{2} \times \frac{25}{3}}{\frac{3}{3} + \frac{1}{2} \times \frac{5}{4}} = \frac{10}{\frac{5}{2}} = \frac{10}{3} \end{aligned}$$

175. The value of

$72 \div 6$ of $12 + 4 \times (5 - 3)$ of $2 \div 4 - 2$ is:

- (a) 5 (b) 4
(c) 0 (d) 3

SSC MTS 22/08/2019 (Shift-II)

Ans. (d) : $72 \div 6$ of $12 + 4 \times (5 - 3)$ of $2 \div 4 - 2$

$$\begin{aligned} &= 72 \div 6 \times 12 + 4 \times 2 \times 2 \times \frac{1}{4} - 2 \\ &= 1 + 4 - 2 \\ &= 3 \end{aligned}$$

176. What is the value of $32 \div 4$ of $2 \times 3 + [5$ of $6 -$

$\{7$ of $8 (10 + 6$ of $\frac{5}{6} \div 5 - 1) \div 80\}] - 7 \times 3 \div 2?$

- (a) 7.5 (b) 17.5
(c) 12.5 (d) 24.5

SSC MTS 02/08/2019 (Shift-I)

Ans. (d) : $32 \div 4$ of $2 \times 3 + [5$ of $6 - \{7$ of $8 (10 + 6$ of $\frac{5}{6} \div 5 - 1) \div 80\}] - 7 \times 3 \div 2$

$$\begin{aligned} &= 32 \div 8 \times 3 + [30 - \{56 (10 + 5 \div 5 - 1) \div 80\}] - 7 \times \frac{3}{2} \\ &= 4 \times 3 + [30 - \{56 (10 + 1 - 1) \div 80\}] - \frac{21}{2} \\ &= 12 + [30 - \{56 (10) \div 80\}] - \frac{21}{2} \\ &= 12 + [30 - 7] - \frac{21}{2} \\ &= 12 + 23 - \frac{21}{2} \\ &= 35 - \frac{21}{2} \\ &= 35 - 10.5 \\ &= 24.5 \end{aligned}$$

177. What is the value of

$\frac{72 \div 9 + 3 - 6 - (2 \times 3) + 5 \text{ of } 3 - (1 + 5 \times 2 - 2)}{8 \div 4 + 2 - (6 \times 8 \div 2) + (7 \times 4 - 2 \times 2)}$?

- (a) $\frac{11}{4}$ (b) $\frac{5}{4}$
(c) 0 (d) $\frac{15}{4}$

SSC MTS 02/08/2019 (Shift-I)

Ans. (b) :

$$\frac{72 \div 9 + 3 - 6 - (2 \times 3) + 5 \text{ of } 3 - (1 + 5 \times 2 - 2)}{8 \div 4 + 2 - (6 \times 8 \div 2) + (7 \times 4 - 2 \times 2)}$$
$$= \frac{8 + 3 - 6 - 6 + 15 - (1 + 10 - 2)}{2 + 2 - (6 \times 4) + (28 - 4)}$$
$$= \frac{26 - 12 - (9)}{4 - 24 + 24}$$
$$= \frac{26 - 21}{4}$$
$$= \frac{5}{4}$$

178. What is the value of

$$(9 \div 30)^2 \times 2.4 + 0.3 \text{ of } 12 \times (1 - 0.3)^2 + 9 \times (0.3)^2 ?$$

- (a) 3.43 (b) 3.69
(c) 2.79 (d) 2.17

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) :

$$(9 \div 30)^2 \times 2.4 + 0.3 \text{ of } 12 \times (1 - 0.3)^2 + 9 \times (0.3)^2$$
$$= \left(\frac{9}{30}\right)^2 \times 2.4 + 0.3 \times 12 \times (0.7)^2 + 9 \times (0.09)$$
$$= \left(\frac{3}{10}\right)^2 \times 2.4 + 3.6 \times 0.49 + 0.81$$
$$= (0.3)^2 \times 2.4 + 3.6 \times 0.49 + 0.81$$
$$= 0.09 \times 2.4 + 3.6 \times 0.49 + 0.81$$
$$= 0.216 + 1.764 + 0.81$$
$$= 2.79$$

179. What is the value of

$$\frac{12 \text{ of } 3 \div 6 + 12 \times 2 - (2 \times 4 - 5)}{12 \div 3 \times 4 + (2 \times 4 - 5)}$$

- (a) $\frac{27}{22}$ (b) $\frac{23}{17}$
(c) $\frac{27}{19}$ (d) $\frac{21}{9}$

SSC MTS 08/08/2019 (Shift-II)

Ans. (c) :

$$\frac{12 \text{ of } 3 \div 6 + 12 \times 2 - (2 \times 4 - 5)}{12 \div 3 \times 4 + (2 \times 4 - 5)}$$
$$= \frac{36 \div 6 + 24 - (3)}{4 \times 4 + (8 - 5)}$$
$$= \frac{6 + 24 - 3}{16 + 3}$$
$$= \frac{27}{19}$$

180. What is the value of 5 of 5 of 5 ÷ 5 + 5 - 6 ÷ 3 × 4 + 2 + (3 ÷ 6 × 2) ?

- (a) 21 (b) 25
(c) 28 (d) 19

SSC MTS 08/08/2019 (Shift-II)

Ans. (b) 5 of 5 of 5 ÷ 5 + 5 - 6 ÷ 3 × 4 + 2 + (3 ÷ 6 × 2)

$$\Rightarrow (5 \times 5 \times 5) \div 5 + 5 - 2 \times 4 + 2 + \left(\frac{1}{2} \times 2\right)$$
$$= 125 \div 5 + 5 - 8 + 2 + 1$$
$$= 25 - 3 + 3$$
$$= 25$$

181. The value of $\left(2\frac{1}{6} + 1\frac{13}{18} - \frac{1}{6}\right) \times 16 \div 4$:

- (a) 42 (b) $41\frac{1}{72}$
(c) $\frac{134}{9}$ (d) 63

SSC MTS 13/08/2019 (Shift-I)

Ans. (c) :

$$\left(2\frac{1}{6} + 1\frac{13}{18} - \frac{1}{6}\right) \times 16 \div 4$$
$$= \left(\frac{13}{6} + \frac{31}{18} - \frac{1}{6}\right) \times 4$$
$$= \left(\frac{39 + 31 - 3}{18}\right) \times 4$$
$$= \frac{67}{18} \times 4$$
$$= \frac{134}{9}$$

182. What is the value of

$$\frac{39 \div 26 + 22 \div 11 \times 2 + 4 \times 3}{2 \text{ of } 5 - 3(7 + 10 \div 2 - 3 \times 3)}$$

- (a) $\frac{61}{2}$ (b) $\frac{49}{2}$
(c) $\frac{39}{2}$ (d) $\frac{35}{2}$

SSC MTS 06/08/2019 (Shift-I)

Ans. (d) : $\frac{39 \div 26 + 22 \div 11 \times 2 + 4 \times 3}{2 \text{ of } 5 - 3(7 + 10 \div 2 - 3 \times 3)} = ?$

$$\frac{39}{26} + 2 \times 2 + 12$$
$$= \frac{39}{2 \times 5 - 3 \times (7 + 5 - 9)}$$
$$= \frac{3}{2} + 4 + 12$$
$$= \frac{10 - 3 \times 3}{2} + 16$$
$$= \frac{3}{2} + 16 = \frac{35}{2}$$

183. Find the value of $(0.4 \text{ of } 50 \times 6 \div 8) \div (12 \times 10 \div 16) + 5 \times 0.2 - 0.01 \times 10^2$

- (a) 1 (b) 4
(c) 2 (d) 3

SSC MTS 16/08/2019 (Shift-III)

Ans. (c)

$$\begin{aligned} & (0.4 \text{ of } 50 \times 6 \div 8) \div (12 \times 10 \div 16) + 5 \times 0.2 - 0.01 \times 10^2 \\ & = (0.4 \times 50 \times 6 \div 8) \div (12 \times 10 \div 16) + 5 \times 0.2 - 0.01 \times 10^2 \\ & = 15 \div \frac{15}{2} + 1 - 1 \\ & = 15 \times \frac{2}{15} = 2 \end{aligned}$$

184. What is the value of $\left(1 - \frac{3}{4}\right) + \frac{1}{2}$ **of** $\frac{6}{10}$ **:**
 $\frac{2}{3} \div \frac{4}{10} + \left(1 - \frac{1}{5}\right)$ **of** $\frac{25}{16}$

- (a) $\frac{33}{175}$ (b) $\frac{49}{115}$
(c) $\frac{29}{175}$ (d) $\frac{47}{115}$

SSC MTS 19/08/2019 (Shift-II)

Ans. (a) :

$$\begin{aligned} & \left(1 - \frac{3}{4}\right) + \frac{1}{2} \text{ of } \frac{6}{10} \\ & \frac{2}{3} \div \frac{4}{10} + \left(1 - \frac{1}{5}\right) \text{ of } \frac{25}{16} \\ & = \frac{\frac{1}{4} + \frac{1}{2} \times \frac{6}{10}}{\frac{2}{3} \times \frac{10}{4} + \left(\frac{4}{5}\right) \times \frac{25}{16}} \\ & = \frac{\frac{1}{4} + \frac{3}{10}}{\frac{10}{6} + \frac{5}{4}} \\ & = \frac{\frac{5+6}{20}}{\frac{20+15}{12}} \\ & \frac{11}{20} \times \frac{12}{35} = \boxed{\frac{33}{175}} \end{aligned}$$

185. What is the value

of $3 \div 3$ **of** $3 + 2 \div 4 + (4 \times 2 - 2) \div 12 + 4$ **?**

- (a) $\frac{12}{5}$ (b) $\frac{16}{3}$
(c) $\frac{14}{3}$ (d) $\frac{17}{6}$

SSC MTS 19/08/2019 (Shift-II)

Ans. (b) :

$$\begin{aligned} & 3 \div 3 \text{ of } 3 + 2 \div 4 + (4 \times 2 - 2) \div 12 + 4 \\ & = 3 \div 3 \times 3 + 2 \div 4 + (6) \div 12 + 4 \\ & \frac{3}{9} + \frac{2}{4} + \frac{6}{12} + 4 \\ & \frac{12+18+18+36 \times 4}{36} \end{aligned}$$

$$\begin{aligned} & = \frac{48+144}{36} = \frac{192}{36} \\ & \frac{192}{36} = \boxed{\frac{16}{3}} \end{aligned}$$

186. What should come in place of the question mark (?) in the following question?

$$\left[\left\{ (16 \div 4) \times 4 \right\} \div 4 \right] = ?$$

- (a) 2 (b) 5
(c) 4 (d) 3

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : $\left[\left\{ (16 \div 4) \times 4 \right\} \div 4 \right]$
 $= \left[\left\{ 4 \times 4 \right\} \div 4 \right]$
 $= [16 \div 4]$
 $= 4$

187. What is the value of

$$\left(2000 \div \frac{1}{2} \text{ of } \frac{25}{2} \times \frac{5}{2} \text{ of } \frac{4}{25} - 5 \right) ?$$

- (a) 121 (b) 123
(c) 122 (d) 126

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : $2000 \div \frac{1}{2} \text{ of } \frac{25}{2} \times \frac{5}{2} \text{ of } \frac{4}{25} - 5$
 $= 2000 \div \frac{25}{4} \times \frac{2}{5} - 5$
 $= 2000 \times \frac{4}{25} \times \frac{2}{5} - 5$
 $= 64 \times 2 - 5$
 $= 128 - 5 = 123$

188. What is the value of $\left(11 \div 4 - \frac{2}{3} \text{ of } \frac{9}{8} + 11 \right)$ **?**

- (a) 13 (b) 11
(c) 15 (d) 17

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (a) : $11 \div 4 - \frac{2}{3} \text{ of } \frac{9}{8} + 11$
 $= \frac{11}{4} - \frac{3}{4} + 11$
 $= \frac{11-3}{4} + 11$
 $= \frac{8}{4} + 11$
 $= 2 + 11$
 $= 13$

189. What is the value of $7\frac{1}{4} + [6 + (5 - 8 \div 4) - 1]$ **?**

- (a) $\frac{61}{4}$ (b) $\frac{29}{2}$
(c) $\frac{23}{2}$ (d) $\frac{57}{4}$

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : $7\frac{1}{4} + [6 + (5 - 8 \div 4) - 1]$

[According to BODMAS rule]

$$= \frac{29}{4} + [6 + 3 - 1]$$

$$= \frac{29}{4} + 8 = \frac{61}{4}$$

190. What is the value of $\left(\frac{5}{2} \text{ of } 5 \div 4 - 2 \text{ of } \frac{1}{7} \div \frac{1}{7}\right)$?

- (a) $\frac{13}{8}$ (b) $\frac{23}{18}$
 (c) $\frac{17}{16}$ (d) $\frac{9}{8}$

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : $\left(\frac{5}{2} \text{ of } 5 \div 4 - 2 \text{ of } \frac{1}{7} \div \frac{1}{7}\right)$

$$\left(\frac{25}{2} \times \frac{1}{4} - \frac{2}{7} \div \frac{1}{7}\right)$$

$$= \frac{25}{8} - 2 = \frac{9}{8}$$

191. What is the value of $80 \div 40 - 10 - 5 \times 4$ of $\left(\frac{1}{3} \div \frac{10}{3}\right)$?

- (a) -12 (b) $\frac{40}{3}$
 (c) $\frac{22}{5}$ (d) -10

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (d) : $80 \div 40 - 10 - 5 \times 4$ of $\left(\frac{1}{3} \div \frac{10}{3}\right)$

$$= \frac{80}{40} - 10 - 20 \times \left(\frac{1}{3} \times \frac{3}{10}\right)$$

$$= 2 - 10 - 20 \times \frac{1}{10}$$

$$= 2 - 10 - 2$$

$$= -10$$

192. What is the value of

$$\left[88 - 44 \div (22 \times 4) \text{ of } \left(\frac{1}{2} - \frac{1}{4} \div \frac{1}{8}\right)\right]?$$

- (a) $\frac{265}{3}$ (b) $\frac{703}{9}$
 (c) $\frac{514}{9}$ (d) $\frac{711}{3}$

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (a) : $88 - 44 \div (88) \text{ of } \left(\frac{1}{2} - 2\right)$

$$= 88 - 44 \div \left(88 \times \frac{-3}{2}\right)$$

$$= 88 - 44 \div (-132)$$

$$= 88 + \frac{44}{132}$$

$$= 88 + \frac{4}{12}$$

$$= 88 + \frac{1}{3} = \frac{265}{3}$$

193. The value of

$$\left(5\frac{1}{9} - 7\frac{7}{8} \div 9\frac{9}{20}\right) \times \frac{9}{11} - \left(5\frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{4} \times \frac{2}{7}\right) \div 4\frac{2}{3} + 1\frac{3}{4}$$

is:

- (a) $2\frac{1}{4}$ (b) $2\frac{1}{3}$
 (c) $3\frac{1}{4}$ (d) $4\frac{1}{2}$

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a)

$$: \left(5\frac{1}{9} - 7\frac{7}{8} \div 9\frac{9}{20}\right) \times \frac{9}{11} - \left(5\frac{1}{4} \div \frac{3}{7} \text{ of } \frac{1}{4} \times \frac{2}{7}\right) \div 4\frac{2}{3} + 1\frac{3}{4}$$

$$= \left(\frac{46}{9} - \frac{63}{8} \div \frac{189}{20}\right) \times \frac{9}{11} - \left[\frac{21}{4} \div \left(\frac{3}{7} \times \frac{1}{4}\right) \times \frac{2}{7}\right] \div \frac{14}{3} + \frac{7}{4}$$

$$\left(\frac{46}{9} - \frac{63}{8} \times \frac{20}{189}\right) \times \frac{9}{11} - \left[\frac{21}{4} \times \frac{28}{3} \times \frac{2}{7}\right] \div \frac{14}{3} + \frac{7}{4}$$

$$= \left(\frac{46}{9} - \frac{5}{6}\right) \times \frac{9}{11} - 14 \times \frac{3}{14} + \frac{7}{4}$$

$$= \left(\frac{184 - 30}{36}\right) \times \frac{9}{11} - \frac{3}{1} + \frac{7}{4}$$

$$= \frac{154}{44} - \frac{5}{4}$$

$$= \frac{154 - 55}{44}$$

$$= \frac{99}{44}$$

$$= 2\frac{1}{4}$$

(II) Miscellaneous

194. Simplify the following expression.

$$(0.14 \times 0.14) - (2 \times 0.14 \times 5.14) + (5.14 \times 5.14)$$

- (a) 5.18 (b) 4
 (c) 16 (d) 25

SSC CHSL 07/06/2022 (Shift-II)

Ans. (d) :

$$(0.14 \times 0.14) - (2 \times 0.14 \times 5.14) + (5.14 \times 5.14)$$

$$(0.14)^2 - (2 \times 0.14 \times 5.14) + (5.14)^2$$

From formula -

$$(a - b)^2 = a^2 + b^2 - 2ab$$

Where,

$$a = 5.14$$

$$b = 0.14$$

$$\begin{aligned} \therefore (a - b)^2 &= (5.14 - 0.14)^2 \\ &= (5)^2 \\ &= 25 \end{aligned}$$

Hence, option (d) is correct.

195. The value of

$$(4^3 + 4) \div [5^2 - (7^2 - 41)] \text{ is:}$$

- (a) 8 (b) 17
(c) 5 (d) 4

SSC CHSL 24/05/2022 (Shift- III)

$$\text{Ans. (d) : } (4^3 + 4) \div [5^2 - (7^2 - 41)]$$

$$\begin{aligned} &= 68 \div [25 - 8] \\ &= 68 \div 17 \\ &= 4 \end{aligned}$$

196. The value of $11.\bar{4} + 22.\bar{567} - 33.\bar{59}$ is:

- (a) $40.\bar{12}$ (b) $4.\bar{12}$
(c) $0.4\bar{12}$ (d) $0.04\bar{12}$

SSC CGL (Tier-II) 03/02/2022

$$\text{Ans : (c) } 11.\bar{4} + 22.\bar{567} - 33.\bar{59}$$

$$\begin{aligned} &= 11 + 0.\bar{4} + 22 + 0.\bar{567} - 33 - 0.\bar{59} \\ &= \frac{4}{9} + \frac{567 - 5}{990} - \frac{59 - 5}{90} \\ &= \frac{4}{9} + \frac{562}{990} - \frac{54}{90} \\ &= \frac{440 + 562 - 594}{990} \\ &= \frac{440 - 32}{990} \\ &= \frac{408}{990} \\ &= 0.4\bar{12} \end{aligned}$$

197. The value of $\frac{(2.53)^3 + (2.47)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7}$ is 5×10^k , where the value of k is:

- (a) -2 (b) -1
(c) 1 (d) 2

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$$\text{Ans : (a) } \frac{(2.53)^3 + (2.47)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7} = 5 \times 10^k$$

$$\frac{(2.53)^3 + (2.47)^3}{25.3 \times 25.3 - 25.3 \times 24.7 + 24.7 \times 24.7} = 5 \times 10^k$$

$$a = 2.53, b = 2.47$$

$$\frac{a^3 + b^3}{100(a^2 - ab + b^2)} = 5 \times 10^k$$

$$\frac{(a + b)(a^2 + b^2 - ab)}{100(a^2 - ab + b^2)} = 5 \times 10^k$$

$$\frac{2.53 + 2.47}{100} = 5 \times 10^k$$

$$\frac{5.00}{100} = 5 \times 10^k$$

$$5 \times 10^{-2} = 5 \times 10^k$$

On comparing power both sides,

$$k = -2$$

198. The value of $0.\bar{46} + 0.\bar{723} - 0.\bar{39} \times 0.\bar{7}$ is:

- (a) $0.\bar{97}$ (b) $0.\bar{57}$
(c) $0.\bar{77}$ (d) $0.\bar{87}$

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$$\text{Ans : (d) } 0.\bar{46} + 0.\bar{723} - 0.\bar{39} \times 0.\bar{7}$$

$$\frac{46 - 4}{90} + \frac{723 - 7}{990} - \frac{39 - 3}{90} \times \frac{7}{9}$$

$$\frac{42}{90} + \frac{716}{990} - \frac{36}{90} \times \frac{7}{9}$$

$$\frac{42}{90} + \frac{716}{990} - \frac{28}{90}$$

$$\frac{462 + 716 - 308}{990}$$

$$\frac{1178 - 308}{990}$$

$$\frac{870}{990}$$

$$= 0.\bar{87}$$

199. Simplify the given expression

$$\left(x - \frac{2}{x}\right)^3 - \left(x + \frac{2}{x}\right)^3$$

(a) $-4\left(3x + \frac{4}{x^3}\right)$ (b) $4\left(3x - \frac{4}{x^3}\right)$

(c) $-4\left(x + \frac{4}{x^3}\right)$ (d) $2\left(x - \frac{4}{x^3}\right)$

SSC CHSL 10/08/2021 (Shift-I)

$$\text{Ans. (a) : } \left(x - \frac{2}{x}\right)^3 - \left(x + \frac{2}{x}\right)^3$$

$$= \left[x^3 - \frac{8}{x^3} - 3 \times x^2 \times \frac{2}{x} + 3 \times x \times \frac{4}{x^2}\right] -$$

$$\left[x^3 + \frac{8}{x^3} + 3 \times x^2 \times \frac{2}{x} + 3 \times x \times \frac{4}{x^2}\right]$$

$$= \frac{-16}{x^3} - 6 \times x^2 \times \frac{2}{x} = -4\left(\frac{4}{x^3} + 3x\right)$$

200. Find value of $\sqrt{3\frac{1}{16} + \frac{1}{2} - \frac{3}{4}}$ =

- (a) $1\frac{3}{4}$ (b) 1
(c) $1\frac{1}{2}$ (d) $1\frac{1}{4}$

SSC MTS 21/08/2019 (Shift-II)

Ans. (c) : $\sqrt{3\frac{1}{16} + \frac{1}{2} - \frac{3}{4}}$
 $= \sqrt{\frac{49}{16} + \frac{1}{2} - \frac{3}{4}}$
 $= \frac{7}{4} + \frac{1}{2} - \frac{3}{4}$
 $= \frac{7}{4} + \frac{2}{4} - \frac{3}{4}$
 $= \frac{6}{4} = \frac{3}{2}$
 $= 1\frac{1}{2}$

201. $\frac{775 \times 775 \times 775 + 225 \times 225 \times 225}{77.5 \times 77.5 + 22.5 \times 22.5 - 77.5 \times 22.5}$ is equal

- to:
(a) 10000 (b) 100000
(c) 0.1 (d) 100

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) : $\frac{775 \times 775 \times 775 + 225 \times 225 \times 225}{77.5 \times 77.5 + 22.5 \times 22.5 - 77.5 \times 22.5}$
 From formula—
 $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$
 $\Rightarrow \frac{a^3 + b^3}{a^2 + b^2 - ab} = (a + b)$
 $\therefore \frac{(775)^3 + (225)^3}{\frac{1}{100}[(775)^2 + (225)^2 - 775 \times 225]}$
 $\Rightarrow 100 \left[\frac{(775)^3 + (225)^3}{(775)^2 + (225)^2 - 775 \times 225} \right]$
 $\Rightarrow 100(775 + 225)$
 $\Rightarrow 100 \times 1000$
 $\Rightarrow 100000$

202. Simplify the following expression,

$$\frac{0.8 \times 0.8 \times 0.8 + 0.6 \times 0.6 \times 0.6}{0.08 \times 0.08 + 0.06 \times 0.06 - 0.08 \times 0.06}$$

- (a) 160 (b) 140
(c) 14 (d) 1.4

SSC CHSL 16/04/2021 (Shift-III)

Ans.(b) : $\frac{0.8 \times 0.8 \times 0.8 + 0.6 \times 0.6 \times 0.6}{0.08 \times 0.08 + 0.06 \times 0.06 - 0.08 \times 0.06}$

$$= \frac{1}{1000}(8^3 + 6^3)$$

$$= \frac{1}{10000}(8^2 + 6^2 - 8 \times 6)$$

$$= 10 \left(\frac{8^2 + 6^2}{8^2 + 6^2 - 8 \times 6} \right)$$

From formula—

$$\frac{a^3 + b^3}{a^2 + b^2 - ab} = (a + b)$$

$$= 10(8 + 6)$$

$$= 10 \times 14$$

$$= 140$$

203. Which of the following statement(s) is/are TRUE?

I. $\frac{1}{1 \times 3} + \frac{1}{3 \times 5} + \frac{1}{5 \times 7} + \dots + \frac{1}{11 \times 13} = \frac{12}{13}$

II. $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{12 \times 13} = \frac{12}{13}$

- (a) Only I (b) Only II
(c) Both I and II (d) Neither I nor II

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : In Statement I:—

$$\text{L.H.S.} = \frac{1}{1 \times 3} + \frac{1}{3 \times 5} + \frac{1}{5 \times 7} + \dots + \frac{1}{11 \times 13}$$

$$= \frac{1}{2} \left[\left(\frac{1}{1} - \frac{1}{3} \right) + \left(\frac{1}{3} - \frac{1}{5} \right) + \left(\frac{1}{5} - \frac{1}{7} \right) + \dots + \left(\frac{1}{11} - \frac{1}{13} \right) \right]$$

$$= \frac{1}{2} \left[1 - \frac{1}{13} \right]$$

$$= \frac{6}{13} \neq \text{R.H.S.}$$

In Statement II:—

$$\text{L.H.S.} = \frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{12 \times 13}$$

$$= \left[\left(\frac{1}{1} - \frac{1}{2} \right) + \left(\frac{1}{2} - \frac{1}{3} \right) + \left(\frac{1}{3} - \frac{1}{4} \right) + \dots + \left(\frac{1}{12} - \frac{1}{13} \right) \right]$$

$$= \left[1 - \frac{1}{13} \right]$$

$$= \frac{12}{13} = \text{R.H.S.}$$

Thus statement II is true.

204. If $1 + (1/2) + (1/3) + \dots + (1/20) = k$, then what is the value of $(1/4) + (1/6) + (1/8) + \dots + (1/40)$?

- (a) $k/2$ (b) $2k$
(c) $(k - 1)/2$ (d) $(k + 1)/2$

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Ans. (c) : $1 + \left(\frac{1}{2}\right) + \left(\frac{1}{3}\right) + \dots + \left(\frac{1}{20}\right) = k$

$\Rightarrow \left(\frac{1}{2}\right) + \left(\frac{1}{3}\right) + \dots + \left(\frac{1}{20}\right) = k - 1 \dots \dots (i)$

$\therefore \left(\frac{1}{4}\right) + \left(\frac{1}{6}\right) + \left(\frac{1}{8}\right) + \dots + \left(\frac{1}{40}\right)$

$= \frac{1}{2} \left[\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{20} \right]$

$= \frac{1}{2} [k - 1]$ in eqⁿ (i)

$= (k-1)/2$

205. What is the value of

$$\frac{3.6 \times 1.62 + 0.48 \times 3.6}{1.8 \times 0.8 + 10.8 \times 0.3 - 2.16} ?$$

- (a) 2.4 (b) 2
(c) 4 (d) 3

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : $\frac{3.6 \times 1.62 + 0.48 \times 3.6}{1.8 \times 0.8 + 10.8 \times 0.3 - 2.16}$

$[\because a^3 + b^3 = (a+b)(a^2 + b^2 - ab)]$

$= \frac{(1.8)^3 + (1.2)^3}{(1.2)^2 + (1.8)^2 - 1.2 \times 1.8}$

$= 1.8 + 1.2 = 3$

206. If

$$\left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{6}\right) \left(1 + \frac{1}{8}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{5}\right)$$

$\left(1 - \frac{1}{7}\right) = 1 + \frac{1}{x}$, then what is the value of x?

- (a) 6 (b) 8
(c) 5 (d) 7

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Ans. (b) :

$$\left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{6}\right) \left(1 + \frac{1}{8}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{5}\right)$$

$\left(1 - \frac{1}{7}\right) = 1 + \frac{1}{x} \Rightarrow \frac{3}{2} \times \frac{5}{4} \times \frac{7}{6} \times \frac{9}{8} \times \frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} = 1 + \frac{1}{x}$

$\frac{9}{8} = 1 + \frac{1}{x}$

$1 + \frac{1}{8} = 1 + \frac{1}{x}$

On comparing
 $x = 8$

207. What is the value of

$$\frac{1}{3 \times 7} + \frac{1}{7 \times 11} + \frac{1}{11 \times 15} + \dots + \frac{1}{899 \times 903} ?$$

- (a) 21/500
(c) 25/301

- (b) 18/403
(d) 29/31

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $\frac{1}{3 \times 7} + \frac{1}{7 \times 11} + \frac{1}{11 \times 15} + \dots + \frac{1}{899 \times 903}$

$\frac{1}{\text{common difference}} \times \left[\frac{1}{\text{first term}} - \frac{1}{\text{last term}} \right]$

$= \frac{1}{4} \left[\frac{1}{3} - \frac{1}{903} \right]$

$= \frac{1}{4} \times \left[\frac{301-1}{903} \right] = \frac{75}{903} = \frac{25}{301}$

208. What is the value of $1/(0.1)^2 + 1/(0.01)^2 + 1/(0.5)^2 + 1/(0.05)^2$?

- (a) 10504 (b) 10404
(c) 10004 (d) 11400

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

$$\frac{1}{(0.1)^2} + \frac{1}{(0.01)^2} + \frac{1}{(0.5)^2} + \frac{1}{(0.05)^2}$$

$= 100 + 10000 + \frac{100}{25} + \frac{10000}{25}$

$= 100 + 10000 + 4 + 400$

$= 10504$

209. What is the value of

$$\left(2 + \sqrt{2}\right) + \left(\frac{1}{2 + \sqrt{2}}\right) + \left(\frac{1}{2 - \sqrt{2}}\right) + \left(2 - \sqrt{2}\right)$$

- (a) 2 (b) 4
(c) 8 (d) 6

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$\left(2 + \sqrt{2}\right) + \left(\frac{1}{2 + \sqrt{2}}\right) + \left(\frac{1}{2 - \sqrt{2}}\right) + \left(2 - \sqrt{2}\right)$$

$= 4 + \frac{2 - \sqrt{2} + 2 + \sqrt{2}}{(2 + \sqrt{2})(2 - \sqrt{2})}$

$= 4 + \frac{4}{2} = 6$

210. What is the value of $1006^2 - 1007 \times 1005 + 1008 \times 1004 - 1009 \times 1003$?

- (a) 6 (b) 3
(c) 12 (d) 24

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : $1006^2 - 1007 \times 1005 + 1008 \times 1004 - 1009 \times 1003$

Let $1003 = x$

$(x+3)^2 - (x+4)(x+2) + (x+5)(x+1) - (x+6)x$

$= x^2 + 9 + 6x - x^2 - 6x - 8 + x^2 + 6x + 5 - x^2 - 6x$

$= 6$

211. What is the value of

$$\frac{(1.2)^3 + (0.8)^3 + (0.7)^3 - 2.016}{(1.35)[(1.2)^2 + (0.8)^2 + (0.7)^2 - 0.96 - 0.84 - 0.56]}?$$

(a) 1/4 (b) 1/2
(c) 1 (d) 2

SSC CGL (Tier-II) 17-2-2018 (Shift-I)

Ans. (d) :

$$\frac{(1.2)^3 + (0.8)^3 + (0.7)^3 - 3 \times 1.2 \times 0.8 \times 0.7}{(1.35)[(1.2)^2 + (0.8)^2 + (0.7)^2 - 0.96 - 0.84 - 0.56]}$$

$\therefore a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$$\frac{(1.2 + 0.8 + 0.7)[(1.2)^2 + (0.8)^2 + (0.7)^2 - 0.96 - 0.84 - 0.56]}{1.35[(1.2)^2 + (0.8)^2 + (0.7)^2 - 0.96 - 0.84 - 0.56]}$$

$$= \frac{2.7}{1.35} = 2$$

212. If $(320 + 342 + 530 + 915) \div (20 + 22 - x + 18) = 43$ then the value of x is ?

- (a) 11 (b) 23
(c) 26 (d) 15

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (a)

$$(320 + 342 + 530 + 915) \div (20 + 22 - x + 18) = 43$$

$$\frac{2107}{60 - x} = 43$$

$$60 - x = \frac{2107}{43}$$

$$60 - x = 49$$

$$x = 60 - 49 = 11$$

213. A student was asked to find the value of

$$\left(2\frac{1}{3} + 2\frac{1}{2} - \frac{1}{6}\right) \div 2\frac{1}{3} \times 5\frac{2}{3} \div 1\frac{2}{3} \text{ of } 4\frac{1}{4}$$

$$3\frac{1}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3} + 5\frac{1}{3} \times \frac{3}{4} \div 2\frac{2}{3}$$

was 6/7. What is the difference between the correct answer and his answer?

- (a) $\frac{11}{49}$ (b) $\frac{6}{49}$
(c) $\frac{9}{14}$ (d) $\frac{5}{14}$

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b)

$$\frac{\left(2\frac{1}{3} + 2\frac{1}{2} - \frac{1}{6}\right) \div 2\frac{1}{3} \times 5\frac{2}{3} \div 1\frac{2}{3} \text{ of } 4\frac{1}{4}}{3\frac{1}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3} + 5\frac{1}{3} \times \frac{3}{4} \div 2\frac{2}{3}}$$

$$= \frac{\left(\frac{7}{3} + \frac{5}{2} - \frac{1}{6}\right) \div \frac{7}{3} \times \frac{17}{3} \div \frac{5}{3} \text{ of } \frac{17}{4}}{\frac{16}{5} \div \frac{9}{2} \text{ of } \frac{16}{3} + \frac{16}{3} \times \frac{3}{4} \div \frac{8}{3}}$$

$$= \frac{\left(\frac{28}{6}\right) \div \frac{7}{3} \times \frac{17}{3} \div \frac{85}{12}}{\frac{16}{5} \div 24 + \frac{16}{3} \times \frac{3}{4} \div \frac{8}{3}} = \frac{\frac{28}{6} \times \frac{3}{7} \times \frac{17}{3} \times \frac{12}{85}}{\frac{16}{5} \times \frac{1}{24} + \frac{16}{3} \times \frac{3}{4} \times \frac{3}{8}}$$

$$= \frac{\frac{8}{5}}{\frac{2}{15} + \frac{3}{2}} = \frac{\frac{8}{5}}{\left(\frac{4+45}{30}\right)} = \frac{8}{5} \times \frac{30}{49}$$

$$= \frac{48}{49}$$

$$\text{Intended difference} = \frac{48}{49} - \frac{6}{7} = \frac{6}{49}$$

214. What is the simplified value of:

$$\frac{1}{8} \left\{ \left(x + \frac{1}{y} \right)^2 - \left(x - \frac{1}{y} \right)^2 \right\}$$

- (a) $\frac{x}{2y}$ (b) $\frac{2x}{y}$
(c) $\frac{x}{y}$ (d) $\frac{4x}{y}$

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (a)

$$\frac{1}{8} \left\{ \left(x + \frac{1}{y} \right)^2 - \left(x - \frac{1}{y} \right)^2 \right\}$$

$$= \frac{1}{8} \left\{ x^2 + \frac{1}{y^2} + \frac{2x}{y} - x^2 - \frac{1}{y^2} + \frac{2x}{y} \right\}$$

$$= \frac{1}{8} \times \frac{4x}{y} = \frac{x}{2y}$$

215. The simplified value of :

$$\frac{1.0025 + 6.25 \times 10^{-6}}{0.0025 + 0.95}$$

- (a) 1.0505 (b) 1.0025
(c) 1.0005 (d) 1.0525

SSC CHSL 09/07/2019 (Shift-III)

Ans. (d) :

$$\frac{1.0025 + 6.25 \times 10^{-6}}{0.0025 + 0.95}$$

$$= \frac{1.0025 + 0.00000625}{0.9525}$$

$$= \frac{1.00250625}{0.9525}$$

$$= 1.0525$$

216. What is the simplified value of $\frac{0.01404}{24^2 + 6^2 - 144}$?

- (a) 6×10^{-5} (b) 2.4×10^{-4}
(c) 3×10^{-5} (d) 3×10^{-4}

SSC CHSL (Tier-I) 10/07/2019

Ans. (c): $\frac{0.01404}{24^2 + 6^2 - 144} = \frac{0.01404}{576 + 36 - 144}$
 $= \frac{0.01404}{612 - 144} = \frac{1404 \times 10^{-5}}{468}$
 $= \frac{351}{117} \times 10^{-5} = 3 \times 10^{-5}$

217. If $x = \frac{1}{12.13} + \frac{1}{13.14} + \frac{1}{14.15} + \dots + \frac{1}{23.24}$

and $y = \frac{1}{36.37} + \frac{1}{37.38} + \frac{1}{38.39} + \dots + \frac{1}{71.72}$,

then the value of $\frac{x}{y}$ is equal to ?

- (a) 3 (b) $\frac{1}{24}$
(c) $\frac{1}{72}$ (d) $\frac{1}{3}$

SSC CHSL 10/07/2019 (Shift-III)

Ans. (a): $x = \frac{1}{12.13} + \frac{1}{13.14} + \frac{1}{14.15} + \dots + \frac{1}{23.24}$
 $y = \frac{1}{36.37} + \frac{1}{37.38} + \frac{1}{38.39} + \dots + \frac{1}{71.72}$
 $\therefore x = \frac{13-12}{12.13} + \frac{14-13}{13.14} + \frac{15-14}{14.15} + \dots + \frac{24-23}{23.24}$
 $x = \frac{1}{12} - \frac{1}{13} + \frac{1}{13} - \frac{1}{14} + \frac{1}{14} - \frac{1}{15} + \dots + \frac{1}{23} - \frac{1}{24}$
 $x = \frac{1}{12} - \frac{1}{24} = \frac{2-1}{24}$
 $x = \frac{1}{24}$

Similarly

$$y = \frac{1}{36} - \frac{1}{37} + \frac{1}{37} - \frac{1}{38} + \frac{1}{38} - \frac{1}{39} + \dots + \frac{1}{71} - \frac{1}{72}$$

$$y = \frac{1}{36} - \frac{1}{72} = \frac{2-1}{72}$$

$$y = \frac{1}{72}$$

$$\frac{x}{y} = \frac{\frac{1}{24}}{\frac{1}{72}} = \frac{72}{24} = 3$$

218. The value of

$$5\frac{1}{3} \times 2\frac{1}{7} \times 9\frac{2}{5} \times 4\frac{3}{8} \times 2\frac{6}{47} \text{ is:}$$

- (a) 1 (b) 1000
(c) 100 (d) 10

SSC MTS 13/08/2019 (Shift-II)

Ans. (b): $5\frac{1}{3} \times 2\frac{1}{7} \times 9\frac{2}{5} \times 4\frac{3}{8} \times 2\frac{6}{47}$
 $\frac{16}{3} \times \frac{15}{7} \times \frac{47}{5} \times \frac{35}{8} \times \frac{100}{47}$
 $10 \times 100 = 1000$

219. The value of $99\frac{95}{99} \times 99 - 95$ is:

- (a) 9897 (b) 9993
(c) 9999 (d) 9801

SSC MTS 09/08/2019 (Shift-I)

Ans. (d): $99\frac{95}{99} \times 99 - 95$
 $\frac{(99 \times 99 + 95)}{99} \times 99 - 95$
 $= 99 \times 99 + 95 - 95$
 $= 9801$

220. Simplify $\left[\left(5\frac{1}{2} \right)^2 - \left(2\frac{3}{4} \right)^2 \right] \div 2\frac{3}{4}$.

- (a) $8\frac{1}{4}$ (b) $5\frac{1}{2}$
(c) $8\frac{3}{4}$ (d) $2\frac{3}{4}$

SSC CHSL 30/05/2022 (Shift-III)

Ans. (a): $\left[\left(5\frac{1}{2} \right)^2 - \left(2\frac{3}{4} \right)^2 \right] \div 2\frac{3}{4}$
 $= \left[\frac{121}{4} - \frac{121}{16} \right] \times \frac{4}{11}$
 $= \frac{363}{16} \times \frac{4}{11}$
 $= \frac{33}{4} = 8\frac{1}{4}$

221. What is the value of:
 $\frac{0.56 \times 0.36 + 0.42 \times 0.32}{0.8 \times 0.21}$

- (a) 1 (b) $\frac{3}{2}$
(c) 3 (d) 2

SSC MTS 09/08/2019 (Shift-I)

Ans. (d): $\frac{0.56 \times 0.36 + 0.42 \times 0.32}{0.8 \times 0.21}$
 $= \frac{0.2016 + 0.1344}{0.8 \times 0.21}$
 $= \frac{0.3360}{0.8 \times 0.21}$
 $= \frac{336}{8 \times 21}$
 $= \frac{42}{21}$
 $= 2$

(I) Simple Problems based on Average

1. The average of five numbers, given in a particular order, is 32. The average of the first three numbers is 28, while that of the last three numbers is 34. what is the average of the first two numbers?
 (a) 29 (b) 30
 (c) 27 (d) 28

SSC CHSL 07/06/2022 (Shift- II)

Ans. (a) : Let the 5 number be x_1, x_2, x_3, x_4, x_5 .Sum of first three number = 28×3

$$\Rightarrow x_1 + x_2 + x_3 = 84$$

Sum of last three numbers = 34×3

$$\Rightarrow x_3 + x_4 + x_5 = 102$$

Sum of five numbers = 32×5

$$\Rightarrow x_1 + x_2 + x_3 + x_4 + x_5 = 160$$

$$\Rightarrow x_1 + x_2 = 160 - 102$$

$$\Rightarrow x_1 + x_2 = 58$$

$$\therefore \text{Average of first two number} = \frac{x_1 + x_2}{2} = \frac{58}{2} = 29$$

Hence, option (a) is correct.

2. If the average of n quantities is P and the average of m quantities is Q , then the average of $(m + n)$ quantities is:

- (a) $\frac{nP + mQ}{m - n}$ (b) $\frac{mP + nQ}{m + n}$
 (c) $\frac{np + mQ}{p + Q}$ (d) $\frac{nP + mQ}{m + n}$

SSC CHSL 25/05/2022 (Shift- III)

Ans. (d) : \therefore Average of n quantities = P \therefore sum of n quantities = nP Again, Average of m quantities = Q Sum of m quantities = mQ

$$\text{Average of } (m + n) \text{ quantities} = \frac{nP + mQ}{m + n}$$

3. Three positive numbers are in the ratio 2 : 3 : 4. The sum of their squares is 2349. The average of the first two numbers is:
 (a) 36 (b) 27.5
 (c) 18 (d) 22.5

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (d) Let three positive numbers are $2x, 3x$ and $4x$ respectively.

According to the question,

$$4x^2 + 9x^2 + 16x^2 = 2349$$

$$29x^2 = 2349$$

$$x^2 = 81$$

$$x = 9$$

$$\text{Average of first two numbers} = \frac{(2x + 3x)}{2}$$

$$= \frac{5x}{2}$$

$$= \frac{5 \times 9}{2}$$

$$= 22.5$$

4. The average of 46 numbers is 50.5. The average of the first 25 numbers is 45 and that of the last 18 numbers is 56. The 28th number is 67. If the 26th and 27th numbers are excluded, then what is the average of the remaining numbers?

- (a) 51.5 (b) 50.4
 (c) 50 (d) 51

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (c) Sum of all 46 numbers = $46 \times 50.5 = 2323$ Sum of first 25 numbers = $25 \times 45 = 1125$ Sum of last 18 numbers = $18 \times 56 = 1008$ Sum of 26th, 27th and 28th numbers = $2323 - 1125 - 1008 = 190$

According to the question,

$$26^{\text{th}} + 27^{\text{th}} + 28^{\text{th}} = 190$$

$$26^{\text{th}} + 27^{\text{th}} + 67 = 190$$

$$26^{\text{th}} + 27^{\text{th}} = 123$$

 \therefore Average of the remaining numbers

$$= \frac{2323 - 123}{44} = 50$$

5. There are 3 groups of persons – male, female and children. There are 20 males and the number of females and children taken together is 4 more than that of the males. The average weight of males is 54 kg, that of females is 49 kg and that of children is 30 kg. If the average weight of the whole group is 48.25 kg, then what is the difference between the number of females and the number of children?

- (a) 17 (b) 10
 (c) 7 (d) 14

SSC CHSL 10/08/2021 (Shift-I)

Ans. (b) : Let the number of females = x And, the number of children = y

According to the question,

$$\therefore x + y = 24 \quad \dots(i)$$

 \therefore Sum of numbers = Average \times No. of total terms

$$54 \times 20 + 49x + 30y = 44 \times 48.25$$

$$1080 + 49x + 30y = 2123$$

$$49x + 30y = 1043 \quad \dots(ii)$$

By solving equation (i) and (ii),
 $x = 17$
 $\therefore y = 7$
 Difference = $17 - 7 = 10$

6. The average of nine 2 digit numbers is decreased by 6 when the digits of one of the 2 digit numbers is interchanged. Find the difference between the digits of that number.
- (a) 4 (b) 2
 (c) 6 (d) 8

SSC CHSL -20/10/2020 (Shift-I)

Ans : (c) Two digit numbers = $10x + y$
 According to the question ,

$$\frac{(10x + y)}{9} - \frac{(10y + x)}{9} = 6$$

$$9x - 9y = 6 \times 9$$

Thus, the difference between the digit of that number =
 $x - y = 6$

7. The average weight of A, B and C is 55kg. The weight of C is 10kg more than A and 5kg more than B. The average weight of A, B, C and D, if D's weight is 19kg more than C, is:
- (a) 61kg (b) 58kg
 (c) 62kg (d) 60kg

SSC CHSL -21/10/2020 (Shift-III)

Ans. (a) Total average weight of A, B & C = $3 \times 55 = 165$
 According to the question,
 $A = C - 10$
 $B = C - 5$
 $\therefore C - 10 + C - 5 + C = 165$
 $3C = 180$
 $C = 60$
 D's weight = $60 + 19 = 79$

Total average of A, B, C and D = $\frac{165 + 79}{4} = 61 \text{ kg.}$

8. The average of 39 numbers is zero. How many of those numbers can be greater than zero?
- (a) 0 (b) 38
 (c) 20 (d) 39

SSC CGL (TIER-I)-2018 - 19.06.2019 (Shift-III)

Ans. (b) : Since the average of 39 number is zero. So maximum 38 number can be greater than zero where as 39th number should be such that the sum is zero i.e negative.

9. Four different numbers are given, out of which the average of the first three numbers is four times the fourth number and the average of all the numbers is 52. What is the average of first three numbers?
- (a) 65 (b) 70
 (c) 64 (d) 39

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c) : Let the 4 numbers are A, B, C and D.
 Given,

$$\frac{A + B + C + D}{4} = 52 \quad \dots(i)$$

And $\frac{A + B + C}{3} = 4D$

$$A + B + C = 12D \quad \dots(ii)$$

On putting the value of equation (ii) in equation (i),

$$\frac{12D + D}{4} = 52$$

$$13D = 208$$

$$D = 16$$

$$\text{Average of first three numbers} = \frac{A + B + C}{3} = 4D = 64$$

10. The average of the first 101 numbers is equal to 102 :

- (a) Natural (b) Perfect Square
 (c) Even (d) Odd

SSC CHSL 10/07/2019 (Shift-II)

Ans. (c) : The average of the first n odd numbers is n while the average of the first n even numbers is (n+1).

$$\therefore \text{Average of the first 101 even numbers} = 101 + 1 = 102$$

11. The average of the first 1234 numbers is equal to 1234.

- (a) Natural (b) Odd
 (c) Even (d) Prime

SSC CHSL 10/07/2019 (Shift-I)

Ans. (b) : **Note**:-The average of the first n odd numbers is always n.

\therefore The average of the first 1234 odd numbers be 1234 only.

12. Average of all even numbers between 104 and 148 is

- (a) 128 (b) 130
 (c) 124 (d) 126

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : Intended average = $\frac{a + l}{2} = \frac{104 + 148}{2} = 126$

13. What is the average of all numbers between 100 and 200 which are divisible by 13 ?

- (a) 147.5 (b) 145.5
 (c) 143.5 (d) 149.5

SC CGL (Tier-II) 20-02-2018

Ans. (d) : Numbers between 100 to 200 which is divisible by 13 are 104, 117 and 195.

$$\text{Average} = \frac{\text{First term} + \text{Last term}}{2}$$

$$= \frac{104 + 195}{2} = 149.5$$

14. When 2 is subtracted from each of the given numbers, then the sum of the numbers so obtained is 102. When 5 is subtracted from each of them, then the sum of the numbers so obtained is 12. What is the average of the given n number?

- (a) 5.8 (b) 5.4
(c) 6.6 (d) 6.2

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (b) : When subtraction is done by $2n$ then sum = 102

When subtraction is done by $5n$ then sum = 12

$$\therefore 3n = 102 - 12$$

$$n = 30$$

$$\therefore \text{Sum of } n \text{ number} = 102 + 2n = 102 + 60 = 162$$

$$\therefore \text{Intended average} = \frac{162}{30} = 5.4$$

- 15. Average of all even numbers between 222 and 250 is**

- (a) 234 (b) 232
(c) 236 (d) 230

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : Even number between 222 to 250

224, 226, 228, 246, 248

$$\text{Thus, Average} = \frac{\text{First term} + \text{Last term}}{2}$$

$$= \frac{224 + 248}{2}$$

$$= \boxed{236}$$

- 16. The average of sixteen numbers is 48. The average of the first six of these numbers is 45 and that of the last seven numbers is 53. The seventh and the eighth numbers are, respectively, 3 and 7 greater than the ninth number. What is the average of the ninth and seventh numbers?**

- (a) 41.5 (b) 40.5
(c) 42 (d) 39

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (b) Sum of all 16 numbers = $16 \times 48 = 768$

Sum of first 6 numbers = $6 \times 45 = 270$

Sum of the last 7 numbers = $7 \times 53 = 371$

Let the 9th number be x .

$$\therefore 7^{\text{th}} \text{ number will be } = 3 + x$$

$$\therefore 8^{\text{th}} \text{ number will be } = 7 + x$$

$$\text{Sum of } 7^{\text{th}}, 8^{\text{th}} \text{ and } 9^{\text{th}} \text{ number} = 768 - 270 - 371 = 127$$

According to the question,

$$x + 3 + x + 7 + x = 127$$

$$x = 39$$

$$\therefore \text{Average of } 9^{\text{th}} \text{ and } 7^{\text{th}} \text{ number} = \frac{39 + 42}{2} = 40.5$$

- 17. The average of twelve numbers is 42. The average of the last five numbers is 40, and that of the first four numbers is 44. The sixth number is 6 less than the fifth number and 5 less than the seventh number. The average of the sixth and seventh numbers is:**

- (a) 41.5 (b) 43.5
(c) 44.5 (d) 45.5

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (a) Sum of all 12 numbers = $12 \times 42 = 504$

Sum of the first 4 numbers = $4 \times 44 = 176$

Sum of the last 5 numbers = $5 \times 40 = 200$

Let the 6th number be x .

$$\therefore 5^{\text{th}} \text{ number will be } = x + 6$$

$$\therefore 7^{\text{th}} \text{ number will be } = x + 5$$

$$\text{Sum of } 5^{\text{th}}, 6^{\text{th}} \text{ and } 7^{\text{th}} \text{ number} = 504 - 176 - 200 = 128$$

According to the question,

$$\Rightarrow x + x + 5 + x + 6 = 128$$

$$\Rightarrow x = 39$$

$$\Rightarrow 6^{\text{th}} \text{ number} = 39$$

$$\Rightarrow 7^{\text{th}} \text{ number} = x + 5 = 39 + 5 = 44$$

$$\therefore \text{Average of } 6^{\text{th}} \text{ and } 7^{\text{th}} \text{ number} = \frac{39 + 44}{2} = 41.5$$

- 18. Of the three numbers, second in one-third of first and is also three-fourth of the third number. If the average of three numbers is 112, then what is the smallest number?**

- (a) 63 (b) 45
(c) 84 (d) 189

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (a) Let the third number be x

$$\text{Then, second number} = \frac{1}{3} \times \text{first number}$$

$$\text{And second number} = \frac{3}{4} \times \text{third number}$$

$$= \frac{3}{4} x$$

$$\Rightarrow \frac{3}{4} x = \frac{1}{3} \times \text{first number}$$

$$\Rightarrow \text{first number} = \frac{9x}{4}$$

According to the question,

$$\text{Average} = \frac{\frac{9x}{4} + \frac{3x}{4} + x}{3}$$

$$\Rightarrow 112 = \frac{9x + 3x + 4x}{12}$$

$$\Rightarrow 16x = 112 \times 12$$

$$x = \frac{112 \times 12}{16}$$

$$x = 84$$

$$\text{Hence, the smallest number} = \frac{3}{4} x = \frac{3}{4} \times 84 = 63$$

- 19. The average of 52, 71, 43, 22, a, and b is 55 and the average of 42, 45, 49, 51, 42, c, and d is 53. What is the average of a, b, c, and d?**

- (a) 54.7 (b) 71
(c) 54 (d) 142

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (b)

From first condition,

$$\frac{52 + 71 + 43 + 22 + a + b}{6} = 55$$

$$188 + a + b = 330$$

$$a + b = 142$$

From second condition,

$$\frac{42+45+49+51+42+c+d}{7} = 53$$

$$229 + c + d = 371$$

$$c + d = 142$$

Average of a, b, c and d = $\frac{142+142}{4}$

$$= \frac{284}{4}$$

$$= 71$$

20. The average of three numbers is 30. The first number is $\frac{2}{3}$ times of the second number, and the second number is $\frac{3}{4}$ of the third number. The first number is:
- (a) 30 (b) 25
(c) 28 (d) 20

SSC MTS 18/10/2021 (Shift-I)

Ans. (d) : Let third number = x

Second number = $\frac{3x}{4}$

First number = $\frac{3x}{4} \times \frac{2}{3} = \frac{x}{2}$

According to the question,

$$\frac{x}{2} + \frac{3x}{4} + x = 30 \times 3$$

$$\frac{2x + 3x + 4x}{4} = 30 \times 3$$

$$\frac{9x}{4} = 30 \times 3$$

$$x = \frac{30 \times 3 \times 4}{9}$$

$$x = 40$$

First number = $\frac{x}{2}$

$$= \frac{40}{2} = 20$$

21. There are four different numbers. The average of the first three numbers is three times the fourth number and the average of all the four numbers is 55. What is the sum of the first three numbers?
- (a) 172 (b) 198
(c) 165 (d) 153

SSC MTS 14/10/2021 (Shift-I)

Ans. (b) : Let four different numbers are a, b, c and d. According to the question,

$$\frac{a+b+c}{3} = 3d$$

$$a + b + c = 9d \dots\dots\dots(i)$$

$$a + b + c + d = 55 \times 4$$

From eqⁿ (i),

$$9d + d = 55 \times 4$$

$$10d = 55 \times 4$$

$$d = 22$$

Sum of first three numbers—

$$a + b + c = 9 \times 22 = 198$$

22. There are three positive numbers. If the average of any two of them is added to the third number, the resulting sums are 154, 148 and 132. The average of the original three numbers is:
- (a) $75\frac{1}{3}$ (b) $72\frac{1}{3}$
(c) $70\frac{1}{3}$ (d) $76\frac{1}{3}$

SSC MTS 26/10/2021 (Shift-I)

Ans. (b) : Let three positive numbers are a, b and c respectively. According to the question,

$$\frac{a+b}{2} + c = 154 \dots\dots (i)$$

$$\frac{b+c}{2} + a = 148 \dots\dots (ii)$$

$$\frac{c+a}{2} + b = 132 \dots\dots (iii)$$

On adding equation (i), (ii) and (iii),

$$4(a+b+c) = 2(434)$$

$$a+b+c = 217$$

Average of the original numbers = $\frac{217}{3} = 72\frac{1}{3}$

23. The average of 9 numbers is 19. If the average of the first four numbers is 14, then the average of the last 5 numbers is:
- (a) 20 (b) 10
(c) 25.25 (d) 23

SSC MTS 11/10/2021 (Shift-I)

Ans. (d) : According to the question,

Average of the last 5 numbers = $\frac{9 \times 19 - 4 \times 14}{5}$

$$= \frac{171 - 56}{5}$$

$$= \frac{115}{5}$$

$$= 23$$

24. The average of 42 numbers is 37. The average of the first 26 numbers is 32, and the average of the last 17 numbers is 44. The 26th number is:
- (a) 28 (b) 27
(c) 26 (d) 25

SSC CHSL 09/08/2021 (Shift-I)

Ans. (c) : The sum of 42 numbers = $42 \times 37 = 1554$

The sum of first 26 numbers = $32 \times 26 = 832$

The sum of last 17 numbers = $44 \times 17 = 748$

Then, 26th number = $(748 + 832) - 1554$

$$= 1580 - 1554 = 26$$

25. The average height of a certain number of students in a group is 155.6 cm. If 12 students having an average height of 150.5 cm join the group and 7 students having an average height of 159 cm leave the group, the average height of the students in the group will decrease by 34 mm. What is the number of students, initially in the group?

- (a) 30 (b) 25
(c) 40 (d) 20

SSC CHSL 05/08/2021 (Shift-I)

Ans. (d) : Let, number of students in group = x
According to the question,
 $155.6x + 12 \times 150.5 - 7 \times 159 = (155.6 - 3.4)(x + 12 - 7)$
 $155.6x + 1806 - 1113 = 152.2x + 761$
 $3.4x = 68$
 $x = 20$

26. The average of the first 10 multiples of 5 is:

- (a) 32.5 (b) 30
(c) 27.5 (d) 40

SSC MTS 27/10/2021 (Shift-I)

Ans. (c) : First 10 multiples of 5 = 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50
Average = $\frac{5+10+15+20+25+30+35+40+45+50}{10}$
 $= \frac{275}{10} = 27.5$

27. The average monthly pocket money of 24 girls in a class is Rs. 275, whereas for 16 boys of the class it is Rs. 325. What is the average monthly pocket money of the whole class?

- (a) Rs. 300 (b) Rs. 290
(c) Rs. 310 (d) Rs. 295

SSC MTS 20/10/2021 (Shift-I)

Ans. (d) : Total money spent by girls
 $= 24 \times 275 = 6600$
Total money spent by boys = $16 \times 325 = 5200$
Total average of monthly expenditure = $\frac{6600+5200}{24+16}$
 $= \frac{11800}{40} = 295$
Hence, ₹295 is the average of monthly expenditure of whole class.

28. A fruit seller has a sale of ₹10435, ₹9927, ₹10855, ₹10230 and ₹9562 for five consecutive months. How much sale (in ₹) must he have in the sixth month so that he gets an average sale of ₹10500?

- (a) 9231 (b) 8231
(c) 8991 (d) 11991

SSC MTS 12/10/2021 (Shift-I)

Ans. (d) : Let the sale of sixth month = ₹ x
According to the question,
 $\frac{10435+10855+9927+10230+9562+x}{6} = 10500$

$$51009 + x = 63000$$

$$x = 63000 - 51009$$

$$x = 11991$$

29. The average of the square of first seven natural numbers is :

- (a) 16 (b) 29
(c) 25 (d) 20

SSC MTS 02/11/2021 (Shift-I)

Ans. (d) :

Average of square of first n natural numbers
 $= \frac{(n+1)(2n+1)}{6}$

Hence the required average

$$= \frac{(7+1)(7 \times 2 + 1)}{6}$$

$$= \frac{8 \times 15}{6}$$

$$= 20$$

30. The average of eleven numbers is 56. The average of first three numbers is 52 and that of next five numbers is 60. The 9th and 10th numbers are 3 and 1 more than the 11th number respectively. What is the average of 9th and 11th numbers ?

- (a) 53.5 (b) 54
(c) 52.5 (d) 52

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (a) : Let, the 11th number = x

\therefore 9th number = $x + 3$

10th number = $x + 1$

Sum of 11 numbers = $56 \times 11 = 616$

$\Rightarrow 52 \times 3 + 60 \times 5 + x + 3 + x + 1 + x = 616$

$\Rightarrow 156 + 300 + 3x + 4 = 616$

$\Rightarrow 3x = 616 - 460$

$\Rightarrow 3x = 156$

$\therefore \boxed{x = 52}$

11th number = 52

9th number = $52 + 3 = 55$

10th number = $52 + 1 = 53$

\therefore Average of 9th and 11th numbers = $\frac{55+52}{2}$

$$= \frac{107}{2}$$

$$= 53.5$$

31. The average of 23 numbers is 51. The average of first 12 numbers is 49 and the average of last 12 numbers is 54. If the twelfth number is removed, then the average of the remaining numbers (correct to two decimal places) is :

- (a) 53.25 (b) 50.45
(c) 51.75 (d) 52.65

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (b) : Sum of 23 numbers = $51 \times 23 = 1173$

Sum of first 12 numbers = 49×12

Sum of last 12 numbers = 54×12

$$\begin{aligned} \therefore \text{Twelfth number} &= (49 \times 12 + 54 \times 12) - 1173 \\ &= 12 \times 103 - 1173 \\ &= 1236 - 1173 = 63 \end{aligned}$$

The average of remaining numbers if twelfth number is removed = $\frac{1173 - 63}{22} = \frac{1110}{22} = 50.45$

32. The average of x occurring 5 times and y occurring 7 times is 37. Also, the average of x occurring 7 times and y occurring 5 times is 35. The value of y is :

- (a) 45 (b) 42
(c) 30 (d) 27

SSC CGL–(Tier-I) 18/08/2021 (Shift I)

Ans. (b) : According to the question –

$$5x + 7y = 37 \times 12 \quad \dots(i)$$

$$7x + 5y = 35 \times 12 \quad \dots(ii)$$

Adding eqⁿ (i) and (ii),

$$12(x+y) = 72 \times 12$$

$$x + y = 72 \quad \dots(iii)$$

Subtracting eqⁿ (ii) from eqⁿ (i),

$$x - y = -12 \quad \dots(iv)$$

After solving eqⁿ (iii) and (iv),

$$x = 30$$

$$y = 42$$

33. What is the ratio of the average of first eight prime numbers to the average of first ten even natural numbers ?

- (a) 7 : 8 (b) 1 : 7
(c) 7 : 80 (d) 8 : 70

SSC CGL–(Tier-I) 16/08/2021 (Shift II)

Ans. (a) : First eight prime numbers = 2, 3, 5, 7, 11, 13, 17 and 19

Average of first eight prime numbers

$$= \frac{2+3+5+7+11+13+17+19}{8}$$

$$= \frac{77}{8}$$

First ten even natural numbers = 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20

Average of first ten even natural numbers

$$= \frac{2+4+6+8+10+12+14+16+18+20}{10}$$

$$= \frac{110}{10}$$

$$= 11$$

$$\text{Required ratio} = \frac{77}{8} \div \frac{11}{1}$$

$$= \frac{77}{8} \times \frac{1}{11}$$

$$= \frac{7}{8}$$

Hence, option (a) is correct answer.

34. The average of ten numbers is 32.5. The average of first four numbers is 25.6 and that of the last three numbers is 38.2. The 5th number is 50% more than the 6th number and 8 less than the 7th number. What is the average of 5th and 7th numbers ?

- (a) 42 (b) 41
(c) 42.4 (d) 41.5

SSC CGL–(Tier-I) 18/08/2021 (Shift II)

Ans. (d) : Average = $\frac{\text{Sum of total numbers}}{\text{Number of terms}}$

$$\text{Sum of 10 numbers} = 32.5 \times 10 = 325$$

$$\text{Sum of first four numbers} = 4 \times 25.6 = 102.4$$

$$\text{Sum of the last three numbers} = 38.2 \times 3 = 114.6$$

$$[\text{Remaining} = 325 - 217 = 108]$$

$$5^{\text{th}} \text{ number} : 6^{\text{th}} \text{ number} : 7^{\text{th}} \text{ number}$$

$$3x : 2x : 3x + 8$$

$$3x + 2x + 3x + 8 = 108$$

$$8x = 108 - 8$$

$$8x = 100$$

$$x = 12.5$$

Average of the 5th and 7th numbers

$$= \frac{3x + 3x + 8}{2} = \frac{6x + 8}{2} = \frac{6 \times 12.5 + 8}{2}$$

$$= \frac{83}{2} = 41.5$$

35. The average daily production of toys in a factory in the month of December is 512. If the average production during first 20 days is 515 and that of the last 13 days is 510, then what is the average of production on 19 and 20 December ?

- (a) 1058 (b) 513
(c) 529 (d) 512

SSC CGL–(Tier-I) 18/08/2021 (Shift III)

Ans. (c) : Total production of toys in month of December

$$= 512 \times 31$$

$$= 15872$$

Total production during first 20 days = 515×20

$$= 10300$$

Total production during last 13 days = 510×13

$$= 6630$$

Average production on 19 and 20 December

$$= \frac{(10300 + 6630) - 15872}{2}$$

$$= \frac{16930 - 15872}{2}$$

$$\frac{1058}{2}$$

$$= 529$$

36. The average of 22 numbers is 37.5. The average of first 12 numbers is 40.6 and the average of the last 12 numbers is 35.4. If 11th and 12th numbers are excluded, then what is the average of the remaining numbers?

- (a) 37.8 (b) 36.9
(c) 37.4 (d) 36.4

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (b) : Sum of 22 numbers = $22 \times 37.5 = 825$
Sum of first 12 numbers = 40.6×12
Sum of last 12 numbers = 35.4×12
 \therefore Sum of total 24 numbers = $12 \times (40.6 + 35.4)$
 $= 12 \times 76$
 $= 912$
Sum of remaining two numbers = $912 - 825$
 $= 87$
After subtracting two numbers, average of remaining numbers = $\frac{825 - 87}{20} \Rightarrow \frac{738}{20}$
 $= 36.9$

37. The average of 40 numbers is 48.2. The average of the first 15 numbers is 45 and that of the next 22 numbers is 50.5. The 38th number is 1 more than the 39th number, and the 39th number is 3 less than the 40th number. What is the average of the 39th and 40th numbers?

- (a) 49 (b) 48.5
(c) 48 (d) 47.5

SSC CHSL 12/08/2021 (Shift-I)

Ans. (d) : Sum of 40 numbers = $48.2 \times 40 = 1928$
Sum of first 15 numbers = $15 \times 45 = 675$
Sum of next 22 numbers = $50.5 \times 22 = 1111$
According to the question,
So,
Sum of three numbers = $1928 - (675 + 1111)$
 $= 1928 - 1786 = 142$
 $(x+1) + x + (x+3) = 142$
 $3x + 4 = 142$
 $3x = 138$
 $x = 46$
Then,
Average of the 39th and 40th number
 $= \frac{x + x + 3}{2} \Rightarrow \frac{2x + 3}{2}$
 $= \frac{2 \times 46 + 3}{2} = 46 + 1.5 = 47.5$

38. The average of 19 numbers is 48. The average of the first 7 numbers is 50.6 and that of the last 13 numbers is 47.6. If the 7th number is excluded, then what is the average of the remaining numbers (correct to one decimal place)?

- (a) 42.4 (b) 49.5
(c) 39.6 (d) 47.3

SSC CHSL 04/08/2021 (Shift-III)

Ans. (d) : Sum of 19 numbers = $19 \times 48 = 912$
Sum of first 7 numbers = $7 \times 50.6 = 354.2$
Sum of last 13 numbers = $13 \times 47.6 = 618.8$
Seventh number = $(618.8 + 354.2) - 912 = 61$
Average of remaining numbers
 $= \frac{912 - 61}{18} = 47.27 \approx 47.3$

39. The average of 5 numbers is 26.4. The first number is one-fifth of the sum of the remaining 4 numbers. What is the first number?

- (a) 21 (b) 23
(c) 20 (d) 22

SSC CHSL 19/04/2021 (Shift-III)

Ans. (d) Let the 5 numbers be a, b, c, d & e respectively
According to the question,
 $a + b + c + d + e = 26.4 \times 5$
 $b + c + d + e = 5a$
 $\Rightarrow a + 5a = 132$
 $\Rightarrow 6a = 132$
 $\Rightarrow a = 22$

40. The average of eighteen number is 42. The average of the last ten numbers is 40 and that of the first five numbers is 44. The seventh number is 6 less than the sixth and 7 less than the eighth number. The average of the sixth and the eighth number is:

- (a) 46.5 (b) 48
(c) 47.5 (d) 45

SSC CHSL 05/08/2021 (Shift-II)

Ans. (c) : Let the seventh number = x
 \therefore 6th number = $x + 6$
And 8th number = $x + 7$
Now, according to the question—
 $5 \times 44 + x + x + 6 + x + 7 + 400 = 42 \times 18$
 $220 + 3x + 13 + 400 = 756$
 $3x = 123$
 $x = 41$
 \Rightarrow Average of 6th and 8th number
 $= \frac{x + 6 + x + 7}{2}$
 $= x + 6.5$
 $= 41 + 6.5 = 47.5$

41. The average of 29 numbers is 38. The average of the first 19 numbers is 34 and that of the last 9 numbers is 48. The 20th number is:

- (a) 28 (b) 26
(c) 24 (d) 22

SSC CHSL 09/08/2021 (Shift-III)

Ans. (c) : Sum of 29 numbers = $38 \times 29 = 1102$
Sum of first 19 numbers = $34 \times 19 = 646$
Sum of last 9 numbers = $48 \times 9 = 432$
20th number = $1102 - (646 + 432)$
 $= 1102 - 1078 = 24$

42. The average of twelve numbers is 42. The average of the last five numbers is 40, and that of the first four numbers is 44. The 6th number is 6 less than the fifth and 5 less than the 7th number. The average of the 5th and the 7th number is:

- (a) 43.5 (b) 43
(c) 44.5 (d) 44

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (c) : Sum of 12 numbers = $12 \times 42 = 504$

Sum of last five numbers = $40 \times 5 = 200$

Sum of first 4 numbers = $44 \times 4 = 176$

Let the 6th number is x.

5th number = $x + 6$

7th number = $x + 5$

As per question,

$$176 + x + 6 + x + x + 5 + 200 = 504$$

$$3x + 387 = 504$$

$$3x = 117$$

$$x = 39$$

Hence the average of 5th and 7th number

$$= \frac{45 + 44}{2} = 44.5$$

43. The average of eleven numbers is 54. The average of the first four numbers is 48 and that of the next four numbers is 25% more than the average of the first four. The ninth number is 8 greater than the 11th number and the tenth number is 4 greater than the 11th number. What is the average of the 9th and the 10th number?

- (a) 54 (b) 56
(c) 54.4 (d) 52.6

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (b) : Let, 11th number = x

9th number = $x + 8$

10th number = $x + 4$

$$\therefore x + (x + 8) + (x + 4) = 11 \times 54 - (4 \times 48 + 4 \times 60)$$

$$3x + 12 = 594 - (192 + 240)$$

$$3x + 12 = 162$$

$$3x = 150$$

$$x = 50$$

$$\begin{aligned} \text{Average of 9}^{\text{th}} \text{ and } 10^{\text{th}} \text{ number} &= \frac{(x + 8) + (x + 4)}{2} \\ &= x + 6 \\ &= 50 + 6 = 56 \end{aligned}$$

44. The average of thirteen number is 80. The average of the first five numbers is 74.5 and that of the next five numbers is 82.5. The 11th number is 6 more than the 12th number and the 12th number is 6 less than the 13th number. What is the average of the 11th and the 13th numbers?

- (a) 87.5 (b) 86
(c) 87 (d) 86.5

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (c) : Let, 12th number = x

11th number = $x + 6$

13th number = $x + 6$

$$\begin{aligned} \therefore (x + 6 + x + 6 + x) &= 13 \times 80 - 5 \times 74.5 - 5 \times 82.5 \\ 3x + 12 &= 1040 - 372.5 - 412.5 \\ 3x + 12 &= 255 \\ 3x &= 243 \\ x &= 81 \end{aligned}$$

$$\begin{aligned} \text{Average of } 11^{\text{th}} \text{ and } 13^{\text{th}} \text{ number} &= \frac{x + 6 + x + 6}{2} \\ &= x + 6 = 81 + 6 = 87 \end{aligned}$$

45. The average of the first four numbers is three times the fifth number. If the average of all the five numbers is 85.8, then the fifth number is:

- (a) 34 (b) 39
(c) 33 (d) 29

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : Let 5th number = x

Sum of first 4 numbers = $3x \times 4 = 12x$

Sum of all 5 numbers = $85.8 \times 5 = 429$

$$12x + x = 429$$

$$x = 33$$

46. Out of 6 numbers, the sum of the first 5 numbers is 7 times of 6th number. If their average is 136, then the 6th number is:

- (a) 116 (b) 102
(c) 84 (d) 96

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) : Let the sixth number = x

Sum of 5 numbers = $7x$

Sum of 6 numbers = 136×6

$$7x + x = 816$$

$$x = 102$$

47. The average of twelve numbers is 45.5. The average of the first four numbers is 41.5 and that of the next five numbers is 48. The 10th number is 4 more than the 11th number and 9 more than the 12th number. What is the average of the 10th and 12th numbers?

- (a) 47.8 (b) 46.5
(c) 47 (d) 46

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (b) : Let the 10th number = x

11th number = $x - 4$

12th number = $x - 9$

$$x + x - 4 + x - 9 = 45.5 \times 12 - (41.5 \times 4 + 48 \times 5)$$

$$3x - 13 = 546 - (166 + 240)$$

$$3x - 13 = 140$$

$$3x = 153$$

$$x = 51$$

Average of 10th and 12th numbers

$$= \frac{2x - 9}{2} = x - \frac{9}{2} = 51 - 4.5 = 46.5$$

48. The average of 24 numbers is 56. The average of the first 10 numbers is 71.7 and that of the next 11 numbers is 42. The next three numbers (i.e., 22rd, 23rd and 24th) are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{5}{12}$. What is the average of the 22nd and 24th numbers?

- (a) 58 (b) 49.5
(c) 55 (d) 60.5

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) : Ratio of 22th, 23rd and 24th numbers

$$= \frac{1}{2} : \frac{1}{3} : \frac{5}{12} = 6 : 4 : 5$$

Sum of 22th, 23rd and 24th number
 $= 24 \times 56 - (10 \times 71.7 + 11 \times 42)$
 $= 1344 - 1179 = 165$

Sum of 22th and 24th numbers $= 165 \times \frac{11}{15} = 121$

Intended ratio $= \frac{121}{2} = 60.5$

49. The average of five positive numbers is 56. If the first number is three-fourth of the sum of the last four numbers, then the average of the last four numbers is:

- (a) 40 (b) 30
(c) 35 (d) 50

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let the sum of last four numbers is y and first number is x.

According to the question,

Sum of five numbers $= x + y = 56 \times 5 = 280$

$x + y = 280$ _____ (1)

$\therefore x = \frac{3}{4}y$ and $y = \frac{4x}{3}$

Thus, in equation (1)

$x + \frac{4x}{3} = 280$

$\Rightarrow 7x = 280 \times 3$

$x = 120$

From equation (1)

$120 + y = 280$

$y = 160$

Thus, the average of last four numbers,

$y = \frac{160}{4}$

$y = 40$

50. The average age of a number of persons in a group was calculated as 35 years, which was 2.5 years more than the correct average as there was an error in recording the age of two persons as 38.5 years and 40 years instead of 29 years and 22 years respectively. The number of persons in the group was:

- (a) 11 (b) 15
(c) 12 (d) 13

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (a) : Let the number of people in group = x

$35x - (38.5 + 40) + (29 + 22) = x \times 32.5$

$35x - 78.5 + 51 = 32.5x$

$2.5x = 27.5$

$x = 11$

51. The average of some numbers is 54.6. If 75% of the numbers are increased by 5.6 each, and the rest are decreased by 8.4% each, then what is the average of the numbers so obtained?

- (a) 55.8 (b) 55.6
(c) 56.3 (d) 56.7

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (d) : Let the total numbers are 100.

Total increase in average $= \frac{75 \times 5.6 - 25 \times 8.4}{100}$

$= \frac{25(16.8 - 8.4)}{100}$

$= \frac{8.4}{4} = 2.1$

\therefore Average of obtained number $= 54.6 + 2.1 = 56.7$

52. 24 students collected money for donation. The average contribution was ₹50. Later on, their teacher also contributed some money. Now the average contribution is ₹56. The teacher's contribution is:

- (a) ₹56 (b) ₹200
(c) ₹194 (d) ₹106

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (b) : Contribution of teacher $= 25 \times 56 - 24 \times 50$
 $= 1400 - 1200 = ₹200$

53. The average of 4 terms is 30 and the 1st term is $\frac{1}{3}$ of the sum of the remaining terms. What is the first term?

- (a) 40 (b) 30
(c) 20 (d) 60

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (b) : Let first number = x

Sum of 4 numbers = 120

According to the question,

$x = (120 - x) \times \frac{1}{3}$

$3x = 120 - x$

$x = 30$

54. The average weight of L, M and N is 93 kg. If the average weight of L and M be 89 kg and that of M and N be 96.5 kg, then the weight (in kg) of M is

- (a) 92 (b) 86
(c) 101 (d) 95

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Total weight of L, M and N $= 93 \times 3$
 $= 279$ kg

Weight of L and M $= 89 \times 2 = 178$ kg

Weight of M and N $= 96.5 \times 2 = 193.0$ kg

\Rightarrow Weight of M $= (178 + 193) - 279$

$= 92$ kg

55. Mahesh buys 3 shirts at an average price of Rs 1250. If he buys 2 more shirts at an average price of Rs. 1450 what will be the average price (in Rs.) of all the 5 shirts he buys ?

- (a) 1370 (b) 1330
(c) 1310 (d) 1390

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Cost of three shirts = $3 \times 1250 = ₹3750$
 Cost of two new shirts = $2 \times 1450 = ₹2900$
 Thus, average price of $[3 + 2]$ shirts = $\left(\frac{3750 + 2900}{5}\right)$

$$= \frac{6650}{5}$$

$$= ₹ 1330$$

56. Of the three numbers whose average is 22, the first is $\frac{3}{8}$ th times the sum of other two. What is the first number ?
 (a) 16 (b) 20
 (c) 22 (d) 18
SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let the first, second and third numbers are x, y and z respectively.
 As per question,

$$x = \frac{3}{8}(y + z) \Rightarrow 8x = 3(y + z)$$

 And, $\frac{x + y + z}{3} = 22$
 $x + y + z = 66$
 $x + \frac{8x}{3} = 66$
 $11x = 198$
 $x = 18$

57. In a set of three numbers, the average of first two numbers is 21, the average of the last two numbers is 24, and the average of the first and the last number is 15. What is the average of three numbers ?
 (a) 20 (b) 60
 (c) 25 (d) 18
SSC CGL (Tier-II) 9-3-2018

Ans. (a) : If three numbers are a, b and c.
 $\therefore a + b = 42$
 $b + c = 48$
 $a + c = 30$
 $\therefore a + b + c = \frac{120}{2} = 60$
 Average of three number = 20

58. A zoo has an average of 500 visitors on Sunday and 200 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is :
 (a) 225 (b) 275
 (c) 300 (d) 250
SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

No. of Sunday = 5
 Other days = 25

Average the number of visitors = $\frac{5 \times 500 + 25 \times 200}{30}$

$$= \frac{7500}{30} = 250$$

59. Of the three numbers whose average is 26, the first is $\frac{2}{11}$ times the sum of other two. The first number is :
 (a) 16 (b) 13
 (c) 11 (d) 12
SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Let the three numbers be a, b & c.
 $a + b + c = 26 \times 3 = 78$
 $a = (b + c) \times \frac{2}{11}$
 $\frac{a}{b + c} = \frac{2}{11}$
 First number (a) = $78 \times \frac{2}{13} = 12$

60. The average marks of 50 students in an examination was 65. It was later found that the marks of one student had been wrongly entered as 83 instead of 38. The correct average is?
 (a) 63.9 (b) 64.5
 (c) 64.7 (d) 64.1
SSC CGL (Tier-II) 17-2-2018

Ans. (d) : Correct average = $65 - \frac{(83 - 38)}{50}$

$$= 64.1$$

61. The average marks of 40 students was found to be 68. If the marks of two students were incorrectly entered as 48 and 64 instead of 84 and 46 respectively, then what is the correct average?
 (a) 68.15 (b) 68.25
 (c) 68.35 (d) 68.45
SSC CGL (TIER-I)-2018 - 10.06.2019 (Shift-II)

Ans. (d) : Correct average = $68 + \frac{(84 + 46) - (48 + 64)}{40}$

$$= 68 + \frac{18}{40} = 68.45$$

62. The average of twelve numbers is 55.5. The average of the first four numbers is 53.4 and that of the next four numbers is 54.6. The 10th number is greater than the 9th number by 3 but lesser than the 11th and 12th number by 2 and 3, respectively. What is the average of the 10th and the 12th numbers?
 (a) 59.5 (b) 58
 (c) 56 (d) 57.5
SSC CGL (TIER-I)-2018 - 10.06.2019 (Shift-I)

Ans. (a) : \therefore Sum of number = Average \times No. of total number
 Sum of 12 number = $55.5 \times 12 = 666$
 Sum of first four number = $53.4 \times 4 = 213.6$

Sum of next four numbers = $54.6 \times 4 = 218.4$

According to the question,

Let 10^{th} No. = x
 9^{th} No. = $x - 3$
 11^{th} No. = $x + 2$
 12^{th} No. = $x + 3$

Remaining four numbers = $666 - (213.6 + 218.4)$
 $x - 3 + x + x + 2 + x + 3 = 666 - 432 = 234$
 $4x + 2 = 234$
 $4x = 232$
 $x = 58$

\therefore Average of 10^{th} and 12^{th} numbers = $\frac{x+x+3}{2}$
 $= \frac{2 \times 58 + 3}{2}$
 $= \frac{119}{2} = 59.5$

63. The average of 18 numbers is 37.5. If six numbers of average x are added to them, then the average of all the numbers increases by one. The value of x is :

- (a) 38.5 (b) 45
(c) 41.5 (d) 40

SSC CGL (Tier-II) 13-09-2019

Ans. (c) :

Sum = Average \times No. of total terms.
 $18 \times 37.5 + 6x = 24 \times 38.5$
 $112.5 + x = 154$
 $x = 154 - 112.5 = 41.5$

64. The average weight of a certain number of students in a group is 72 kg. If 10 students having an average weight of 78 kg leave and 4 students having an average weight of 80 kg join the group, the average weight of the students in the group decreases by 0.7 kg. The number of students initially in the group is :

- (a) 54 (b) 46
(c) 56 (d) 44

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let the total number of student = x

Total weight = $72x$
According to the question,
Total weight = $71.3 \times (x - 6)$
 $72x - 780 + 320 = 71.3x - 427.8$
 $0.7x = 460 - 427.8 = 32.2$
 $x = 46$

65. The average of thirteen numbers is 47. The average of the first three numbers is 39 and that of next seven numbers is 49. The 11th number is two times the 12th number and 12th number is 3 less than the 13th number. What is the average of 11th and 13th numbers?

- (a) 55.5 (b) 56
(c) 54.5 (d) 57

SSC CGL (Tier-II) 11-9-2019

Ans. (d): Let 12^{th} number = x

11^{th} number = $2x$

13^{th} number = $(x + 3)$

According to the question,

$13 \times 47 = 3 \times 39 + 7 \times 49 + 2x + x + x + 3$

$611 = 117 + 343 + 4x + 3$

$4x = 611 - 463 = 148$

$x = 37$

$\frac{2x + x + 3}{2} = \frac{3x + 3}{2} = \frac{37 \times 3 + 3}{2}$
 $= \frac{111 + 3}{2} = \frac{114}{2}$
 $= 57$

66. The average of 33 numbers is 74. The average of the first 17 numbers is 72.8 and that of the last 17 numbers is 77.2. If the 17th number is excluded, then what will be the average of the remaining numbers (correct to one decimal place) ?

- (a) 73.4 (b) 72.9
(c) 70.8 (d) 71.6

Ans. (b) : Average of 33 number = $74 \times 33 = 2442$

\therefore 17^{th} number = [Sum of first 17 numbers + Sum of last 17 numbers] – sum of 33 numbers

$= (17 \times 72.8 + 77.2 \times 17) - 2442$
 $= 2550 - 2442 = 108$

\therefore After removing 17^{th} number the average of remaining number

$= \frac{2442 - 108}{32} = \frac{2334}{32} = 72.93$

67. The average weight of some students in a class was 60.5 kg. When 8 students, whose average weight was 65kg, joined the class, then the average weight of all the students increased by 0.9kg. The number of students in the class, initially was:

- (a) 32 (b) 37
(c) 40 (d) 42

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (a) Let, the number of students in starting = x

According to the question,

$(x + 8) \times (60.5 + 0.9) = x \times 60.5 + 8 \times 65$

$(x + 8) \times 61.4 = 60.5x + 520$

$61.4x + 491.2 = 60.5x + 520$

$0.9x = 520 - 491.2$

$x = \frac{28.8}{0.9}$

$x = 32$

68. The average of 19 numbers is 22.8. The average of the first ten numbers is 18.4 and the last ten number is 28.6. If the 10th number is excluded from the given numbers, then what is the average of the remaining numbers? (Your answer should be nearest to an interger.)

- (a) 22 (b) 23
(c) 21 (d) 20

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a)

$$\text{Sum of 19 numbers} = 22.8 \times 19 = 433.2$$

$$\text{Sum of first 10 numbers} = 18.4 \times 10 = 184$$

$$\text{Sum of last 10 numbers} = 28.6 \times 10 = 286$$

$$\begin{aligned}\therefore 10^{\text{th}} \text{ number} &= (184+286) - 433.2 \\ &= 470 - 433.2 \\ &= 36.8\end{aligned}$$

After removing 10^{th} number, the average of remaining number

$$\begin{aligned}&= \frac{433.2 - 36.8}{18} \\ &\approx 22\end{aligned}$$

69. The average of eleven numbers is 68. The average of the first four numbers is 78 and that of the next four numbers is 63. The 9^{th} number is two times the 11^{th} number and the 10^{th} number is 4 less than the 11^{th} number. What is the average of the 9^{th} and 11^{th} numbers?

- (a) 72.6 (b) 70.1
(c) 72.2 (d) 70.5

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d)

$$\text{Sum of 11 numbers} = 11 \times 68 = 748$$

As per question,

$$\therefore \text{Sum of first four numbers} = 4 \times 78 = 312$$

$$\text{Sum of next 4 numbers} = 4 \times 63 = 252$$

Let, 11^{th} number is x .

$$\therefore 10^{\text{th}} \text{ number is} = x - 4$$

$$\text{And } 9^{\text{th}} \text{ number} = 2x$$

$$\therefore 2x + (x - 4) + x = 748 - (312 + 252)$$

$$4x = 188$$

$$x = 47$$

$$\begin{aligned}\therefore \text{Average of } 9^{\text{th}} \text{ and } 11^{\text{th}} \text{ numbers} &= \frac{(47 \times 2) + 47}{2} \\ &= \frac{141}{2} = 70.5\end{aligned}$$

70. The average of n numbers is 42. If 75% of the numbers are increased by 4 each and the remaining numbers are decreased by 8 each, then what is the average of the numbers, so obtained?

- (a) 43.8 (b) 42.5
(c) 43 (d) 44

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c) According to the question,

$$\begin{aligned}\text{New average} &= 42 + \frac{\frac{3}{4} \times n \times 4 - \frac{1}{4} \times n \times 8}{n} \\ &= 42 + \frac{n(3-2)}{n} \\ &= 42 + 1 \\ &= 43\end{aligned}$$

71. The average of twelve numbers is 39. The average of the last five numbers is 35, and that of the first four numbers is 40. The fifth number is 6 less than the sixth number and 5 more than the seventh number. The average of the sixth and seventh number is:

- (a) 50 (b) 39
(c) 47.5 (d) 44.5

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : Let the 7^{th} number is x .

$$\text{Fifth number} = (x + 5)$$

$$\text{Sixth number} = (x+11)$$

$$\begin{aligned}\text{Sum of last five numbers} &= 35 \times 5 \\ &= 175\end{aligned}$$

$$\begin{aligned}\text{Sum of first four numbers} &= 40 \times 4 \\ &= 160\end{aligned}$$

$$\begin{aligned}\text{Sum of 12 numbers} &= 12 \times 39 \\ &= 468\end{aligned}$$

According to the question,

$$160 + x + (x+5) + (x+11) + 175 = 468$$

$$\Rightarrow 3x + 351 = 468$$

$$\Rightarrow 3x = 468 - 351$$

$$\Rightarrow x = \frac{117}{3}$$

$$\Rightarrow x = 39$$

$$\begin{aligned}\text{Average of } 6^{\text{th}} \text{ and } 7^{\text{th}} \text{ numbers} &= \frac{39 + (39+11)}{2} \\ &= \frac{89}{2} \\ &= \boxed{44.5}\end{aligned}$$

72. The average of n observations is 40. If one observation of value 80 is added, then the average of all the observations is 41. What is the value of n ?

- (a) 40 (b) 43
(c) 39 (d) 38

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) From question,

$$\frac{n \times 40 + 80}{n+1} = 41 \quad (\because \text{Sum} = \text{Average} \times \text{No. of terms})$$

$$n+1$$

$$40n + 80 = 41n + 41$$

$$n = 39$$

73. The average of ten numbers is 72. The average of the first four numbers is 69 and that of the next three numbers is 74. The 8^{th} number is 6 more than the 9^{th} number and 12 more than the 10^{th} number. What is the average of the 8^{th} and 9^{th} numbers?

- (a) 76 (b) 77.5
(c) 76.5 (d) 77

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d)

Let the 8^{th} number = x

$$\therefore 9^{\text{th}} \text{ number} = x - 6$$

$$\text{And } 10^{\text{th}} \text{ number} = x - 12$$

According to the question,
 $x + (x - 6) + (x - 12) = 72 \times 10 - (69 \times 4 + 74 \times 3)$
 $3x - 18 = 720 - 498$
 $3x = 240$
 $x = 80$
 \therefore Average of 8th and 9th numbers = $\frac{80 + (80 - 6)}{2} = 77$

74. The average age of 24 students is 15.5 years. The age of the teacher is 24 years more than the average age of all the students and teacher. What is the age (in years) of the teacher?

- (a) 40.5 (b) 42
(c) 41.4 (d) 40

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) Let the age of teacher = x years
Sum of age of 24 students = $24 \times 15.5 = 372$ years
As per question,

$$x = \frac{372 + x}{25} + 24$$

$$x = \frac{372 + x + 600}{25}$$

$$25x = x + 972$$

$$24x = 972$$

$$x = \frac{972}{24} = 40.5 \text{ years}$$

75. In a set of three numbers, the average of the first two numbers is 7, the average of the last two numbers is 10, and the average of the first and the last numbers is 14. What is the average of the three numbers?

- (a) 25/4 (b) 31/3
(c) 37/3 (d) 29/4

SSC CHSL -16/10/2020 (Shift-III)

Ans. (b): Let the three numbers x, y and z respectively.

According to the question,

$$\frac{x+y}{2} = 7 \Rightarrow x+y = 14$$

$$\frac{y+z}{2} = 10 \Rightarrow y+z = 20$$

$$\frac{x+z}{2} = 14 \Rightarrow x+z = 28$$

Addition of three equation,

$$2(x+y+z) = 62$$

$$x+y+z = 31$$

$$\text{Average of three numbers} = \frac{x+y+z}{3} = \frac{31}{3}$$

76. If the average of 35 numbers is 22, the average of the first 17 numbers is 19, and the average of the last 17 numbers is 20, then the 18th number is:

- (a) 107 (b) 133
(c) 132 (d) 108

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) : Sum of 35 numbers = $35 \times 22 = 770$

Sum of first 17 numbers = $17 \times 19 = 323$

Sum of last 17 numbers = $17 \times 20 = 340$

\therefore 18th number = $770 - (323 + 340)$
= $770 - 663 = 107$

77. The average of series of 21 numbers is 43. Out of which the average of the first eleven numbers is 33. The average of last eleven numbers is 53. What is the average of first three numbers ?

- (a) 47 (b) 46
(c) 43 (d) 33

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (c) : Let 11th number = x

Sum of 21 numbers = $21 \times 43 = 903$

Sum of first 11 numbers = $11 \times 33 = 363$

Sum of last 11 numbers = $11 \times 53 = 583$

According to the question,

$$903 = 363 + 583 - x$$

$$x = 43$$

78. The average weight of P, Q and R is 62 kg. The weight of R is 12 kg more than P and 9 kg more than Q. What is the average weight of P, Q, R and S if weight of S is 15 kg less than R?

- (a) 58 kg (b) 62 kg
(c) 64 kg (d) 60 kg

SSC CHSL -26/10/2020 (Shift-III)

Ans. (d) : According to the question,

$$\frac{P+Q+R}{3} = 62 \Rightarrow P+Q+R = 186 \quad \text{--- (i)}$$

$$R = P + 12 \quad \text{--- (ii)}$$

$$R = Q + 9 \quad \text{--- (iii)}$$

$$S = R - 15 \quad \text{--- (iv)}$$

From equation (ii) and (iii)

$$2R = P + Q + 21$$

$$2R = 186 - R + 21 \quad \text{(From equation (i))}$$

$$3R = 207 \Rightarrow R = 69$$

Put the value of R in equation (iv),

$$S = 69 - 15 = 54$$

$$\text{Then, } \frac{P+Q+R+S}{4} = ?$$

$$= \frac{186 + 54}{4} = \frac{240}{4} = 60 \text{ kg.}$$

79. A library has an average of 265 visitors on Sunday and 130 visitors on other days. The average number of visitors per day in a month of 30 days beginning with a Monday is:
- (a) 165 (b) 135
(c) 129 (d) 148

SSC CHSL -19/10/2020 (Shift-III)

Ans. (d) : Number of Sunday in 30 days = 4

$$\text{Average number} = \frac{265 \times 4 + 130 \times 26}{30}$$

$$= \frac{1060 + 3380}{30} = \frac{4440}{30}$$

$$= 148$$

80. The average of 24 numbers is 26. The average of the first 15 numbers is 23 and that of the last 8 numbers is 33. Find the 16th number.
- (a) 15 (b) 16
(c) 17 (d) 18

SSC CHSL -19/10/2020 (Shift-II)

Ans. (a) : 16th number = Sum of 24 numbers - [Sum of first 15 numbers + Sum of last 8 numbers]

$$= 24 \times 26 - (15 \times 23 + 8 \times 33)$$

$$= 624 - (345 + 264) = 624 - 609$$

\therefore 16th number = 15

81. If 40 is added to a list of natural numbers, the average is increased by 4. When 30 is added to the new list, the average of the numbers in the new list is increased by 1. How many numbers were in the original list?
- (a) 4 (b) 5
(c) 8 (d) 6

SSC CHSL -26/10/2020 (Shift-I)

Ans. (a) : Let natural number is n and his average is k.

From first condition,

$$\therefore \frac{nk + 40}{n + 1} = k + 4$$

$$nk + 40 = nk + 4n + k + 4$$

$$k = 36 - 4n \quad \text{--- (i)}$$

From second condition,

Thus, $\frac{nk + 40 + 30}{n + 2} = k + 5$

$$nk + 70 = nk + 5n + 2k + 10$$

$$60 = 5n + 72 - 8n \quad \text{[From eqⁿ(i)]}$$

$$3n = 12$$

$$n = 4$$

82. The average of 40 numbers is 50 and that of other 60 numbers is 70. What is the average of all the numbers?
- (a) 62 (b) 42
(c) 85 (d) 40

SSC MTS 11-10-2017 (Shift-I)

Ans : (a) Sum of 40 numbers = $40 \times 50 = 2000$

Sum of 60 numbers = $60 \times 70 = 4200$

Thus, average of all number = $\frac{2000 + 4200}{100} = 62$

83. The average of 35 numbers is 6. The average of the first 18 numbers is 4 and the average of the last 18 numbers be 9. What is the value of middle number?
- (a) 21 (b) 24
(c) 27 (d) 18

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) : From question,

Sum of 35 number = $35 \times 6 = 210$

Sum of first 18 numbers = $18 \times 4 = 72$

Sum of last 18 numbers = $18 \times 9 = 162$

Middle number = $(162 + 72) - 210$

$$= 234 - 210 = 24$$

84. The average of 104, 102, 109, A and 112 is 109. What is the value of A?
- (a) 114 (b) 116
(c) 118 (d) 120

SSC MTS 11-10-2017 (Shift-III)

Ans. (c) :

$$\text{Average} = \frac{\text{Sum of total number}}{\text{Number of total numbers}}$$

$$109 = \frac{104 + 102 + 109 + A + 112}{5}$$

$$109 \times 5 = 427 + A$$

$$545 - 427 = A$$

A = 118

85. The mean of 20 numbers is 35. If four numbers 24, 20, 21 and 27 are removed, then what will be the mean of remaining numbers?
- (a) 38 (b) 40
(c) 33 (d) 37

SSC MTS 10-10-2017 (Shift-I)

Ans : (a) Sum of 20 numbers = $20 \times 35 = 700$

Sum of removed 4 numbers = $24 + 20 + 21 + 27 = 92$

\therefore Sum of remaining 16 numbers = $700 - 92 = 608$

Thus, the average of 16 numbers = $\frac{608}{16} = 38$

86. The mean of 15 numbers is 40. If two numbers 45 and 35 are removed, then what will be the mean of remaining numbers?
- (a) 37.5 (b) 40
(c) 42.5 (d) 38

SSC MTS 10-10-2017 (Shift-II)

Ans. (b) : Sum of 15 numbers = $15 \times 40 = 600$

Sum of remaining number after removing 45 and 35.

$$= 600 - (45 + 35)$$

$$= 600 - 80 = 520$$

Average of remaining numbers $(15 - 2 = 13) = 520 / 13 = 40$

87. The average of 15 numbers is 45. The average of first six numbers is 42 and the average of last six numbers is 43. 7th number is double of the 8th number but 5 more than the 9th number. What is the average of 7th and 9th number?
- (a) 65.5 (b) 64
(c) 53.2 (d) 65

SSC MTS 21/08/2019 (Shift-III)

Ans. (a) : Sum of 15 numbers = 45×15
 $= 675$
Sum of first 6 numbers = 42×6
 $= 252$
Sum of last 6 numbers = 43×6
 $= 258$
Let 8th number = x
 \therefore 7th number = $2x$
And 9th number = $2x - 5$
Then,
 $252 + 2x + x + 2x - 5 + 258 = 675$
 $505 + 5x = 675$
 $5x = 675 - 505$
 $5x = 170$
 $x = 34$
 \therefore Seventh number = $2x \Rightarrow 34 \times 2 = 68$
 \therefore Ninth number = $2x - 5 = 34 \times 2 - 5 = 63$
Required average = $\frac{63 + 68}{2}$
 $= \frac{131}{2} = 65.5$

- 88. The average page number of 9 books is 400. if first five books average page number is 430 and last five books is 380, then what is the number of pages in fifth book?**
(a) 430 (b) 440
(c) 420 (d) 450

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : Number of pages in fifth books
 $= 5 \times 430 + 5 \times 380 - 9 \times 400$
 $= 4050 - 3600$
 $= 450$

- 89. The average temperature of first three days of week is 23°C and next three days of week is 24°C and full week is 23.5°C. What is the temperature of the last day?**
(a) 22.5°C (b) 21.5°C
(c) 24.5°C (d) 23.5°C

SSC MTS 21/08/2019 (Shift-I)

Ans. (d)
Total temperature of first 3 days = $23 \times 3 = 69^\circ\text{C}$
Total temperature of next 3 days = $24 \times 3 = 72^\circ\text{C}$
Total temperature of a week = 164.5°C
Temperature of last day of week $[164.5 - (69 + 72)] = 23.5^\circ\text{C}$

- 90. Four different numbers are given. The average of first three numbers is four times the fourth number and the average of all four numbers is 87.75 what is the average of first three numbers?**
(a) 90 (b) 108
(c) 100 (d) 96

SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : Let fourth number = x
Average of first 3 numbers = $4x$
Sum of first three numbers = $3 \times 4x = 12x$

According to the question,
 $12x + x = 87.75 \times 4$
 $13x = 351$
 $x = \frac{351}{13} = 27$
Average of first three numbers = $4x$
 $= 4 \times 27 = 108$

- 91. The average age of a group of 20 men is 30 years. A 50 years old man leaves the group, while a woman joins the group. The average age decreases by 1 year. What is the age of the women?**
(a) 40 years (b) 30 years
(c) 35 years (d) 38 years

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) : \therefore The sum of ages of a group of 20 men = 20×30
 $= 600$
According to the question,
 $600 - 50 + \text{Woman} = 29 \times 20$
 $550 + \text{Woman} = 580$
 $\therefore \text{Woman} = 580 - 550$
 $= 30 \text{ years}$

- 92. The average of 36, 28, 43, 56, 74, 65, 12 and x is 45. What is the value of x ?**
(a) 48 (b) 42
(c) 44 (d) 46

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : Average = $\frac{36 + 28 + 43 + 56 + 74 + 65 + 12 + x}{8}$
 $8 \times 45 = 36 + 28 + 43 + 56 + 74 + 65 + 12 + x$
 $360 = 314 + x$
 $x = 46$

- 93. The average of a and b is 10, average of b and c is 12 and average of c and a is 15. What is the average of a, b and c?**
(a) $\frac{37}{3}$ (b) $\frac{74}{3}$
(c) 74 (d) 37

SSC MTS 19/08/2019 (Shift-II)

Ans. (a) :
According to the question,
 $a + b = 10 \times 2 = 20$
 $b + c = 12 \times 2 = 24$
 $c + a = 15 \times 2 = 30$
 $2(a + b + c) = 74$
 $a + b + c = 37$
 \therefore Average of $(a + b + c) = \frac{37}{3}$

- 94. An owner of a bike buys petrol at 64,80,320 Rs. per litre respectively for three years (regular). If he spends Rs. 32,000 every year on buying petrol then average price per litre of petrol is:**

- (a) ₹120 (b) ₹84
(c) ₹108 (d) ₹96

SSC MTS 16/08/2019 (Shift-III)

Ans. (d) : Total consumption of petrol in first year
 $= \frac{32000}{64} = 500$ litres

Consumption of petrol in second year $= \frac{32000}{80} = 400$

Consumption of petrol in third year $= \frac{32000}{320} = 100$

Average price of petrol/litre $= \frac{3 \times 32000}{(500 + 400 + 100)}$
 $= \frac{96000}{1000} = ₹ 96$

95. The average of 13 numbers is 42. If a 14th number is included, then the average becomes 44. What is the 14th number?

- (a) 70 (b) 60
(c) 66 (d) 68

SSC MTS 02/08/2019 (Shift-I)

Ans. (a) : Let 14th number = a

Then, $\frac{13 \times 42 + a}{14} = 44$

$$13 \times 42 + a = 44 \times 14$$

$$a = 44 \times 14 - 13 \times 42$$

$$a = 14(44 - 39)$$

$$a = 14 \times 5$$

$$a = 70$$

96. The average weight of a group of eight people increased by 2.5 kg when a person weighting 80 kg joined in place of one of the members of the group. The weight of the member replaced was:

- (a) 60 kg (b) 77.5 kg
(c) 70 kg (d) 62.5 kg

SSC MTS 16/08/2019 (Shift-I)

Ans. (a) : Let average of 8 men = x

And the weight of the person leaving the group = a

According to the question,

$$\frac{8 \times x + 80 - a}{8} = x + 2.5$$

$$8x + 80 - a = 8x + 20$$

$$80 - a = 20$$

$$a = 80 - 20$$

$$a = 60 \text{ kg}$$

97. The average weight of 38 students is 42 kg. It was found later that the figure of 46 kg was misread as 26 kg in one of the readings. What is the correct average? (correct to one decimal places)

- (a) 42.5kg (b) 45.5kg
(c) 39 kg (d) 44 kg

SSC MTS 14/08/2019 (Shift-III)

Ans. (a) Total weight of 38 students = $38 \times 42 = 1596$ kg.

Correct weight = $(1596 - 26 + 46) = 1616$ kg.

Correct average $= \frac{1616}{38} = 42.5$ kg.

98. The average of 10 numbers is P and the average of 4 of these numbers is Q. If the average of remaining numbers is R then which of the following is correct:

- (a) $3P = 2Q + 4R$ (b) $5P = 3Q + 2R$
(c) $5P = 2Q + 3R$ (d) $4P = 2Q + 3R$

SSC MTS 13/08/2019 (Shift-II)

Ans. (c) : Sum of 10 numbers = $10 \times P = 10P$

Sum of 4 numbers = $4Q$

Sum of remaining 6 numbers = $6R$

According to the question,

$$10P = 4Q + 6R$$

$$5P = 2Q + 3R$$

99. The average marks obtained by a student in 9 subjects is 98. On subsequent verification it was found that the marks obtained by him in a subject was wrongly copied as 86 instead of 68. The correct average of the marks obtained by him is:

- (a) 94 (b) 95
(c) 96 (d) 97

SSC MTS 13/08/2019 (Shift-III)

Ans. (c) : Correct average $= \frac{98 \times 9 - 86 + 68}{9}$

$$= \frac{882 - 18}{9}$$

$$= \frac{864}{9}$$

$$= 96$$

100. Average of 10 numbers is 14.8. If two numbers 5 and 23 are replaced by 13 and 26 respectively, then what is the new average?

- (a) 15.9 (b) 13.8
(c) 16.3 (d) 14.5

SSC MTS 19/08/2019 (Shift-I)

Ans. (a) :

\therefore Total sum of 10 numbers = Average \times No. of total terms

$$= 14.8 \times 10 = 148$$

According to the question,

$$\text{New average} = \frac{148 - (5 + 23) + 13 + 26}{10}$$

$$= \frac{148 - (28) + 39}{10} = \frac{159}{10} = 15.9$$

101. The average of four numbers is 20. If the average of the first two numbers is 15, then what is the average of the last two numbers?

- (a) 22 (b) 18
(c) 25 (d) 20

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) : Let last two numbers be a and b.
According to the question,

$$\frac{15 \times 2 + a + b}{4} = 20$$

$$30 + a + b = 80$$

$$a + b = 50$$

Then, the average of last two numbers = $\frac{a+b}{2} = 25$

102. Five years ago, the average age of four girls, was 7 years. A new girl is included then the average present age becomes 13 years. The present age of the new girl is:

- (a) 14 years (b) 19 years
(c) 16 years (d) 17 years

SSC MTS 13/08/2019 (Shift-I)

Ans. (d) : ∴ Age of 4 girls in 5 years ago = $4 \times 7 = 28$ years

∴ Age of four girl in present time = $(28 + 4 \times 5) = 48$ years

∴ Age of five girl in present time = $5 \times 13 = 65$ years

∴ Age of new girl = $65 - 48 = 17$ years

103. The average of 23, 27, 29, 36, 47 and x is 35. What is the value of x?

- (a) 45 (b) 52
(c) 48 (d) 39

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (c) : From question,

$$\frac{23 + 27 + 29 + 36 + 47 + x}{6} = 35$$

$$162 + x = 210$$

$$x = 210 - 162$$

$$\boxed{x = 48}$$

104. The average monthly salary of 30 employees and 5 managers is ₹ 80000. One manager with salary ₹ 180000 is replaced by a new manager. If the average monthly salary now becomes ₹ 78500, then what is the monthly salary of the new manager?

- (a) ₹ 142500 (b) ₹ 132000
(c) ₹ 127500 (d) ₹ 154500

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (c) : Monthly salary of 30 employees and 5 managers.

$$= 80000 \times (30+5)$$

$$= ₹ 2800000$$

Let the monthly salary are x.

According to the question,

$$2800000 - (180000 - x) = 78500 \times 35$$

$$2620000 + x = 2747500$$

$$x = 2747500 - 2620000$$

$$x = ₹ 127500$$

105. A person purchased 12 bags of sugar at the rate of ₹1200 per bag, 8 bags at the rate of ₹1500 per bag and 10 bags at the rate of ₹2100 per bags. What will be the average cost of all the bags together?

- (a) ₹ 1420 (b) ₹ 1680
(c) ₹ 1580 (d) ₹ 1640

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (c) : From question,

$$\text{Average cost} = \frac{(12 \times 1200) + (8 \times 1500) + (10 \times 2100)}{(12 + 8 + 10)}$$

$$= \frac{14400 + 12000 + 21000}{30}$$

$$= \frac{47400}{30} = ₹ 1580$$

106. The total weight of 12 boys and 8 girls is 1080 kg. If the average weight of boys is 50 kg, then what will be average weight of girls?

- (a) 55 kg (b) 50 kg
(c) 60 kg (d) 45 kg

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : Let the average weight of girls = x kg

According to the question,

$$12 \times 50 + 8 \times x = 1080$$

$$8x = 1080 - 600$$

$$x = \frac{480}{8} = 60 \text{ kg}$$

107. The average of 21 numbers is 66. The average of the first 9 numbers is 63.7 and that of the last 13 numbers is 69.9. If the 9th number is excluded, then what is the average of the remaining numbers?

- (a) 64 (b) 63
(c) 64.5 (d) 63.5

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (c) : Sum of 21 numbers = $21 \times 66 = 1386$

∴ 9th number = (Sum of first 9 numbers + Sum of last 13 numbers) - Sum of 21 numbers.

$$= (63.7 \times 9 + 69.9 \times 13) - 1386$$

$$= 573.3 + 908.7 - 1386 = 96$$

When the ninth number is excluded then,

$$\text{New average} = \frac{1386 - 96}{20} = \frac{1290}{20} = 64.5$$

(II) Problems based on Average of Consecutive Numbers

108. The average of a set of 18 consecutive integers is 22.5. What is the largest integer in the set?

- (a) 14 (b) 13
(c) 31 (d) 17

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (c) According to the question,

Average of 18 consecutive integers = 22.5

∴ Sum of 18 consecutive integers = 405

Let, first term (a) = x

Last term (l) = x + 17

$$\therefore \text{Sum of n term (S}_n) = \frac{n(a+l)}{2}$$

$$\Rightarrow 405 = \frac{18(x + x + 17)}{2}$$

$$\Rightarrow \frac{810}{18} = 2x + 17$$

$$\Rightarrow 45 - 17 = 2x$$

$$\Rightarrow 28 = 2x$$

$$\therefore \boxed{x = 14}$$

\therefore Largest integer = $x + 17 = 14 + 17 = 31$

Hence, option (c) is correct.

109. The average of the squares of four consecutive odd natural numbers is 201. The average of 7 times of the largest number and 3 times of the smallest number is:

- (a) 72 (b) 78
(c) 76 (d) 66

SSC CHSL 06/08/2021 (Shift-III)

Ans. (c) : Let the consecutive odd numbers are $x, x + 2, x + 4$ and $x + 6$.

According to the question,

$$(x)^2 + (x + 2)^2 + (x + 4)^2 + (x + 6)^2 = 201 \times 4$$

$$x^2 + x^2 + 4 + 4x + x^2 + 16 + 8x + x^2 + 36 + 12x = 804$$

$$4x^2 + 24x + 56 = 804$$

$$4x^2 + 24x - 748 = 0$$

$$2x^2 + 12x - 374 = 0$$

$$2x^2 + 34x - 22x - 374 = 0$$

$$2x(x + 17) - 22(x + 17) = 0$$

$$\Rightarrow (x + 17)(2x - 22) = 0$$

$$\Rightarrow x = 11$$

$\therefore x = -17$ (Not possible)

Again, according to the question-

$$\text{Average} = \frac{17 \times 7 + 11 \times 3}{2}$$

$$= \frac{152}{2}$$

$$= 76$$

110. The average of five consecutive even numbers is M. If the next five even numbers are also included, the average of ten numbers will be:

- (a) $M + 5$ (b) 11
(c) 10 (d) $M + 10$

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-III)

Ans. (a) : Let the five consecutive even number $x, (x+2), (x+4), (x+6), (x+8)$

$$\therefore \frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} = M$$

$$\frac{5x + 20}{5} = M$$

$$x = M - 4$$

For 10 terms,

$x, (x+2), (x+4), \dots, (x+18)$

$$\text{Average} = \frac{x + x + 18}{2} = x + 9 = M - 4 + 9 = M + 5$$

111. The average of five consecutive odd numbers is m. If the next three odd numbers are also included, then what is the increase in the average?

- (a) 3 (b) 0
(c) 17 (d) 8

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-I)

Ans. (a): Let five consecutive odd numbers is $x, (x+2), (x+4), (x+6)$ and $(x + 8)$.

$$\therefore x + x + 2 + x + 4 + x + 6 + x + 8 = 5m$$

$$5x + 20 = 5m$$

$$x + 4 = m$$

\therefore New average =

$$\frac{x + x + 2 + x + 4 + x + 6 + x + 8 + x + 10 + x + 12 + x + 14}{8}$$

$$= \frac{8x + 56}{8} = x + 7$$

$$\text{Intended increase} = x + 7 - (x + 4) = 3$$

112. The average of three consecutive odd numbers is 52 more than $\frac{1}{3}$ rd of the largest of these numbers. What is the smallest of these numbers?

- (a) 79 (b) 75
(c) 81 (d) 77

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let the three odd numbers is $x, x + 2, x + 4$

According to the question,

$$\frac{3x + 6}{3} = 52 + \frac{(x + 4)}{3}$$

$$3x + 6 = 156 + x + 4$$

$$2x = 154$$

$$x = 77$$

Thus, the smallest number is 77.

113. The average of 44 consecutive odd numbers is 144. What is the largest number?

- (a) 189 (b) 191
(c) 187 (d) 193

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Let consecutive odd numbers-

$x, (x+2), (x+4), (x+6), \dots, 44$ numbers

According to the question,

$$x + (x+2) + (x+4) + (x+6), \dots = 44 \times 144$$

From formula-

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{44} = \frac{44}{2} [2x + (44-1) \times 2]$$

$$6336 = 22[2x + 86]$$

$$2x + 86 = \frac{6336}{22}$$

$$2x = 202$$

$$x = 101$$

Last term (ℓ) = $a + (n-1)d$

$$= 101 + (44-1) \times 2$$

$$= 101 + 86$$

$$= 187$$

114. The average of all odd numbers from 113 to 159 is

- (a) 135 (b) 134
(c) 133 (d) 136

SSC CGL (Tier-II) 9-3-2018

$$\text{Ans. (d) : Average} = \frac{\text{First term} + \text{Last term}}{2}$$

$$= \frac{113 + 159}{2} = 136$$

115. The average of 41 consecutive odd numbers is 49. What is the largest number.

- (a) 89 (b) 91
(c) 93 (d) 95

SSC CGL (Tier-II) 17-2-2018 (Shift-I)

Ans. (a): Average of 41 consecutive odd numbers = 49
Sum of 41 numbers = $41 \times 49 = 2009$
 $a = ?$, $d = 2$, $n = 41$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$2009 = \frac{41}{2} [2a + (41-1)2]$$

$$\frac{2009 \times 2}{41} = [2a + 80]$$

$$2a = 18$$

$$a = 9$$

$$\therefore l = a + (n-1)d$$

$$= 9 + (41-1)2$$

$$= 9 + 80$$

$$= 89$$

116. The average of 35 consecutive even numbers is 44. Find the smallest number.

- (a) 8 (b) 12
(c) 10 (d) 14

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let, 35 consecutive even numbers are $x, (x+2), (x+4), (x+6) \dots \dots (x+68)$

$$\text{Average} = \frac{n(a+l)}{2n} = \frac{a+l}{2}$$

$$44 = \frac{x + x + 68}{2}$$

$$44 = x + 34$$

$$x = 10$$

$$\therefore \text{Smallest number} = 10$$

117. The average of four consecutive odd natural numbers is eight less than the average of three consecutive even natural numbers. If the sum of these three even numbers is equal to the sum of above four odd numbers, then the average of four original odd numbers is:

- (a) 32 (b) 24
(c) 18 (d) 36

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b) Let 4 consecutive odd numbers = $x, (x + 2), (x + 4), (x + 6)$
Three consecutive even numbers = $y, (y + 2), (y + 4)$

According to the first condition,

$$\left[\frac{x + (x+2) + (x+4) + (x+6)}{4} \right] + 8 = \left[\frac{y + (y+2) + (y+4)}{3} \right]$$

$$\Rightarrow (x+3) + 8 = y+2$$

$$\Rightarrow y - x = 9 \quad \text{(i)}$$

According to the second condition,

$$[x + (x+2) + (x+4) + (x+6)] = [y + (y+2) + (y+4)]$$

$$4x + 12 = 3y + 6$$

$$3y - 4x = 6 \quad \text{(ii)}$$

On solving the equation (i) and (ii),

$$x = 21$$

Thus the average of four odd numbers

$$= \frac{21 + 23 + 25 + 27}{4}$$

$$= \frac{96}{4}$$

$$= \boxed{24}$$

118. The average of four consecutive even numbers is 27. By adding which number does the average become 28?

- (a) 30 (b) 32
(c) 29 (d) 33

SSC CHSL -18/03/2020 (Shift-II)

Ans. (b) : Sum of four consecutive even number = $4 \times 27 = 108$

Sum of five even number = $5 \times 28 = 140$

Intended added number = $140 - 108 = 32$

119. The sum of 17 consecutive numbers is 289. The sum of another 10 consecutive numbers, whose first term is 5 more than the average of the first set of consecutive number is:

- (a) 315 (b) 265
(c) 300 (d) 285

SSC CHSL -14/10/2020 (Shift-II)

Ans. (b) : Average of 17 consecutive numbers = $\frac{289}{17} = 17$

Sum of the number = $22 + 23 + 24 + \dots \dots \dots 10$

$$= \frac{10}{2} [2 \times 22 + 9 \times 1]$$

$$= 5 \times 53 = 265$$

120. The average of 35 consecutive natural numbers is N. Dropping the first 10 numbers and including the next 10 numbers, the average is changed to M. If the value of $M^2 - N^2 = 600$, then the average of 3M and 5N is:

- (a) 100 (b) 120
(c) 115 (d) 90

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) : If the next 10 number are included after taking out the first 10 numbers.

$$\text{Average} = M$$

$$N + 10 = M$$

$$M - N = 10 \quad \dots \text{(i)}$$

But, $M^2 - N^2 = 600$
 $(M - N)(M + N) = 600$
 $M + N = 60 \dots(ii)$
 On solving the equation (i) and (ii)
 $M = 35$
 $N = 25$
 \therefore Average of 3M and 5N = $\frac{3 \times 35 + 5 \times 25}{2} = 115$

121. The numbers 24, 45, a, 35, 59, 83, 46, b, 29, 74 are serially numbered as they appear in the sequence. When each number is added to its serial number, then the average of the new numbers formed is 55. The average of the missing numbers (a and b) is:
 (a) 38 (b) 50
 (c) 58 (d) 62

SSC CHSL -13/10/2020 (Shift-II)

Ans. (b) : Given number is in sequence then adding a serial number to each number

1	2	3	4	5	6	7	8	9	10
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
24	45	a	35	59	83	46	b	29	74

Average = $\frac{25 + 47 + (a + 3) + 39 + 64 + 89 + 53 + (b + 8) + 38 + 84}{10} = 55$

$a + b = 550 - 450 = 100$

\therefore Average of a and b = $\frac{a + b}{2} = \frac{100}{2} = 50$

122. The average of 5 consecutive odd numbers is 75. By adding which number, will the average become 76?
 (a) 81 (b) 79
 (c) 77 (d) 76

SSC CHSL -14/10/2020 (Shift-III)

Ans. (a) : Sum of five consecutive odd numbers = $75 \times 5 = 375$
 Sum of six numbers after adding a new number = $76 \times 6 = 456$
 Intended number = $456 - 375 = 81$

123. The average of 40 numbers is 36. The average of the first 25 numbers is 31 and the average of last 16 numbers is 43. Find the 25th number.
 (a) 23 (b) 24
 (c) 22 (d) 21

SSC CHSL -19/03/2020 (Shift-II)

Ans. (a) : \therefore Average of 40 numbers = 36
 Sum of 40 numbers = $36 \times 40 = 1440$
 \therefore Average of first 25 numbers = 31
 \therefore Sum of first 25 numbers = $31 \times 25 = 775$
 \therefore Average of last 16 numbers = 43
 \therefore Sum of last 16 numbers = $43 \times 16 = 688$
 Sum of (16 + 25 = 41) numbers = $775 + 688 = 1463$
 25th number = Sum of 41 number - Sum of 40 number
 \therefore 25th number = $1463 - 1440 = 23$

124. Average of 5 consecutive even numbers is 42. Which number is the largest of the 5 numbers?
 (a) 44 (b) 46
 (c) 42 (d) 48

SSC MTS 10-10-2017 (Shift-III)

Ans. (b) : Let 5 consecutive even numbers is $x, x + 2, x + 4, x + 6$ and $x + 8$.

According to the question.

$$\frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} = 42$$

$$5x + 20 = 210$$

$$5x = 190$$

$$x = \frac{190}{5} = 38$$

Largest number = $x + 8 = 38 + 8 = 46$

125. What is the average of first 15 whole numbers?
 (a) 8 (b) 7
 (c) 9 (d) 10

SSC MTS 08/08/2019 (Shift-I)

Ans. (b) : 0, 1, 2, 3, 14

\therefore Sum of first n natural number = $\frac{n(n+1)}{2}$

\therefore Sum of first 15 numbers = $\frac{14 \times 15}{2} = 105$

Thus, intended average = $\frac{105}{15} = 7$

126. What is the average of the first 15 even number starting from 2 ?
 (a) 16 (b) 15
 (c) 17 (d) 14

SSC MTS 08/08/2019 (Shift-II)

Ans. (a) : Intended average =

$$\frac{2 + 4 + 6 + 8 + \dots + 30}{15}$$

$$= \frac{2[1 + 2 + 3 + 4 \dots 15]}{15}$$

$$= \frac{2}{15} \left[\frac{n(n+1)}{2} \right]$$

$$= \frac{2}{15} \left[\frac{15(15+1)}{2} \right]$$

$$= 16$$

OR

Average of first n even numbers = $(n + 1)$
 $= 15 + 1$
 $= 16$

127. The average of all the prime and composite numbers upto 100 is:
 (a) 51 (b) 50
 (c) 50.5 (d) 49.5

SSC MTS 09/08/2019 (Shift-I)

Ans. (a) : Prime number $\Rightarrow [2, 3, 5, 7, \dots]$
 Composite number $\Rightarrow [4, 6, 8, 9, 10, \dots]$
 Intended number $\Rightarrow [2, 3, 4, 5, 6, 7, 8, \dots, 100]$

$$\text{Average} = \frac{a + \ell}{2} = \frac{2 + 100}{2} = 51$$

128. What is the average of first 15 odd numbers among the natural numbers?

- (a) 18 (b) 15
 (c) 16 (d) 7

SSC MTS 08/08/2019 (Shift-III)

Ans. (b) :

$$\text{Intended average} = \frac{1+3+5+7+9+11+13+\dots+29}{15}$$

$$= \frac{(1+2+3+4+5+\dots+29) - (2+4+6+8+\dots+28)}{15}$$

$$= \left[\frac{\frac{29(29+1)}{2} - 2(1+2+3+4+\dots+14)}{15} \right]$$

$$\left\{ \because 1+2+3+\dots+n = \frac{n(n+1)}{2} \right\}$$

$$= \left[\frac{\frac{29(30)}{2} - \frac{2(14)(14+1)}{2}}{15} \right]$$

$$= \left[\frac{29 \times 15 - 14 \times 15}{15} \right]$$

$$= \frac{15(29-14)}{15} = 15$$

OR

Average of first n odd numbers = n

\therefore Average of the first 15 odd numbers = 15

129. The average of five numbers is 612. If the average of the first two numbers is 418 and the average of the last two numbers is 521, find the third number.

- (a) 1180 (b) 1185
 (c) 1172 (d) 1182

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : Sum of five numbers = $5 \times 612 = 3060$

Sum of first two numbers = $2 \times 418 = 836$

Sum of last two numbers = $2 \times 521 = 1042$

$$\therefore \text{Third number} = 3060 - (836 + 1042)$$

$$= 3060 - 1878 = 1182$$

130. The average of five consecutive even number in the increasing order is k. If the next four consecutive even number are included, then the average of all the number is

- (a) $k + 5$ (b) $k + 4$
 (c) $k + 6$ (d) $2k - 1$

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : Let five consecutive even numbers is $x, x + 2, x + 4, x + 6, x + 8$, and next four even numbers is $x+10, x+12, x+14, x+16$

According to the question,

$$x + x + 2 + x + 4 + x + 6 + x + 8 = 5k$$

$$5x + 20 = 5k \Rightarrow k = (x + 4) \rightarrow (i)$$

Again including the next four numbers,

$$\text{Average} = \frac{5x + 20 + (x + 10 + x + 12 + x + 14 + x + 16)}{9}$$

$$= \frac{(5x + 20) + (4x + 52)}{9}$$

$$= \frac{9x + 72}{9} = x + 8 = (x + 4) + 4 = k + 4$$

131. The average of six consecutive odd numbers is 36. If next four consecutive odd number are included, then what is the average of all the numbers?

- (a) 42 (b) 44
 (c) 40 (d) 39

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (c) : Average of 6 consecutive odd numbers = 36
 Required average on adding next four consecutive odd numbers = $36 + 4 = 40$

(III) Problems based on Finding Average Age/Weight

132. The average present age of four members of family is 27 years and average increases by 3 years when one of their relatives joins them. The age of the relative is:

- (a) 40 years (b) 42 years
 (c) 46 years (d) 44 years

SSC CHSL 27/05/2022 (Shift- II)

Ans. (b) : According to the question:-

Total sum of ages of 4 members = $27 \times 4 = 108$ years

\therefore Average is increased by 3 when a new relative joins

\therefore Sum of ages of 5 members = $(27 + 3) \times 5$

Hence, age of relative = $150 - 108 = 42$ years

133. The average weight of some students in a group is 58 kg. If 8 students of average weight 54 kg leave the group, and 3 students weighing 53.6 kg, 54 kg and 57.4 kg join the group, then the average weight of the remaining students in the group will increase by 575 g. The number of students initially, in the group is:

- (a) 40 (b) 45
 (c) 35 (d) 50

SSC CHSL 19/04/2021 (Shift-I)

Ans. (b) : Let, total students = x

According to the question,

$$58x - 432 + (53.6 + 54 + 57.4) = (x - 5) \times (58.575)$$

$$58x - 432 + 165 = x \times 58.575 - 292.875$$

$$457.875 - 432 = 0.575x$$

$$x = \frac{25.875}{0.575}$$

$$x = 45$$

Hence, total number of students initially = 45

134. The average weight of some students in a class was 69.5 kg. When 10 students of average weight 68 kg joined the class, and 6 students of average weight 60 kg left the class, it was noted that the average weight of the new group of students increased by 2 kg. How many students are there in the class now?

- (a) 17 (b) 21
(c) 23 (d) 19

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : Let initial number of students = x

According to the question,

$$69.5x + 10 \times 68 - 6 \times 60 = (x+10-6) \times (69.5+2)$$

$$69.5x + 10 \times 68 - 6 \times 60 = (x+4) \times 71.5$$

$$69.5x + 680 - 360 = 71.5x + 286$$

$$2x = 320 - 286$$

$$2x = 34$$

$$x = 17$$

$$\therefore \text{Number of students} = 17 + 4 = 21$$

135. The average weight of some persons in a group is 72 kg. When 5 persons with average weight 66.6 kg join and 13 persons with average weight 75 kg leave the group, the average weight of the persons in the group decreases by 1.65 kg. How many persons were there in the group initially?

- (a) 44 (b) 40
(c) 48 (d) 38

SSC CHSL 15/04/2021 (Shift-I)

Ans. (c) : Let x be a group of people.

According to the question,

$$72x + 5 \times 66.6 - 13 \times 75 = (72 - 1.65)(x + 5 - 13)$$

$$72x + 333 - 975 = 70.35(x - 8)$$

$$72x + 333 - 975 = 70.35x - 562.8$$

$$72x - 70.35x = 642 - 562.8$$

$$1.65x = 79.2$$

$$x = \frac{79.2}{1.65} = 48$$

136. In a class of 80 students, 60% are girls and the rest are boys. The average weight of boys is 5% more than that of girls. If the average weight of all the student is 51kg, then what is the average weight (in kg) of the boys?

- (a) 47.5 (b) 55
(c) 52.5 (d) 50

SSC MTS 13/10/2021 (Shift-I)

Ans. (c) : No. of boys = $\frac{80 \times 40}{100}$

$$= 32$$

$$\text{No. of girls} = 48$$

$$\text{Total weight of students} = 51 \times 80$$

$$= 4080$$

$$\text{Let average weight of girls} = x$$

$$\text{Total weight} = 48x$$

$$\text{Average weight of boys} = x \times \frac{105}{100}$$

$$\begin{aligned} \text{Total weight of boys} &= 32x \times \frac{105}{100} \\ &= \frac{168x}{5} \end{aligned}$$

According to the question,

$$48x + \frac{168x}{5} = 4080$$

$$240x + 168x = 20400$$

$$x = 50$$

$$\text{Average weight of boys} = x \times \frac{105}{100}$$

$$= 50 \times \frac{105}{100}$$

$$= 52.5 \text{ kg.}$$

137. The average weight of 25 boxes in a boat is increased by 2 kg when one of the boxes weighing 68 kg is replaced by a new box. The weight (in kg) of the new box is:

- (a) 70 (b) 118
(c) 132 (d) 97

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) : Let, weight of new box is y kg.

Average of 25 boxes = x

According to the question,

$$25 \times x - 68 + y = (x + 2) \times 25$$

$$25x - 68 + y = 25x + 50$$

$$-68 + y = 50$$

$$y = 50 + 68$$

$$\therefore y = 118 \text{ kg}$$

138. The average weight of 30 boys is more than average weight of 20 girls by 5 kg. If the total weight of 30 boys is 1050 kg, then the total weight of 20 girls is:

- (a) 400 kg (b) 550 kg
(c) 650 kg (d) 600 kg

SSC MTS 18/10/2021 (Shift-I)

Ans. (d) : Total weight of 30 boys = 1050 kg

$$\text{Average weight of 30 boys} = \frac{1050}{30} = 35 \text{ kg}$$

$$\therefore \text{Average weight of 20 girls} = 35 - 5$$

$$= 30 \text{ kg}$$

$$\text{Total weight of 20 girls} = 30 \times 20$$

$$= 600 \text{ kg}$$

139. The average weight of 3 persons A, B and C is 60 kg. When D joins the group, the average weight becomes 65 kg. When another person E whose weight is 3 kg less than that of D replaces A, the average weight of B, C, D and E becomes 67 kg. What is the weight of A?

- (a) 60 kg (b) 69 kg
(c) 72 kg (d) 65 kg

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) $\therefore A+B+C = 180$ kg(i)
 $A+B+C+D = 260$ kg(ii)
 $\therefore D = 80$ kg (From equation (i) and (ii))
 Again, $B + C+D+E = 268$ kg ($\because E = D - 3$ kg)
 $B+C = 268-157$
 $B+C = 111$ (iii)
 From eqⁿ. (i) and eqⁿ. (ii),
 $A + B + C = 180$
 $\underline{B + C = 111}$
 $A = 69$
 Weight of A = 69 kg

- 140.** The average weight of 30 persons of group A is 3 kg more than the average weight of 25 persons of group B. The average weight of 25 persons of group B is 2.5 kg more than the average weight of 20 persons of group C. If the total weight of 30 persons of group A is 1725 kg, then what will be the average weight of the persons of group A and group C taken together (in kg)?
 (a) 55.1 (b) 55
 (c) 55.3 (d) 55.4

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c) Total weight of 30 persons of group A = 1725kg
 Total average of 30 persons of group A = $\frac{1725}{30} = 57.5$ kg
 Total average of 25 persons of group B = 54.5 kg
 Total average of 20 persons of group C = 52 kg
 Average of persons of group A and C = $\frac{1725 + 52 \times 20}{30 + 20}$
 $= \frac{1725 + 1040}{50} = \frac{2765}{50} = 55.3$ kg

- 141.** In a class of 80 students (boys and girls) there are 60% girls. The average weight of the boys is 58 kg and that of the girls is 52 kg. What is the average weight (in kg) of the whole class?
 (a) 53.6 (b) 54.4
 (c) 56.2 (d) 55

SSC CHSL 10/08/2021 (Shift-III)

Ans. (b) : Total no. of girls = $\frac{80 \times 60}{100} = 48$
 \therefore Total no. of boys = $80 - 48 = 32$
 Total weight of girls = $52 \times 48 = 2496$ kg
 Total weight of boys = $58 \times 32 = 1856$ kg
 Average weight of whole class
 $= \frac{2496 + 1856}{80}$ kg
 $= \frac{4352}{80}$
 $= 54.4$ kg

- 142.** The average age of 35 persons is 40 years. 5 new persons with an average of 35 years joined them. The average age of all the persons is:

- (a) $39\frac{1}{8}$ years (b) $39\frac{3}{8}$ years
 (c) $39\frac{5}{8}$ years (d) $39\frac{7}{8}$ years

SSC CHSL 11/08/2021 (Shift-III)

Ans. (b) : Average age of all persons = $\frac{35 \times 40 + 5 \times 35}{40}$
 $= \frac{1400 + 175}{40} = \frac{1575}{40} = 39\frac{3}{8}$ years

- 143.** The average age of 7 members of a family is 35 years. If the youngest members are twins and they are 15 years old, then what was the average age (in years) of the family members at the time of the birth of the twins?

- (a) 25 (b) 27
 (c) 28 (d) 30

SSC CHSL 12/08/2021 (Shift-II)

Ans. (c) : Total age of 7 members of family = $35 \times 7 = 245$ years

At the time of birth of twins,
 Total age of 5 members of family
 $= [245 - 15 \times 2]$
 $= 140$
 Average age of family members at the time of the birth
 $= \frac{140}{5}$
 $= 28$ years.

- 144.** The average age of 125 students in a group is 16.2 years. 40% of the students are boys and the rest are girls. The average age of the boys is 20% more than the average age of the girls. What is the average age (in years) of the boys?

- (a) 18.5 (b) 18
 (c) 17.5 (d) 17

SSC CHSL 13/04/2021 (Shift-II)

Ans. (b) : Let, the average age of girls = x years

\therefore Average age of boys = $x \times \frac{120}{100}$
 $= \frac{6x}{5}$ years

According to the question,

Total number of boys = $125 \times \frac{40}{100} \Rightarrow 50$

Total number of girls = $125 - 50 \Rightarrow 75$

$\therefore 75x + 50 \times \frac{6x}{5} = 16.2 \times 125$

$\Rightarrow 75x + 60x = 2025$

$$\Rightarrow 135x = 2025$$

$$\Rightarrow x = 15$$

$$\therefore \text{Average age of boys} = \frac{6 \times 15}{5} = 18 \text{ years}$$

145. In a class of 60 students, 40% are girls. The average weight of the whole class is 59.2 kg and the average weight of the girls is 55 kg. What is the average weight of the boys?

- (a) 62 kg (b) 60 kg
(c) 63 kg (d) 61 kg

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (a) : Let the average weight of boys = x kg

$$\therefore \text{Number of girls} = \frac{60}{100} \times 40 = 24$$

$$\text{Thus, number of boys} = 60 - 24 = 36$$

Average of all class

$$= \frac{\text{Weight of all boys} + \text{Weight of all girls}}{\text{Number of student}}$$

$$59.2 = \frac{36 \times x + 24 \times 55}{60}$$

$$59.2 \times 60 = 36 \times x + 24 \times 55$$

$$36 \times x = 3552 - 1320$$

$$x = \frac{2232}{36}$$

$$x = 62 \text{ kg}$$

Thus, the average weight of boys in class will be 62 kg.

146. The average age of A, B and C is 20 years, and that of B and C is 25 years. What is the age of A?

- (a) 20 years (b) 10 years
(c) 15 years (d) 25 years

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (b) : Total age of A, B, C = 20 × 3 = 60 years

$$\text{Total age of B and C} = 25 \times 2 = 50 \text{ years}$$

$$\text{Age of A} = 60 - 50 = 10 \text{ years}$$

147. The average weight of P, Q and R is 71 kg. If the average weight of P and Q be 66 kg and that of Q and R be 76.5 kg, then the weight (in kg) of Q is :

- (a) 60 (b) 72
(c) 81 (d) 75

SSC CGL (Tier-II) 18-02-2018

Ans. (b): According to the question,

$$\text{Weight of (P+Q+R)} = 71 \times 3 \dots\dots (i)$$

$$\text{Weight of (P+Q)} = 66 \times 2 \dots\dots (ii)$$

$$\text{Weight of (Q+R)} = 76.5 \times 2 \dots\dots (iii)$$

$$\text{From equation (ii) + equation (iii) – equation (i),}$$

$$Q = 132 + 153 - 213$$

$$= 72 \text{ kg.}$$

148. The average age of 120 students in a group is 13.56 years. 35% of the number of students are girls and the rest are boys. If the ratio of the average age of boys and girls is 6:5, then what is the average age (in years) of the girls ?

- (a) 14.4
(c) 11.6

- (b) 10
(d) 12

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

$$\text{Ans. (d) : Number of girls} = 120 \times \frac{35}{100} = 42$$

$$\text{Number of boys} = 120 - 42 = 78$$

Let the average age of boys and girls is 6x and 5x respectively.

∴ According to the question,

$$78 \times 6x + 42 \times 5x = 120 \times 13.56$$

$$78x + 35x = 20 \times 13.56$$

$$113x = 20 \times 13.56$$

$$x = \frac{20 \times 13.56}{113}$$

$$x = 2.4$$

$$\text{Average age of girls} = 5 \times 2.4 = 12 \text{ years}$$

149. The average age of 40 students of a class is 16 years. After admission of 10 new students to the class the average becomes 15 years. If the average age of 5 of the new students is 11 years, then the average age (in years) of the remaining 5 new students is:

- (a) 15 (b) 11
(c) 10 (d) 16

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : Total age of 40 students = 40 × 16 = 640 years

(40 + 10 New student) Total age = 50 × 15 = 750 year

$$\therefore \text{Total age of 10 new students} = 750 - 640 = 110 \text{ years}$$

$$\therefore \text{Total age of 5 new students} = 11 \times 5 = 55 \text{ years}$$

$$\text{Thus, the average age of 5 new students} = \frac{55}{5} = 11 \text{ years}$$

150. The average age of husband, wife and child 7 years ago was 42 years and that of wife and child 9 years ago was 36 years. The present age of the husband is:

- (a) 57 (b) 55
(c) 48 (d) 50

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a) : Let the consecutive age of husband wife and child is x, y, z years.

According to the question,

$$7 \text{ years ago sum of ages of all three} = 42 \times 3$$

$$x - 7 + y - 7 + z - 7 = 126$$

$$x + y + z = 147 \dots\dots\dots (i)$$

$$9 \text{ years ago, the sum of ages of y and z} = 36 \times 2$$

$$y - 9 + z - 9 = 72$$

$$y + z = 90 \dots\dots\dots (ii)$$

From equation (i) – (ii),

$$x = 147 - 90$$

$$x = 57 \text{ years}$$

151. The average age of 16 students in a college is 20. Out of them, the average age of 5 students is 20 and the average age of the other 10 students is 20.4. Find the age of the 16th student of college.

- (a) 20 (b) 24
(c) 16 (d) 22

SSC CHSL –17/03/2020 (Shift-III)

Ans. (c) :

Sum of 16 student ages = $16 \times 20 = 320$ years
Sum of 5 student ages = $5 \times 20 = 100$ years
 \therefore Sum of 10 student ages = $10 \times 20.4 = 204$ years
 \therefore $(5 + 10 = 15)$ Sum of 15 student ages = $100 + 204 = 304$ years
Thus, the age of 16th student = $320 - 304 = 16$ years

152. In a company with 600 employees, the average age of the male employees is 42 years and that of the female employees is 41 years. If the average age of all the employees in the company is 41 years 9 months, then the number of female employees is

- (a) 450 (b) 350
(c) 150 (d) 250

SSC CHSL –16/10/2020 (Shift-I)

Ans. (c) : Let the number of female employees = x

Number of male employees = $(600 - x)$

\therefore Total sum = Average \times No. of terms

$$\therefore (600 - x) \times 42 + 41x = 600 \times \left(41 + \frac{9}{12}\right)$$

$$600 \times 42 - 42x + 41x = 600 \times \frac{167}{4}$$

$$x = 600 \left[42 - \frac{167}{4}\right]$$

$$x = 600 \times \frac{1}{4} = 150$$

153. Three years ago, the average age of a husband, wife and child was 26 years, and that of the wife and the child, 5 years ago, was 20 years. The present age of the husband is:

- (a) 39 years (b) 45 years
(c) 42 years (d) 37 years

SSC CHSL –12/10/2020 (Shift-III)

Ans. (d): 3 years ago, the total age of all three = $26 \times 3 = 78$ year

\therefore At present age of all three = $78 + 3 \times 3 = 87$ years

\therefore Average age of wife and child, 5 year ago = 20 year

\therefore Total age of both in 5 years ago = $20 \times 2 = 40$ years

\therefore At present age of both = $40 + 5 \times 2 = 50$ years

\therefore Present age of husband = $87 - 50 = 37$ years

154. The average age of 25 men is 28 years. 5 new men of an average age of 25 years joined them. Find the average age of all the men together.

- (a) 28.5 years (b) 26.5 years
(c) 29.5 years (d) 27.5 years

SSC CHSL –12/10/2020 (Shift-I)

Ans. (d) :

\therefore Average age of a group of 25 men = 28 years

\therefore Total age of 25 men = $25 \times 28 = 700$ years

Total age of 5 men with average age of 25 years = $25 \times 5 = 125$ years.

\therefore Total age = $700 + 125 = 825$ years

Total number of men = $25 + 5 = 30$

\therefore Average age of all the men together = $\frac{825}{30} = 27.5$ years

155. In a group of 150 people, $\frac{2}{5}$ are men, $\frac{1}{3}$ are women and the rest are children. The average age of the women is $\frac{4}{5}$ of the average age of the men. The average age of the children is $\frac{1}{5}$ of the average age of the men. If the average age of the men is 50 years, then the average age of all the people in the group is:

- (a) 28 years (b) 32 years
(c) 36 years (d) 35 years

SSC CHSL –21/10/2020 (Shift-II)

Ans. (c)

$$\text{No. of man} = 150 \times \frac{2}{5} = 60$$

$$\text{No. of woman} = 150 \times \frac{1}{3} = 50$$

$$\text{No. of child} = [150 - (60 + 50)] = 40$$

$$\text{Average age ratio of men, woman and child} = 50 : 40 : 10$$

$$\text{Average age of all person} = \frac{60 \times 50 + 50 \times 40 + 40 \times 10}{150}$$

$$= \frac{5400}{150} = 36 \text{ years}$$

156. The average age of 12 boys is 15 years and the average age of 18 girls is 12 years. What is the combined average age of the boys and girls, taken together?

- (a) 15.4 (b) 13.2
(c) 16.6 (d) 14.8

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Total age of 12 boys = $15 \times 12 = 180$ years

Total age of 18 girls = $18 \times 12 = 216$ years

$$\text{Average age of [12 boys + 18 girls]} = \left(\frac{180 + 216}{12 + 18}\right)$$

$$= \frac{396}{30} = 13.2 \text{ years}$$

157. In a class the number of girl students is 60% more than the number of boys students. In comparison to girls the average weight of boys is 2.6 kg more. If the average weight of every boys and girls is 50 kg then what is the average weight of girls (in kg)?

- (a) 48.8 (b) 49.2
(c) 49 (d) 48

SSC MTS 21/08/2019 (Shift-III)

Ans. (c) : Ratio of number of boys and girls
= 100 : 160 = 5 : 8

Again let the average age of girls is x.

Then,

$$\frac{5(x + 2.6) + 8x}{13} = 50$$

$$5x + 13 + 8x = 650$$

$$13x = 650 - 13 \Rightarrow 13x = 637 \Rightarrow x = 49$$

158. The average weight of 44 workers of a company is 55 kg. If the weight newly selected employee is included the average weight increases by 250g. What is the weight of newly selected employee (in kg)?

- (a) 66.25 (b) 64.25
(c) 62.25 (d) 60.25

SSC MTS 20/08/2019 (Shift-III)

Ans. (a) : Newly selected person weight = (55 kg + 45 × 250 gram)

$$= 55\text{kg} + 45 \times \frac{1}{4} \text{ kg}$$

$$= 55 \text{ kg} + 11.25 \text{ kg}$$

$$= 66.25 \text{ kg}$$

159. The average weight of 13 students and their teacher is 24.5 kg. If the weight of the teacher is 31 kg, then what is the average weight of the 13 students?

- (a) 23.5 kg (b) 23 kg
(c) 24 kg (d) 25 kg

SSC MTS 19/08/2019 (Shift-II)

Ans. (c) : From question,

Average weight of 13 student and 1 teacher = 24.5 kg

$$\text{Total sum} = 24.5 \times 14 = 343$$

Weight of teacher = 31 kg

Weight of student = 343 - 31 = 312

Total average weight of all students = $\frac{312}{13} = 24\text{kg}$

160. Age of A is 6 years more than three times the age of B. After three years, A's age will be 8 years more than twice the age of B. The average of present ages of A and B (in years) is:

- (a) 12 (b) 11
(c) 14 (d) 13

SSC MTS 13/08/2019 (Shift-II)

Ans. (d) : Let the present age of B = x years

Present age of A = 3x + 6 years

$$\therefore 3x + 6 + 3 = (x + 3) \cdot 2 + 8$$

$$3x + 9 = 2x + 6 + 8$$

$$x = 5$$

Average age of A and B

$$= \frac{3x + 6 + x}{2} = 2x + 3 = 13$$

161. The average weight of a group of 24 students increases by 2 kg when the weight of teacher is also included. If the initial average weight of the group of 24 students was 30 kg, then what is the weight of teacher?

- (a) 32 kg (b) 82 kg
(c) 80 kg (d) 92 kg

SSC GD Constable 11/02/2019 (Shift-II)

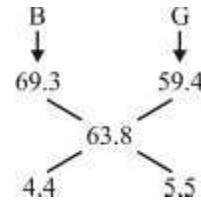
Ans. (c) : Weight of teacher = $25 \times 32 - 24 \times 30$
= 800 - 720 = 80 kg

162. The average of the weights of boys in a class is 69.3 kg and that of girls in the same class is 59.4 kg. If the average of the weights of all the boys and girls in the class is 63.8 kg then the percentage of the number of girls in the class is:

- (a) $45\frac{5}{9}\%$ (b) $55\frac{5}{9}\%$
(c) $54\frac{5}{9}\%$ (d) $44\frac{5}{9}\%$

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (b) : B = Boys, G = Girls



or B : G = 44 : 55 = 4 : 5

Percentage of number of girls in the class = $\frac{5}{9} \times 100$

$$= 55\frac{5}{9}\%$$

163. The average weight of certain number of children in a group was 27 kg. If 12 students of average weight 28.5 kg joined the group, then the average weight of all the children increased by 0.45 kg. The number of children, initially, in the group was.

- (a) 28 (b) 23
(c) 18 (d) 13

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : Let the number of children in the group be x.

According to the question,

$$\frac{27x + 12 \times 28.5}{x + 12} = 27 + 0.45$$

$$27x + 342 = (x + 12) \times 27.45$$

$$27x + 342 = 27.45x + 329.4$$

$$0.45x = 12.6$$

$$x = 28$$

Hence, the number of children in the group is 28.

164. The average age of students in a school is 16.2 years. The average age of boys is 17.4 years and that of girls is 15.2 years. The ratio of the number of boys to that of girls is
- (a) 5:6 (b) 3:4
(c) 4:3 (d) 7:5

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : Let there are boys (B) and girls (G) in the school.

According to the question,

$$\frac{B \times 17.4 + G \times 15.2}{B + G} = 16.2$$

$$17.4B + 15.2G = 16.2B + 16.2G$$

$$1.2B = 1.0G$$

$$\frac{B}{G} = \frac{1}{1.2}$$

$$\frac{B}{G} = \frac{5}{6}$$

$$B : G = 5 : 6$$

(IV) Problems based on Marks Obtained by Students in an Examination

165. The average height of some students in a group is 156 cm. If 5 students of average height 160 cm join the group, then the average height of all the students in the group increases by 0.8 cm. What is the number of students in the group, initially?
- (a) 10 (b) 15
(c) 20 (d) 25

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (c) : Let the number of students initially be x.

According to the question,

$$156x + 5 \times 160 = (x + 5) 156.8$$

$$0.8x = 800 - 784$$

$$8x = 160$$

$$x = 20$$

166. The average weight of a class of 50 students is 48.6 kg. If the average weight of the 20 boys is 54 kg, then find the average weight (in kg) of the girls in the class.
- (a) 40 (b) 46
(c) 45 (d) 42

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

$$\begin{aligned} \text{Average weight of girls} &= \frac{(50 \times 48.6) - (20 \times 54)}{30} \\ &= \frac{2430 - 1080}{30} = \frac{1350}{30} = 45 \text{kg} \end{aligned}$$

167. The average weight of a certain number of students in a class is 55.5 kg. If 4 students with average weight 60 kg join the class, then the average weight of all students in the class increases by 360 g. The number of students in the class, initially, is :

- (a) 46 (b) 31
(c) 41 (d) 36

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (a) : Let the number of students initially is x.

According to the question,

$$55.5 \times x + 60 \times 4 = (x + 4) \times 55.860$$

$$55.5x + 240 = 55.860x + 223.44$$

$$.36x = 16.56$$

$$x = \frac{1656}{36}$$

$$x = 46$$

168. In a class of 90 students 60% are girls and remaining are boys. Average marks of boys are 63 and that of girls are 70. What are the average marks of the whole class ?
- (a) 65.3 (b) 66.7
(c) 67.2 (d) 58.9

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (c) : Given,

Total number of students in class = 90

$$\text{Total number of girls in the class} = 90 \times \frac{60}{100} = 54$$

$$\text{Total number of boys in the class} = (90 - 54) = 36$$

$$\text{Average marks of the whole class} = \frac{63 \times 36 + 70 \times 54}{36 + 54}$$

$$= \frac{6048}{90}$$

$$= 67.2$$

169. In a class of 50 students, 46% are girls and the remaining are boys. The average of the boys marks is 58 and that of the girls is 62. What are the average marks of the whole class?
- (a) 59.84 (b) 60.12
(c) 60.65 (d) 60.38

SSC CGL (TIER-I)-2018 - 11.06.2019 (Shift-III)

Ans. (a):

Total students = 50

$$\text{Number of girls} = 50 \times \frac{46}{100} = 23$$

Number of boys = 27

Let, the average score of the whole class be x.

$$x = \frac{27 \times 58 + 23 \times 62}{50}$$

$$x = \frac{1566 + 1426}{50}$$

$$x = \frac{2992}{50}$$

$$x = 59.84$$

170. The average marks of 50 students in a class was found to be 64. If the marks of two students were incorrectly entered as 38 and 42 instead of 83 and 24, respectively, then what is the correct average?

- (a) 64.54 (b) 61.24
(c) 61.86 (d) 62.32

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (a) : Correct average = $64 + \frac{83+24-38-42}{50}$
 $= 64 + \frac{107-80}{50} = 64 + \frac{27}{50}$
 $= 64 + 0.54 = 64.54$

171. The average of 60 student's results is 38. If the average of the first 22 students is 36, and that of the last 32 students is 32, then the average result of the remaining students is:

- (a) 65.30 (b) 52.12
(c) 81.9 (d) 77.33

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (d) : Remains average of all students
 $= \frac{60 \times 38 - (22 \times 36 + 32 \times 32)}{6}$
 $= 380 - (132 + 170.67)$
 $= 380 - 302.67 = 77.33$

172. The average of the marks of 30 boys is 88 and when the top two scores were excluded, the average marks reduced to 87.5. If the top two scores differ by 2, then the highest marks is:

- (a) 90 (b) 94
(c) 96 (d) 92

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (c) : Let the highest marks = x
 Second highest marks = (x-2)
 $\therefore x + x - 2 = 30 \times 88 - 28 \times 87.5$
 $2x - 2 = 2640 - 2450$
 $2x - 2 = 190$
 $x = 96$

173. The average score in Mathematics of 90 students of sections A and B together is 49. The number of students in A was 25% more than that of B, and the average score of the students in B was 20% higher than that of the students in A. What is the average score of the students in A ?

- (a) 44 (b) 45
(c) 45.5 (d) 44.5

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (b) : Ratio of student of section A and B = 125 : 100 = 5 : 4 = 50 : 40
 Ratio of average mark of student of section A and B.
 $= 100 : 120$
 $= 5 : 6$
 Let the average marks A & B be 5x and 6x
 $\therefore 50 \times 5x + 40 \times 6x = 90 \times 49$
 $490x = 90 \times 49$
 $x = 9$
 \therefore Average marks of section A students = $9 \times 5 = 45$

174. In a class, the average score of thirty students on a test is 69. Later on it was found that the score of one student was wrongly read as 88 instead of 58. The actual average score is :

- (a) 88 (b) 68
(c) 58 (d) 69

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (b) : Decrease in average marks = $\frac{88-58}{30} = 1$

\therefore Actual average = $69 - 1 = 68$

175. The number of students in a class is 75, out of which $33\frac{1}{3}\%$ are boys and the rest are girls.

The average score in mathematics of the boys is $66\frac{2}{3}\%$ more than that of the girls. If the average score of all the students is 66, then the average score of the girls is:

- (a) 55 (b) 54
(c) 58 (d) 52

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

Total number of students = 75

Number of boys = $75 \times 33\frac{1}{3}\% = 75 \times \frac{100}{3 \times 100} = 25$

Number of girls = $75 - 25 = 50$

Let the average score of girls = x

$\left(\because 66\frac{2}{3}\% = \frac{2}{3} \right)$

Average score of boys = $x + \frac{2x}{3} = \frac{5x}{3}$

$25 \times \frac{5x}{3} + 50 \times x = 66 \times 75$

$5x + 6x = 594$

$x = 54$

176. In a class of 60 students there are 20 girls who scored an average of 40 marks in the test, what is the average marks of the boys if the class average is 60 marks?

- (a) 60 (b) 70
(c) 50 (d) 80

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

Total average marks of student in class = 60×60
 $= 3600$

Total average marks of 20 girls = 20×40
 $= 800$

Average marks of the remaining boys = $\frac{3600 - 800}{(60 - 20)}$

$= \frac{2800}{40}$
 $= 70$

177. While tabulation of marks scored in an examination by the students of a class, by mistake the marks scored by one student got recorded as 93 in place of 63, and thereby the average marks increased by 0.5. What was the number of students in the class?

- (a) 20 (b) 15
(c) 60 (d) 30

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) Let the number of student in class = x
 Increase in digits by writing 93 in place of 63 = $93 - 63 = 30$

By writing 93 in place of 63, the increase in the average of the marks = 0.5

$$\text{Increase in average} = \frac{\text{Increase in average}}{\text{Number of student}}$$

$$0.5 = \frac{30}{x}$$

$$x = 60$$

178. The average weight of the boys in a class is 69.3 kg and that of the girls in the same class is 59.4kg. If the average weight of all the boys and girls in the class is 63.8kg, then the percentage of the number of boys in the class is:

- (a) 45 (b) 40
 (c) $44\frac{4}{9}$ (d) $55\frac{5}{9}$

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) Let the number of boys in class is x.

Total weight = $69.3x + 59.4y = (x + y) \times 63.8$

$$69.3x + 59.4y = 63.8x + 63.8y$$

$$5.5x = 4.4y$$

$$\frac{x}{y} = \frac{4.4}{5.5} = \frac{4}{5}$$

\therefore Percentage of the number of boys = $\frac{4}{9} \times 100$

$$= 44\frac{4}{9}\%$$

179. The average score of 42 students in a test is 69. The ratio of the number of boys to that of girls is 10:11. The average score of the boys is 20% more than that of the girls. The average score of the boys is:

- (a) 75.6 (b) 73.5
 (c) 82.8 (d) 75.2

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) From question,

$$\text{No. of boys} = \frac{10}{21} \times 42 = 20$$

$$\text{No. of girls} = 22$$

Let the average marks of the girls = x

$$\text{Average marks of the boys} = x \times \frac{120}{100} = \frac{6x}{5}$$

$$\therefore 20 \times \frac{6x}{5} + 22 \times x = 42 \times 69$$

$$120x + 110x = 210 \times 69$$

$$x = \frac{210 \times 69}{230} = 63$$

$$\text{Average marks of the boys} = \frac{6}{5} \times 63 = 75.6$$

180. In a class, there are 54 students. $33\frac{1}{3}\%$ of the number of students are boys and rest are girls. The average score in mathematics of boys is 50% more than that of the girls. If the average score of all the students is 70, then what is the average score of the boys?

- (a) 84 (b) 81
 (c) 87 (d) 90

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d)

$$\text{Number of boys} = 54 \times \frac{1}{3} = 18$$

$$\text{Number of girls} = 36$$

Let the average mark of girl = x

$$\therefore \text{Average mark of boys} = x \times \frac{150}{100} = \frac{3}{2}x$$

According to the question,

$$18 \times \frac{3}{2}x + 36x = 54 \times 70$$

$$27x + 36x = 3780$$

$$63x = 3780$$

$$x = 60$$

$$\therefore \text{Average mark of boys} = \frac{3}{2} \times x = \frac{3}{2} \times 60 = 90$$

181. Several students have taken an exam. There was an error in the answer key which affected the marks of 48 students and their average marks reduced from 78 to 66. The average of remaining students increased by 3.5 marks. This resulted the reduction of the average of all students by 4.5 marks. The number of students that attended the exam is:

- (a) 96 (b) 84
 (c) 93 (d) 100

SSC CHSL –18/03/2020 (Shift-I)

Ans. (c) : Let remaining number of students = x

According to the question,

$$48 \times 66 + x \times 81.5 = (48 + x) \times 73.5$$

$$48 \times 66 + 81.5x = 48 \times 73.5 + 73.5x$$

$$(81.5 - 73.5)x = 48(73.5 - 66)$$

$$8x = 48 \times 7.5$$

$$x = \frac{48 \times 7.5}{8}$$

$$x = 6 \times 7.5 = 45$$

$$\therefore \text{Total number of students are attend the exam} = (48 + 45) = 93$$

182. The average marks of a group of 15 students in Mathematics is 87. Then other 25 students join the group and the average marks becomes 79.5. The average marks of 24 students of another group is 74. Find the marks of the 25th student of other group.

- (a) 82 (b) 99
 (c) 76 (d) 89

SSC MTS 05/08/2019 (Shift-III)

Ans. (b) :

Total marks of a group of 15 students in Math
 $= 15 \times 87 = 1305$
Marks of 40 students in Math $= 40 \times 79.5 = 3180$
Marks of 24 students of second group $= 24 \times 74 = 1776$
Then 25th student of second group marks obtained =
 $3180 - (1305 + 1776)$
 $= 3180 - 3081 = 99$

183. The ratio of number of boys and girls in a class is 2 : 3 and the average number of marks obtained in Mathematics is 54. The average marks obtained by the boys is 50% more than the average marks obtained by the girls. What is the average marks obtained by the girls?

- (a) 50 (b) 42
(c) 45 (d) 40

SSC MTS 20/08/2019 (Shift-I)

Ans. (c) : Let the average marks of girl = x

Average marks of the boys $= \frac{x \times 150}{100} = \frac{3x}{2}$

Average marks of the class = 54

$$\therefore \frac{2 \times \frac{3x}{2} + 3x}{5} = 54$$

$$6x = 54 \times 5$$
$$x = 45$$

184. The average marks of 42 students in an examination was 64. Later it was found that the marks of three students were misread as 72, 58 and 44 instead of the actual marks 64, 42 and 26 respectively. What is the correct average marks?

- (a) 61 (b) 62
(c) 63 (d) 60

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : The sum of the marks of 42 students = $64 \times 42 = 2688$

So the place of 64, 42 and 26 are 72, 58 and 44 are read.

$$\therefore \text{Error in marks} = (72 + 58 + 44) - (64 + 42 + 26)$$
$$= 174 - 132 = 42$$

$$\therefore \text{Actual mark of 42 students} = 2688 - 42 = 2646$$

$$\therefore \text{Correct average of students} = \frac{2646}{42} = 63$$

(V) Problems based on Runs Scored in Cricket Matches

185. A batsman in his 13th innings makes a score of 97 runs, thereby increasing his average score by 5. What is his average score after the 13th innings?

- (a) 37 (b) 77
(c) 67 (d) 57

SSC CHSL 11/08/2021 (Shift-I)

Ans. (a) : Let average score of a batsman in 12th innings = x

According to the question,

Average score after the 13th innings = (x+5)

$$\text{So, } 13(x+5) - 12x = 97$$

$$x + 65 = 97$$

$$x = 32$$

$$\text{Average score after the 13th innings} = x + 5 = 32 + 5 = 37$$

186. In a one day match of 50 overs in an innings the team A had a run rate of 5.3 runs per over. Team B is playing and 5 overs are left and the required run rate to tie the match is 7.2 per over to match the score of Team A. What is team B's score ?

- (a) 265 (b) 238
(c) 254 (d) 229

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : Total run of team A = $5.3 \times 50 = 265$

Team B scored in last 5 overs = 7.2×5

$$= 36$$

Score of team B = $265 - 36$

$$= 229 \text{ Run}$$

187. In a one day match of 50 overs in an innings the Team A had a run rate of 6.1 runs per over. Team B is playing and 10 overs are left and the required run rate to tie the match is 6.5 per over. What is Team B's score now ?

- (a) 235 (b) 230
(c) 240 (d) 225

SSC CGL (Tier-II) 21-02-2018

Ans. (c) :

Total run scored by Team A in 50 overs = 50×6.1
 $= 305$

Total scored run in last 10 overs by Team B = 10×6.5
 $= 65$

Thus, all score of Team B = $305 - 65$

$$= \boxed{240 \text{ Run}}$$

188. The average runs scored by Sunil in 17 innings is 37. What is his score in the 17th innings, thereby, increasing his average score by 9 runs?

- (a) 81 (b) 108
(c) 181 (d) 167

SSC CHSL 30/05/2022 (Shift- III)

Ans. (c) : According to the question,

Sunil score in 17th innings = $17 \times 37 - [16 \times (37 - 9)]$

$$= 17 \times 37 - 16 \times 37 + 16 \times 9$$

$$= 37 + 144$$

$$= 181$$

189. A batsman scores 98 runs in the 17th match of his career. His average runs per match increased by 2.5. What is his average before the 17th match ?

- (a) 58 (b) 60.5
(c) 63 (d) 55.5

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let, in the 17 match, the average score of first batsman is x .
According to the question,
$$\Rightarrow \frac{16x + 98}{17} = x + 2.5$$

$$\Rightarrow 16x + 98 = 17x + 42.5$$

$$\therefore x = 55.5$$

190. A batsman scores 87 runs in the 21st match of his career. His average runs per match increases by 2. What was his average before the 21st match?

- (a) 45 (b) 46
(c) 44 (d) 43

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : Let the average of 21th match is x .
According to the question,

$$x + 2 = \frac{20 \times x + 87}{21}$$

$$21x + 42 = 20x + 87$$

$$x = 87 - 42 = 45$$

191. The average run rate of a cricket team during the first 20 overs is 4.5. What should be the asking rate per over for the next 30 overs, if it has to chase a target of 282 runs in total?

- (a) 6.0 (b) 6.8
(c) 6.4 (d) 6.3

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) Run required for win = 282
Total run in 20 overs = $20 \times 4.5 = 90$
Remaining run for winning the match = $282 - 90 = 192$
For run rate required for winning in 30 overs
$$= \frac{192}{30} = 6.4$$

192. A batsman scores 92 runs in the 15th inning and thus increases his average by 4. What is his average after the 15th inning?

- (a) 32 (b) 36
(c) 40 (d) 35

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b) : Let, the average of the 14th round = x
According to the question,
$$14 \times x + 92 = 15 \times (x + 4)$$

$$14x + 92 = 15x + 60$$

$$x = 32$$

Average after 15th inning = $x + 4$
$$= 32 + 4 = 36$$

193. The average score of a cricketer for 20 matches is 52 runs. His highest score is more than its lowest score by 120 runs. If these two innings are excluded, the average of the remaining 18 matches is 50 runs. The highest score of the player is:

- (a) 125 (b) 130
(c) 120 (d) 140

SSC CHSL –19/10/2020 (Shift-I)

Ans. (b) : The total score of cricket in 20 matches
$$= 52 \times 20 = 1040 \text{ Run}$$

Sum of the total score in 18 matches
$$= 18 \times 50 = 900 \text{ Run}$$

Highest score = lowest score + 120

\therefore According to the question,

Sum of highest score and lowest score = $1040 - 900 = 140$

Highest + Highest - 120 = 140

$2 \times \text{Highest score} = 140 + 120 = 260$

\therefore Highest score = 130

194. The average of the runs of a cricket player in 20 matches is 35. If the average of the first 12 matches is 45, find the average of the last 8 matches.

- (a) 16 (b) 20
(c) 22 (d) 18

SSC CHSL –12/10/2020 (Shift-II)

Ans. (b) : Total score of 20 matches = $20 \times 35 = 700$

Total score of first 12 matches = $12 \times 45 = 540$

\therefore Total score of last 8 matches = $700 - 540 = 160$

\therefore Average score of last 8 matches = $\frac{160}{8} = 20$

195. A batsman in his 11th inning makes a score of 77 runs, thereby increasing his average scores by 3. What is his average score after the 11th inning?

- (a) 47 (b) 46
(c) 49 (d) 48

SSC CHSL –17/03/2020 (Shift-I)

Ans. (a) : Let average score of after 10 round, = x
According to the question,

$$\frac{10x + 77}{11} = (x + 3)$$

$$10x + 77 = 11x + 33$$

$$x = 44$$

\therefore Average score of after 11th round = $(x + 3) = 44 + 3 = 47$

196. A cricket team has scored 156 runs in 30 overs. They need to score 275 in 50 overs. What is the average runs per over they need to score in the next 20 overs?

- (a) 5.75 (b) 5.95
(c) 5.85 (d) 5.9

SSC MTS 16/08/2019 (Shift-I)

Ans. (b) : Intended average = $\frac{275 - 156}{50 - 30}$

$$= \frac{119}{20} = 5.95$$

(VI) Miscellaneous

197. x, y and z are three positive numbers such that y is $\frac{4}{5}$ times of x and z is $\frac{5}{8}$ times of y . If the average of reciprocals of the numbers x, y and z is $\frac{17}{240}$, then the average of 3 times of x and 5 times of y will be:
- (a) 60 (b) 45
(c) 70 (d) 40

SSC CHSL 10/082021 (Shift-II)

Ans. (c) :

$$\begin{array}{ccc} x & y & z \\ k & \frac{4}{5}k & \frac{1}{2}k \\ 10k & 8k & 5k \end{array}$$

Sum of reciprocals of the numbers

$$= \frac{1}{10k} + \frac{1}{8k} + \frac{1}{5k} = \frac{17 \times 3}{240}$$

$$= \frac{4+5+8}{40k} = \frac{17}{80}$$

$$\frac{17}{40k} = \frac{17}{80}$$

$$k = 2$$

According to the question,

$$\text{Average of } x \text{ and } y = \frac{3 \times 2 \times 10 + 5 \times 2 \times 8}{2}$$

$$= \frac{140}{2}$$

$$= 70$$

198. Find the average of (5 + 5 + up to 200) and (8 + 8 + up to 100 times).
- (a) 6.5 (b) 7
(c) 6 (d) 75

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : Sum of $5+5+5+\dots$ up to 200 = $200 \times 5 = 1000$

Sum of $8+8+8+\dots$ up to 100 = $100 \times 8 = 800$

$$\therefore \text{Average number of 100 and 200} = \frac{1000+800}{200+100}$$

$$= \frac{1800}{300} = 6$$

199. 30kg of rice costing ₹50 per kg is mixed with 20kg of rice costing ₹60 per kg. What is the average cost of the mixture per kg?
- (a) ₹ 54 (b) ₹ 56
(c) ₹ 52 (d) ₹ 55

SSC MTS 08/08/2019 (Shift-II)

$$\begin{aligned} \text{Ans. (a) : Intended average} &= \frac{30 \times 50 + 20 \times 60}{(30 + 20)} \\ &= \frac{1500 + 1200}{50} \\ &= \frac{2700}{50} \\ &= ₹ 54 \end{aligned}$$

200. Three numbers are such that if the average of any two of them is added to the third number, the sums obtained are 168, 174 and 180 respectively. What is the average of the original three numbers?

- (a) 86 (b) 87
(c) 84 (d) 89

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (b) : Let number is x, y and z .

$$\frac{x+y}{2} + z = 168 \Rightarrow x+y+2z = 336 \dots\dots(i)$$

$$\frac{y+z}{2} + x = 174 \Rightarrow y+z+2x = 348 \dots\dots(ii)$$

$$\frac{z+x}{2} + y = 180 \Rightarrow z+x+2y = 360 \dots\dots(iii)$$

After adding equation (i), (ii) and (iii)

$$4(x+y+z) = 1044$$

$$x+y+z = 261$$

$$\text{Average of three number } (x + y + z) = \frac{261}{3} = 87$$

201. Four different positive numbers are written in ascending order. One-third of the average of all the four numbers is 19 less than the greatest of these numbers. If the average of the first three numbers is 12, the greatest number among the given numbers is :

- (a) 21 (b) 25
(c) 22 (d) 24

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (d) : Let the highest number = X

Average of first three number = 12

Sum of first three number = $12 \times 3 = 36$

According to the question,

$$\frac{1}{3} \left(\frac{36+X}{4} \right) = X - 19$$

$$36 + X = 12 \times X - 228$$

$$11 \times X = 228 + 36$$

$$X = \frac{264}{11} = 24$$

Highest number = $X = 24$

202. Three numbers are such that if the average of any two of them is added to the third number, the sums obtained are 164, 158 and 132 respectively. What is the average of the original three numbers?

- (a) 74 (b) $75\frac{1}{3}$
 (c) $75\frac{2}{3}$ (d) 76

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (c) : Let three numbers are A, B, C.

According to the question,

$$\frac{A+B}{2} + C = 164$$

$$A + B + 2C = 328 \quad \dots\dots\dots(i)$$

$$\frac{B+C}{2} + A = 158$$

$$B + C + 2A = 316 \quad \dots\dots\dots(ii)$$

$$\frac{C+A}{2} + B = 132$$

$$C + A + 2B = 264 \quad \dots\dots\dots(iii)$$

eq. (i) + eq. (ii) + eq. (iii),
 $\Rightarrow 4(A + B + C) = 908$
 $\Rightarrow A + B + C = 227$

Thus, the average of original three numbers

$$= \frac{A + B + C}{3}$$

$$= \frac{227}{3} = 75\frac{2}{3}$$

203. The average marks of 45 students was found to be 66. If the marks of two students were incorrectly entered as 28 and 64 instead of 82 and 46 respectively, then what is the correct average?

- (a) 66.6 (b) 67.2
 (c) 66.4 (d) 66.8

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (d) :

$$\text{New average} = 66 + \frac{(82+46)-(28+64)}{45}$$

$$= 66 + \frac{36}{45}$$

$$= 66.8$$

204. The average of 27 numbers is zero. Out of them, how many may be greater than zero at the most?

- (a) 0 (b) 15
 (c) 26 (d) 20

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (c) : If the average of 27 numbers are zero then maximum 26 number will be greater than zero while the sum of 27th number will zero i.e. negative

205. The average temperature for Monday, Wednesday and Friday was 41°C. The average for Wednesday, Friday and Thursday was 42°C. If the temperature on Thursday was 43°C, then the temperature on Monday was:

- (a) 40°C (b) 41°C
 (c) 42°C (d) 43°C

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : $(M+W+F) = 41 \times 3 = 123^\circ\text{C} \quad \dots\dots(1)$

$(W+F+Th) = 42 \times 3 = 126^\circ\text{C}$

$W+F = 126 - 43 = 83^\circ\text{C} \quad \dots\dots(2)$

$\therefore \text{Temperature of Monday} = 123^\circ\text{C} - 83^\circ\text{C} = 40^\circ\text{C}$

206. The average weight of a group of 3 people A, B and C is 70 kg. When D joins this group, the average becomes 60 kg. A and E, whose weight is 5 kg more than that of D, replaces A and the average weight of B, C, D and E now becomes 59 kg. What is the average weight (in kg) of A, D and E? (correct to the nearest integer)

- (a) 40 (b) 30
 (c) 39 (d) 35

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : According to the question,

$A + B + C = 210 \quad \dots\dots(1)$

Including D in this group, the average of group

$$\frac{A+B+C+D}{4} = 60 \text{ kg}$$

$A + B + C + D = 240 \quad \dots\dots(2)$

Average weight = $\frac{E+B+C+D}{4} = 59 \text{ kg}$

$E + B + C + D = 236 \quad \dots\dots(3)$

From equation (2) and (3)

$A - E = 4$

$\therefore D = 30$

From equation (1) and (2),

$\therefore E = 30 + 5 = 35$

According to the question,

So, $A - 35 = 4$

$A = 39$

Hence, Average weight of A, D and E

$$= \frac{39+30+35}{3}$$

$$= \frac{104}{3} = 34.66 \approx 35 \text{ kg}$$

207. The total number of students in sections A and B of a class is 72. The ratio of the number of students in A and B is 7:5. The average weight (in kg) of the students in section B is 20% more than that of the students in section A. If the average weight of all the students in the class is 52 kg, then what is the average weight (in kg) of the students in section B?

- (a) 58.2 (b) 57.6
 (c) 57.9 (d) 56.4

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (b)

Let, average age of group A students = x kg

$\therefore \text{Average age of group B students} = x \times \frac{120}{100} = \frac{6x}{5} \text{ kg}$

According to the question,

$$\begin{aligned} \therefore 7 \times x + 5 \times \frac{6x}{5} &= 52 \times 12 \\ 13x &= 52 \times 12 \\ \boxed{x = 48\text{kg}} \\ \therefore \text{Average age of group B students} &= \frac{6x}{5} = \frac{6 \times 48}{5} \\ &= 57.6 \text{ kg} \end{aligned}$$

208. The average of 20 numbers is 27. If each number is multiplied by 3, then new average will be?

- (a) 91 (b) 61
(c) 81 (d) 71

SSC MTS 20/08/2019 (Shift-III)

$$\text{Ans. (c) : New average} = 27 \times 3 = 81$$

209. A party is organized for 50 people at their expenses. Out of which 48 people, every one pays ₹950 whereas other two spend ₹1200 more than the average expenses of the group. what was then total expense?

- (a) ₹75,000 (b) ₹40,000
(c) ₹25,000 (d) ₹50,000

SSC MTS 14/08/2019 (Shift-I)

Ans. (d) : Total expenses in organizing a party for 50 people

$$\begin{aligned} &= \left(950 + \frac{2 \times 1200}{48} \right) \times 50 \\ &= (950 + 50) \times 50 \\ &= 1000 \times 50 \\ &= ₹50000 \end{aligned}$$

210. A person is told to guess his weight. He has estimated that his weight is more than 70 kg but less than 80 kg. His friend has estimated his weight be more than 74 kg but less than 84 kg. His mother told that his weight is less than 78. Assuming that weight is an integer and all three of them has given correct estimates then what is the average weight of estimates together?

- (a) 76.5 kg (b) 76 kg
(c) 77 kg (d) 75 kg

SSC MTS 14/08/2019 (Shift-I)

Ans. (b) : Weight according to person → more than 70 kg and less than 80 kg.

Weight according to friend → more than 74 kg and less than 84 kg.

Weight of person according to her mother → less than 78 kg.

Thus, possible weight is 75, 76, 77 kg.

$$\text{Average} = \frac{75 + 76 + 77}{3} = 76 \text{ kg}$$

211. There are three positive numbers. If the average of any two of them is added to the third number, the sum obtained are 68, 74 and 98. What is the average of the smallest and the greatest of the given numbers?

- (a) 46 (b) 48
(c) 47 (d) 52

SSC MTS 22/08/2019 (Shift-II)

Ans. (a) : Let three numbers are x, y, z.

According to the question,

$$\frac{x+y}{2} + z = 68$$

$$x + y + 2z = 136 \text{ ——— (i)}$$

$$\frac{y+z}{2} + x = 74$$

$$y + z + 2x = 148 \text{ ——— (ii)}$$

$$\frac{z+x}{2} + y = 98$$

$$z + x + 2y = 196 \text{ ——— (iii)}$$

Adding equation (i), (ii), (iii)

$$4x + 4y + 4z = 136 + 148 + 196$$

$$x + y + z = 120 \text{ ——— (iv)}$$

In equation (i) and (iv)

$$z = 16$$

In equation (iii) and (iv) ,

$$y = 76$$

Average of the smallest and greatest number

$$= \frac{16 + 76}{2} = 46$$

212. Out of four numbers the average of the first three is 16 and that of the last three is 15. If the last number is 21 then the first number is:

- (a) 28 (b) 22
(c) 21 (d) 24

SSC MTS 13/08/2019 (Shift-III)

Ans. (d) : Let number is a, b, c, d.

$$\text{Then, } \frac{a+b+c}{3} = 16$$

$$\Rightarrow a + b + c = 48 \text{(i)}$$

$$\text{And } \frac{b+c+d}{3} = 15$$

$$b + c + d = 45 \text{(ii)}$$

And last number, d = 21

From eqⁿ (ii),

$$b + c + 21 = 45$$

$$b + c = 24 \text{(iii)}$$

On putting the value from eqⁿ (iii) to eqⁿ (i),

$$a = 24$$

First number is 24.

07.

Ratio and Proportion

(I) Problems based on Basic Interpretation of Ratio and Proportion

1. Find the fourth proportional to 7, 13 and 21.
 (a) 14 (b) 26
 (c) 39 (d) 21

Ans. (c) : 7, 13 and 21

$$\text{Fourth proportional} = \frac{21 \times 13}{7} = 39$$

2. One cup has juice and water in the ratio 5 : 2, while another cup of the same capacity has them in the ratio 7 : 4, respectively. If contents of both the cups (when full) are poured in a vessel, then what will be the final ratio of water to juice in the vessel?
 (a) 52 : 25 (b) 25 : 52
 (c) 26 : 25 (d) 25 : 26

SSC CGL (Tier-II) 29/01/2022

Ans : (b)

	Juice	Water
Cup A	5	2
Cup B	7	4

On making capacity equal of both cups A and B and adding—

$$\begin{aligned} [5 : 2] \times 11 &\Rightarrow 55 : 22 \\ [7 : 4] \times 7 &\Rightarrow \frac{49 : 28}{104 : 50} \end{aligned}$$

$$\begin{aligned} \text{Hence, final ratio of water to juice} &= 50 : 104 \\ &= 25 : 52 \end{aligned}$$

3. If x and y are two numbers having opposite signs, $x^2 : y^2 = 16 : 81$, then what is the value of

$$\frac{3x + 4y}{2x - 3y} ?$$

- (a) $\frac{12}{25}$ (b) $-\frac{27}{40}$
 (c) $-\frac{24}{35}$ (d) $\frac{48}{35}$

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) : According to the question,

Let x is positive and y is negative.

$$x^2 : y^2 = 16 : 81 \Rightarrow x : y = 4 : -9, x = 4, y = -9$$

$$\therefore \frac{3x + 4y}{2x - 3y} = \frac{3 \times 4 - 4 \times 9}{2 \times 4 + 3 \times 9} = \frac{12 - 36}{8 + 27}$$

$$= \frac{-24}{35}$$

4. A sum of ₹ x is divided among A, B, C and D in the ratio of $\frac{1}{3} : \frac{1}{5} : \frac{1}{6} : \frac{1}{9}$. If the difference between the shares of B and D is ₹832, then the value of x is:

- (a) ₹7,384 (b) ₹7,488
 (c) ₹7,696 (d) ₹7,592

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d) :

$$A : B : C : D = \frac{1}{3} : \frac{1}{5} : \frac{1}{6} : \frac{1}{9} \quad [\text{LCM of } (3, 5, 6, 9) = 90]$$

$$\Rightarrow A : B : C : D = 30 : 18 : 15 : 10$$

$$8 \text{ units} \rightarrow 832$$

$$1 \text{ unit} \rightarrow 104$$

$$\text{Now, } X = 30 + 18 + 15 + 10$$

$$\Rightarrow 73 \text{ unit} \rightarrow 73 \times 104 = ₹7592$$

5. A certain amount is divided among Sunita, Amit and Vibha in the ratio of 2 : 3 : 4. If Vibha gets ₹14,416 then the total amount is:

- (a) ₹43,248 (b) ₹32,436
 (c) ₹3,604 (d) ₹16,219

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (b) : Ratio of shares of Sunita, Amit and Vibha = 2 : 3 : 4

$$\therefore 4 \rightarrow ₹14416$$

$$1 \rightarrow ₹3604$$

$$\text{Total amount, } 9 \rightarrow ₹32,436$$

6. A sum of money is divided among A, B and C in the ratio 2 : 3 : 7, respectively. If the share of B is ₹15000, then what will be the difference in the shares of B and C?

- (a) ₹18000 (b) ₹20000
 (c) ₹15000 (d) ₹50000

SSC CHSL 12/04/2021 (Shift-I)

Ans : (b) Let share of A, B and C are $2x$, $3x$ and $7x$ respectively.

Given,

$$B's \text{ share} = 15000$$

$$\Rightarrow 3x = 15000$$

$$\Rightarrow x = ₹5000$$

According to the question,

$$\begin{aligned} \text{Difference in the share of B and C} &= 7x - 3x = 4x \\ &= 4 \times 5000 = ₹20000 \end{aligned}$$

7. The product of two positive numbers is 1344 and their ratio is 7 : 12. The smaller of these numbers is:

- (a) 16 (b) 28
 (c) 112 (d) 48

SSC MTS 11/10/2021 (Shift-I)

Ans. (b) : Let smallest number is $7x$ and greatest number is $12x$.
According to the question,
 $7x \times 12x = 1344$
 $x^2 = 16$
 $x = 4$
Hence, the smallest number = $7x = 7 \times 4 = 28$

8. A sum of ₹6342 is divided amongst A, B, C and D in the ratio 3 : 4 : 8 : 6. What is the difference between the shares of B and D ?
(a) ₹906 (b) ₹1510
(c) ₹302 (d) ₹604

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (d) : Let the share of A, B, C and D are in the ratio $3x, 4x, 8x$ and $6x$ respectively.
Total sum = ₹ 6342
Difference between the shares of B and D
$$= \frac{6342 \times (6x - 4x)}{21x}$$
$$= \frac{6342 \times 2x}{21x} = ₹604$$

9. A sum of money is distributed among P, Q, R and S in the ratio 3: 4: 5: 6, respectively. If R gets Rs. 500 more than Q, then the sum of all the shares (in Rs) is:
(a) 8000 (b) 9000
(c) 7500 (d) 6000

SSC MTS 26/10/2021 (Shift-I)

Ans. (b) : Let the share of P, Q, R and S be $3x, 4x, 5x$ and $6x$ respectively.
 \therefore R gets Rs. 500 more than Q.
According to the question,
 $\therefore 5x - 4x = 500$
 $x = 500$
 \therefore Sum of all the shares = $3x + 4x + 5x + 6x$
 $= 18x$
 $= 18 \times 500 = ₹9000$

10. In a proportion, the product of the first and fourth terms is 70 and that of the second and third terms is $3.5y$. The value of y is:
(a) 17 (b) 20
(c) 15 (d) 22

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) : Given that,
 $I \times IV = 70$
 $II \times III = 3.5y$
 $a : b :: c : d$
 $a \times d = b \times c$
Where, $I \rightarrow a$
 $II \rightarrow b$
 $III \rightarrow c$
 $IV \rightarrow d$
 $\therefore 70 = 3.5y$
 $y = \frac{70}{3.5} = 20$

11. The total number of students in three classes of an Engineering Institute is 885. The strength of the students in the first two classes are in the ratio of 4 : 9. The ratio of the number of students in the second and the third classes is 6:11. How many students are there in the class that has the maximum number of students?
(a) 594 (b) 495
(c) 954 (d) 459

SSC MTS 22/10/2021 (Shift-I)

Ans. (b) : Total number of students = 885

$$\begin{array}{l} I : II = 4 : 9 \\ II : III = 6 : 11 \\ \hline I : II : III = 24 : 54 : 99 \\ I : II : III = 8 : 18 : 33 \\ \hline \text{Required number} = \frac{33}{59} \times 885 \\ = 33 \times 15 = 495 \end{array}$$

12. If $x : y = 5 : 7$, then $(6x - y) : (5x + 3y)$ is equal to :
(a) 1 : 4 (b) 11 : 2
(c) 4 : 1 (d) 1 : 2

SSC MTS 02/11/2021 (Shift-I)

Ans. (d) : $x : y = 5 : 7$

$$x = 5$$

$$y = 7$$

According to the question:-

$$\begin{array}{l} \frac{6x - y}{5x + 3y} = \frac{30 - 7}{25 + 21} \\ = \frac{23}{46} = \frac{1}{2} \\ = 1 : 2 \end{array}$$

13. If p is the third proportional to 3, 9, then what is the fourth proportional to 6, p , 4 ?

- (a) $\frac{3}{2}$ (b) 10
(c) 18 (d) $2\sqrt{3}$

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (c) : If a and b are numbers then third proportional = $\frac{b^2}{a}$

$$p = \frac{9^2}{3} = 27$$

Let fourth proportional = x

$$\frac{6}{p} = \frac{4}{x}$$

$$\frac{6}{27} = \frac{4}{x}$$

$$x = 18$$

14. Find the ratio between the fourth proportional of 12, 16, 6 and the third proportional of 4, 6.

- (a) 4 : 3 (b) 3 : 2
(c) 11 : 5 (d) 8 : 9

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (d) : Let the fourth proportional of a, b and c be x.

$$12 : 16 :: 6 : x$$

$$x = \frac{96}{12}$$

$$x = 8$$

Third proportional of a and b = $\frac{b^2}{a}$

$$= \frac{36}{4}$$

$$= 9$$

Required ratio $\rightarrow 8 : 9$

15. Fourth proportion to 12, 18 and 6 is same as the third proportion to k and 6. What is the value of k ?

- (a) $3\sqrt{6}$ (b) 4
(c) 13.5 (d) 3

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (b) : Let fourth proportion be x.

$$12 : 18 :: 6 : x$$

$$\Rightarrow x = \frac{18 \times 6}{12}$$

$$\Rightarrow x = 9$$

Now, third proportion of a and b = $\frac{b^2}{a}$

$$\Rightarrow 9 = \frac{(6)^2}{k}$$

$$\Rightarrow k = 4$$

16. What is the difference in the mean proportional between 1.8 and 3.2 and the third proportional to 5 and 3 ?

- (a) 0.7 (b) 0.4
(c) 0.5 (d) 0.6

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (d) : According to the question,

$$\left| \sqrt{1.8 \times 3.2} - \frac{3 \times 3}{5} \right| = \left| \sqrt{5.76} - \frac{9}{5} \right|$$

$$= |2.4 - 1.8|$$

$$= 0.6$$

17. If a : b = 5 : 7, b : c = 8 : 15, then find the value of 8c : 5a.

- (a) 24 : 5 (b) 21 : 5
(c) 176 : 65 (d) 8 : 21

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) : a : b = (5 : 7) \times 8 = 40 : 56

$$b : c = (8 : 15) \times 7 = 56 : 105$$

$$\therefore a : b : c = 40 : 56 : 105$$

$$\begin{aligned} \text{Then, } 8c : 5a &= 8 \times 105 : 5 \times 40 \\ &= 105 : 25 \\ &= 21 : 5 \end{aligned}$$

18. If A : B = 11 : 7 and B : C = 5 : 19, then what is A : B : C?

- (a) 55 : 35 : 133 (b) 35 : 55 : 133
(c) 35 : 133 : 55 (d) 55 : 133 : 35

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) : A : B = (11 : 7) \times 5

$$B : C = (5 : 19) \times 7$$

$$A : B : C = 55 : 35 : 133$$

19. If 7A = 4B = 14C, then what is A : B : C?

- (a) 2 : 4 : 7 (b) 4 : 2 : 7
(c) 4 : 7 : 2 (d) 2 : 7 : 4

SSC CHSL 16/04/2021 (Shift-I)

Ans. (c) : 7A = 4B = 14C

$$A : B : C = \frac{1}{7} : \frac{1}{4} : \frac{1}{14}$$

$$= 4 : 7 : 2$$

20. A sum of x is divided among A, B and C such that the ratio of the shares of A and C is 8 : 7 and that of B and C is 3 : 2. If the difference between the shares of A and B is ₹240, then what is the value of x?

- (a) 2490 (b) 2580
(c) 2448 (d) 2544

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : A : C \rightarrow (8 : 7) \times 2 = 16 : 14

$$B : C \rightarrow (3 : 2) \times 7 = 21 : 14$$

So,

$$A : B : C = 16 : 21 : 14 \quad (A+B+C = 51 \text{ units})$$

According to the question,

$$A \sim B = 240$$

$$5 \text{ units} = 240$$

$$1 \text{ unit} = 48$$

$$51 \text{ units} = 48 \times 51 = 2448$$

Hence,

$$\text{The value of } x = 2448$$

21. In a bag, white mobile covers and black mobile covers are in the ratio of 4 : 7. If there are 280 black mobile covers, then how many white mobile covers are there in the bag?

- (a) 154 (b) 158
(c) 160 (d) 156

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : Let number of white and black mobile covers are 4x and 7x respectively.

According to the question,

$$7x = 280$$

$$x = 40$$

Hence, number of white mobile covers = $40 \times 4 \Rightarrow 160$

22. If a : b = 2 : 3 and c : d = 5a : 3b, then 2c : 5d is equal to:

- (a) 1 : 1 (b) 10 : 9
(c) 4 : 9 (d) 9 : 10

SSC CHSL 04/08/2021 (Shift-II)

Ans. (c) : Given,
 $a : b = 2 : 3$
 $c : d = 5 \times 2 : 3 \times 3 = 10 : 9$
 Then, $2c : 5d = 10 \times 2 : 5 \times 9$
 $= 20 : 45$
 $= 4 : 9$

23. There are three numbers if the ratio of the first to the second numbers is 2:7 and that of the second to the third number is 5:8, then the ratio of the first to the third number is:
 (a) 7:8 (b) 5:28
 (c) 1:4 (d) 5:7

SSC CHSL 04/08/2021 (Shift-III)

Ans. (b) : I : II : III
 $2 : 7$
 $\frac{5}{2} : 8$
 $10 : 35 : 56$
 I : III = 10 : 56 or 5 : 28

24. If $a : b = 3 : 5$, $b : c = 7 : 8$ and $c : d = 2 : 3$, then $2a : 3d$ is equal to:
 (a) 1:2 (b) 7:30
 (c) 7:15 (d) 7:20

SSC CHSL 05/08/2021 (Shift-III)

Ans. (b) :
 $3 : 5$
 $7 : 8$
 $2 : 3$
 $\frac{42}{3} : \frac{70}{5} : \frac{80}{2} : \frac{120}{2}$
 $21 : 35 : 40 : 60$
 Now, $2a : 3d$
 $42 : 180$
 $7 : 30$

25. What is the ratio of the mean proportional between 1.2 and 10.8 to the third proportional of 0.2 and 1.2?
 (a) 2 : 1 (b) 1 : 3
 (c) 3 : 1 (d) 1 : 2

SSC CHSL 10/08/2021 (Shift-III)

Ans. (d) : Mean proportion of 1.2 and 10.8
 $= \sqrt{1.2 \times 10.8}$
 $= \sqrt{12.96}$
 $= 3.6$
 Third proportion of 0.2 and 1.2
 $= \frac{1.2 \times 1.2}{0.2}$
 $= 7.2$
 Required ratio = 3.6 : 7.2
 $= 1 : 2$

26. The ratio of boys and girls in a school is 6:7, If the total number of students in the school is 3289, then what is the number of girls?

- (a) 1984 (b) 1771
 (c) 1569 (d) 1876

SSC CHSL 19/04/2021 (Shift-III)

Ans. (b) : Let the no. of boys & girls be $6x$ and $7x$ respectively.
 ATQ, $13x = 3289$
 $x = 253$
 No. of girls = $7x$
 $= 7 \times 253$
 $= 1771$

27. Three numbers are in the ratio $\frac{1}{4} : \frac{5}{9} : \frac{7}{12}$. The difference between the greatest and the smallest number is 180. Find the sum of all the three numbers.

- (a) 500 (b) 650
 (c) 800 (d) 750

SSC CHSL 12/04/2021 (Shift-III)

Ans. (d) According to the question,

$\frac{1}{4} : \frac{5}{9} : \frac{7}{12}$
 $\frac{1}{4} \times 36 : \frac{5}{9} \times 36 : \frac{7}{12} \times 36$ [\because LCM of 4, 9 and 12]
 $= 9 : 20 : 21$
 Again, according to the question,
 12 units = 180
 1 unit = 15
 50 units = 15×50
 $= 750$

28. If $x : y = 4 : 5$, then the value of $(8x - 6y) : (9x - 7y)$ is:
 (a) 2:1 (b) 1:2
 (c) 2:3 (d) 1:3

SSC CHSL 09/08/2021 (Shift-III)

Ans. (a) : Let
 $x = 4$ & $y = 5$
 According to the question,
 $8x - 6y : 9x - 7y$
 $32 - 30 : 36 - 35$
 $2 : 1$

29. If two numbers are in the ratio 4:7 and the sum of their cubes is 407000, then the greater number will be:
 (a) 70 (b) 63
 (c) 84 (d) 77

SSC CHSL 09/08/2021 (Shift-II)

Ans. (a) : Let the numbers are $4x$ & $7x$ respectively.
 ATQ,
 $(4x)^3 + (7x)^3 = 407000$
 $64x^3 + 343x^3 = 407000$
 $407x^3 = 407000$
 $x = 10$
 Now, the greater number = $7x = 7 \times 10$
 $= 70$

30. If 9685 is divided into three parts in such a way that one-fourth of the first part, one-third of the second part and one-sixth of the third part are equal, then what is the first part?
 (a) 4470 (b) 2980
 (c) 2253 (d) 2235

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b)

I II III

$$\frac{x}{4} = \frac{y}{3} = \frac{z}{6}$$

$$3x = 4y = 2z$$

$$3x = 4y$$

$$\frac{x}{y} = \frac{4}{3}$$

$$4y = 2z$$

$$\frac{y}{z} = \frac{1}{2}$$

$$x : y = 4 : 3$$

$$y : z = 1 : 2$$

$$x : y : z = 4 : 3 : 6$$

$$\text{First part} = \frac{4}{13} \times 9685$$

$$= 4 \times 745$$

$$= 2980$$

31. The sum of three numbers is 280. If the ratio between the first and second numbers is 2 : 3 and the ratio between second and third numbers is 4 : 5, then find the second number.
 (a) 96 (b) 90
 (c) 86 (d) 80

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let the numbers are A, B and C

According to the question

$$A + B + C = 280$$

$$A : B = 2 : 3$$

$$B : C = 4 : 5$$

$$\therefore A : B : C = 8 : 12 : 15$$

$$\Rightarrow 35x = 280$$

$$x = 8$$

$$\text{Hence, the second number} = 12 \times 8 = 96$$

32. The ratio of boys and girls in a school is 27 : 23. If the difference between the number of boys and girls is 200, then find the number of boys.
 (a) 1200 (b) 1250
 (c) 1300 (d) 1350

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : Ratio of boys and girls

$$= 27 : 23$$

$$\text{Difference between them} = 4$$

$$4 = 200$$

$$\Rightarrow 1 = 50$$

$$\text{Hence, number of boys} = 27 \times 50 = 1350$$

33. If $a : b = 4 : 5$, then $(2a + 3b) : (3a + 2b)$ is equal to:
 (a) 10 : 9 (b) 22 : 23
 (c) 9 : 10 (d) 23 : 22

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (d) : $a : b = 4 : 5$, let a & b $4x, 5x$

$$\begin{aligned} \therefore (2a + 3b) : (3a + 2b) &= (8x + 15x) : (12x + 10x) \\ &= 23x : 22x \\ &= 23 : 22 \end{aligned}$$

34. If $a : b = 3 : 2$, then $(5a + 2b) : (3a + 4b)$ is equal to:
 (a) 19 : 17 (b) 8 : 7
 (c) 17 : 14 (d) 16 : 15

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (a) : Given that,

$$a : b = 3 : 2$$

$$\therefore (5a + 2b) : (3a + 4b)$$

$$= (5 \times 3 + 2 \times 2) : (3 \times 3 + 4 \times 2)$$

$$= 19 : 17$$

35. What is the ratio of the mean proportional 4.8 and 10.8 and the third proportional to 0.4 and 2.4?
 (a) 2 : 3 (b) 1 : 2
 (c) 3 : 2 (d) 2 : 1

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (b) : Mean proportional = \sqrt{ab}

$$\text{Third proportional} = \frac{b^2}{a}$$

$$\therefore \text{Mean proportional} = \sqrt{4.8 \times 10.8} = 7.2$$

$$\therefore \text{Third proportional} = \frac{(2.4)^2}{0.4} = 14.4$$

$$\therefore \text{Mean : Third proportional} = 7.2 : 14.4 = 1 : 2$$

36. If $a : b = 5 : 8$ and $c : b = 4 : 3$, then $a : b : c$ is equal to:
 (a) 15 : 24 : 28 (b) 15 : 24 : 32
 (c) 5 : 8 : 6 (d) 5 : 6 : 8

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (b) :

$$a : b = (5 : 8) \times 3 = 15 : 24 \text{ (on equalizing b)}$$

$$c : b = (4 : 3) \times 8 = 32 : 24$$

$$a : b : c = 15 : 24 : 32$$

37. If $a : b = 5 : 3$, then $(8a - 5b) : (8a + 5b)$ is equal to:
 (a) 3 : 13 (b) 5 : 11
 (c) 2 : 5 (d) 3 : 11

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (b) : $a : b = 5 : 3$

Let a & b = $5x, 3x$

$$\begin{aligned} \therefore (8a - 5b) : (8a + 5b) &= (40x - 15x) : (40x + 15x) \\ &= 25x : 55x = 5 : 11 \end{aligned}$$

38. If $a : b = 2 : 5$, $c : b = 3 : 4$, then $a : b : c$ is equal to:
 (a) 2 : 5 : 4 (b) 2 : 5 : 3
 (c) 8 : 20 : 15 (d) 6 : 15 : 20

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (c) :

$$\therefore a : b = (2 : 5) \times 4 \text{ and } c : b = (3 : 4) \times 5$$

$$\therefore a : b : c = 8 : 20 : 15$$

39. If $a : b = 5 : 7$, then $(5a - 3b) : (4a - 2b)$ is equal to:
 (a) 5 : 4 (b) 2 : 3
 (c) 3 : 2 (d) 4 : 3

SSC CGL (Tier-I)-2018 – 13.06.2019 (Shift-I)

Ans. (b) : $(5a - 3b) : (4a - 2b)$
 $= (5 \times 5 - 3 \times 7) : (4 \times 5 - 2 \times 7)$
 $= 4 : 6$
 $= 2 : 3$

40. Two numbers are in the ratio 5 : 7. If the first number is 20, then the second number will be:

- (a) 22 (b) 8
 (c) 18 (d) 28

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (d) : Let numbers are $5x$ and $7x$
 $\therefore 5x = 20$
 $x = 4$
 \therefore Second number, $7x = 28$

41. The total number of students in a class is 65. If the total number of girls in the class is 35, then the ratio of the total number of boys to the total number of girls is :

- (a) 6 : 7 (b) 7 : 13
 (c) 13 : 7 (d) 7 : 6

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (a) : Number of boys = $65 - 35 = 30$
 Required ratio = $\frac{30}{35} = \frac{6}{7} = 6 : 7$

42. If $3A = 4B = 5C$, then $A : B : C$ is equal to:

- (a) 10 : 7 : 6 (b) 10 : 5 : 4
 (c) 20 : 15 : 12 (d) 20 : 15 : 16

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (c) : $3A = 4B = 5C$
 $A : B : C = \frac{1}{3} : \frac{1}{4} : \frac{1}{5}$
 $= 20 : 15 : 12$

43. Find the third proportional to 6 and 12.

- (a) 18 (b) 9
 (c) 24 (d) 15

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : Third proportion = $\frac{b^2}{a}$
 $= \frac{12 \times 12}{6} = 24$

44. Find two numbers such that their mean proportional is 18 and the third proportional to them is 144.

- (a) 6 and 42 (b) 9 and 36
 (c) 3 and 18 (d) 6 and 12

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Suppose the numbers be 'a' and 'b'.
 Mean proportion = $\sqrt{ab} = 18$
 $ab = 324 \dots\dots(1)$
 Third proportion = $\frac{b^2}{a} = 144 \dots\dots(2)$
 On multiplying of (1) and (2) we get
 $b^3 = 324 \times 144 = 9 \times 9 \times 9 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
 $b = 9 \times 2 \times 2 = 36$
 $\therefore a = 9$

45. If $(5x + 2y) : (10x + 3y) = 5 : 9$, then $(2x^2 + 3y^2) : (4x^2 + 9y^2) = ?$

- (a) 31 : 87 (b) 16 : 47
 (c) 1 : 3 (d) 10 : 27

SSC CGL (Tier-II) 13-09-2019

Ans. (a) :

$\frac{5x + 2y}{10x + 3y} = \frac{5}{9}$
 $45x + 18y = 50x + 15y$
 $5x = 3y$
 $\frac{x}{y} = \frac{3}{5}$
 Hence, $(2x^2 + 3y^2) : (4x^2 + 9y^2)$
 $= (18 + 75) : (36 + 225) = 93 : 261 = 31 : 87$

46. What is the ratio of the third proportional to 0.4 and 0.8, to the mean proportional between 13.5 and 0.24 ?

- (a) 5 : 4 (b) 7 : 8
 (c) 9 : 10 (d) 8 : 9

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : \therefore Third proportion = $\frac{b^2}{a}$

$\therefore a = 0.4, b = 0.8$ (Given)

\therefore Third proportion = $\frac{0.8 \times 0.8}{0.4} = \frac{16}{10}$

\therefore Mean proportion = $\sqrt{c \times d}$

$\therefore c = 13.5, d = 0.24$ (Given)

\therefore Mean proportion = $\sqrt{13.5 \times 0.24} = \frac{18}{10}$

Ratio = $\frac{16}{10} : \frac{18}{10}$
 $= 8 : 9$

47. If $(a + b) : (b + c) : (c + a) = 7 : 6 : 5$ and $a + b + c = 27$, then what will be the value of $\frac{1}{a} : \frac{1}{b} : \frac{1}{c}$?

- (a) 3 : 6 : 4 (b) 3 : 2 : 4
 (c) 4 : 3 : 6 (d) 3 : 4 : 2

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : Let, $(a + b) = 7k, (b + c) = 6k, (c + a) = 5k$

$\therefore a + b + c = \frac{18k}{2} = 9k$

$27 = 9k$

$k = 3$

$\therefore a + b = 21, b + c = 18, c + a = 15$

$\therefore \frac{1}{a} : \frac{1}{b} : \frac{1}{c} = \frac{1}{9} : \frac{1}{12} : \frac{1}{6} = 4 : 3 : 6$

48. In an office $\frac{5}{8}$ of the total number of employees

are males and the rest are females. $\frac{2}{5}$ of the

number of males are non technical workers

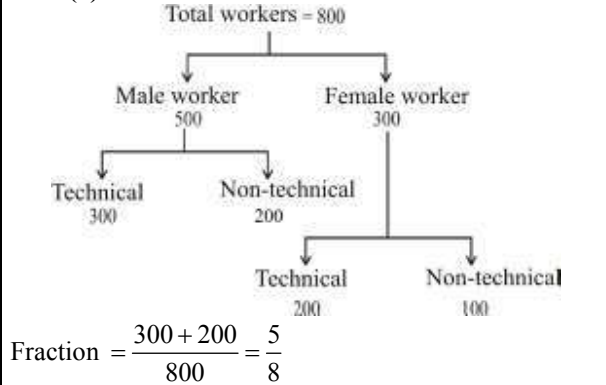
while $\frac{2}{3}$ of the number of females are technical

workers. What fraction of the total number of employees are technical workers ?

- (a) $\frac{5}{8}$ (b) $\frac{1}{2}$
 (c) $\frac{2}{5}$ (d) $\frac{3}{8}$

SSC CGL (Tier-II) 13-09-2019

Ans. (a):



49. What is the fourth proportional to 189, 273 and 153?

- (a) 117 (b) 299
 (c) 221 (d) 187

SSC CGL (Tier-II) 17-2-2018

Ans. (c) :

Fourth proportion of 189, 273 and 153 = $\frac{273 \times 153}{189} = 221$

50. If $12A = 16B = 15C$; find $A : B : C$.

- (a) 12:16:15 (b) 15:16:12
 (c) 20:15:16 (d) 16:15:20

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : $12A = 16B = 15C = K$ (Say)

$A : B : C = \frac{K}{12} : \frac{K}{16} : \frac{K}{15}$

On multiplying by 240, we get
 $= 20 : 15 : 16$

51. Rs 10,200 has to be divided among A, B & C so that A gets $\frac{2}{3}$ of what B gets and B gets $\frac{1}{4}$ of what C gets. How much more does C get over A (in Rs)?

- (a) 6000 (b) 7200
 (c) 1800 (d) 1200

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Let, share of C = 12

$A : B : C = 2 : 3 : 12$

17 units = Rs. 10200

1 unit = Rs. 600

10 units = Rs. 6000

Hence, C will get Rs. 6000 more than A.

52. A sum of ₹8,200 was divided among A, B and C in such a way that A has ₹500 more than B, and C has ₹300 more than A. How much was A's share (in Rs.)

- (a) 2,300 (b) 3,100
 (c) 2,800 (d) 2,000

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : According to the question,

$$\begin{matrix} A & B & C \\ x+500 & x & x+800 \end{matrix}$$

$\therefore x + 500 + x + x + 800 = 8200$

$3x + 1300 = 8200$

$3x = 6900 \Rightarrow x = 2300$

\therefore Share of A = $(x+500) = 2300 + 500 = 2,800$

53. If A is $\frac{1}{6}$ of C, and B is twice of A, and the average of A, B and C is 30, then the difference between A and C is:

- (a) 40 (b) 60 (c) 50 (d) 80

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : According to the question,

$\Rightarrow A : B : C = 1 : 2 : 6$

$\therefore \frac{A+B+C}{3} = 30$

$A+B+C = 90$

Required between A and C = $\left(\frac{6-1}{9}\right) \times 90 = 50$

54. What is the ratio of fourth proportional of 3, 4 and 9 and mean proportional of 2 and 98 ?

- (a) 6 : 7 (b) 7 : 6
 (c) 8 : 7 (d) 7 : 8

SSC CHSL 11/07/2019 (Shift-II)

Ans. (a) : Let fourth proportion of 3, 4, 9 = x

$\therefore 3 : 4 :: 9 : x$

\therefore Fourth proportion = $x = \frac{4 \times 9}{3} = 12$

Mean proportion of 2 and 98 = $\sqrt{2 \times 98} = 14$

Ratio = $12 : 14 = 6 : 7$

55. Find one-fifth of three-eighth of one-third of 11760.

- (a) 598 (b) 467
 (c) 645 (d) 294

SSC CHSL -17/03/2020 (Shift-III)

Ans. (d) : 11760 of $\frac{1}{3}$ of $\frac{3}{8}$ of $\frac{1}{5}$

$= 11760 \times \frac{1}{3} \times \frac{3}{8} \times \frac{1}{5}$

$= \frac{11760}{8 \times 5} = 294$

56. The ratio of tables and chairs in a room is 7 : 9. If there are 560 tables and chairs in the room, then what is the number of chairs?

- (a) 315 (b) 463
 (c) 397 (d) 489

SSC CHSL -17/03/2020 (Shift-III)

Ans. (a) : \therefore Ratio of tables and chairs = 7 : 9

Let tables and chairs are $7x$ and $9x$ respectively

According to the question,

$7x + 9x = 560$

$16x = 560$

$x = 35$

\therefore Number of chairs = $9x = 9 \times 35 = 315$

57. The ratio of the number of men and women in a factory is 14 : 19. If the total number of employees in the factory is 2145, then the number of women in the factory is:
 (a) 1976 (b) 1367
 (c) 1235 (d) 1645

SSC CHSL -19/10/2020 (Shift-III)

Ans. (c) :

$$\begin{aligned} \text{Number of women employees} &= 2145 \times \frac{19}{(14+19)} \\ &= 65 \times 19 = 1235 \end{aligned}$$

58. In a bag, white marbles and red marbles are in the ratio of 3:5. If the number of red marbles are 150, then how many white marbles are there?
 (a) 90 (b) 120
 (c) 60 (d) 30

SSC CHSL -14/10/2020 (Shift-III)

Ans. (a) : Ratio of white and red marble = 3:5

$$\begin{aligned} \therefore 5 \text{ units} &= 150 \\ \therefore 3 \text{ units} &= 90 \\ \text{No. of white marbles} &= 90 \end{aligned}$$

59. If $2145 : x :: 3003 : 42$, then the value of y so that $x : 2508 :: y : 11704$, is:
 (a) 140 (b) 156
 (c) 96 (d) 212

SSC CHSL -13/10/2020 (Shift-I)

Ans. (a) : $2145 : x :: 3003 : 42$

$$\begin{aligned} \text{Product of extreme most terms} &= \text{Product of inner terms} \\ 2145 \times 42 &= 3003 \times x \\ \Rightarrow x &= \frac{2145 \times 42}{3003} \end{aligned}$$

$$\therefore x = 30$$

$$\text{Then } x : 2508 :: y : 11704$$

$$\begin{aligned} \text{Product of extreme most terms} &= \text{Product of inner terms} \\ x \times 11704 &= 2508 \times y \\ y &= \frac{30 \times 11704}{2508} \\ y &= \frac{351120}{2508} = 140 \end{aligned}$$

60. ₹ 6,300 is divided among X, Y, Z such that $X : Y = 7 : 5$ and $Y : Z = 4 : 3$. Find the share of Y.
 (a) ₹ 1,800 (b) ₹ 2400
 (c) ₹ 2,000 (d) ₹ 2,200

SSC CHSL -12/10/2020 (Shift-I)

Ans. (c) : $X : Y = (7 : 5) \times 4$

$$\begin{aligned} Y : Z &= (4 : 3) \times 5 \\ X : Y : Z &\Rightarrow 28 : 20 : 15 \\ \text{Total amount} &= ₹ 6300 \end{aligned}$$

$$Y\text{'s share} = 6300 \times \frac{20}{63} = ₹ 2000$$

61. Two numbers are respectively 25% and 60% more than a third number. The ratio of the two numbers is:
 (a) 21 : 31 (b) 25 : 32
 (c) 20 : 35 (d) 20 : 30

SSC CHSL -18/03/2020 (Shift-III)

Ans. (b) : Let third number be 100.

\therefore First & second numbers are 125 and 160 respectively

$$\text{Required ratio} = \frac{125}{160} = 25 : 32$$

62. What is the third proportional to 16 and 24?

- (a) 32 (b) 28
 (c) 34 (d) 36

SSC CHSL -21/10/2020 (Shift-II)

Ans. (d) Let third proportion be x .

$$16 : 24 :: 24 : x$$

$$\frac{16}{24} = \frac{24}{x}$$

$$x = 36$$

63. If $\frac{1}{5}$ th of $\frac{1}{4}$ th of a number is 35, then what will

be the value of $\frac{7}{8}$ th of that number?

- (a) 624.5 (b) 723.5
 (c) 715 (d) 612.5

SSC CHSL -17/03/2020 (Shift-II)

Ans. (d) : Let number be x .

According to the question,

$$x \times \frac{1}{4} \times \frac{1}{5} = 35$$

$$x = 35 \times 20$$

$$x = 700$$

$$\begin{aligned} \therefore \frac{7}{8} \text{ of that number} &= \frac{700 \times 7}{8} \\ &= 612.5 \end{aligned}$$

64. The ratio of two numbers is 2:9. If their difference is 70, then what is the smaller number?

- (a) 15 (b) 20
 (c) 25 (d) 30

SSC MTS 9-10-2017 (Shift-II)

Ans. (b) : Let numbers are $2x$ and $9x$

According to the question,

$$9x - 2x = 70$$

$$7x = 70$$

$$x = 10$$

$$\text{Numbers} = 20, 90$$

$$\text{Smaller numbers} = 20$$

65. If $3A = 2B = 12C$, then what is $A:B:C$.

- (a) 10:5:2 (b) 4:6:1
 (c) 4:6:5 (d) 2:5:10

SSC MTS 9-10-2017 (Shift-II)

Ans. (b) : $\therefore 3A = 2B = 12C = K$ (say)

$$\begin{aligned} \therefore A:B:C &= \frac{K}{3} : \frac{K}{2} : \frac{K}{12} \\ &= 4:6:1 \end{aligned}$$

66. If 6.3 of $a = 1.17$ of b , then what is $a : b$?

- (a) 13 : 70 (b) 91 : 7
 (c) 7 : 130 (d) 13 : 7

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : a of 6.3 = b of 1.17

$$a \times 6.3 = b \times 1.17$$

$$\frac{a}{b} = \frac{1.17}{6.3} = \frac{117}{630}$$

$$\frac{a}{b} = \frac{13}{70}$$

$$a : b = 13 : 70$$

67. If $P:Q = 3:4$ and $Q:R = 2:5$, then what is $(P+Q):(Q+R) = ?$

- (a) 1:2 (b) 1:3
(c) 2:3 (d) 2:5

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) :

$$P : Q : R$$

$$3 : 4 :$$

$$\frac{2 : 5}{3 : 4 : 10}$$

$$3 : 4 : 10$$

$$(P+Q):(Q+R) = 7 : 14 = 1 : 2$$

68. If $(2/3)P = (4/5)Q = (3/2)R$, then what is $P : Q : R$?

- (a) 18 : 15 : 8 (b) 15 : 8 : 18
(c) 2 : 4 : 3 (d) 3 : 5 : 2

SSC MTS 10-10-2017 (Shift-I)

Ans : (a) Given,

$$\text{Let, } \left(\frac{2}{3}\right)P = \left(\frac{4}{5}\right)Q = \left(\frac{3}{2}\right)R = K$$

$$P : Q : R = \frac{3K}{2} : \frac{5K}{4} : \frac{2K}{3}$$

$$P : Q : R = 18 : 15 : 8$$

69. If $P : Q = 1 : 5$ and $Q : R = 3 : 2$, then what is $(P + Q) : (Q + R)$?

- (a) 6 : 7 (b) 5 : 7
(c) 18 : 25 (d) 13 : 18

SSC MTS 11-10-2017 (Shift-I)

Ans : (c) $P : Q = (1 : 5) \times 3$

$$Q : R = (3 : 2) \times 5$$

$$\therefore P : Q : R = 3 : 15 : 10$$

$$\Rightarrow (P + Q) : (Q + R) = 18 : 25$$

70. Amount of ₹6859 is divided among A, B, C and D such that the amount between A and B is divided in the ratio of 4 : 3, between B and C is 5 : 4 and between C and D in the ratio of 6 : 5 what is the amount of B?

- (a) ₹1805 (b) ₹1444
(c) ₹2508 (d) ₹2407

SSC MTS 21/08/2019 (Shift-III)

Ans. (a) :

$$A : B = (4 : 3) \times 5$$

$$B : C = (5 : 4) \times 3$$

$$C : D = (6 : 5) \times 2$$

$$A : B : C : D = (20 : 15 : 12 : 10)$$

$$\text{Share of B} = \frac{6859}{57} \times 15 = ₹1805$$

71. Suppose that $y > 0$, if $5 : 15 :: x : 90$ and $162 : y :: y : 128$ then $8x : y$ is equal to.

- (a) 5 : 3 (b) 10 : 7
(c) 3 : 2 (d) 4 : 3

SSC MTS 21/08/2019 (Shift-III)

Ans. (a) : $\therefore 5 : 15 :: x : 90$

$$\frac{5}{15} = \frac{x}{90}$$

$$\boxed{x = 30}$$

And $162 : y :: y : 128$

$$\frac{162}{y} = \frac{y}{128}$$

$$y^2 = 128 \times 162$$

$$y^2 = 16 \times 8 \times 18 \times 9$$

$$y^2 = 16 \times 16 \times 81$$

$$y = 144$$

Then,

$$8x : y = 8 \times 30 : 144 \\ = 5 : 3$$

72. If $a : b = 2 : 3$ and $b : c = 2 : 3$, then value of $(3a^2 + b^2 + c^2) : (a^2 + 2b^2 + c^2)$ is?

- (a) 169 : 165 (b) 165 : 169
(c) 7 : 5 (d) 5 : 7

SSC MTS 21/08/2019 (Shift-II)

Ans. (b) : $a : b = (2 : 3) \times 2$

$$b : c = (2 : 3) \times 3$$

$$a : b : c = 4 : 6 : 9$$

Then,

$$\frac{(3a^2 + b^2 + c^2)}{(a^2 + 2b^2 + c^2)}$$

$$= \frac{[3 \times (4)^2 + (6)^2 + (9)^2]}{(4)^2 + 2 \times (6)^2 + (9)^2}$$

$$= \frac{48 + 36 + 81}{16 + 72 + 81}$$

$$= \frac{165}{169}$$

$$= 165 : 169$$

73. If $V_1 : V_2 = 1 : 2$ and $V_1 + V_2 = 147$, then what is the value of $V_2 - V_1$?

- (a) 48 (b) 56
(c) 98 (d) 49

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) :

$$\therefore V_1 : V_2 = 1 : 2 = x : 2x \text{ (Let)}$$

$$V_1 + V_2 = 147 \text{ (Given)}$$

$$x + 2x = 147$$

$$3x = 147$$

$$x = 49$$

$$V_2 - V_1 = x = 49$$

74. The proportion of the number of students in three classes is 1 : 2 : 3. If 20 students are included in each class, then the proportion becomes 3 : 5 : 7. What was initially the total number of students in the three classes?

- (a) 200 (b) 280
(c) 220 (d) 240

SSC MTS 08/08/2019 (Shift-I)

Ans. (d): Let number of students are $x, 2x$ and $3x$.
 Total number of students = $x + 2x + 3x = 6x$
 According to the question,
 $(x + 20) : (2x + 20) : (3x + 20) = 3 : 5 : 7$
 $\frac{x + 20}{2x + 20} = \frac{3}{5}$
 $5x + 100 = 6x + 60$
 $x = 40$
 Total number of students = $6x$
 $= 6 \times 40$
 $= 240$

75. If $a : b = 2 : 5$, $b : c = 4 : 7$ and $c : d = 9 : 14$, then what is the value of $a : b : c : d$?

- (a) 72 : 180 : 245 : 490
 (b) 72 : 180 : 315 : 490
 (c) 72 : 144 : 315 : 490
 (d) 36 : 180 : 315 : 490

SSC MTS 14/08/2019 (Shift-I)

Ans. (b) : $a : b = (2:5) \times 4$ (On equalizing 'b' we get)
 $b : c = (4:7) \times 5$
 $a : b : c = (8:20:35) \times 9$ (On equalizing 'c' we get)
 $c : d = (9:14) \times 35$
 $a : b : c : d = 72 : 180 : 315 : 490$

76. The number of students studying subjects A, B and C in a school are in the proportion 12 : 15 : 16. There is a proposal to increase the number of students studying A, B and C, respectively by 50%, 20% and 50%. What will be the new proportion of the number of students studying A, B and C?

- (a) 3 : 3 : 5
 (b) 3 : 3 : 4
 (c) 2 : 3 : 3
 (d) 5 : 8 : 12

SSC MTS 14/08/2019 (Shift-II)

Ans. (b) : $A : B : C = 12 : 15 : 16$
 Let, $A = 12x$, $B = 15x$, $C = 16x$
 Increase in A = $12x \times \frac{150}{100} = 18x$
 Increase in B = $15x \times \frac{120}{100} = 18x$
 Increase in C = $16x \times \frac{150}{100} = 24x$
 Ratio after increment
 $A : B : C = 18x : 18x : 24x = 3 : 3 : 4$

77. In a 100 m race, A beat B by 10 m and B beats C by 10 m. By what distance does A beat C (in m)?

- (a) 19
 (b) 18
 (c) 20
 (d) 21

SSC MTS 09/08/2019 (Shift-II)

Ans. (a) :
 $A : B = 100 : 90$
 $B : C = (100 : 90) \times \frac{9}{10} = 90 : 81$
 $A : B : C = 100 : 90 : 81$
 $A - C = 100 - 81$
 $A - C = 19 \text{ m}$

78. If the ratio of selected to unselected candidates was 14:25. If 35 less would have been applied and 10 less selected, the ratio of selected to unselected would have been 3:8. What is the number of candidates who had applied for a job?

- (a) 200
 (b) 175
 (c) 275
 (d) 195

SSC MTS 09/08/2019 (Shift-I)

Ans. (d) : Let selected and unselected candidates are $14x$ and $25x$.

$$\text{Total number of applicants} = 14x + 25x = 39x$$

According to the question,

When 35 less people filled form and 10 less people selected.

$$\text{Then, total number} = (39x - 35)$$

$$\text{Selected candidates} = 14x - 10$$

$$\therefore \frac{14x - 10}{39x - 35} = \frac{3}{8}$$

$$112x - 80 = 117x - 105$$

$$5x = 25 \Rightarrow x = 5$$

$$\begin{aligned} \text{Total number of applicants} &= 39x \\ &= 39 \times 5 \\ &= 195 \end{aligned}$$

79. The ratio of boys and girls in a college was 4:5. New students got admitted and the number of boys went up by 50% and the number of girls went up by 60%. What is the new ratio of boys and girls in the college?

- (a) 3 : 5
 (b) 3 : 4
 (c) 5 : 8
 (d) 2 : 3

SSC MTS 16/08/2019 (Shift-I)

Ans. (b) : Let number of boys = $4x$

And, number of girls = $5x$

According to the question,

$$\begin{aligned} \text{Required ratio} &= (4x + 2x) : (5x + 3x) \\ &= 6x : 8x \\ &= 3 : 4 \end{aligned}$$

80. If $A : B$ is 2 : 3 and $B - A = 28$, then what is the value of $B + A$?

- (a) 120
 (b) 150
 (c) 130
 (d) 140

SSC MTS 05/08/2019 (Shift-I)

Ans. (d) : $A : B = 2 : 3 \Rightarrow A = 2x$, $B = 3x$

And, $B - A = 28$

$$\Rightarrow 3x - 2x = 28$$

$$\Rightarrow x = 28$$

$$B + A = 5x = 140$$

81. x is the 4th proportional to 12, 16 and 5 and 20, y , 15, 21 are in proportion. Then the value of $(6x - y)$ is:

- (a) 9
 (b) 18
 (c) 13
 (d) 12

SSC MTS 22/08/2019 (Shift-II)

Ans. (d) : x is the 4th proportional to 12, 16 and 15

$$12 : 16 :: 5 : x$$

$$12x = 80$$

$$x = \frac{20}{3}$$

$$20 : y :: 15 : 21$$

$$15y = 21 \times 20$$

$$y = 28$$

Then,

$$6x - y = 6 \times \frac{20}{3} - 28$$

$$= 40 - 28$$

$$= 12$$

82. If $\frac{a}{b} = \frac{3}{4}$, $\frac{b}{c} = \frac{4}{5}$ and $\frac{c}{d} = \frac{5}{6}$, then the sum of the numerator and the denominator (which are co-primes) of $\left(\frac{a}{d}\right)^{10}$ is:

- (a) 1025 (b) 4097
(c) 2049 (d) 513

SSC MTS 02/08/2019 (Shift-I)

Ans. (a) : $\because \frac{a}{b} = \frac{3}{4}$, $\frac{b}{c} = \frac{4}{5}$ and $\frac{c}{d} = \frac{5}{6}$

$$\therefore a : b : c : d = 3 : 4 : 5 : 6$$

$$\frac{a}{d} = \left(\frac{3}{6}\right)$$

$$\frac{a}{d} = \frac{1}{2}$$

$$\left(\frac{a}{d}\right)^{10} = \left(\frac{1}{2}\right)^{10}$$

$$\frac{a}{d} = \frac{1}{1024}$$

Then, $(a + d) = 1 + 1024$
 $= 1025$

83. Seventy eight is divided into two parts such that four times the first part and five times the second part are in the ratio of 14:15. The first part is:

- (a) 42 (b) 36
(c) 30 (d) 48

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) : Let first part and second part be A and B respectively.

$$\frac{4A}{5B} = \frac{14}{15}$$

$$\frac{A}{B} = \frac{7}{6}$$

First part = $78 \times \frac{7}{13}$
 $= 42$

84. A certain sum is divided among p, q and r in a manner that for every rupee that p gets, q gets 75 paise and for every rupee that q gets, r gets 50 paise. If r's share in the total sum is ₹36, then find the share of p.

- (a) ₹ 96 (b) ₹ 72
(c) ₹ 54 (d) ₹ 60

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (a) : 'r' share in total amount is ₹36.

Ratio of 'p' and 'q' share

$$= 100 : 75$$

$$= 4 : 3$$

Ratio of 'q' and 'r' = 100 : 50

$$= 2 : 1$$

$$\therefore p : q = 4 \times 2 : 3 \times 2 = 8 : 6$$

$$q : r = 2 \times 3 : 1 \times 3 = 6 : 3$$

$$p : q : r = 8 : 6 : 3$$

Given, r's share = 36

$$\therefore 1 = 12$$

$$\therefore \text{Share of P} = 12 \times 8 = ₹96$$

85. In a class there are a total of 60 boys and girls. Which of the following can't represent the ratio of the number of boys and girls in the class?

- (a) 2 : 3 (b) 1 : 3
(c) 1 : 6 (d) 3 : 7

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : Except (ratio of boys and girls) 1 : 6, all ratio's divide 60 completely.

86. A : B = 5 : 8 and B : C = 11 : 13. If A = 110, then what is the value of C?

- (a) 176 (b) 104
(c) 208 (d) 88

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (c) : A : B = (5 : 8) × 11

$$B : C = (11 : 13) \times 8$$

$$A : B : C = 55 : 88 : 104$$

$$\therefore 55 \rightarrow 110$$

$$1 \rightarrow 2$$

$$\therefore 104 \rightarrow 208$$

$$\text{Value of C} = 208$$

87. If P : Q : R = 5 : 3 : 6, then what will be the ratio of (P/Q) : (Q/R) : (R/P)?

- (a) 50 : 15 : 36 (b) 50 : 45 : 36
(c) 75 : 15 : 36 (d) 40 : 12 : 27

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : P : Q : R = 5 : 3 : 6

$$\frac{P}{Q} : \frac{Q}{R} : \frac{R}{P} = \frac{5}{3} : \frac{3}{6} : \frac{6}{5}$$

$$= 50 : 15 : 36$$

88. Four numbers are in the ratio of 2 : 5 : 3 : 8 respectively. If the sum of these four numbers is 432, then what is the sum of first and fourth number?

- (a) 192 (b) 216
(c) 240 (d) 232

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : Let four numbers are 2x, 5x, 3x and 8x.

According to the question,

$$2x + 5x + 3x + 8x = 432$$

$$18x = 432$$

$$x = 24$$

Sum of first and fourth number

$$= 2x + 8x = 10x = 10 \times 24 = 240$$

89. A sum of Rs. x is divided among A, B, C and D such that the ratio of the shares of A and B is 4 : 5, that of B and C is 3 : 4 and that of C and D is 5 : 7. If the difference between the shares of B and D is Rs. 3,276 then the value of x is :

- (a) ₹17,400 (b) ₹17,500
(c) ₹18,900 (d) ₹18,800

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (c) : Given,

$$A : B = (4 : 5) \times 3$$

$$B : C = (3 : 4) \times 5$$

$$C : D = (5 : 7) \times 4$$

$$A : B : C : D = 12 : 15 : 20 : 28$$

$$\text{Difference between the share of B and D} = 3276$$

$$28 - 15 = 3276$$

$$13 \text{ units} = 3276$$

$$1 \text{ unit} = \frac{3276}{13} = ₹252$$

$$\begin{aligned} \therefore \text{Total amount} &= 252 \times (A+B+C+D) \\ &= 252 \times 75 \\ &= ₹18900 \end{aligned}$$

90. If x is added to each of 11, 17, 23, 33, then the numbers so obtained in this order are in proportion. What is the value of $(5x - 3)$?

- (a) 37 (b) 42
(c) 27 (d) 32

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

$$\text{Ans. (d): } \frac{11+x}{17+x} = \frac{23+x}{33+x}$$

$$363 + 11x + 33x + x^2 = 391 + 17x + 23x + x^2$$

$$44x - 40x = 391 - 363$$

$$4x = 28$$

$$x = 7$$

$$\therefore 5x - 3$$

$$= 5 \times 7 - 3 = 32$$

(II) Problems based on Finding New Proportion due to Increase or Decrease in Original Ratio/Proportion

91. If x is subtracted from each of 52, 47, 20 and 19, the numbers so obtained in this order are in proportion. What is the mean proportional between $(x + 4)$ and $(x - 8)$?

- (a) 8 (b) 12
(c) 9 (d) 10

SSC MTS 14/10/2021 (Shift-I)

Ans. (a) : According to the question,

$$\frac{52-x}{47-x} = \frac{20-x}{19-x}$$

$$988 - 19x - 52x + x^2 = 940 - 20x - 47x + x^2$$

$$988 - 940 = -67x + 71x$$

$$4x = 48$$

$$x = 12$$

$$\text{Numbers} = x + 4 = 12 + 4 = 16$$

$$\text{And, } x - 8 = 12 - 8 = 4$$

$$\text{Mean proportional} = \sqrt{16 \times 4} = 8$$

92. Two numbers are in the ratio of 13 : 8. If each number is increased by 25, then the ratio becomes 44 : 29. The difference between the two numbers is:

- (a) 75 (b) 80
(c) 70 (d) 85

SSC MTS 18/10/2021 (Shift-I)

Ans. (a) : Let first number = $13x$

Second number = $8x$

According to the question,

$$\frac{13x + 25}{8x + 25} = \frac{44}{29}$$

$$377x + 725 = 352x + 1100$$

$$377x - 352x = 1100 - 725$$

$$25x = 375$$

$$x = 15$$

Now, difference of both numbers = $13x - 8x$

$$= 5x$$

$$= 5 \times 15$$

$$= 75$$

93. Two numbers are in the ratio 4:5. If 2 is subtracted from the first number and 2 is added to the second number, then their ratio becomes 2:3. The difference between the two numbers is:

- (a) 5 (b) 1
(c) 9 (d) 2

SSC MTS 20/10/2021 (Shift-I)

Ans. (a) : Ratio of numbers is 4 : 5

Let, the numbers are $4x$ and $5x$ respectively.

If first number is decreased by 2 and second number is increased by 2 then the new ratio = 2 : 3

As per question,

$$\frac{4x-2}{5x+2} = \frac{2}{3}$$

$$\Rightarrow 12x - 6 = 10x + 4$$

$$\Rightarrow 12x - 10x = 4 + 6$$

$$\Rightarrow 2x = 10$$

$$\Rightarrow x = 5$$

Difference between both numbers = $5x - 4x = x$

$$= 5$$

94. How much is subtracted from each terms of ratio 16 : 19, so that its ratio will be 7 : 6?

- (a) 36 (b) 37
(c) 35 (d) 34

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) : Let x be the number which is subtracted from 16 & 19
According to the question,
 $\frac{16-x}{19-x} = \frac{7}{6}$
 $\Rightarrow 96 - 6x = 133 - 7x$
 $\Rightarrow 7x - 6x = 133 - 96$
 $\Rightarrow x = 37$

95. If $a = 2b$, then the value of $\frac{a+b}{a-b}$ is :
(a) 6 (b) 5
(c) 4 (d) 3

SSC CHSL -19/03/2020 (Shift-I)

Ans. (d) : \because Given, $a = 2b$
 $\therefore \frac{a+b}{a-b} = \frac{2b+b}{2b-b}$ [$a = 2b$]
 $= \frac{3b}{b} \Rightarrow 3$

96. If $x : y = 3 : 2$ and $x + y = 90$, then the value $(x - y)$ is:
(a) 14 (b) 12
(c) 18 (d) 16

SSC CHSL -19/03/2020 (Shift-I)

Ans. (c) : $x = 90 \times \frac{3}{5}$
 $= 54$
 $y = 90 - 54 = 36$
 $\therefore x - y = 54 - 36 = 18$

97. If $x : y = 3 : 2$ and $x + y = 90$. Then the value $7(x - y) : (x + y)$ is:
(a) 7 : 5 (b) 7 : 9
(c) 2 : 3 (d) 7 : 6

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) : $\frac{x}{y} = \frac{3}{2}$
Hence, $\frac{7(x-y)}{x+y} = \frac{7(3-2)}{3+2} = \frac{7}{5}$

98. If $a : b = 3 : \sqrt{5}$, then the value of $(2a + b) : (3a - 2b)$ is:

- (a) $\frac{1}{61}(64 + 21\sqrt{5})$ (b) $\frac{1}{63}(64 + 21\sqrt{5})$
(c) $\frac{1}{64}(64 + 21\sqrt{5})$ (d) $\frac{1}{62}(64 + 21\sqrt{5})$

SSC CHSL -16/10/2020 (Shift-III)

Ans. (a)
 $\therefore (2a+b) : (3a-2b) = \frac{2a+b}{3a-2b}$
 $= \frac{6+\sqrt{5}}{9-2\sqrt{5}}$
 $= \frac{(6+\sqrt{5})(9+2\sqrt{5})}{(9-2\sqrt{5})(9+2\sqrt{5})}$
 $= \frac{54+12\sqrt{5}+9\sqrt{5}+10}{81-20}$

$$= \frac{64+21\sqrt{5}}{61}$$

$$= \frac{1}{61}(64+21\sqrt{5})$$

99. What number must be added to each of the numbers 8, 13, 26 and 40 so that the numbers obtained in this order are in proportion?

- (a) 2 (b) 1
(c) 4 (d) 3

SSC CHSL -16/10/2020 (Shift-II)

Ans. (a) : Let numbers obtained on adding x to each number are in proportion.
According to the question,

$$\frac{8+x}{13+x} = \frac{26+x}{40+x}$$

$$(8+x)(40+x) = (13+x)(26+x)$$

$$320 + 8x + 40x + x^2 = 338 + 13x + 26x + x^2$$

$$320 + 48x = 338 + 39x$$

$$48x - 39x = 338 - 320$$

$$9x = 18$$

$$x = 2$$

100. If x is subtracted from each of 52, 47, 20 and 19, the number so obtained in this order are in proportion. What is the mean proportional between $(x + 13)$ and $(x - 8)$?

- (a) 12 (b) 10
(c) 15 (d) 9

SSC MTS 13/10/2021 (Shift-I)

Ans. (b) : According to the question,

$$(52-x) : (47-x) :: (20-x) : (19-x)$$

$$\frac{52-x}{47-x} = \frac{20-x}{19-x}$$

$$988 - 19x - 52x + x^2 = 940 - 47x - 20x + x^2$$

$$-71x + 67x = 940 - 988$$

$$-4x = -48$$

$$x = 12$$

$$\therefore x + 13 \Rightarrow 12 + 13 = 25$$

$$x - 8 \Rightarrow 12 - 8 = 4$$

$$\text{Mean proportional} = \sqrt{25 \times 4}$$

$$= 10$$

101. The ratio of two numbers A and B is 5 : 8. If 5 is added to each of A and B, then the ratio of A and B becomes 2 : 3. The sum of A and B is :

- (a) 42 (b) 78
(c) 65 (d) 91

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (c) : Let the number A and B are $5x$ and $8x$ respectively.

According to the question,

$$\frac{5x+5}{8x+5} = \frac{2}{3}$$

$$15x + 15 = 16x + 10$$

$$x = 5$$

$$\text{The sum of A and B} = (5x + 8x)$$

$$= 5 \times 5 + 8 \times 5$$

$$= 25 + 40$$

$$= 65$$

102. Two numbers are in the ratio of 7:4. If each number is increased by 12, then the ratio becomes 3:2. The sum of the number is:

- (a) 60 (b) 66
(c) 68 (d) 56

SSC CHSL 11/08/2021 (Shift-I)

Ans. (b) : Let two numbers are $7x$ and $4x$ respectively. According to the question,

$$\frac{7x+12}{4x+12} = \frac{3}{2}$$

$$14x + 24 = 12x + 36$$

$$2x = 12$$

$$x = 6$$

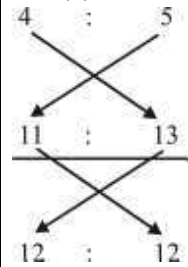
Then, sum of the numbers = $7x + 4x$
 $= 11x = 11 \times 6 = 66$

103. The ratio of the ages of A and B, four years ago was 4 : 5. Eight years hence, the ratio of the ages of A and B will be 11 : 13. What is the ratio of their present ages?

- (a) 11 : 9 (b) 9 : 11
(c) 7 : 8 (d) 8 : 7

SSC CHSL 16/04/2021 (Shift-III)

Ans.(b) :



$(55 - 52)$ units $\rightarrow 13 \times 12 - 11 \times 12$

3 units $\rightarrow 24$

1 unit $\rightarrow 8$

Present age of A = $4 \times 8 + 4 = 36$ years

Present age of B = $5 \times 8 + 4 = 44$ years

Required ratio = $36 : 44$
 $= 9 : 11$

104. If x is added to each of 12, 28, 21 and 45, the numbers so obtained, in this order, are in proportion. What is the mean proportional between $(x + 3)$ and $(4x + 1)$?

- (a) 15 (b) 18
(c) 12 (d) 10

SSC CGL (TIER-I)-2018 - 04.06.2019 (Shift-III)

Ans. (a) : $\frac{12+x}{28+x} = \frac{21+x}{45+x}$

$\Rightarrow 12 \times 45 + 12x + 45x + x^2 = 28 \times 21 + 28x + 21x + x^2$

$\Rightarrow 57x - 49x = 28 \times 21 - 12 \times 45$

$\Rightarrow 8x = 588 - 540$

$\Rightarrow x = \frac{48}{8}$

$x = 6$

\therefore Mean proportion = $\sqrt{(x+3) \times (4x+1)}$
 $= \sqrt{9 \times 25}$
 $= 15$

105. If x is subtracted from each of 23, 39 32 and 56, the number so obtained, in this order, are in proportion. What is the mean proportional between $(x + 4)$ and $(3x + 1)$?

- (a) 10 (b) 15
(c) 14 (d) 12

SSC CGL (TIER-I)-2018 - 04.06.2019 (Shift-II)

Ans. (d) : $\frac{23-x}{39-x} = \frac{32-x}{56-x}$
 $23 \times 56 - 23x - 56x + x^2 = 39 \times 32 - 32x - 39x + x^2$
 $1288 - 79x = 1248 - 71x$
 $8x = 40$
 $x = 5$

\therefore Mean proportion of $(x + 4)$ and $(3x + 1)$

$b = \sqrt{ac}$

$b = \sqrt{(x+4) \times (3x+1)}$

$b = \sqrt{9 \times 16}$

$b = 12$

106. When x is subtracted from each of 21, 22, 60 and 64, the numbers so obtained, in this order, are in proportion. What is the mean proportional between $(x + 1)$ and $(7x + 8)$?

- (a) 24 (b) 21
(c) 18 (d) 27

SSC CGL (TIER-I)-2018 - 06.06.2019 (Shift-I)

Ans. (a) : According to the question,

$\frac{21-x}{22-x} = \frac{60-x}{64-x}$

$1344 - 21x - 64x + x^2 = 1320 - 22x - 60x + x^2$

$1344 - 85x = 1320 - 82x$

$3x = 24$

$x = 8$

\therefore Mean proportion = $\sqrt{(x+1)(7x+8)}$

$= \sqrt{9 \times 64} = 3 \times 8 = 24$

107. The ratio of the number of boys to the number of girls in a school of 640 students, is 5: 3. If 30 more girls are admitted in the school, then how many more boys should be admitted so that the ratio of boys to that of the girls, becomes 14 : 9.

- (a) 25 (b) 15
(c) 20 (d) 30

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-I)

Ans. (c) : Initially, number of boys = $640 \times \frac{5}{8} = 400$

Number of girls = 240

Let, x be the number of new admitted boys

$\therefore \frac{400+x}{240+30} = \frac{14}{9}$

$400 + x = 420$

$x = 20$

108. Before a battle the ratio of captains to soldiers was 2 : 7. During the war 25 captains and 100 soldiers were martyred. The new ratio of captains here becomes 3 : 10. What is the number of soldiers after the war?
 (a) 250 (b) 200
 (c) 150 (d) 100

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Let the number of captains and soldiers before war are $2x$ and $7x$ respectively.
 According to the question,

$$\frac{2x - 25}{7x - 100} = \frac{3}{10}$$

$$20x - 250 = 21x - 300$$

$$x = 50$$

$$\text{Number of soldiers after war} = 7x - 100$$

$$= 7 \times 50 - 100$$

$$= 250$$

109. What is the number of candidates who had applied if the ratio of selected to unselected was 14 : 25. If 35 less had applied and 10 less selected, the ratio of selected to unselected would have been 3 : 5?
 (a) 195 (b) 205
 (c) 185 (d) 175

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Let selected and unselected candidates are $14x$ and $25x$ respectively.

$$\text{Total applicants} = 14x + 25x = 39x$$

According to the question,

$$\text{Total new applicants} = 39x - 35$$

$$\text{If 10 candidates less selected} = 14x - 10$$

$$\text{Now, } \frac{14x - 10}{39x - 35} = \frac{3}{8}$$

$$112x - 80 = 117x - 105$$

$$5x = 25$$

$$x = 5$$

$$\text{Hence, total applicants} = 39x$$

$$= 39 \times 5 = 195$$

110. The ratio of the bank balance of three brothers A, B and C is 10:12:5. B transfers Rs. 60,000 from his account to C's. The new ratio of the bank balances becomes 10:9:8. What is the bank balance of A (in Rs.) ?
 (a) 100000 (b) 200000
 (c) 300000 (d) 400000

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Ratio of bank balances of A, B and C = 10:12:5

B transfers Rs. 60,000 from his account to C's

Now, ratio of their bank balances = 10:9:8

∴ According to the question,

$$\frac{12x - 60000}{5x + 60000} = \frac{9}{8}$$

$$\frac{4x - 20000}{5x + 60000} = \frac{3}{8}$$

$$\frac{32x - 160000}{17x} = \frac{3}{8}$$

$$32x - 160000 = 15x + 180000$$

$$17x = 340000$$

$$x = 20000$$

$$\text{Bank balance of A} = 10 \times 20000 = \text{Rs. } 2,00,000$$

111. What number should be added to each of the number 103, 135, 110 and 144 so that the resulting numbers are in proportion ?
 (a) 12 (b) 15
 (c) 9 (d) 6

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let 'x' be the number to be added.

$$\frac{103 + x}{135 + x} = \frac{110 + x}{144 + x}$$

By hit & trail,

From option (c),

$$\frac{112}{144} = \frac{119}{153}$$

$$\frac{7}{9} = \frac{7}{9}$$

112. Before a battle the ratio of tanks to planes in an army was 5 : 3. During the war 1000 tanks were destroyed and 800 planes were destroyed. The ratio of tanks to planes became 2 : 1. What is the number of tanks after the war ?
 (a) 2000 (b) 1000
 (c) 3000 (d) 4000

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : Let initially number of tanks and planes are $5x$ and $3x$ respectively.

According to the question-

$$\frac{5x - 1000}{3x - 800} = \frac{2}{1}$$

$$5x - 1000 = 6x - 1600$$

$$x = 600$$

Hence, no. of tanks after war = $5x - 1000 = 2000$

113. Two numbers are in the ratio 3 : 5. If 13 is subtracted from each, the new numbers are in the ratio 10 : 21. If 15 is added to each of the original numbers, then the ratio becomes :
 (a) 24 : 35 (b) 23 : 33
 (c) 5 : 7 (d) 4 : 5

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : Let numbers are $3x$ and $5x$.

According to the question,

$$\frac{3x - 13}{5x - 13} = \frac{10}{21}$$

$$63x - 273 = 50x - 130$$

$$13x = 143$$

$$x = 11$$

$$\text{Ratio after adding 15} = \frac{3x + 15}{5x + 15} = \frac{33 + 15}{55 + 15}$$

$$= \frac{48}{70} = 24 : 35$$

114. The salaries of Raju and Peter are in the ratio 3:5. If the salary of each is increased by ₹2,500, then the new ratio will be 11:15. What is Peter's salary?
 (a) ₹ 5,000 (b) ₹ 2,500
 (c) ₹ 4,000 (d) ₹ 3,500

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (a) : Let salaries of Raju and Peter are $3x$ and $5x$ respectively.

According to the question,

$$\frac{3x + 2500}{5x + 2500} = \frac{11}{15}$$

$$45x + 37500 = 55x + 27500$$

$$10x = 10000$$

$$x = 1000$$

Hence, Peter's salary = $5x = 5 \times 1000 = ₹ 5,000$

115. The ratio of two numbers is 3:5. If eight is added to the first, and seven to the second, then the ratio becomes 2:3, What will be the ratio become if six is added to each?

(a) 7:9

(b) 5:9

(c) 5:7

(d) 9:14

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d) Let numbers are $3x$ and $5x$.

According to the question,

$$\frac{3x + 8}{5x + 7} = \frac{2}{3}$$

$$9x + 24 = 10x + 14$$

$$x = 10$$

$$\text{Required Ratio} = \frac{3x + 6}{5x + 6} = \frac{36}{56} = 9 : 14$$

116. If x is subtracted from each of the numbers 20, 37, 54 and 105, then the numbers so obtained in this order are in proportion. What is the mean proportional between $(7x-5)$ and $(x+1)$?

(a) 8

(b) 6

(c) 12

(d) 9

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (a) According to the question,

$$\frac{20 - x}{37 - x} = \frac{54 - x}{105 - x}$$

$$2100 - 20x - 105x + x^2 = 1998 - 54x - 37x + x^2$$

$$-125x + 91x = 1998 - 2100$$

$$-34x = -102$$

$$x = 3$$

Mean proportion of $(7x - 5)$ and $(x + 1)$

$$= \sqrt{(7x - 5)(x + 1)}$$

$$= \sqrt{16 \times 4} = 8$$

117. Find the number of students who took an exam if the ratio of those who passed to those who failed in the exam was 10:3. If 40 more students had taken the exam and 10 less had failed, then the ratio of those who passed to those who failed in the exam would have been 6 : 1.

(a) 200

(b) 250

(c) 300

(d) 260

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Let number of students who passed and those who failed in exam be $10x$ and $3x$ respectively.

Total students = $13x$

If 40 more students had taken the exam,

Then, total students = $13x + 40$

If 10 less students failed,

Failed students = $3x - 10$

$$\frac{13x + 40}{3x - 10} = \frac{6}{1}$$

$$13x + 40 = 18x - 60$$

$$5x = 100$$

$$x = 20$$

Hence, total number of students = 260

118. The ratio of the two numbers A and B is 5 : 2. If four is added to each number, the ratio becomes 9 : 4. If five is subtracted from each number, what will be the ratio of A and B ?

(a) 4 : 1

(b) 8 : 3

(c) 3 : 1

(d) 7 : 2

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c) : Let $A = 5x$, $B = 2x$

According to the question,

$$\frac{5x + 4}{2x + 4} = \frac{9}{4}$$

$$\Rightarrow 20x + 16 = 18x + 36$$

$$\Rightarrow 2x = 20$$

$$\Rightarrow x = 10$$

Hence $A = 50$ and $B = 20$

Ratio of A and B after subtracting 5 from original

$$\text{number} = \frac{45}{15} = 3 : 1$$

119. Two numbers are in the ratio of 3 : 4. By increasing 30 each, their ratio becomes 9 : 10. The sum of numbers is :

(a) 35

(b) 25

(c) 32

(d) 30

SSC CHSL 2018 08/07/2019 (Shift-I)

Ans. (a) : Let the numbers are $3x$ and $4x$.

According to the question,

$$\frac{3x + 30}{4x + 30} = \frac{9}{10}$$

$$\Rightarrow 30x + 300 = 36x + 270$$

$$\Rightarrow 6x = 30$$

$$\Rightarrow x = 5$$

Hence, sum of numbers = $3x + 4x = 7x = 7 \times 5 = 35$

120. The salaries of Vipin and Dinesh are in the ratio 5 : 8. If the salary of each is increased by ₹4800, then new ratio becomes 7 : 10. What is Vipin's salary?

(a) ₹12000

(b) ₹10000

(c) ₹13000

(d) ₹12500

SSC CHSL –20/10/2020 (Shift-I)

Ans : (a) Let, Vipin's salary = $5x$

and, Dinesh's salary = $8x$

$$\frac{5x + 4800}{8x + 4800} = \frac{7}{10}$$

$$50x + 48000 = 56x + 33600$$

$$6x = 14400$$

$$x = 2400$$

Hence, Vipin's salary = $5x$

$$= 5 \times 2400 = ₹12000$$

121. The ratio of the present ages of A and B is 1:3. After 10 years, the ratio of their ages will be 2:5. Find B's present age.
- (a) 90 years (b) 85 years
(c) 70 years (d) 80 years

SSC CHSL -21/10/2020 (Shift-I)

Ans. (a) Let the present age of A and B be x years and 3x years respectively.

∴ From question,

$$\frac{x+10}{3x+10} = \frac{2}{5}$$

$$5x+50 = 6x+20$$

$$x = 30$$

B's present age (3x) = 3 × 30 = 90 years

122. The monthly salaries of A and B are in the ratio 11 : 21. If both of them get a salary increment of Rs 4000 per month, the new ratio becomes 3 : 5. What is the new monthly salary of A ?

- (a) Rs. 11000 (b) Rs. 15000
(c) Rs. 25000 (d) Rs. 25000

SSC MTS 7-10-2017 (Shift-I)

Ans. (b) : Let salaries of A and B be 11x and 21x respectively

According to the question,

$$\frac{11x+4000}{21x+4000} = \frac{3}{5}$$

$$55x+20000 = 63x+12000$$

$$8x = 8000$$

$$x = 1000$$

New monthly salary of A = 11x + 4000 = Rs.15,000

123. If a : b : c = 1 : 3 : 5, then what is the value of

$$\frac{4a-b+2c}{3(a+b+c)} ?$$

- (a) $\frac{11}{27}$ (b) $\frac{10}{27}$
(c) $\frac{1}{3}$ (d) $\frac{8}{27}$

SSC CHSL 09/07/2019 (Shift-III)

Ans. (a) : Let a = k, b = 3k, c = 5k

$$\text{then, } \frac{4a-b+2c}{3(a+b+c)} = \frac{4 \times k - 3k + 2 \times 5k}{3(k+3k+5k)}$$

$$= \frac{k[4-3+10]}{k[3(1+3+5)]} = \frac{11}{27}$$

124. If $A = \frac{1+2x}{1-2x}$ and $B = \frac{1-2x}{1+2x}$, then the value of

$$\frac{A+B}{A-B} \text{ is:}$$

- (a) $x + \frac{1}{4x}$ (b) $x - \frac{1}{4x}$
(c) $\frac{1}{4x} - x$ (d) $x^2 + \frac{1}{4x^2}$

SSC CHSL -26/10/2020 (Shift-II)

Ans. (a) : Given:

$$A = \frac{1+2x}{1-2x} \quad B = \frac{1-2x}{1+2x}$$

$$\frac{A+B}{A-B} = \frac{\frac{1+2x}{1-2x} + \frac{1-2x}{1+2x}}{\frac{1+2x}{1-2x} - \frac{1-2x}{1+2x}}$$

$$= \frac{(1+2x)^2 + (1-2x)^2}{(1-2x)(1+2x)}$$

$$= \frac{(1+2x)^2 - (1-2x)^2}{(1-2x)(1+2x)}$$

$$= \frac{1+4x^2+4x+1+4x^2-4x}{1+4x^2+4x-1-4x^2+4x}$$

$$= \frac{2+8x^2}{8x}$$

$$= \frac{2}{8x} + \frac{8x^2}{8x}$$

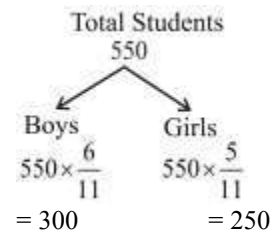
$$= \frac{1}{4x} + x = x + \frac{1}{4x}$$

125. In a school there are 550 students. The ratio of the boys to that of the girls is 6 : 5. How many more girls should join the school so that the ratio becomes 5 : 6?

- (a) 25 (b) 170
(c) 50 (d) 110

SSC MTS 14/08/2019 (Shift-III)

Ans. (d) :



Let x new girls join the class

$$\text{then, } \frac{300}{250+x} = \frac{5}{6}$$

$$1250 + 5x = 1800$$

$$5x = 550$$

$$x = 110$$

126. The ratio of two numbers is 2 : 1 . If each number is increased by 5, then the new ratio becomes 3 : 2. What is the sum of the numbers.

- (a) 15 (b) 45
(c) 30 (d) 20

SSC MTS 19/08/2019 (Shift-I)

Ans. (a): Let numbers are 2x and x.

According to the question,

$$\frac{2x+5}{x+5} = \frac{3}{2}$$

$$4x+10 = 3x+15$$

$$x = 5$$

∴ Sum of both numbers = 3x = 3 × 5 = 15

127. The ratio of boys and girls in a group is 7 : 6. If 4 more boys join the group and 3 girls leave the group, then the ratio of boys to girls becomes 4 : 3. What is the total number of boys and girls initially in the group?

- (a) 117 (b) 91
(c) 78 (d) 104

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) : Let number of boys and girls in groups be 7x and 6x.

According to the question-

$$\frac{7x+4}{6x-3} = \frac{4}{3}$$

$$21x + 12 = 24x - 12$$

$$3x = 24$$

$$x = 8$$

Initially, total numbers of boys and girls = 13x = 104

128. How many job applicants had applied if the ratio of selected to unselected was 19:17. If 1,200 less had applied and 800 less had selected, then the ratio of selected to unselected would have been 1 : 1.

- (a) 6000 (b) 7200
(c) 8400 (d) 4800

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Let, initially number of selected applicants = 19x

And, unselected applicants = 17x

If 1,200 less applied and 800 less selected = (36x-1200) : (19x-800)

$$\frac{36x-1200}{19x-800} = \frac{2}{1}$$

$$18x-600 = 19x-800$$

$$x = 200$$

Hence, Number of total applicants
= 36x
= 36 × 200
= 7200

(III) Problems based on Income and Expenditures

129. The ratio of the monthly incomes of A and B is 11 : 13 and the ratio of their expenditures is 9 : 11. If both of them manage to save ₹4,000 per month, then the difference in their incomes (in ₹).

- (a) 2,500 (b) 3,200
(c) 4,000 (d) 3,000

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

Ans. (c) Income → 11 : 13

Expenditure → $\frac{9}{11}$
Savings → 4000 4000

121 ~ 117 units = 44000 ~ 36000

4 units = 8000

1 unit = 2000

Difference in their incomes = 2 × 2000 = ₹4,000

130. Between two consecutive years, my income is in the ratio 2:5 and expenses are in the ratio 4:7. If my income in the second year is ₹75,000 and my expenses in the first year are ₹20,000, then my total savings in the two years together are:

- (a) ₹55,000 (b) ₹60,000
(c) ₹50,000 (d) ₹40,000

SSC MTS 06/10/2021 (Shift-I)

Ans. (c) : Given,

Ratio of income = 2:5

Ratio of expenditure = 4:7

Expenditure in first year = 20,000

Income in second year = 75,000

Let the income and expenditure in first and second year be x and y rupees respectively.

According to the question,

$$\frac{x}{75000} = \frac{2}{5}$$

$$5x = 150000$$

$$x = 30000$$

And, $\frac{20000}{y} = \frac{4}{7}$

$$4y = 140000$$

$$y = 35000$$

Now, total saving in two years,
= (30000-20000)+(75000-35000)
= 10000+40000
= ₹50,000

131. The incomes of A and B are in the ratio 3 : 4, and their expenditures are in the ratio 9 : 5. If the income of A is equal to three times the expenditure of B, then what is the ratio of the savings of A and B?

- (a) 5 : 2 (b) 3 : 5
(c) 5 : 3 (d) 2 : 5

SSC MTS 12/10/2021 (Shift-I)

Ans. (d) : A : B

Income → 3 : 4

Expenditure → 9 : 5

Income of A = 3x

Income of B = 4x

Expenditure of A = 9k

Expenditure of B = 5k

According to the question,

$$3x = 3 \times 5k$$

$$x = 5k$$

$$\frac{\text{Saving of A}}{\text{Saving of B}} = \frac{3x-9k}{4x-5k} = \frac{15k-9k}{20k-5k} = \frac{6}{15} = \frac{2}{5}$$

$$\frac{6}{15} = \frac{2}{5}$$

Required ratio = 2 : 5

132. The ratio of the incomes of A and B is 7:5. A and B save ₹4,000 and ₹3,500 respectively. If the expenditure of B is half the expenditure of A, then the total income of A and B (in ₹) will be:

- (a) 13,500 (b) 15,000
(c) 10,000 (d) 12,000

SSC CHSL 05/08/2021 (Shift-II)

Ans. (d) : Let the income of A and B be $7x$ and $5x$ respectively.

Expenditure of A = $2y$ (say)

\therefore Expenditure of B = y

Now, $7x - 2y = 4000$ -----(i)

$5x - y = 3500$ -----(ii)

On solving equation (i) and (ii) we get,

$x = 1000$

Total income of A and B = $7x + 5x$

= $12x$

= 12×1000

= ₹12,000

- 133. The ratio of the incomes of A and B is 3:5, whereas the ratio of their expenditures is 4:7 respectively. If A and B save ₹16,000 and ₹26,000, respectively, then what is the difference (in ₹) between their expenditures?**

- (a) 6000 (b) 6800
(c) 5400 (d) 5000

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a) Let ratio of income of A and B is $3a$ and $5a$ and ratio of their expenditures are $4b$ and $7b$ respectively.

According to the question,

$$3a - 4b = 16000 \quad \dots(i)$$

$$5a - 7b = 26000 \quad \dots(ii)$$

On solving equation (i) and (ii) we get,

$$a = 8000$$

$$b = 2000$$

\therefore Difference between their expenditure

$$= 7b - 4b$$

$$= 3b$$

$$= ₹6,000$$

- 134. ₹ 63,800 is to be divided between A and B in the ratio 4 : 7. The difference between their shares (in ₹) is :**

- (a) 23,200 (b) 40,600
(c) 25,000 (d) 17,400

SSC MTS 13/10/2021 (Shift-I)

Ans. (d) : Amount received by A = $4x$

Amount received by B = $7x$

Difference = $7x - 4x$

$$= 3x$$

$$11x = 63,800$$

$$x = 5,800$$

Required difference = $5,800 \times 3$

$$= 17,400$$

- 135. The ratio of incomes of A and B is 5 : 3 and the ratio of their expenditures is 9 : 5. If A's income is twice of B's expenditure, find the ratio of savings of A and B.**

- (a) 2 : 3 (b) 3 : 4
(c) 3 : 2 (d) 1 : 1

SSC CHSL 04/07/2019 (Shift-I)

Ans. (d) : Let Income of A = $5x$
Income of B = $3x$
And, Expenditure of A = $9y$
Expenditure of B = $5y$

According to the question,

$$5x = 2 \times 5y$$

$$x = 2y$$

$$\text{Income of A} = 5 \times 2y = 10y$$

$$\text{Income of B} = 3 \times 2y = 6y$$

\therefore Savings = Income – Expenditure

Ratio of savings of A and B = $(10y - 9y) : (6y - 5y)$

$$= y : y$$

$$A : B = 1 : 1$$

- 136. A sum of ₹11236 is divided among A, B and C such that the ratio of the shares of A and B is 3 : 5 and the ratio of the shares of A and C is 4 : 7. The share of B is:**

- (a) ₹3392 (b) ₹2544
(c) ₹4452 (d) ₹4240

SSC CHSL 19/04/2021 (Shift-I)

Ans. (d) : Given,

$$A : B = (3 : 5) \times 4$$

$$A : C = (4 : 7) \times 3$$

$$\Rightarrow A : B : C = 12 : 20 : 21$$

According to the question,

$$B's \text{ share} = \frac{20}{(12 + 20 + 21)} \times 11236$$

$$= \frac{20}{53} \times 11236$$

$$= ₹4240$$

- 137. The income of two persons P and Q are in the ratio 5 : 6. If each of them saves ₹200 per month, the ratio of their expenditures is 3 : 4. Find the income of Q.**

- (a) ₹740 (b) ₹800
(c) ₹600 (d) ₹750

SSC CHSL –18/03/2020 (Shift-II)

Ans. (c) : Let income of P and Q is $5x$ and $6x$ respectively.

According to the question,

$$\frac{5x - 200}{6x - 200} = \frac{3}{4}$$

$$20x - 800 = 18x - 600$$

$$2x = 200 \Rightarrow x = 100$$

Hence income of Q = $6x = 6 \times 100 = ₹600$

- 138. The ratio of monthly incomes of Pawan and Sunil is 4 : 3 and the ratio of their monthly expenditures is 3 : 2. If Pawan and Sunil save ₹4000 and ₹6000 respectively per month, then what is the sum of their monthly incomes?**

- (a) ₹60000 (b) ₹70000
(c) ₹50000 (d) ₹36000

SSC MTS 02/08/2019 (Shift-I)

Ans. (b) : Let, income of Pawan = $4x$

And, income of Sunil = $3x$

\therefore Income – Saving = Expenditure

Then, $\frac{4x - 4000}{3x - 6000} = \frac{3}{2}$
 $8x - 8000 = 9x - 18000$
 $9x - 8x = 18000 - 8000$
 $x = 10,000$
 Total income of both Pawan and Sunil
 $= 4x + 3x$
 $= 7x$
 $= ₹70,000$

139. A sum of ₹12,992 divided among A, B and C such that the ratio of the shares of A and C is 4 : 15 and that of the shares of A and B is 2 : 5. The difference (in ₹) between the shares of B and C is:
 (a) 1,792 (b) 3,136
 (c) 2,240 (d) 2,688
 SSC CHSL 19/08/2021 (Shift-II)

Ans. (c) : According to the question,
 $A : C = 4 : 15$
 $A : B = (2 : 5) \times 2$
 $\Rightarrow A : B : C = 4 : 10 : 15$
 29 units \rightarrow 12992
 1 unit \rightarrow $\frac{12992}{29}$
 $= 448$
 Required difference = 15 units - 10 units \Rightarrow 5 units
 \therefore 5 units $\rightarrow 448 \times 5$
 $= ₹2240$

140. Rs. 21,000 is divided among A, B and C in such a way that the shares of A and B are in the ratio 2:3, and those of B and C are in the ratio 4:5. The share of B is:
 (a) ₹12,000 (b) ₹10,500
 (c) ₹7,200 (d) ₹7,000
 SSC MTS 20/10/2021 (Shift-I)

Ans. (c) : Given,
 $\frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{4}{5}$
 $\Rightarrow \frac{A}{B} = \frac{2}{3} \times \frac{4}{4}, \frac{B}{C} = \frac{4}{5} \times \frac{3}{3}$
 $\Rightarrow \frac{A}{B} = \frac{8}{12}, \frac{B}{C} = \frac{12}{15}$
 $A : B : C = 8 : 12 : 15$
 Hence,
 $\Rightarrow 8x + 12x + 15x = 21000$
 $\Rightarrow 35x = 21000$
 $x = 600$
 $B = 12x = 12 \times 600 = 7200$
 Hence the share of B is ₹7200.

141. According to the wealth of Rs. 21,25,000 was to be divided between the son and the daughter in the ratio 7/6 : 5/3. How much did the son get (in Rs.) ?

- (a) 875000 (b) 12,5,000
 (c) 10,00,000 (d) 11,25,000

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Ratio of wealth of son and daughter
 $= \frac{7}{6} : \frac{5}{3}$
 $= 7 : 10$
 Share of Son = $2125000 \times \left(\frac{7}{10+7} \right)$
 $= 125000 \times 7$
 $= ₹875000$

142. If Rs. 25,000 is to be divided among A, B and C in the ratio of 1/10 : 1/6 : 1/15, then how much will C get (in Rs.) ?
 (a) 5000 (b) 7500
 (c) 10000 (d) 12500
 SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Given that,
 $A : B : C = \frac{1}{10} : \frac{1}{6} : \frac{1}{15}$
 $\Rightarrow A : B : C = 3 : 5 : 2$
 \therefore Share of C = $25000 \times \left(\frac{2}{3+5+2} \right)$
 $= ₹5000$

143. The ratio of the sum of the salaries of A and B to the difference of their salaries is 11:1 and the ratio of the sum of the salaries of B and C to the difference of their salaries is also 11:1. If A's salary is the highest and C's is the lowest then what is B's salary (in Rs.) given the total of all their salaries is Rs. 1,82,000 ?
 (a) 72000 (b) 60000
 (c) 50000 (d) 86400
 SSC CGL (Tier-II) 20-02-2018

Ans. (b) :
 $\frac{\text{Sum of salary of A and B (A+B)}}{\text{Difference of salaries of A and B (A-B)}} = \frac{11}{1}$
 $A + B + A - B = 2A = 12$
 $A = 6$
 $B = 5$
 $\frac{\text{Sum of salary of B and C (B+C)}}{\text{Difference of salary of B and C (B-C)}} = \frac{11}{1}$
 $B + C + B - C = 2B = 12$
 $B = 6, C = 5$
 According to the question,
 Ratio between A, B and C
 $A : B : C$
 $6 : 5$
 $\frac{6}{36} : \frac{5}{30} : \frac{5}{25}$
 $36 : 30 : 25$
 Salary of B $\Rightarrow \frac{30}{91} \times 182000$
 $\Rightarrow 60000$ Rs.

144. If a sum of ₹1,180 is to be divided among A, B and C, such that 2 times A's share, 5 times B's share and 7 times C's share, are equal, then A's share is:

- (a) ₹750 (b) ₹500
(c) ₹650 (d) ₹700

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (d): According to the question,

$$2A = 5B = 7C$$

$$\therefore A : B : C = \frac{1}{2} : \frac{1}{5} : \frac{1}{7} = 35 : 14 : 10$$

$$\therefore \text{Sum of ratio} = (35 + 14 + 10)$$

$$59 \rightarrow 1180 \text{ Rs.}$$

$$1 \rightarrow 20$$

$$35 \rightarrow 700 \text{ Rs.}$$

$$\therefore \text{A's share} = 700 \text{ Rs.}$$

145. Rs. 63,800 is to be divided between A and B in the ratio 4 : 7. The share (in Rs.) received by B is:

- (a) 40,600 (b) 17,400
(c) 23,200 (d) 25,000

SSC MTS 14/10/2021 (Shift-I)

Ans. (a) : A : B = 4 : 7

$$\text{B's share} = 63800 \times \frac{7}{11}$$

$$= 40,600$$

$$= ₹40,600$$

146. A sum of ₹12,000 is divided among A, B, C and D such that the ratio of shares of A and B is 8:9, that of B and C is 2:3 and that of C and D is 9:13. What is the difference between the shares of B and D?

- (a) ₹2,760 (b) ₹2,400
(c) ₹1,320 (d) ₹2,520

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) A : B = (8 : 9) × 2

$$B : C = (2 : 3) \times 9$$

$$A : B : C = 16 : 18 : 27$$

$$C : D = (9 : 13) \times 3$$

$$A : B : C : D = 16 : 18 : 27 : 39$$

$$\text{Required difference} = \left(\frac{39-18}{100} \right) \times 12000 = ₹2520$$

147. A's salary increases in the ratio 8 : 11. If his new salary is ₹33000, then what was his original salary (in Rs.)?

- (a) 20000 (b) 24000
(c) 22000 (d) 18000

SSC CHSL 12/04/2021 (Shift-II)

Ans : (b) According to the question,
Ratio between original and new salary,

$$\times 3000 \left(\begin{array}{c} 8 \\ \vdots \\ 11 \end{array} \right) \times 3000$$

24,000 33000

148. When the ticket prices of a water park are increased in the ratio 11:12 then the number of daily visitors to the park fall in the ratio 8:7. If the daily revenues before the increase in ticket price was Rs. 176,000, then find the daily revenues after the increase in ticket price.

- (a) ₹264000 (b) ₹112000
(c) ₹192000 (d) ₹168000

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Revenue = Number of tickets × Number of visitors

$$\text{Price of ticket} \rightarrow 11 : 12$$

$$\text{No. of daily visitors} \rightarrow 8 : 7$$

$$\text{Daily revenue} \rightarrow 88 : 84$$

$$88 \rightarrow 176000$$

$$1 \rightarrow 2000$$

$$84 \rightarrow 168000$$

$$\text{Revenue after increment in price of ticket} = \text{Rs. } 168000$$

149. The entry ticket at a fun park was increased in the ratio 7 : 9, due to which customers fell in the ratio 13 : 11. What is the new daily collection (in Rs.), if the daily collection before the price hike was Rs. 2,27,500?

- (a) 237500 (b) 247500
(c) 232500 (d) 242500

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : Ratio of price of ticket = 7 : 9

$$\text{Ratio of no. of visitors} = 13 : 11$$

$$\text{Daily collection} \rightarrow 91 : 99$$

$$91 \rightarrow 227500$$

$$1 \rightarrow 2500$$

$$99 \rightarrow 247500$$

150. If an amount of ₹990 is divided among A, B and C in the ratio of 3 : 4 : 2, then B will get:

- (a) ₹247.5 (b) ₹350
(c) ₹440 (d) ₹110

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

$$\text{Ans. (c) : B will get} = 990 \times \frac{4}{(3+4+2)} = 440$$

151. A sum is divided among A, B, C and D such that the ratio of the shares of A and B is 2 : 3, that of B and C is 1 : 2 and that of C and D is 3 : 4. If the difference between the shares of A and D is ₹648, then the sum of their shares is :

- (a) ₹2,484 (b) ₹2,160
(c) ₹ 1,944 (d) ₹ 2,052

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : A : B = (2:3) × 1

$$B : C = (1:2) \times 3$$

$$C : D = 3 : 4$$

$$A : B : C = 2 : 3 : 6$$

$$C : D = (3:4) \times 2$$

$$A : B : C : D = 2 : 3 : 6 : 8$$

$$(8-2) \text{ units} = 648 \text{ Rs.}$$

$$1 \text{ unit} = 108$$

$$19 \text{ units} = 2052 \text{ Rs.}$$

$$\text{Sum of their shares} = 2052 \text{ Rs.}$$

152. On dividing the amount of ₹18,144 among three people A, B, C in the ratio of 3 : 5 : 8, the amount B gets more than A:

- (a) ₹2,268 (b) ₹2,178
(c) ₹2,464 (d) ₹2,386

SSC CHSL -14/10/2020 (Shift-II)

$$\text{Ans. (a): Amount} = \frac{(5-3)}{16} \times 18144$$

$$= 2 \times 1134 = ₹2268$$

153. A sum of ₹x is divided among A, B and C such that the ratio of shares of A and B is 7 : 12 and that of B and C is 8 : 5. If the difference in the shares of A and C is ₹214, then the value of x is:

- (a) 11,556
(b) 11,342
(c) 11,770
(d) 11,128

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-III)

$$\text{Ans. (b) : } A : B = (7 : 12) \times 2$$

$$B : C = (8 : 5) \times 3$$

$$A : B : C = 14 : 24 : 15$$

According to the question-

$$(15-14) \text{ unit} = 214\text{Rs.}$$

$$1 \text{ unit} = 214\text{Rs.}$$

$$53 \text{ units} = 214 \times 53 = 11342$$

$$\therefore x = 11342\text{Rs.}$$

154. ₹3,600 is divided among Seema, Komal and Rita, such that the ratio of the shares of Seema : Komal = 1.5 : 2 and Komal : Rita = 2 : 2.5. Find Rita's Share.

- (a) ₹1,500 (b) ₹1,400
(c) ₹1,300 (d) ₹1,200

SSC CHSL -12/10/2020 (Shift-II)

$$\text{Ans. (a) : } \frac{\text{Seema}}{\text{Komal}} = \frac{1.5}{2}, \quad \frac{\text{Komal}}{\text{Rita}} = \frac{2}{2.5}$$

$$\text{Seema : Komal : Rita} = 3 : 4 : 5$$

$$\text{Total amount} = ₹3600$$

$$\text{Rita's share} = 3600 \times \frac{5}{12}$$

$$= ₹1500$$

155. The price of a movies ticket was increased in the ratio 9 : 10. What is the increase in the revenue (in Rs.) of the cinema hall, if the original fare was Rs 180 and 2200 tickets were sold.

- (a) 44000 (b) 44000
(c) 39600 (d) 39600

SSC CGL (Tier-II) 19-02-2018

$$\text{Ans. (a) :}$$

$$\text{Initial revenue of cinema hall} = 180 \times 2200 = ₹396000$$

$$\text{Increase in revenue of cinema hall}$$

$$= 396000 \times \left(\frac{10-9}{9} \right) = ₹ 44000$$

156. If by increasing the price of a ticket in the ratio 8:11, the number of tickets sold fall in the ratio 23:21 then what is the increase (in Rs.) in revenue if revenue before increase in price of ticket was Rs. 36,800 ?

- (a) 21250 (b) 9400
(c) 7850 (d) 12850

SSC CGL (Tier-II) 20-02-2018

$$\text{Ans. (b) : Revenue} = \text{Price} \times \text{No. of tickets}$$

Old price	:	New price
Price → 8	:	11
Ticket → 23	:	21
184	:	231

$$\therefore \text{Total number of old tickets } 184 = 36800$$

$$\text{Increase in revenue} = (231-184) = 47 \Rightarrow$$

$$\frac{36800}{184} \times 47 = \text{Rs.} 9400$$

157. A sum of ₹ x is divided among A, B and C such that the ratio of the shares of A and B is 6 : 7 and that of B and C is 3 : 2. If the difference between the shares of A and C is ₹540, then the value of x is :

- (a) 7020 (b) 7155
(c) 7425 (d) 7290

SSC CGL (Tier-II) 12-09-2019

$$\text{Ans. (b) : } A : B = (6 : 7) \times 3$$

$$B : C = (3 : 2) \times 7$$

$$\therefore A : B : C = 18 : 21 : 14$$

According to the question,

$$4 \text{ units} \Rightarrow 540$$

$$1 \text{ unit} \Rightarrow 135$$

$$53 \text{ units} \Rightarrow 135 \times 53$$

$$= 7155 \text{ Rs.}$$

$$\therefore x = 7155 \text{ Rs.}$$

158. A sum of ₹8,200 was divided among A, B and C in such a way that A had ₹500 more than B and C had ₹300 more than A. How much was C's share (in ₹)?

- (a) 2,300 (b) 2,800
(c) 3,100 (d) 2,000

SSC CPO-SI 24/11/2020 (Shift-I)

$$\text{Ans. (c) : Let B has ₹ } x,$$

$$A = x + 500 \text{ and } C = (x+500)+300$$

According to the question,

$$x + 500 + x + (x + 500) + 300 = 8,200$$

$$3x + 1300 = 8200$$

$$3x = 6900$$

$$x = 2300$$

$$\text{Hence, share of C} = 2300 + 800 = ₹3100$$

159. ₹10, 000 is to be distributed among 3 artisans, 5 assistants and 6 labourers in such a way that each assistant receives double the amount of money received by 1 labourer and each artisan receives thrice the amount of money received by 1 labourer. What is the amount of money received by the 3 artisans ?

- (a) ₹2,700 (b) ₹3,600
(c) ₹4,000 (d) ₹2,400

SSC CHSL 10/07/2019 (Shift-II)

Ans. (b) : Total Prices = ₹10000
 Artisan : Assistant : Labourer = 3 : 2 : 1 = 3x : 2x : x
 3 Artisan : 5 Assistant : 6 Labourer = 9x : 10x : 6x
 $\therefore 9x + 10x + 6x = 10000$
 $25x = 10000$
 $x = ₹400$
 \therefore All three labourers earns money = $9x = 9 \times 400 = ₹3600$

160. A number is divided into three parts such that thrice of first part, six times of second part and 8 times of third part are equal. If the first part is ₹16000 then the third part is?

- (a) ₹450 (b) ₹900
(c) ₹600 (d) ₹750

SSC MTS 16/08/2019 (Shift-III)

Ans. (c) : Let numbers are x, y and z respectively
 According to the question,
 $3x = 6y = 8z$
 $\Rightarrow x : y : z = \frac{1}{3} : \frac{1}{6} : \frac{1}{8} = 8 : 4 : 3$
 $\therefore 8 \rightarrow 1600$
 $\therefore 1 \rightarrow 200$
 Then, third part = $3 \rightarrow ₹600$

161. The ratio of the income of A to that of B is 5 : 7. A and B save ₹ 4,000 and ₹ 5,000 respectively.

If the expenditure of A is equal to $66\frac{2}{3}\%$ of the expenditure of B, then the total income of A and B is :

- (a) ₹ 26,400 (b) ₹ 28,800
(c) ₹ 24,000 (d) ₹ 25,200

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : Let income of A = 5x
 Income of B = 7x
 According to the question,
 Expenditure of A = Expenditure of B $\times 66\frac{2}{3}\%$
 $5x - 4000 = (7x - 5000) \times \frac{2}{3}$
 $15x - 12000 = 14x - 10000$
 $x = 2000$
 Total income of A and B = $5x + 7x = 12x = ₹24,000$

162. The ratio of the sum of the salaries of A and B to the difference of their salaries is 11:1. The ratio of the sum of the salaries of B and C to the difference of their salaries is also 11:1. If A's salary is the highest and C's is the lowest then what is B's salary (in Rs.), given that the total of their salaries is Rs. 18,200?

- (a) 8500 (b) 5500
(c) 6000 (d) 7200

SSC MTS 09/08/2019 (Shift-I)

Ans. (c) : $\therefore A + B + C = 18200$
 $\therefore \frac{A+B}{A-B} = \frac{11}{1}$

By componendo and dividendo,

$$\frac{A+B}{A-B} = \frac{11}{1} \text{ and } \frac{B+C}{B-C} = \frac{11}{1}$$

$$\frac{A}{B} = \frac{12}{10} \quad \frac{B}{C} = \frac{12}{10}$$

$$\frac{A}{B} = \frac{6}{5} \quad \frac{B}{C} = \frac{6}{5}$$

$$\Rightarrow A:B = 6:5 \quad B:C = 6:5$$

$$A : B : C = 36 : 30 : 25$$

$$\text{Income of B} = \frac{30}{91} \times 18200 = \text{Rs.}6000$$

163. The ratio of monthly income of A and B is 3 : 4 and ratio of monthly expenses is 2 : 3. If each saves ₹ 4000 per month then what is the income of B?

- (a) ₹ 20000 (b) ₹ 14000
(c) ₹ 16000 (d) ₹ 12000

SSC MTS 05/08/2019 (Shift-III)

Ans. (c) : Let income of A and B is 3x and 4x respectively.

According to the question,

$$\frac{3x - 4000}{4x - 4000} = \frac{2}{3}$$

$$9x - 12000 = 8x - 8000$$

$$x = 4000$$

$$\text{Income of B} = 4x = 4 \times 4000 = ₹16000$$

(IV) Problems based on Ratio of Coins and Rupees

164. A bag contains coins of denomination ₹1, ₹2 and ₹5 in the ratio of 4:5:8. If the total value of these coins is ₹432, then what is the number of ₹2 coins?

- (a) 40 (b) 30
(c) 50 (d) 60

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Let the number of coins of ₹1, ₹2 and ₹5 are 4x, 5x and 8x respectively.

According to the question,

$$4x \times 1 + 5x \times 2 + 8x \times 5 = 432$$

$$\Rightarrow 54x = 432$$

$$\therefore x = 8$$

$$\therefore \text{Number of ₹2 coins} = 5x = 5 \times 8 = 40$$

165. Atul purchased bread costing ₹20 and gave a 100 rupee note to the shopkeeper. The shopkeeper gave the balance money in coins of denomination ₹2, ₹5 and ₹10. If these coins are in the ratio 5 : 4 : 1, then how many ₹5 coins did the shopkeeper give ?

- (a) 6 (b) 5
(c) 4 (d) 8

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (d) : Given that-

Cost of bread = ₹20

Rest money left with Atul = $100 - 20 = ₹80$
 Ratio of the coins of denominations of ₹2, ₹5 and ₹10 = $5 : 4 : 1$
 According to the question,
 Ratio of amount = $5 \times ₹2 : 4 \times ₹5 : 1 \times ₹10$
 $\Rightarrow ₹80 = 10 : 20 : 10$
 $\Rightarrow ₹80 = 1 : 2 : 1$
 $\therefore 4 = ₹80$
 $\therefore 2 = \frac{80 \times 2}{4}$
 $= ₹40$
 \therefore No. of ₹5 coins = $\frac{40}{5}$
 $= 8$
 So, option (d) is correct.

166. Hridaya opened her piggy bank and found coins of denomination ₹1, ₹2, ₹5 and ₹10 in the ratio $10 : 5 : 2 : 1$. If there are 72 coins in all, then how much money (in ₹) was there in the piggy bank in the form of coins ?
 (a) 100 (b) 72
 (c) 160 (d) 90

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (c) : According to the question,
 $10x + 5x + 2x + x = 72$
 $\Rightarrow 18x = 72$
 $\therefore x = 4$
 \therefore Number of coins of ₹1, ₹2, ₹5 and ₹10 is 40, 20, 8 and 4 respectively.
 So, total amount in piggy bank = $40 \times 1 + 20 \times 2 + 8 \times 5 + 4 \times 10$
 $= 40 + 40 + 40 + 40$
 $= ₹160$
 Hence, option (c) is correct answer.

167. In a wallet, there are notes of the denomination ₹10 and ₹50. The total number of notes is 12. The number of ₹10 and ₹50 notes are in the ratio of $1 : 2$. Total money in the wallet is:
 (a) ₹280 (b) ₹110
 (c) ₹360 (d) ₹440

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (d) : Total money = $12 \times \frac{1}{3} \times 10 + 12 \times \frac{2}{3} \times 50$
 $= 40 + 400 = ₹440$

168. A purse has Rs. 34.5 in the form of 1-rupee, 50-paise and 10-paise coins in the ratio of $6:9:10$. Find the number of 10-paise coins.
 (a) 10 (b) 30
 (c) 20 (d) 40

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let number of coins of Rs. 1, 50 paise and 10 paise are $6x, 9x$ and $10x$ respectively
 $\therefore 6x \times 1 + 9x \times 0.5 + 10x \times 0.1 = 34.5$

$\Rightarrow 6x + 4.5x + x = 34.5$
 $\Rightarrow 11.5x = 34.5$
 $\therefore x = 3$
 Number of coins of 10 paise = 30

169. ₹8000 is distributed among A, B and C in such a way that they receive the notes of denominations of ₹500, ₹200 and ₹100. The amount received by them is in the ratio of $15 : 2 : 3$. What is the ratio of the number of notes of ₹500, ₹200 and ₹100 ?
 (a) $3 : 1 : 3$ (b) $4 : 1 : 2$
 (c) $3 : 3 : 1$ (d) $3 : 2 : 2$

SSC CHSL 10/07/2019 (Shift-I)

Ans. (a) : Total amount = ₹ 8000
 \therefore A, B and C receive notes of ₹ 500, ₹ 200 and ₹ 100
 Ratio of values = $15 : 2 : 3$
 \therefore Ratio of numbers = $\frac{15}{500} : \frac{2}{200} : \frac{3}{100}$
 $= 3 : 1 : 3$

170. A bag contains one rupee, 50 paise and 25 paise coins in the proportion $5 : 7 : 9$. If the total amount in the bag is ₹ 430. then how many 25 paise coins are there ?
 (a) 400 (b) 360
 (c) 380 (d) 340

SSC MTS 08/08/2019 (Shift-II)

Ans. (b) Let number of coins of Rs.1, 50 paise and 25 paise are $5x, 7x$ and $9x$ respectively
 $5x + \frac{7x}{2} + \frac{9x}{4} = 430$
 $\frac{20x + 14x + 9x}{4} = 430$
 $\frac{43x}{4} = 430$
 $x = 40$
 \therefore No. of coins of 25 paise = $9x$
 $= 9 \times 40$
 $= 360$

171. A bag contains 1R, 50P and 25 P coins in the ratio of $1 : 2 : 4$. If the total amount in bag is ₹ 225 then how much is the number of 50P coins in the bag?
 (a) 150 (b) 125
 (c) 175 (d) 200

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) :
 Let number of coins be $x, 2x$ and $4x$.

Then, $x + \frac{2x}{2} + \frac{4x}{4} = 225$
 $x + x + x = 225$
 $3x = 225$
 $x = \frac{225}{3}$
 $x = 75$

Hence, number of coins of 50 paise = $75 \times 2 = 150$

172. A bag contains ten rupee, five rupee and two rupee note in the ratio 10:5:2. The total value of five rupee notes in the bag is Rs. 84 more than that of two rupee notes. The total value of ten rupee notes in the bag (in Rs.) is:
- (a) 350 (b) 450
(c) 300 (d) 400

SSC MTS 13/08/2019 (Shift-II)

Ans. (d) : Let number of notes of Rs. 10, Rs. 5 and Rs. 2 are $10x$, $5x$ and $2x$ respectively.

From question,

$$25x = 84 + 4x$$

$$21x = 84$$

$$x = 4$$

$$\begin{aligned} \text{Total number of notes of Rs 10} &= 10 \times 10x = 100x \\ &= 100 \times 4 = 400 \end{aligned}$$

173. A bag has ₹ 840 in the denomination of ₹ 1, ₹ 2 and ₹ 5 coins. ₹ 1, ₹ 2 and ₹ 5 coins are in the ratio of 8 : 1 : 5. How many coins of ₹ 5 are in the bag?
- (a) 60 (b) 24
(c) 600 (d) 120

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Given-

Total values of ₹ 1, ₹ 2 and ₹ 5 = ₹ 840

⇒ No. of coins of ₹ 1 = $8x$

⇒ No. of coins of ₹ 2 = $1x$

No. of coins of ₹ 5 = $5x$

According to the question,

$$(8x \times 1) + (x \times 2) + (5 \times 5x) = 840$$

$$\Rightarrow 35x = 840$$

$$x = 24$$

Hence, no. of coins of Rs. 5 = $5x = 5 \times 24 = 120$

(V)

Miscellaneous

174. What is the mean proportional between 64 and 4096?
- (a) 512 (b) 192
(c) 128 (d) 8

SSC CHSL 10/06/2022 (Shift- II)

Ans. (a) : Let, the mean proportional be x .
Therefore, 64, x and 4096 are in proportion.

$$\therefore x = \sqrt{64 \times 4096}$$

$$= \sqrt{64 \times 64 \times 64}$$

$$= 8 \times 64 = 512$$

Hence, option (a) is correct.

175. If $1.5x = 0.04y$, then what will be the value of

$$\frac{y-x}{y+x} ?$$

(a) $\frac{77}{73}$

(b) $\frac{77}{72}$

(c) $\frac{72}{77}$

(d) $\frac{73}{77}$

SSC CHSL 02/06/2022 (Shift- I)

Ans. (d) : $1.5x = 0.04y$

$$\frac{x}{y} = \frac{0.04}{1.5}$$

$$\frac{x}{y} = \frac{4}{150}$$

$$\frac{x}{y} = \frac{2}{75}$$

$$\frac{y-x}{y+x} = \frac{75-2}{75+2}$$

$$\frac{y-x}{y+x} = \frac{73}{77}$$

176. If p is the third proportional to 8, 20 and q is the fourth proportional to 3, 5, 24, then find the value of $(2p + q)$.

- (a) 140 (b) 126
(c) 90 (d) 104

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (a) Third proportional of 8, 20, p

$$p = \frac{20^2}{8}$$

$$p = 50$$

Fourth proportional of 3, 5, 24

$$q = \frac{24 \times 5}{3} = 40$$

$$\begin{aligned} 2p + q &= 2 \times 50 + 40 \\ &= 140 \end{aligned}$$

177. The ratio of square of a number and reciprocal of its cube is $\frac{243}{16807}$? What is the number?

- (a) $\frac{7}{3}$ (b) $\frac{2}{7}$
(c) $\frac{3}{7}$ (d) $\frac{5}{7}$

SSC CHSL 11/07/2019 (Shift-I)

Ans. (c) Let number be x .

According to the question,

$$\frac{x^2}{\frac{1}{x^3}} = \frac{243}{16807}$$

$$\Rightarrow x^5 = \frac{243}{16807}$$

$$\Rightarrow x = \sqrt[5]{\frac{243}{16807}}, \quad x = \frac{3}{7}$$

178. A is 150% of B and B is 40% of C. If $A+B+C = 20$, then the value of $2B + 3C - 4A$ is equal to:

- (a) 16 (b) 14
(c) 20 (d) 15

SSC CHSL 04/08/2021 (Shift-I)

Ans. (b) : Given:-

$$A + B + C = 20$$

$$A = \frac{B \times 150}{100}$$

$$\frac{A}{B} = \frac{3}{2}, \quad B = \frac{C \times 40}{100}$$

$$\frac{B}{C} = \frac{2}{5}$$

$$A : B : C$$

$$\begin{array}{ccc} 3 & 2 & 5 \\ \swarrow & \searrow & \swarrow \\ 2 & 5 & 2 \end{array}$$

$$\underline{6 : 4 : 10}$$

$$6 + 4 + 10 = 20$$

$$1 \text{ unit} = 1$$

According to the question,

$$A = 6, B = 4, C = 10$$

$$2B + 3C - 4A = ?$$

$$= 2 \times 4 + 3 \times 10 - 4 \times 6$$

$$= 8 + 30 - 24$$

$$= 38 - 24$$

$$= 14$$

179. Two numbers are in the ratio 3 : 5. If the sum of their squares is 2176, find the sum of the two numbers.

- (a) 68 (b) 56
(c) 60 (d) 64

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : Let, numbers $3x$ and $5x$ respectively.
According to the question,

$$(3x)^2 + (5x)^2 = 2176$$

$$= 9x^2 + 25x^2 = 2176$$

$$= 34x^2 = 2176$$

$$\Rightarrow x^2 = 64$$

$$\Rightarrow x = 8$$

Hence, sum of both numbers = $8x = 64$

180. If x is the mean proportional between 12.8 and 64.8 and y is the third proportional to 38.4 and 57.6, then $2x : y$ is equal to:

- (a) 3 : 4 (b) 1 : 2
(c) 2 : 3 (d) 4 : 5

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-II)

Ans. (c) : Mean proportion (x) = $\sqrt{12.8 \times 64.8}$

$$= \sqrt{0.64 \times 81 \times 2 \times 8} = 28.8$$

$$\text{Third proportion (y)} = \frac{b^2}{a} = \frac{57.6 \times 57.6}{38.4} = 86.4$$

$$2x : y = (2 \times 28.8) : 86.4 = 2 : 3$$

181. If $2x + 1$, $x + 2$, 2 and 5 are in proportion, then what is the mean proportional between $3.5(1-x)$ and $8(1+x)$?

- (a) 5.5 (b) 4.5
(c) 5.25 (d) 4.25

SSC CGL (Tier-I)-2019 - 04/03/2020 (Shift-I)

Ans. (c) :

$$\frac{2x+1}{x+2} = \frac{2}{5}$$

$$10x + 5 = 2x + 4$$

$$8x = -1$$

$$x = -\frac{1}{8}$$

$$\text{Mean proportion} = \sqrt{3.5(1-x) \times 8(1+x)}$$

$$= \sqrt{28 \times (1-x^2)} = \sqrt{28 \times \left(1 - \frac{1}{64}\right)}$$

$$= \sqrt{28 \times \frac{63}{64}} = \frac{42}{8} = 5.25$$

182. When x is added to each of 10, 16, 22 and 32, the numbers so obtained in this order are in proportion. What is the mean proportional between the numbers $(x + 1)$ and $(3x + 1)$?

- (a) 12 (b) 10
(c) 9 (d) 15

SSC CGL (Tier-I)-2019 - 05/03/2020 (Shift-II)

Ans. (d) : According to the question,

$$\frac{10+x}{16+x} = \frac{22+x}{32+x}$$

$$16+x \quad 32+x$$

$$320 + 10x + 32x + x^2 = 352 + 16x + 22x + x^2$$

$$42x - 38x = 32$$

$$x = 8$$

$$\text{Mean proportion} = \sqrt{(x+1)(3x+1)} = \sqrt{9 \times 25} = 15$$

183. The sum of the squares of 3 natural numbers is 1029, and they are in the proportion 1 : 2 : 4. The difference between greatest number and smallest number is:

- (a) 21 (b) 15
(c) 18 (d) 31

SSC CGL (Tier-I)-2019 - 06/03/2020 (Shift-III)

Ans. (a) : Let the number are x , $2x$ and $4x$

$$x^2 + (2x)^2 + (4x)^2 = 1029$$

$$21x^2 = 1029$$

$$x^2 = 49$$

$$x = 7$$

$$\therefore \text{Required difference} = 3x = 21$$

184. Priya's marks in History and Geography are in the ratio 5 : 7. If she got 14 marks more in Geography than in History, what are her History marks ?

- (a) 49 (b) 42
(c) 56 (d) 35

SSC CGL (Tier-II) 18-02-2018

Ans. (d) :

History : Geography

5

:

7

Difference

$$2 \longrightarrow 14$$

$$1 \longrightarrow 7$$

$$\text{Marks in History} = 7 \times 5 = 35$$

185. Rs. 11,550 has to be divided among X, Y & Z such that X get $\frac{4}{5}$ of what Y gets and Y gets $\frac{2}{3}$ of what Z gets. How much more does Z get over X (in Rs.)?

- (a) 7200 (b) 1800
(c) 1309 (d) 2450

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

$$x : y : z = \frac{8}{15} : \frac{2}{3} : 1 = 8 : 10 : 15$$

$$\text{Required amount} = \frac{15-8}{33} \times 11550 = ₹2450$$

186. The ratio of the incomes of A and B last year was 4 : 3, respectively. The ratios of their individual incomes of the last year and the present year are 3 : 4 and 5 : 6, respectively. If their total income for the present year is ₹8.04 lakh, then the income of B last year was :

- (a) ₹2.7 lakh
(b) ₹2.4 lakh
(c) ₹3.6 lakh
(d) ₹2.8 lakh

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Let last year income of A and B is $4x$ and $3x$ respectively.

Last year : Present year

$$A \rightarrow 3 : 4$$

$$B \rightarrow 5 : 6$$

Present year income,

$$A = 4x \times \frac{4}{3} = \frac{16x}{3}, B = 3x \times \frac{6}{5} = \frac{18x}{5}$$

Total present income,

$$A + B = \frac{16x}{3} + \frac{18x}{5} = 804000$$

$$\frac{134x}{15} = 804000$$

$$x = 90000$$

$$\text{Hence, in last year B's income} = 3x = 3 \times 90000 = ₹2.7 \text{ lakh}$$

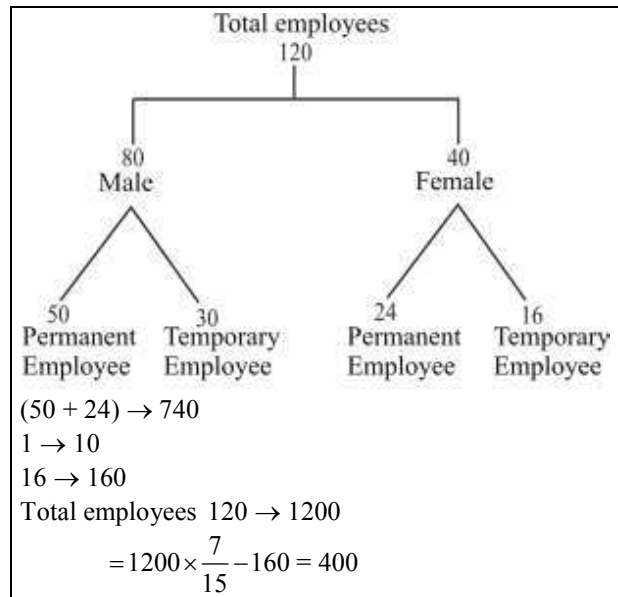
187. Two-third of the number of employees of a company are males and the rest are females. If $\frac{3}{8}$ of the male employees and $\frac{2}{5}$ of the female employees are temporary employees and the total number of permanent employees is 740, then $\frac{7}{15}$ of the total number of employees exceeds the number of temporary female employees by :

- (a) 400 (b) 308
(c) 340 (d) 320

SSC CGL (Tier-II) 12-09-2019

Ans. (a): LCM of (3, 8, 5) = 120

Let total number of employees = 120



188. A shopkeeper placed a supply order for jeans, shirts and t-shirts at the rates of ₹500, ₹350 and ₹200 per piece, respectively. He buys articles of each type in the ratio 1 : 2 : 3 for ₹46,800. For how many t-shirts did he place the order?

- (a) 104 (b) 26
(c) 78 (d) 52

SSC MTS 27/10/2021 (Shift-I)

Ans. (c) : Let the number of Jeans, Shirt and T-Shirt are x , $2x$ and $3x$ respectively.

According to the question,

$$500 \times x + 350 \times 2x + 200 \times 3x = 46800$$

$$500x + 700x + 600x = 46800$$

$$1800x = 46800$$

$$x = \frac{46800}{1800}$$

$$x = 26$$

$$\text{Number of T-Shirts} = 3x = 3 \times 26 = 78$$

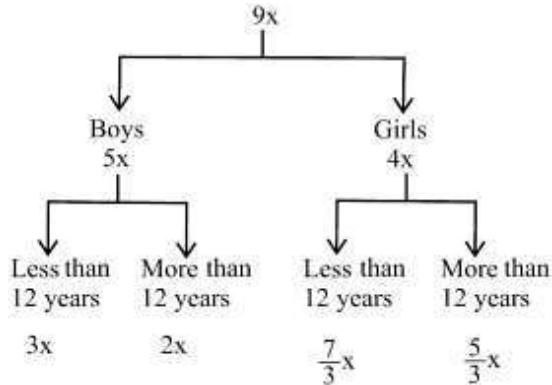
189. $\frac{4}{9}$ of the total number of students in a school are girls and the remaining are boys. $\frac{3}{5}$ of the total number of boys is below than 12 years and $\frac{5}{12}$ of the total number of girls is 12 years or more. If the number of students below than 12 years is 480, which of the following is equal to $\frac{5}{18}$ of the total number of students in the school ?

- (a) 270 (b) 315
(c) 225 (d) 240

SSC CGL (Tier-II) 11-9-2019

Ans. (c)

Let total number of students = $9x$



Number of students less than 12 years

$$= 3x + \frac{7}{3}x = \frac{16}{3}x$$

According to the question-

$$\frac{16}{3}x = 480$$

$$x = 90$$

$$\frac{5}{18} \text{ of total number of student} = 9x \times \frac{5}{18} = \frac{5x}{2} = 225$$

190. When x is added to each of 2, 3, 30 and 35, then the numbers obtained in this order, are in proportion. What is the mean proportional between $(x+7)$ and $(x-2)$?

- (a) 7 (b) 6
(c) 5 (d) 4

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

According to the question,

$$\frac{2+x}{3+x} = \frac{30+x}{35+x}$$

$$70+35x+2x+x^2 = 90+3x+30x+x^2$$

$$4x = 20$$

$$x = 5$$

$$\therefore \text{Mean proportion of } (x+7) \text{ and } (x-2)$$

$$= \sqrt{(x+7) \times (x-2)}$$

$$= \sqrt{12 \times 3} = 6$$

191. A sum of ₹ 4,360 was to be divided among A, B, C and D in the ratio of 3 : 4 : 5 : 8 but it was divided in the ratio $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{8}$ by mistake.

Which of the following statements will hold true as a result?

- (a) C received ₹ 130 less
(b) D received ₹ 1,144 more
(c) B received ₹ 318 less
(d) A received ₹ 956

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a) : A : B : C : D = 3 : 4 : 5 : 8 (Correct ratio)

or $20x = 4360$

$$x = ₹ 218$$

$$\therefore A = 218 \times 3 = 654$$

$$B = 218 \times 4 = 872$$

$$C = 218 \times 5 = 1090$$

$$D = 218 \times 8 = 1744$$

Again, A : B : C : D = $\frac{1}{3} \times 120 : \frac{1}{4} \times 120 : \frac{1}{5} \times 120 : \frac{1}{8} \times 120$
(incorrect ratio)

$$= 40 : 30 : 24 : 15$$

$$109y = 4360 \Rightarrow y = 40$$

$$\therefore A = 40y = 40 \times 40 = 1600$$

$$B = 30y = 30 \times 40 = 1200$$

$$C = 24y = 24 \times 40 = 960$$

$$D = 15 \times y = 15 \times 40 = 600$$

Hence it is clear that C received ₹130 less.

192. What is the ratio of the mean proportional of 14.4 and 3.6 and the third proportional to 5 and 4?

- (a) 4 : 9 (b) 8 : 5
(c) 9 : 4 (d) 5 : 8

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) :

$$\text{Ratio} = \frac{\text{Mean proportion of 14.4 and 3.6}}{\text{Third proportion of 5 and 4}}$$

$$= \frac{\sqrt{14.4 \times 3.6}}{4 \times 4}$$

$$= \frac{5}{4 \times 4}$$

$$= \frac{1.2 \times 6 \times 5}{4 \times 4}$$

$$= \frac{9}{4}$$

$$= 9 : 4$$

193. The sum of ₹4360 was to be divided among A, B, C and D in the ratio of 3 : 4 : 5 : 8 but divided in the ratio of $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{8}$ by mistake.

The resultant is :

- (a) A received ₹956 more
(b) B received ₹318 more
(c) D received ₹1,144 less
(d) C received ₹132 less

SSC CHSL 01/07/2019 (Shift-III)

Ans. (c) : A : B : C : D = 3 : 4 : 5 : 8

$$\text{Wrong ratio} = A : B : C : D = \frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{8}$$

$$= 40 : 30 : 24 : 15$$

$$(3 : 4 : 5 : 8) \times 218$$

$$(40 : 30 : 24 : 15) \times 40$$

Divided amount initially,

$$654 : 872 : 1090 : 1744$$

$$(654 + 872 + 1090 + 1744 = 4360)$$

Divided amount,

$$1600 : 1200 : 960 : 600$$

$$(1600 + 1200 + 960 + 600 = 4360)$$

$$A \quad B \quad C \quad D$$

Hence, B gets, $1744 - 600 = ₹1144$ less.

194. If x , 8 and 27 are in continued proportion, then what is the value of x ?

- (a) $\frac{2}{3}$ (b) $\frac{8}{3}$
 (c) $\frac{4}{3}$ (d) $\frac{64}{27}$

SSC MTS 20/08/2019 (Shift-III)

Ans. (d) : $x : 8 :: 8 : 27$

$$\frac{x}{8} = \frac{8}{27}$$

$$x = \frac{64}{27}$$

195. What is the ratio of the medial proportional between 24 and 150 and the third proportional between 12 and $6\sqrt{5}$?

- (a) 2 : 1 (b) 1 : 2
 (c) 1 : 4 (d) 4 : 1

SSC MTS 08/08/2019 (Shift-I)

Ans. (d): Mean Proportion = \sqrt{ab}

$$\text{Third proportion} = \frac{b^2}{a}$$

$$\frac{\text{Mean Proportion}}{\text{Third Proportion}} = \frac{\sqrt{24 \times 150}}{\frac{36 \times 5}{12}} = \frac{60}{15} = 4 : 1$$

196. Suppose that x is the medial proportional of 25.6 and 32.4 and y is the third proportional of y , 32 and 48. then $3x : 2y =$ _____.

- (a) 5 : 3 (b) 3 : 5
 (c) 4 : 5 (d) 5 : 4

SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : $x = \sqrt{25.6 \times 32.4}$

$$= \frac{16 \times 18}{10} = 28.8$$

$$y = \frac{48 \times 48}{32} = 72$$

$$\therefore 3x : 2y = (3 \times 28.8) : (2 \times 72) \\ = 288 : 480 = 3 : 5$$

197. A sum is divided between two persons in the ratio of 3 : 2 . If one person got ₹ 12 less than the other persons, then what is the sum ?

- (a) ₹60 (b) ₹50
 (c) ₹72 (d) ₹44

SSC MTS 19/08/2019 (Shift-I)

Ans. (a) : $A : B = 3 : 2$

1 unit = Rs.12

5 units = Rs.60

\therefore Amount = Rs.60

198. If $A : B = 2 : 3$, $B : C = 4 : 5$ and $C : D = 6 : 7$,

then the value of $\frac{A+B+C}{D}$ is:

- (a) 3 (b) 7
 (c) 5 (d) 2

SSC MTS 14/08/2019 (Shift-III)

Ans. (d) : $A : B = (2 : 3) \times 8$

$B : C = (4 : 5) \times 6$

$C : D = (6 : 7) \times 5$

$A : B : C : D = 16 : 24 : 30 : 35$

$$\therefore \frac{A+B+C}{D} = \frac{16+24+30}{35} = \frac{70}{35} = 2$$

199. Rizwan has a box in which he kept red and blue marbles. The red marbles and blue marbles were in the ratio 5:4. After he lost 5 red marbles the ratio became 10:9. How many marbles does he have now ?

- (a) 81 (b) 86
 (c) 76 (d) 91

SSC CGL (Tier-II) 21-02-2018

Ans. (c) :

Let the number of red and blue marbles are $5x$ & $4x$ respectively

According to the question,

$$\frac{5x-5}{4x} = \frac{10}{9}$$

$$\Rightarrow 45x - 45 = 40x$$

$$\Rightarrow 5x = 45$$

$$\Rightarrow x = 9$$

Hence, marbles left with Rizwan = $(5x+4x) - 5$

$$= 9x - 5$$

$$= 9 \times 9 - 5 = 76$$

200. If Rs. 7,800 is to be divided among A, B and C in the ratio $1/2 : 1/3 : 1/4$, then how much share will B get (in Rs.) ?

- (a) 3600 (b) 1800
 (c) 2400 (d) 1200

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : The ratio of A, B and C

$$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$$

$$\text{B's share} = \frac{4}{13} \times 7800 = ₹2400$$

201. Bunty had candies and chewing gums in his sweet box in the ratio 7 : 13. After he has eaten 8 candies and 11 chewing gums the ratio became 1:2. How many candies does he have now ?

- (a) 65 (b) 35
 (c) 54 (d) 27

SSC CGL (Tier-II) 18-02-2018 (Shift-I)

Ans. (d) : Let the number of candies and chewing gums be $7x$ and $13x$ respectively .

According to the question,

$$\frac{7x-8}{13x-11} = \frac{1}{2}$$

$$14x - 16 = 13x - 11$$

$$x = 5$$

Candies left with Bunty = $[7 \times 5 - 8]$

$$= 27$$

(I) Problems based on Concepts of Percentage

1. The price of a TV has been reduced by 20%. IN order to restore the original price, the new price must be increased by:

(a) 20% (b) 28%
(c) 31% (d) 25%

SSC CHSL 27/05/2022 (Shift- III)

Ans. (d) : Let the original price of T.V. = ₹100

∴ On reducing 20% price = ₹80

According to the question:-

To restore the original price will be increased by ₹20

$$\therefore \% \text{ increase} = \frac{20}{80} \times 100 = \boxed{25\%}$$

2. 91% of A is 39% of B, and B is x% of A, then the value of x is:

(a) $\frac{200}{3}$ (b) $\frac{700}{3}$
(c) $\frac{400}{3}$ (d) $\frac{500}{3}$

SSC CGL (Tier-II) 03/02/2022

Ans : (b) 91% of A = 39% of B

$$\frac{A}{B} = \frac{39}{91}, \frac{A}{B} = \frac{3}{7}$$

B = x% of A

$$7 = \frac{x}{100} \times 3$$

$$700 = 3x$$

$$x = \frac{700}{3}$$

3. The value of $17\frac{1}{2}\%$ of $3\frac{1}{4}\%$ of $33\frac{1}{3}\%$ of 7200

is:

(a) 7.65 (b) 11.68
(c) 13.65 (d) 9.65

SSC CGL (Tier-II) 03/02/2022

Ans : (c) $17\frac{1}{2}\%$ of $3\frac{1}{4}\%$ of $33\frac{1}{3}\%$ of 7200

$$= \frac{7}{40} \times \frac{13}{400} \times \frac{1}{3} \times 7200$$

$$= \frac{7 \times 13 \times 3}{20}$$

$$= \frac{273}{20} = 13.65$$

4. A number is first increased by 20% and then reduced by 15%. If the final value is 2040, then what is the initial value of the number?

(a) 2100 (b) 1800
(c) 2000 (d) 1900

SSC MTS 02/08/2019 (Shift-I)

Ans. (c) : Let Initial number = x

According to the question,

$$x \times \frac{120}{100} \times \frac{85}{100} = 2040$$

$$x \times \frac{6}{5} \times \frac{17}{20} = 2040$$

$$x \times \frac{6}{5} \times \frac{1}{20} = 120$$

$$\frac{x}{100} = 20$$

$$x = 2000$$

5. If 60% of (x - y) = 45% of (x + y) and y = k% of x, then 21% of k is equal to:

(a) 1 (b) 6
(c) 7 (d) 3

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) (x - y) of 60% = 45% (x + y)

$$(x - y) \times \frac{60}{100} = (x + y) \times \frac{45}{100}$$

$$60x - 60y = 45x + 45y$$

$$15x = 105y$$

$$x = 7y$$

$$x = 7 \times \frac{x \times k}{100}$$

$$k = \frac{100}{7}$$

$$k \text{ of } 21\% = \frac{100}{7} \times \frac{21}{100} = 3$$

6. A man started off a business with a certain capital amount. In the first year, he earned 60% profit and donated 50% of the total capital (initial amount + profit). He followed the same procedure with the remaining capital after the second and the third year. If at the end of the three years, he is left with ₹16,360, what was the initial amount (in ₹) with which the man started his business?

(a) 20,000 (b) 30,000
(c) 25,000 (d) 32,000

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (b) Let, initial amount = ₹x
 Profit $\rightarrow 100\% + 60\% = 160\% = \frac{8}{5}$
 Donate $\rightarrow 50\% = \frac{1}{2}$

Year	Principal	Amount	Donate= Remaining
I st year	x	$\frac{8x}{5}$	$\frac{8x}{5} \times \frac{1}{2}$
II nd year	$\frac{8x}{10}$	$\frac{8x}{10} \times \frac{8}{5}$	$\frac{8x}{10} \times \frac{8}{5} \times \frac{1}{2}$
III rd year	$\frac{16}{25}x$	$\frac{16x}{25} \times \frac{8}{5}$	$\frac{16x}{25} \times \frac{8}{5} \times \frac{1}{2}$

According to the question,
 At the end of the year,

$$\Rightarrow \frac{16x}{25} \times \frac{8}{5} \times \frac{1}{2} = 15,360$$

$$\Rightarrow x = \frac{15360 \times 5 \times 2 \times 25}{16 \times 8}$$

$$\Rightarrow x = 30,000$$

Hence, the initial amount is ₹30,000

7. In an examination, 45% of the students who appeared are boys and the rest are girls. If 60% of the boys and 70% of the girls passed, then what is the percentage of students who failed?

- (a) 36 (b) 40
 (c) 35.4 (d) 34.5

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (d) : Let the total number of student be 100.
 According to the question –

$$\therefore \text{Boys} = 45$$

$$\therefore \text{Girls} = 55$$

$$\text{Number of boys passed} = \frac{45 \times 60}{100} = 27$$

$$\text{Number of girls passed} = \frac{55 \times 70}{100} = 38.5$$

$$\text{Total percentage of failed students} = [100 - (27 + 38.5)] = 34.5\%$$

8. A number was divided by 8, instead of being multiplied by 8. As a result of this, there was an error in the answer. What is the percentage difference (correct to two places of decimal) in the answer due to this miscalculation?

- (a) 48.67% (b) 67.33%
 (c) 98.44% (d) 72.00%

SSC MTS 08/10/2021 (Shift-I)

Ans. (c) : Let number = x
 Multiplying by 8 (real number) = 8x

$$\text{No. dividing by 8} = \frac{x}{8}$$

$$\% \text{ error} = \frac{\left(8x - \frac{x}{8}\right)}{8x} \times 100$$

$$\begin{aligned} &= \frac{63x}{64x} \times 100 \\ &= \frac{6300}{64} \\ &= 98.44\% \end{aligned}$$

9. Due to 20% reduction in the price of wheat per kg, Ram is able to buy 5 kg more for Rs. 800. What is the original quantity (in kg) of wheat?

- (a) 50 (b) 20
 (c) 40 (d) 30

SSC MTS 14/10/2021 (Shift-I)

Ans. (b) : Reduced price = $800 \times \frac{20}{100} = 160$

160 is the price of 5kg of wheat

So, for 1 kg = $160/5 = 32$

Original price : –

As reduction is 20%,

So, 80% = Rs. 32

$\Rightarrow 100\% = \text{Rs. } 40$

\therefore Original quantity = $\text{Rs. } 800/40 = 20 \text{ kg}$

10. A reduction of 15% in the price of sugar enables Aruna Rai to buy 6kg more for ₹272. The reduced price of sugar per kg is

- (a) ₹7.80 (b) ₹6
 (c) ₹6.80 (d) ₹6.50

SSC MTS 06/10/2021 (Shift-I)

Ans. (c) : Reduction in price of sugar = $\frac{15}{100} = \frac{3}{20}$

$$\text{Price of 1 kg sugar} = \frac{272}{6}$$

$$\text{Reduced price of sugar per kg} = \left(\frac{272}{6} \times \frac{3}{20}\right)$$

$$\Rightarrow \frac{816}{120} = ₹6.80$$

Hence, option (c) is correct.

11. Ramesh invested 30% more than Suresh. Suresh invested 40% less than Arun, who invested ₹ 8,000. The total amount invested by all of them together is :

- (a) ₹ 19,020 (b) ₹ 18,020
 (c) ₹ 19,040 (d) ₹ 19,080

SSC MTS 06/10/2021 (Shift-I)

Ans. (c) : According to the question,

$$\text{Ramesh : Suresh} = 13:10$$

$$\text{Suresh : Arun} = 60:100$$

$$= 3:5$$

$$\text{Ramesh : Suresh : Arun} = 39:30:50$$

$$\therefore 50 \text{ units} = 8000$$

$$1 \text{ unit} = 160$$

$$119 \text{ units} = 160 \times 119$$

$$= ₹19,040$$

12. Two numbers are 32% and 48% more than a third number. What percentage (correct to two decimal places) is the second of the first?

- (a) 89.19% (b) 112.12%
(c) 102.19% (d) 150.12%

SSC MTS 22/10/2021 (Shift-I)

Ans. (b) : Let, third number be x.

I	II	III
$\frac{x \times 132}{100}$	$\frac{x \times 148}{100}$	x
$\frac{33x}{25}$	$\frac{37x}{25}$	x

$$\text{Required percentage} = \frac{\frac{37x}{25} \times 100}{\frac{33x}{25}}$$

$$= \frac{37x \times 100 \times 25}{25 \times 33x} = 112.12\%$$

13. A town with literacy rate of 85% has a population of 2500. If male population is 55% and 92% of them are literate, then find the literacy rate of females in the town.

- (a) 82% (b) 75%
(c) $72\frac{5}{9}\%$ (d) $76\frac{4}{9}\%$

SSC MTS 20/10/2021 (Shift-I)

Ans. (d) : Literate population = $\frac{2500}{100} \times 85 = 2125$
 Population of male = $2500 \times 55/100 = 1375$
 Literate male = $\frac{1375}{100} \times 92 = 1265$
 Population of female = $2500 - 1375 = 1125$
 Population of literate female = $2125 - 1265 = 860$
 Literacy rate of females = $\frac{860}{1125} \times 100$
 $= 76\frac{4}{9}\%$

14. Two numbers are respectively, 17% and 50% more than a third number. The ratio of the two numbers is:

- (a) 39 : 50 (b) 50 : 39
(c) 59 : 39 (d) 39 : 59

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) : Let third number = 100
 Let the number are A, B and C—
 According to the question,
 A = 117
 B = 150
 C = 100
 A : B = 117 : 150
 $= 39 : 50$

15. The total number of students in a school is 1400, out of which 35% of the students are girls and the rest are boys. If 80% of the boys and 90% of the girls passed in an annual examination, then the percentage of the students who failed is :

- (a) 16.5 (b) 21.5
(c) 17.4 (d) 15.8

SSC CGL—(Tier-I) 24/08/2021 (Shift I)

Ans. (a) : Number of girls in the school = $1400 \times \frac{35}{100}$
 $= 490$
 Number of boys in the school = $1400 - 490$
 $= 910$
 The number of students who failed
 $= 490 \times \frac{10}{100} + 910 \times \frac{20}{100}$
 $= 49 + 182 = 231$
 Failed % = $\frac{231}{1400} \times 100 = 16.5\%$

16. In a class the ratio of rural to urban students is 4 : 7. In an examination the average percentage marks of the rural and the urban students are respectively 65 and 63. What is the overall percentage marks of the class (correct to two decimal places) ?

- (a) 63.73% (b) 65.87%
(c) 64.37% (d) 73.63%

SSC CGL—(Tier-I) 17/08/2021 (Shift II)

Ans. (a)

Rural : Urban
↓ ↓
4 : 7

Average = $(63 + 2)$, 63
 Let average is 63.
 \therefore Required average = $63 + \frac{2 \times 4}{11}$
 $\cong 63.73\%$

17. Rita spends 25% of her monthly income on house rent and 30% of the remaining income on food. If she saves ₹5250, what is her monthly income?

- (a) ₹12000 (b) ₹16000
(c) ₹10000 (d) ₹14000

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : $25\% = \frac{1}{4}$, $30\% = \frac{3}{10}$
 Let total monthly income of Rita = 40 units
 Her savings = $40 - (10 + 9) = 21$ units
 21 units = ₹5250
 1 unit = ₹250
 Total monthly income = 40 units = ₹10000

18. In a workshop with 80 students and 10 resource persons, sweets were distributed at the end of the workshop. The amount spent for distributing sweets to each student was 30% of the total number of students and amount spent towards each resource persons was 40% of the total number of students. The total amount spent for sweets distribution in the workshop was:

- (a) ₹2420 (b) ₹2440
(c) ₹2400 (d) ₹2240

SSC CHSL 10/08/2021 (Shift-II)

Ans. (d) : Total no. of students = 80
Total no. of resource persons = 10
Amount spent on each student = $\frac{80 \times 30}{100} = 24$
Amount spent on each resource person = $80 \times \frac{40}{100} = 32$
Total amount spent = $80 \times 24 + 10 \times 32$
= 1920 + 320
= ₹2240

19. A, B and C are positive numbers such that A is 70% of B, and B is 40% of C. If the sum of all three number is 336, then 15% of the sum of B and C is:

- (a) 48 (b) 42
(c) 32 (d) 44

SSC CHSL 11/08/2021 (Shift-II)

Ans. (b) : A B C
28 40 100
⇒ 168 units → 336
1 unit → $\frac{336}{168}$
21 units → $\frac{336}{168} \times 21$ $\left[\because (40+100) \times \frac{15}{100} \right]$
= 42

20. A number P is 20% more than a number Q but 10% less than a number R. What percentage is number Q of number R?

- (a) 80 (b) 85
(c) 75 (d) 90

SSC CHSL 05/08/2021 (Shift-III)

Ans. (c) : Let R = 100
P Q R
90 75 100 $\left[\frac{90 \times 100}{120} = 75 \right]$
Required % = $\frac{75}{100} \times 100$
= 75

21. If A is 28% less than B and C is 25% less than the sum of A and B, then by what percentage will C be more than A (correct to one decimal place)?

- (a) 84.3% (b) 75.5%
(c) 81.6% (d) 79.2%

SSC CHSL 16/04/2021 (Shift-III)

Ans. (d) : Let B = 100
Then, A = $\frac{100 \times 72}{100} = 72$

And C = $172 \times \frac{75}{100}$
= 129
Required percentage = $\frac{129 - 72}{72} \times 100$
≈ 79.2%

22. What is the value of x, if 25% of 480 + 30% of 500 + x% of 90 = 35% of 900?

- (a) 45 (b) 40
(c) 55 (d) 50

SSC CHSL 12/04/2021 (Shift-II)

Ans : (d) The given expression is—
25% of 480 + 30% of 500 + x% of 90 = 35% of 900

$$\Rightarrow \frac{25}{100} \times 480 + \frac{30}{100} \times 500 + \frac{x}{100} \times 90 = \frac{35}{100} \times 900$$

$$\Rightarrow 120 + 150 + \frac{9x}{10} = 315$$

$$\Rightarrow \frac{9x}{10} = 45$$

$$\Rightarrow x = 50$$

23. What is the value of 9% of 5500 + 2.4% of 1100 - 40% of 1600?

- (a) 181.6 (b) -118.6
(c) 118.6 (d) -181.6

SSC CHSL 12/04/2021 (Shift-II)

Ans : (b) The given expression is—
9% of 5500 + 2.4% of 1100 - 40% of 1600

$$\Rightarrow \frac{9}{100} \times 5500 + \frac{2.4}{100} \times 1100 - \frac{40}{100} \times 1600$$

$$\Rightarrow 495 + 26.4 - 640$$

$$\Rightarrow -118.6$$

24. 35% of the students in a college are girls and the rest are boys. The total number of students in the college is 2800. 75% of the boys and 85% of the girls passed the final examination. The percentage of total students who passed the final examination is:

- (a) 80% (b) 82%
(c) 78% (d) 78.5%

SSC CHSL 15/04/2021 (Shift-III)

Ans. (d) : Total girls in a college = $2800 \times \frac{35}{100} = 980$

Total boys in a college = 2800 - 980 = 1820

Total number of girls and boys passed in exam

$$= 980 \times \frac{85}{100} + 1820 \times \frac{75}{100} = 833 + 1365 \Rightarrow 2198$$

$$\therefore \text{Required percentage} = \frac{2198}{2800} \times 100 = 78.5\%$$

25. 24% of Reena's Salary is equal to 38% of Sunita's Salary. Veena's Salary is two-third of the total salary of Reena and Sunita. If Veena's Salary is Rs. 62,000 then Sunita's Salary is.

- (a) ₹36,000 (b) ₹38,000
(c) ₹35,000 (d) ₹32,000

SSC CHSL 12/08/2021 (Shift-III)

Ans. (a) : According to the question,

$$\begin{aligned} \text{Total salary of Reena and Sunita} &= 62000 \times \frac{3}{2} \\ &= 93000 \end{aligned}$$

$$\frac{24}{100} \times \text{Reena} = \frac{38}{100} \times \text{Sunita}$$

$$\Rightarrow 12 \text{ Reena} = 19 \text{ Sunita}$$

$$\Rightarrow \text{Reena/Sunita} = 19/12$$

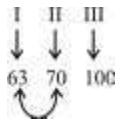
$$\therefore \text{Sunita's salary} = 93000 \times \frac{12}{31} = ₹36000$$

26. Two numbers are less than a third number by 37% and 30% respectively. By what percentage is the second number more than the first?

- (a) $\frac{100}{9}$ (b) $\frac{10}{9}$
(c) 10 (d) $\frac{100}{3}$

SSC CHSL 06/08/2021 (Shift-II)

Ans. (a) :



$$\begin{aligned} \text{Required percentage} &= \frac{7}{63} \times 100 = \frac{100}{9} \\ &= \frac{100}{9} \% \end{aligned}$$

27. A number is mistakenly multiplied by $\frac{7}{5}$ instead of being multiplied by $\frac{3}{2}$. What is the percentage change in the result due to this mistake?

- (a) $3\frac{2}{3}\%$ (b) $6\frac{2}{3}\%$
(c) $7\frac{2}{3}\%$ (d) $5\frac{2}{3}\%$

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b) Let the number be N,
According to the question,

$$\Rightarrow N \times \frac{7}{5} = \frac{7N}{5}$$

$$\Rightarrow N \times \frac{3}{2} = \frac{3N}{2}$$

\therefore % Change in result

$$\begin{aligned} &= \frac{\frac{7N}{5} - \frac{3N}{2}}{\frac{3N}{2}} \times 100 = \frac{2}{3} \times 100 = 6\frac{2}{3}\% \end{aligned}$$

28. A's salary is 15% less than B's salary, B's salary is 30% less than C's salary. By how much percent approximately, is C's salary more than A's salary?

- (a) 45 (b) 75
(c) 40 (d) 68

SSC CHSL 12/08/2021 (Shift-II)

Ans. (d) : According to the question.

$$A : B = 85 : 100$$

$$= 17 : 20$$

$$B : C = 70 : 100$$

$$= 7 : 10$$

A	B	C
17×7	20×7	10×20
119	140	200

$$\therefore \text{Required \%} = \frac{81}{119} \times 100 \approx 68\%$$

29. Rajan spent 10% of his salary on rent. He spent 20% of the remaining part of the salary on transport. After which he spent 40% of the balance of the salary on food. Further, he spent 80% of the balance on various bills. He deposits ₹5000 in the bank and kept the remaining ₹1480 for his own petty expenditure. Find his monthly salary (in ₹).

- (a) 75000 (b) 80000
(c) 64800 (d) 82500

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (a) : Let Rajan's monthly salary be x.

According to the question.

$$x \times \frac{90}{100} \times \frac{80}{100} \times \frac{60}{100} \times \frac{20}{100} - 5000 = 1480$$

$$\frac{x \times 9 \times 8 \times 6 \times 2}{100 \times 100} = 1480 + 5000$$

$$\frac{x \times 54}{25 \times 25} = 6480$$

$$x = \frac{6480}{54} \times 625$$

$$x = 120 \times 625$$

$$x = ₹75000$$

30. What is to be added to 15% of 180 so that the sum is equal to 20% of 360?

- (a) 60 (b) 45
(c) 50 (d) 40

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let number x to be added.

According to the question–

$$180 \times 15\% \times \frac{1}{100} + x = 360 \times 20\% \times \frac{1}{100}$$

$$27 + x = 72$$

$$\boxed{x = 45}$$

31. Two numbers are 90% and 75% lesser than a third number. By what % should the first number be increased so that it becomes equal to the second number?

(a) 250 (b) 200
(c) 150 (d) 100

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :

Let third number = 100

I : II : III = 10 : 25 : 100 = 100 : 250 : 1000

Required increased % = $\frac{150}{100} \times 100 = 150\%$

32. When a number is increased by 216, it becomes 140% of itself. What is the number ?

(a) 540 (b) 756
(c) 450 (d) 675

SSC CGL (Tier-II) 20-02-2018

Ans. (a) :

$\therefore 40\% = 216$

$10\% = 54$

$100\% = 540$

Hence, number = 540

Trick :

Let number = x

$x \times \frac{140}{100} = x + 216$

$\frac{7x}{5} - x = 216$

$\frac{2x}{5} = 216$

$x = 540$

33. In an examination, 92% of the students passed and 480 students failed. If so, how many students appeared in the examination?

(a) 6000 (b) 5800
(c) 5000 (d) 6200

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : $\therefore 92\%$ student passed in exam

Thus 8% student are failed

According to question

$8\% = 480$

$1\% = 60$

$100\% = 6000$

Thus the total number of students = 6000

34. Two numbers are 70% and 55% lesser than a third number. By what % should the first number be increased so that it becomes equal to the second number?

(a) 60 (b) 80
(c) 50 (d) 100

SSC CGL (Tier-I) 2018

Ans. (c)

Let third number = 100

I : II : III = 30 : 45 : 100

Required increased % = $\frac{15}{30} \times 100 = 50\%$

35. When a number is increased by 240, it becomes 120% of itself. What is the number ?

(a) 1200 (b) 2200
(c) 1400 (d) 2400

SSC CGL (Tier-I) 2018

Ans. (a)

$\therefore 20\% = 240$

$1\% = 12$

$100\% = 1200$

The number is 1200.

36. The sum of weights of A and B is 80 kg. 50% of A's weight is $\frac{5}{6}$ times the weight of B. Find the difference between their weights.

(a) 20 kg (b) 25 kg
(c) 15 kg (d) 10 kg

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : According to the question.

Sum of weight of A and B = 80 kg

$\therefore \frac{A}{2} = \frac{5}{6} B$

$\frac{A}{B} = \frac{5}{3}$

$\therefore 8 \text{ unit} \rightarrow 80 \text{ kg}$

$A - B = 2 \text{ unit} \rightarrow 20 \text{ kg}$

Hence, difference between their weights = 20 kg

37. The income of A is 25% more than that of B and the income of C is 65% less than the sum of the incomes of A and B. Income of C is what percent less than the income of A?

(a) 37 (b) 35
(c) 28 (d) 32

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (a) :

$$25\% = \frac{15}{4} \rightarrow B$$

A	B
5	4
$\times 100$	$\times 100$
500	400

Income of C is 65% less than (A + B) income.

$$\text{Income of C} = 900 \times \frac{35}{100} = 315$$

$$\text{Income of C is less than A} = \frac{500 - 315}{500} \times 100 = \frac{185}{5} = 37\%$$

38. A is 20% less than B while C is 20% more than D. If D is 25% less than A, then which of the following is true?

(a) $C = 0.72 B$ (b) $B = 0.675 C$
(c) $C = 0.675 B$ (d) $B = 0.72 C$

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (a) : $A = B \times \frac{80}{100}$

$$A = \frac{4B}{5} \quad \dots\dots(i)$$

$$C = D \times \frac{120}{100} = \frac{6D}{5}$$

$$D = \frac{5C}{6} \quad \dots\dots(ii)$$

$$D = A \times \frac{75}{100} = A \times \frac{3}{4} \quad \dots\dots(iii)$$

$$\frac{5C}{6} = \frac{4B}{5} \times \frac{3}{4} \quad [\text{From eq. (i), (ii) \& (iii)}]$$

$$C = \frac{18}{25}B \Rightarrow C = 0.72B$$

39. A is 20% less than B and C is 30% more than D. If D is 25% less than A, then which of the following is true?
 (a) $C = 0.39B$ (b) $B = 0.78C$
 (c) $B = 0.39C$ (d) $C = 0.78B$
SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (d) : $A = B \times \frac{80}{100} = \frac{4B}{5}$

$$C = D \times \frac{130}{100} = \frac{13D}{10}$$

$$D = A \times \frac{75}{100} = \frac{3A}{4}$$

thus its clear, that
 $5A = 4B$
 or $15A = 12B$ (i)
 $10C = 13D$ (ii)
 $4D = 3A$
 or $20D = 15A$ (iii)
 From equation (i) and (iii)
 $15A = 12B = 20D$

Solving the equation (ii),
 $D = \frac{10}{13}C$
 $\therefore 12B = 20D$
 $\therefore 12B = 20 \times \frac{10}{13}C$
 $C = \frac{12 \times 13 \times B}{200}$
 $C = 0.78B$

(On balancing the ratio from below)
Trick :
 $A : B = (4 : 5) \times 10$
 $D : A = (3 : 4) \times 10$
 $C : D = (13 : 10) \times 3$
 $A : B : C : D = 40 : 35 : 39 : 30$
 $\frac{C}{B} = \frac{39}{50}$
 $C = 0.78B.$

40. The income of A is 40% more than that of B. If A got a 25% rise in his income and B got a 40% rise in his income, then the percentage increase in the combined incomes of A and B is:
 (a) 28.25 (b) 34.5
 (c) 24.5 (d) 31.25

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (d) : Let Income of B = 100
 Income of A = 140
 According to the equestion

A = 140	B = 100
↓ +25%	↓ +40%
175	140

\therefore % increases in combined incomes of A and B =

$$\frac{(175 + 140) - (100 + 140)}{(100 + 140)} \times 100$$

$$= \frac{315 - 240}{240} \times 100$$

$$= \frac{75}{240} \times 100 = 31.25\%$$

41. If 50% of a number is added to 75, the obtained result is the same number, the number is-
 (a) 400 (b) 100
 (c) 250 (d) 150

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (d) : Let, that number is x.
 \therefore According to the question-

$$x \times \frac{50}{100} + 75 = x$$

$$75 = x - \frac{x}{2} = \frac{x}{2}$$

$$\therefore \frac{x}{2} = 75$$

$$x = 150$$

42. If the Difference between 62% and 80% of a numbers is 198, then the difference between 92% and 56% of the number will be:
 (a) 1100 (b) 360
 (c) 3564 (d) 396

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (d) : $(80 - 62)\% = 198$
 $18\% = 198 \Rightarrow 1\% = 11$
 $(92 - 56) = 36\% = 36 \times 11 = 396$

43. In an examination in which the full marks were 500, A scored 25% more marks than B, B scored 60% more marks than C and C scored 20% less marks than D. If A scored 80% marks, then the percentage of marks obtained by D is:
 (a) 65% (b) 54%
 (c) 50% (d) 60%

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (c) : Full mark \rightarrow A B C D
 $160 : 128 : 80 : 100$
 $\therefore 160 \rightarrow 80\%$
 $1 \rightarrow \frac{1}{2}\%$
 $100 \rightarrow 50\%$

44. By what number must the given number be multiplied to increase the number by 25%.

- (a) 3 (b) $\frac{3}{4}$
(c) $\frac{5}{4}$ (d) $\frac{2}{5}$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (c) : Let number = x
New number = $x \times \frac{125}{100} = \frac{5}{4}x$
 \therefore Must be multiplied by $\frac{5}{4}$

45. The price of cooking oil increased by 25%. Find by how much percentage a family must reduce its consumption in order to maintain the same budget?

- (a) 70% (b) 20%
(c) 30% (d) 80%

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (b) : Percentage reduce in consumption
 $= \left(\frac{x}{100+x} \times 100 \right) \%$ [Where x is increase percentage in price]
 $= \frac{25}{125} \times 100 = 20\%$

46. 0.08% of 120% of 50,000 is equal to

- (a) 480 (b) 48
(c) 4800 (d) 4.8

SSC CGL (Tier-II) 21-02-2018

Ans. (b) :
50000 of 120% of 0.08%
 $= 50000 \times \frac{120}{100} \times \frac{0.08}{100}$
 $= 5 \times \frac{6}{5} \times 8$
 $= 48$

47. When a number is increased by 24, it becomes 115% of itself. What is the number ?

- (a) 160 (b) 250
(c) 100 (d) 200

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Let number is x.
According to the question—
 $x + 24 = \frac{x \times 115}{100}$
 $20x + 480 = 23x$
 $3x = 480$
 $x = 160$

48. Two numbers are 40% and 80% lesser than a third number. By how much percent is the second number to be enhanced to make it equal to the first number ?

- (a) 100 (b) 33.3
(c) 66.6 (d) 200

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Let third number is 100.
Then as per question,
First number = $100 - 40 = 60$
Second number = $100 - 80 = 20$
Increment in the second number for a value is equal to first number = $60 - 20$

$$\text{Increment percent} = \left(\frac{60-20}{20} \right) \times 100$$

$$= 200$$

49. 2% of a = b, then b% of 10 is the same

- (a) 200% of a (b) 20% of a/10
(c) 20% of a/10 (d) 200% of a/10

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :
According to the question.

$$a \times \frac{2}{100} = b$$

$$b = \frac{a}{50}$$

then,

$$10 \text{ of } b\% = 10 \times \frac{a}{50} \times \frac{1}{100}$$

$$= \frac{a}{100} \times \frac{1}{5}$$

$$= 20\% \text{ of } \frac{a}{100}$$

50. A man's annual income has increased by Rs 1.2 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays the same amount of tax as before. What is his increased income (in Rs lakh)?

- (a) 8.4 (b) 7.2
(c) 9.6 (d) 6

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :
Let Annual income of a man = x lakh
According to the question

$$(x+1.2) \times \frac{10}{100} = x \times \frac{12}{100}$$

$$10x + 12 = 12x$$

$$x = 6 \text{ lakh}$$

Hence Increase income of a man = ₹ (6+1.2) lakh
= ₹ 7.2 lakh

51. 250% of a = b, then b% of 250 is the same as a% of

- (a) 625 (b) 1000
(c) 100 (d) 6250

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : a of 250% = b

$$\begin{aligned}\text{Then, } 250 \text{ of } b\% &= 250 \times \frac{b}{100} \\ &= 250 \times \frac{a \times 250}{100 \times 100} \\ &= 625 \times \frac{a}{100} = a\% \text{ of } 625\end{aligned}$$

52. 150% of 0.05% of x is 75. Find x.

- (a) 1,00,000 (b) 75000
(c) 1,25,000 (d) 1,50,000

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : x of 0.05% of 150% = 75

$$\begin{aligned}x \times \frac{5}{10000} \times \frac{150}{100} &= 75 \\ x &= 1,00,000\end{aligned}$$

53. A man's annual income has increased by Rs. 2 lakhs but the tax on income that he has to pay has reduced from 20% to 16%. He now pays the same amount of tax as before. What is his increased income (in Rs. lakhs) ?

- (a) 8 (b) 10
(c) 12 (d) 6

SSC CGL (Tier-II) 9-3-2018

Ans. (b): Let initially income (lakh) = x Rs.

$$\begin{aligned}x \times \frac{20}{100} &= (x + 2) \times \frac{16}{100} \\ 5x &= 4x + 8 \\ x &= 8 \text{ Rs. lakh.} \\ \text{Total increased income} &= 8 + 2 = 10 \text{ Rs (lakh).}\end{aligned}$$

54. 0.02 of 150% of 600 is :

- (a) 0.18 (b) 1.8
(c) 18 (d) 0.018

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : 600 of 150% of 0.02%

$$\begin{aligned}&= 600 \times \frac{150}{100} \times \frac{0.02}{100} \\ &= 0.18\end{aligned}$$

55. When a number is increased by 40, it becomes 125% of itself. What is the number?

- (a) 200 (b) 60
(c) 160 (d) 100

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let number = x

As per question,

$$x + 40 = x \times \frac{125}{100}$$

$$\frac{5x}{4} - x = 40$$

$$\frac{x}{4} = 40$$

$$x = 160$$

OR

$$25\% = 40$$

$$100\% = 160$$

56. 5% of a = b, then b% of 20 is the same as ____.

- (a) 20% of a/2 (b) 50% of a/20
(c) 50% of a/2 (d) 20% of a/20

SSC CGL (Tier-II) 17-2-2018 (Shift-I)

Ans. (d) : a of 5% = b

$$a \times \frac{5}{100} = b$$

$$\frac{a}{b} = 20$$

$$20 \text{ of } b\% = \frac{a}{b} \text{ of } b\%$$

$$= \frac{a}{b} \times \frac{b}{100} \times \frac{20}{20}$$

$$= \frac{a}{20} \times \frac{20}{100}$$

$$= 20\% \text{ of } \frac{a}{20}$$

57. A man's annual income has increased by Rs. 5 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays Rs. 10,000 more income tax. What is his increased income (in Rs. lakhs)?

- (a) 20 (b) 25
(c) 15 (d) 10

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : let annual income of a man = ₹x

According to the question,

$$x \times \frac{12}{100} = (x + 500000) \times \frac{10}{100} - 10000$$

$$12x = 10x + 5000000 - 1000000$$

$$2x = 4000000$$

$$x = 2000000$$

$$\begin{aligned}\therefore \text{Increased income} &= 2000000 + 500000 = 2500000 \\ &= 25 \text{ lakh}\end{aligned}$$

58. If 25% of half of x is equal to 2.5 times the value of 30% of one-fourth of y, then x is what per cent more or less than y ?

- (a) 50% more (b) $33\frac{1}{3}\%$ less
(c) $33\frac{1}{3}\%$ more (d) 50% less

SSC CGL (Tier-II) 13-09-2019 (Shift-I)

$$\text{Ans. (a) : } y \times \frac{1}{4} \times 30\% \times 2.5 = x \times \frac{1}{2} \times 25\%$$

$$y \times 1.5 = x$$

$$\frac{x}{y} = \frac{3}{2}$$

$$\text{Intended percent} = \frac{1}{2} \times 100 = 50\% \text{ more}$$

59. In a class, $83\frac{1}{3}\%$ of the number of students are girls and the rest are boys. If 60% of the number of boys and 80% of the number of girls are present, then what percentage of the total number of students in the class is absent?

- (a) $22\frac{2}{3}$ (b) $12\frac{1}{3}$
 (c) $26\frac{2}{3}$ (d) $23\frac{1}{3}$

SSC CGL (Tier-II) 12-09-2019

Ans. (d) :

$$\therefore 83\frac{1}{3}\% = \frac{250}{300} = \frac{5}{6}$$

Let

$$\text{Number of girls} \Rightarrow 5 = 50$$

$$\text{Numbers of boys} \Rightarrow 1 = 10$$

Total number of boy and girl are absent.

$$= 50 \times 20\% + 10 \times 40\%$$

$$= 10 + 4 = 14$$

$$\text{Total number of boy and girl} = 50 + 10 = 60$$

$$\therefore \text{Percent of absent students} = \frac{14}{60} \times 100$$

$$= \frac{70}{3} = 23\frac{1}{3}\%$$

60. A is 25% more than B and B is 40% less than C. If C is 30% more than D, then by what percent is A less than D ?

- (a) 2.5 (b) 4
 (c) 1.5 (d) 5

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Let D = 100

$$C = 130$$

$$B = 78$$

$$A = \frac{195}{2}$$

According to question.

$$\text{decrease percent (\%)} = \frac{100 - 195/2}{100} \times 100$$

$$= \frac{5}{200} \times 100 = \frac{5}{2} = 2.5\%$$

61. If 60% of a number is 120 more than 20% of the number, then 28% of the number is less than $33\frac{1}{3}\%$ of the number by:

- (a) 16 (b) 15
 (c) 12 (d) 14

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : $\therefore 40\% = 120$

$$100\% = 300$$

$$\text{less intended} = 300 \times \frac{1}{3} - 300 \times \frac{28}{100}$$

$$= 100 - 84$$

$$= 16$$

62. If A is 28% more than B and C is 25% less than the sum of A and B, then by what percent will C be more than A (correct to one decimal place)?

- (a) 32.2% (b) 28%
 (c) 43% (d) 33.6%

SSC CGL (Tier-II) 11-9-2019

Ans. (d) :

A	B	C
128	100	171

$$\text{Intended \%} = \frac{(171-128)}{128} \times 100$$

$$= \frac{43}{128} \times 100$$

$$= 33.6\%$$

63. In an examination, A obtained 10% more marks than B, B obtained 20% more marks than C and C obtained 32% less marks than D. If A obtained 272 more marks than C, then the marks obtained by B is :

- (a) 850 (b) 1020
 (c) 816 (d) 952

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : A : B = (11:10) × 3

$$B : C = (6:5) \times 5$$

$$A : B : C = 33 : 30 : 25$$

$$\therefore 8 \rightarrow 272$$

$$1 \rightarrow 34$$

$$\therefore 30 \rightarrow 1020$$

Thus marks obtained by B = 1020

64. 0.09% of 25% of 1200 is equal to

- (a) 0.27 (b) 2.7
 (c) 27 (d) 270

SSC CGL (Tier-II) 18-02-2018

Ans. (a) :

$$1200 \times 25\% \times 0.09\% = 1200 \times \frac{1}{4} \times \frac{9}{100} \times \frac{1}{100} = 0.27$$

65. When a number is increased by 20, it becomes 116% of itself. What is the number?

- (a) 100 (b) 250
 (c) 125 (d) 400

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Let the number is x-

According to question,

$$x + 20 = x \times \frac{116}{100}$$

$$16x = 2000$$

$$x = 125$$

66. Two numbers are 50% and 75% lesser than a third number. By how much percent is the second number to be enhanced to make it equal to the first number ?

- (a) 50 (b) 25
 (c) 75 (d) 100

SSC CGL (Tier-II) 18-02-2018 (Shift-I)

Ans. (d) : Let third number c = 100

First number and Second number are 50% and 75% lesser than a third number.

a	b	c
50	25	100

$$\text{Intended Increase\%} = \frac{25}{25} \times 100 = 100\%$$

67. A class has five sections that have 25, 30, 40, 45 and 60 students, respectively. The pass percentage of these sections are 20%, 30%, 35%, 40% and 100%, respectively. The pass percentage of the entire class is

- (a) 79% (b) 63%
(c) 87% (d) 53%

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Total passed student

$$= 25 \times \frac{20}{100} + 30 \times \frac{30}{100} + 40 \times \frac{35}{100} + 45 \times \frac{40}{100} + 60 \times \frac{100}{100}$$

$$= 5 + 9 + 14 + 18 + 60 = 106$$
 Total no. of student in class = 25 + 30 + 40 + 45 + 60 = 200
 Percentage of pass student = $\frac{106}{200} \times 100 = 53\%$

68. If 49% of X = Y, then Y% of 50 is:

- (a) 40% of Y/ X of 50%
(b) 24.5% of X/ X of 24.5%
(c) 40% of Y/ Y of 40%
(d) 24.5 of Y/ Y of 24.5%

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : 50 of Y% = 50% of Y

$$= 50\% \text{ of } X \text{ of } 49\%$$

$$= \frac{1}{2} \text{ of } X \text{ of } 49\% = X \text{ of } 24.5\%$$

69. A person's salary has increased from ₹7,000 to ₹12,000. What is the percentage increase in his salary?

- (a) $61\frac{1}{7}\%$ (b) $76\frac{4}{7}\%$
(c) $71\frac{3}{7}\%$ (d) $69\frac{1}{7}\%$

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Increase in salary = 12,000 – 7,000 = ₹5,000
 Increase percent = $\frac{5000}{7000} \times 100$

$$= \frac{500}{7} = 71\frac{3}{7}\%$$
 Thus, the salary is increased $71\frac{3}{7}\%$

70. A person's salary increased from ₹8,100 to ₹9,000. What is the percentage increase in his salary?

- (a) $9\frac{1}{9}\%$ (b) $13\frac{7}{9}\%$
(c) $11\frac{1}{9}\%$ (d) $6\frac{1}{9}\%$

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : Increase in salary = (9000–8100) = ₹900
 Percentage increase in salary = $\frac{900}{8100} \times 100 = 11\frac{1}{9}\%$

71. If decreasing 110 by x% gives the same result as increasing 50 by x%, then x% of 650 is what percentage more than (x+20) % of 180 ?

(Correct to nearest integer)

- (a) 80% (b) 154%
(c) 136% (d) 90%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : According to question.

$$\frac{(100-x)}{100} 110 = \frac{(100+x)}{100} 50$$

$$\frac{100-x}{100+x} = \frac{50}{110}$$

$$\Rightarrow \frac{100}{x} = \frac{16}{6} \Rightarrow x = \frac{75}{2}\% \text{ or } x = \frac{3}{8}$$

$$\frac{3}{8} \times 650 : \left(\frac{3}{8} + \frac{1}{5}\right) 180$$

$$\therefore \frac{3 \times 65}{8} : \frac{23}{40} \times 18$$

$$5 \times 65 : 23 \times 6$$

$$325 : 138$$

Thus Intended percent % = $\left(\frac{325-138}{138}\right) \times 100$

$$\frac{187}{138} \times 100 = 135.50, \approx 136\%$$

72. The difference between the 38% of a number and 22% of that number is 3200. What is the 15½ % of that number?

- (a) 3100 (b) 3000
(c) 3200 (d) 2800

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) Let number = x

According to question,

$$x \times \frac{38}{100} - x \times \frac{22}{100} = 3200$$

$$\frac{38x - 22x}{100} = 3200$$

$$16x = 320000$$

$$x = 20000$$

$$\therefore 20000 \text{ of } 15\frac{1}{2}\%$$

$$= 20000 \times \frac{31}{2 \times 100} = 3100$$

73. If 25% of 400 + 35% of 1260 + 27% of 1800 = 1020+x, then the value of x lies between:

- (a) 11 to 15 (b) 6 to 10
(c) 16 to 20 (d) 0 to 5

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b):

$$400 \text{ of } 25\% + 1260 \text{ of } 35\% + 1800 \text{ of } 27\% = 1020 + x$$

$$400 \times \frac{25}{100} + 1260 \times \frac{35}{100} + 1800 \times \frac{27}{100} = 1020 + x$$

$$100 + 441 + 486 = 1020 + x$$

$$1027 - 1020 = x$$

$$x = 7$$

∴ Value of x is lies between 6 to 10.

74. If decreasing 110 by x% gives the same result as increasing 50 by x%, then x% of 650 is what percentage (correct to the nearest integer) more than (x-10)% of 780?

- (a) 12% (b) 14%
(c) 17% (d) 18%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : $\frac{110 \times (100 - x)}{100} = \frac{50 \times (100 + x)}{100}$

$$1100 - 11x = 500 + 5x$$

$$16x = 600 \Rightarrow x = 37.5$$

Thus x % of 650 = 650 of 37.5% {∴ x = 37.5}

$$= \frac{650 \times 37.5}{100} = 243.75$$

or 780 of (x-10)% = 780 of (37.5-10)%

$$= \frac{780 \times 27.5}{100}$$

$$= 214.5$$

Now, the required percentage =

$$\left(\frac{243.75 - 214.5}{214.5} \right) \times 100 = 13.63$$

$$\approx 14\%$$

75. If the numerator of a fraction is increased by 60% and the denominator is increased by 40% then the resultant fraction is $\frac{16}{63}$. The original fraction is:

- (a) $\frac{5}{9}$ (b) $\frac{4}{9}$
(c) $\frac{2}{9}$ (d) $\frac{2}{11}$

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Let the numerator of fraction is x and denominator is y.

According to question,

$$\frac{x \times \frac{160}{100}}{y \times \frac{140}{100}} = \frac{16}{63}$$

$$\frac{16x}{14y} = \frac{16}{63}$$

$$\frac{x}{y} = \frac{14}{63}$$

$$\frac{x}{y} = \frac{2}{9}$$

76. If the x% of y is 150 and y% of z is 300 then. What is the relation between x and z ?

- (a) z = x/2 (b) z = x
(c) z = 2x (d) z = x/3

SSC CHSL 05/07/2019 (Shift-III)

Ans. (c) : According to question,

$$y \times \frac{x}{100} = 150 \Rightarrow y = \frac{150 \times 100}{x} \dots\dots\dots(i)$$

$$z \times \frac{y}{100} = 300 \dots\dots\dots(ii)$$

$$z \times \frac{150 \times 100}{x} \times \frac{1}{100} = 300 \quad (\text{Putting the value of } y)$$

$$z = 2x$$

77. The difference between a number and one-third of that number is 228. What is 20% of that number?

- (a) 72.5 (b) 68.4
(c) 58.9 (d) 61.8

SSC CHSL -17/03/2020 (Shift-III)

Ans. (b) : Number = 300 unit

$$(300 - 100) \text{ unit} = 228$$

$$200 \text{ unit} = 228$$

$$300 \text{ unit} = 114 \times 3$$

$$300 \text{ unit of } 20\% = 114 \times 3 \times \frac{1}{5} = 68.4$$

78. The difference between two positive numbers is equal to 30% of the greater number. If the smaller number is 28, then the sum of both the numbers is

- (a) 72 (b) 65
(c) 68 (d) 64

SSC CHSL -26/10/2020 (Shift-III)

Ans. (c) : Let greater positive number is = x

According to the question,

$$(x-28) = x \times \frac{30}{100}$$

$$10x - 280 = 3x$$

$$7x = 280 \Rightarrow x = 40$$

$$\text{then, sum of both number} = (40+28) = 68$$

79. 68 is 25% of which of the following numbers?

- (a) 272 (b) 204
(c) 285 (d) 136

SSC CHSL -19/10/2020 (Shift-III)

Ans. (a) : Let the number is x.

$$\therefore x \times \frac{25}{100} = 68$$

$$x = 68 \times 4 = 272$$

80. The value of a motorcycle depreciates every year by 4%. What will be its value after 2 years, if its present value is ₹75,000?

- (a) ₹70,120 (b) ₹69,000
(c) ₹69,120 (d) ₹72,000

SSC CHSL -16/10/2020 (Shift-I)

Ans. (c): Value of motorcycle after 2 years

$$= P \left(1 - \frac{r}{100} \right)^n = 75000 \left(1 - \frac{4}{100} \right)^2$$

$$= 75000 \times \frac{24}{25} \times \frac{24}{25} = ₹69120$$

81. In a class, if 60% of the students are boys and the number of girls is 36, then the number of boys is:
 (a) 58 (b) 65
 (c) 60 (d) 54

SSC CHSL -15/10/2020 (Shift-I)

Ans. (d) : Given,
 The percentage of boy in class = 60%
 Then,
 The percentage of girls in class = $100 - 60 = 40\%$
 As per question,
 $\therefore 40\%$ of total student = 36
 $\therefore 1\%$ of total student = $\frac{36}{40}$
 \therefore Total number of boys = 60% of total student
 $= \frac{36}{40} \times 60 = 54$

82. A student multiplied a number with $\frac{3}{4}$ instead of $\frac{4}{3}$. What is the error percentage?
 (a) 43.75% (b) 67.45%
 (c) 59.67% (d) 39.34%

SSC CHSL -15/10/2020 (Shift-II)

Ans. (a) : Let number is = 12
 Percentage error = $\frac{16-9}{16} \times 100$
 $= \frac{7}{16} \times 100 = 43.75\%$

83. The length and breadth of a cuboid are increased by 10% and 20%, respectively, and its height is decreased by 20%. The percentage increase in the volume of the cuboid is:
 (a) $5\frac{3}{5}\%$ (b) $5\frac{2}{5}\%$
 (c) $5\frac{1}{5}\%$ (d) $5\frac{4}{5}\%$

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) : Percentage increase in volume of cuboid %
 $\left(x + y + \frac{xy}{100}\right)$
 $\left(10 + 20 + \frac{10 \times 20}{100}\right)\% = 32\%$
 $\left(x - y - \frac{xy}{100}\right)$
 $\left(32 - 20 - \frac{32 \times 20}{100}\right)\% = 12 - \frac{32}{5} = \frac{28}{5} = 5\frac{3}{5}\%$

84. A crate of fruits contains one spoiled fruit for every 25 fruits. 60% of the spoiled fruits were sold. If the seller had sold 48 spoiled fruits, then the number of fruits in the crate were:
 (a) 2400 (b) 1200
 (c) 300 (d) 2000

SSC CHSL -14/10/2020 (Shift-II)

Ans. (d) : $60\% = 48$
 $5\% = 4$
 $100\% = 80$
 Total spoiled fruit = 80

Hence, Number of total fruit = $25 \times 80 = 2000$

85. Two numbers A and B are, respectively, 80% and 20% more than a third number C. The ratio of the numbers A to B is:
 (a) 5:4 (b) 4:5
 (c) 3:2 (d) 3:4

SSC CHSL -26/10/2020 (Shift-I)

Ans. (c) : Let third number C is 100.
 According to the question,
 A : B : C
 180 : 120 : 100
 A : B
 180 : 120
 A : B = 3 : 2

86. If 40% of a number is less than its 60% by 30, then the 20% of that number is:
 (a) 30 (b) 40
 (c) 60 (d) 50

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) : Let number = 100 unit
 $(60 - 40)$ unit = 30
 20 unit = 30
 100 unit = 150
 Number of 20% = $150 \times \frac{1}{5} = 30$

87. A man purchased a car for ₹12 Lakhs and was insured for 80% of the cost. He sold the car at a 15% loss, but had not yet delivered it to the buyer when he met with an accident. After the accident, the car was damaged a lot and the insurance company paid 90% of the insured amount. The net difference in the two transactions is:
 (a) ₹1.38 lakhs (b) ₹92 lakhs
 (c) ₹1.56 lakhs (d) ₹88 lakhs

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) : The person bought the car for 12 lakhs and got it insured for 80% of its cost.
 Sum insured = $1200000 \times \frac{80}{100} = 960000$
 Loss of 15% = $1200000 \times \frac{15}{100} = 180000$
 Hence, he sold the car for 1020000.
 Insurance company paid 90% of the insured amount.
 $= 960000 \times \frac{90}{100} = 864000$ paid
 Net difference in both transaction = $1020000 - 864000 = 156000 = 1.56$ lakh

88. If 22% of x = 30% of y, then y : x is equal to:
 (a) 17 : 16 (b) 11 : 15
 (c) 15 : 14 (d) 15 : 11

SSC CHSL -12/10/2020 (Shift-III)

Ans. (b) : x of 22% = y of 30%

$$\Rightarrow \frac{y}{x} = \frac{22}{30} = \frac{11}{15} = 11:15$$

89. A runner is running at a speed of 40 km/h. If he runs at a speed of 30 km/h, then what will the decrease in the percentage of his speed be?

- (a) 30% (b) 20%
(c) 15% (d) 25%

SSC CHSL –12/10/2020 (Shift-II)

Ans. (d) : Decrease in speed of runner = 40 – 30 = 10 km/h

$$\therefore \text{Percentage decrease in speed} = \frac{10}{40} \times 100 = 25\%$$

90. Kavita's attendance in her school for the academic session 2018-2019 was 216 days. On computing her attendance, it was observed that her attendance was 90%. The total working days of the school were:

- (a) 250 (b) 240
(c) 195 (d) 194

SSC CHSL –12/10/2020 (Shift-I)

Ans. (b) : Given,

Kavita's attendance at her school (in day) = 216 days

Kavita's attendance at her school (in%) = 90%

$$\therefore 90\% = 216$$

$$\therefore 1\% = \frac{216}{90}$$

$$\therefore 100\% = \frac{216}{90} \times 100 = 240$$

Hence, total number of working day of the school = 240

91. Two numbers are respectively 25% and 65% more than a third number. The ratio of the two numbers is:

- (a) 25 : 33 (b) 16 : 17
(c) 16 : 19 (d) 25 : 42

SSC CHSL –14/10/2020 (Shift-III)

Ans. (a) : First No. : Second No. : Third No.

$$125 : 165 : 100$$

$$25 : 33 : 20$$

Hence ratio of both number = 25 : 33

92. Sachin scored 120 runs, which included 6 boundaries and 4 sixes. What percentage of his total score did he make by running between the wickets?

- (a) 45% (b) $33\frac{1}{3}\%$
(c) $46\frac{4}{9}\%$ (d) 60%

SSC CHSL –14/10/2020 (Shift-III)

Ans. (d) Runs scored by 6 boundaries and 4 sixes = 48

$$\text{Intended (\%)} = \frac{120 - 48}{120} \times 100 = 60\%$$

93. Find x, if 30% of 400 + x% of 70 = 25% of 536.

- (a) 30 (b) 10
(c) 20 (d) 40

SSC CHSL –18/03/2020 (Shift-II)

Ans. (c) : According to the question.

$$400 \times \frac{30}{100} + 70 \times \frac{x}{100} = 536 \times \frac{25}{100}$$

$$70x = 13400 - 12000$$

$$70x = 1400$$

$$x = 20$$

94. If a% of 240 is c and c% of a is 117.6, then the value of a + c is:

- (a) 260 (b) 196
(c) 238 (d) 144

SSC CHSL –18/03/2020 (Shift-I)

Ans. (c) : According to the question,

$$240 \times \frac{a}{100} = c \quad \text{--- (i)}$$

$$\text{And } a \times \frac{c}{100} = 117.6 \quad \text{--- (ii)}$$

$$\text{Eq}^n \text{ (i) divided eq}^n \text{ (ii)}$$

$$c^2 = 240 \times 117.6 = 28224$$

$$c = \sqrt{28224} = 168$$

Putting value of c in eqⁿ (i),

$$240 \times \frac{a}{100} = 168 \Rightarrow a = \frac{1680}{24} \Rightarrow a = 70$$

$$\therefore (a + c) = (168 + 70) = 238$$

95. A shopkeeper has certain number of apples of which 10% are found to be rotten. He sells 85% of the remaining good apples and still has 405 good apples. How many apples did he originally have?

- (a) 3000 (b) 3500
(c) 2500 (d) 2000

SSC CHSL –21/10/2020 (Shift-III)

Ans. (a) Let total number of apples = x
Number of remaining good apple

$$= \frac{(100 - 10) \times x}{100} = \frac{9x}{10}$$

According to the question,

$$(100 - 85)\% \times \frac{9x}{10} = 405$$

$$\frac{15}{100} \times \frac{9x}{10} = 405$$

$$x = 3000$$

96. The value of 18% of 15% of $\frac{25}{9}$ of 3800 is:

- (a) 583 (b) 385
(c) 582 (d) 285

SSC CHSL –19/03/2020 (Shift-I)

Ans. (d) : 3800 of $\frac{25}{9}$ of 15% of 18%

$$= 3800 \times \frac{25}{9} \times \frac{15}{100} \times \frac{18}{100}$$

$$= \frac{38 \times 15 \times 18}{9 \times 4}$$

$$= 19 \times 15$$

$$= 285$$

97. If one-third of a number is 125, then what will be the 64% of that number?

- (a) 240 (b) 360
(c) 480 (d) 180

SSC MTS 9-10-2017 (Shift-III)

Ans: (a) Let number = x

According to the question $x \times \frac{1}{3} = 125$

$$\text{or } x = 375$$

Now 64% of number x = 64% of 375

$$= 375 \times \frac{64}{100} = 240$$

98. In a school 55% of the students are girls. If number of boys is 360, then what is the total number of students in the school?

- (a) 720 (b) 800
(c) 1000 (d) 1200

SSC MTS 10-10-2017 (Shift-II)

Ans. (b): Percentage of girls in school = 55%

Hence percentage of boys = $(100 - 55) = 45\%$

Given-

$$45\% = 360$$

$$1\% = 360/45$$

$$\therefore 100\% \text{ Total student} = \frac{360}{45} \times 100$$

$$= 8 \times 100 = 800$$

99. What is the value of 20% of 30% of 1200?

- (a) 36 (b) 72
(c) 108 (d) 144

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) : $1200 \times \frac{30}{100} \times \frac{20}{100}$

$$= 12 \times 3 \times 2 = 72$$

100. When 120 is subtracted from 70% of a number, the result is 90. What is the value of the number?

- (a) 300 (b) 280
(c) 450 (d) 270

SSC MTS 11-10-2017 (Shift-II)

Ans. (a) : Let the number be x

According to the question,

$$x \times \frac{70}{100} - 120 = 90$$

$$\frac{70x - 12000}{100} = 90$$

$$70x = 9000 + 12000$$

$$70x = 21000$$

So that number (x) = 300

101. If one-third of a number is 75, then what will be the 80% of that number?

- (a) 180 (b) 240
(c) 270 (d) 360

SSC MTS 11-10-2017 (Shift-II)

Ans. (a) : Let the number be x.

According to the question,

$$x \times \frac{1}{3} = 75$$

$$x = 225$$

$\therefore 80\%$ of x -

$$225 \times \frac{80}{100} = 9 \times 20 = 180$$

102. When 30 is subtracted from 45% of a number, the result is 150. What is the value of the number?

- (a) 400 (b) 300
(c) 600 (d) 800

SSC MTS 11-10-2017 (Shift-I)

Ans: (a) Let the number be x.

$$x \times 45\% - 30 = 150$$

$$x \times \frac{45}{100} = 150 + 30$$

$$x \times \frac{45}{100} = 180$$

$$x = \frac{180 \times 100}{45} = 400$$

Hence intended number = 400

103. If one-third of a number is 35, then what will be the 64% of that number?

- (a) 67.2 (b) 70.8
(c) 61.4 (d) 72.6

SSC MTS 11-10-2017 (Shift-I)

Ans : (a) Let the number be x.

$$x \times \frac{1}{3} = 35$$

$$x = 105$$

64% of number

$$= 105 \times \frac{64}{100} = 67.2$$

104. 2898 is how much percent of 12600 ?

- (a) 19% (b) 21%
(c) 23% (d) 27%

SSC MTS 7-10-2017 (Shift-I)

Ans. (c) : The required percentage

$$= \frac{2898}{12600} \times 100 = 23\%$$

105. 32240 is how much percent of 62000 ?

- (a) 46% (b) 42%
(c) 48% (d) 52%

SSC MTS 7-10-2017 (Shift-I)

Ans. (d) : Required Percentage = $\frac{32240}{62000} \times 100$

$$= \frac{32240}{620} = 52\%$$

106. If two-fifth of a certain number's 40% is 24. Then number is?

- (a) 136 (b) 148
(c) 150 (d) 154

SSC MTS 21/08/2019 (Shift-II)

Ans. (c) : Let number = x

$$x \times \frac{2}{5} \times \frac{40}{100} = 24, \quad x \times \frac{2}{5} \times \frac{2}{5} = 24$$

$$\frac{4x}{25} = 24$$

$$x = 150$$

107. There are 780 bananas in a box in which 130 bananas are rotten and Remaining bananas are found to be in good quality. what is the percentage of good quality bananas (upto 2 decimal places).

- (a) 71.12% (b) 65.35%
(c) 83.33% (d) 53.33%

SSC MTS 21/08/2019 (Shift-I)

Ans. (c) : The number of bananas in a box is = 780

Rotten banana = 130

$$\text{Number of good quality bananas} = 780 - 130 = 650$$

Percentage of good quality bananas =

$$\frac{\text{Good bananas}}{\text{Total bananas}} \times 100$$

$$= \frac{650}{780} \times 100$$

$$= \frac{250}{3} \% = 83.33\%$$

108. 320 is how much percentage less than 400?

- (a) 20% (b) 18%
(c) 12% (d) 15%

SSC MTS 07/08/2019 (Shift-II)

Ans. (a) : Percentage decrease = $\frac{400 - 320}{400} \times 100$

$$= \frac{80}{4} = 20\%$$

109. 60% of a number is 168, then what is the number

- (a) 280 (b) 320
(c) 240 (d) 200

SSC MTS 08/08/2019 (Shift-I)

Ans. (a) : Let the number be x

According to the question.

$$\frac{60}{100} \times x = 168$$

$$x = \frac{168 \times 100}{60}$$

$$= 28 \times 10$$

$$= 280$$

110. What percent of 5.6 kg is 140 gram?

- (a) 2.5 (b) 1.8
(c) 2 (d) 1.5

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) Required% = $\frac{140}{5600} \times 100 = 2.5\%$

111. A is 25% more than B while B is 20% less than C and C is 10% more than D. Which of the following is not true?

- (a) B is 22% less than A
(b) A is 10% more than D
(c) B is 12% less than D
(d) A = C

SSC MTS 22/08/2019 (Shift-II)

Ans. (a)

Let D = 100

$$C = 100 \times \frac{110}{100} = 110$$

$$B = 110 \times \frac{80}{100} = 88$$

$$A = 88 \times \frac{125}{100} = 110$$

From Option (a)

B is less than A by $(110 - 88)/110 \times 100 = 20\%$

Option (a) is not true.

112. If height of a circular cone is decreased by 10% and its radius is increased by 10%, then what will be the change in its volume?

- (a) Decrease by 8.9%
(b) Decreases by 3.2%
(c) Increase by 8.9%
(d) Increases by 3.2%

SSC MTS 09/08/2019 (Shift-II)

Ans. (c) : Radius = $\left(2r + \frac{r^2}{100}\right)\%$

$$\text{Radius} = \left(2 \times 10 + \frac{100}{100}\right)\% = 21\%$$

Height = (-10)%

$$\% \text{ Increase} = +r + h - \frac{rh}{100}$$

$$= 21 - 10 - \frac{21 \times 10}{100}$$

$$= 21 - 12.1 = \boxed{8.9\%} \text{ Increase}$$

113. Amar, Bhavan, Chetan and Dinesh have a total of ₹150 with them, Amar has one-fourth of the total amount with the other. The amount with Amar (in ₹) is:

- (a) 37.5 (b) 30
(c) 25 (d) 20

SSC MTS 09/08/2019 (Shift-II)

Ans. (b): Let, Bhavan, Chetan and Dinesh have x rupees.

$$\text{Amar's have} = \frac{x}{4}$$

$$\text{Total amount} = x + \frac{x}{4} = 150$$

$$5x = 600$$

$$x = 120$$

$$\text{Amount of Amar.} = \frac{x}{4} = \frac{120}{4} = 30$$

114. If 40% of x equal 50% of y, then y : x is:

- (a) 4 : 5 (b) 3 : 2
(c) 2 : 3 (d) 5 : 4

SSC MTS 09/08/2019 (Shift-II)

Ans. (a) : $\frac{40 \times x}{100} = \frac{50 \times y}{100}$

$$4x = 5y$$

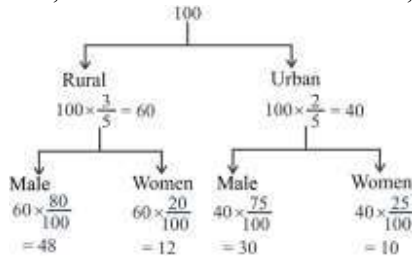
$$y : x = 4 : 5$$

115. The ratio of the number of rural and urban workers (includes men and women only) in an office is 3:2. If 20% of rural and 25% of urban are women, the percentage of men is:

- (a) 67.50% (b) 82.50%
(c) 78% (d) 58%

SSC MTS 09/08/2019 (Shift-I)

Ans. (c) : Let, Total Number of workers = 100,



Number of men = 48 + 30 = 78

$$\text{Required Percentage} = \frac{78}{100} \times 100\% = 78\%$$

116. What is the difference between 0.9 and 0.9%?

- (a) 0.981 (b) 0.891
(c) 0.198 (d) 8.91

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) : Required difference = $0.9 - \frac{0.9}{100}$

$$= 0.9 - 0.009$$

$$= 0.900 - 0.009$$

$$= 0.891$$

117. If 60% of a number is equal to 3/7 of another number, then what is the ratio of the two numbers?

- (a) 4 : 5 (b) 5 : 8
(c) 5 : 7 (d) 1 : 2

SSC MTS 14/08/2019 (Shift-II)

Ans. (c) : Let the number be x and y respectively

According to the question, $x \times 60\% = \frac{3}{7} \times y$

$$x \times \frac{60}{100} = \frac{3y}{7}$$

$$x \times \frac{3}{5} = y \times \frac{3}{7}$$

$$x : y = 5 : 7$$

118. 12.5% of A = 55. What is the value of A ?

- (a) 480 (b) 500
(c) 440 (d) 550

SSC MTS 19/08/2019 (Shift-I)

Ans. (c) : According to the question,

$$12.5\% \times A = 55$$

$$A \times \frac{12.5}{100} = 55$$

$$A \times \frac{125}{1000} = 55 \Rightarrow A \times \frac{5}{40} = 55$$

$$A = 440$$

119. A number is first increased by $16\frac{2}{3}\%$ and then decreased by 15% to get 238. What is 37.5% of that number

- (a) 150 (b) 75
(c) 120 (d) 90

SSC MTS 05/08/2019 (Shift-I)

Ans. (d) : $\therefore 16\frac{2}{3}\% = \frac{1}{6}, 15\% = \frac{3}{20}, 37.5\% = \frac{3}{8}$

Let the number be x.

According to the question,

$$x \times \frac{7}{6} \times \frac{17}{20} = 238$$

$$x = 240$$

Then number of $\frac{3}{8}$

$$= 240 \times \frac{3}{8} = 90$$

120. A is 20% more than B. B is 25% more than C. C is less than A (in percentage)?

- (a) 33.33% (b) 37.5%
(c) 50% (d) 66.66%

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) : Let C is 100

According to the question,

A	B	C
150	125	100

$$\text{Required \%} = \left(\frac{150 - 100}{150} \right) \times 100$$

$$= \frac{50}{150} \times 100 = 33.33\%$$

121. An examination was conducted for five papers where the maximum marks for each paper was 100. X obtained 82, 97, 88, 91 respectively in four subjects. If his total marks were 90% then how much marks he obtained in fifth subject?

- (a) 92 (b) 94
(c) 89 (d) 79

SSC MTS 16/08/2019 (Shift-III)

Ans. (a) : Total marks of the examination = $5 \times 100 = 500$

$$\text{Total score of the exam} = 500 \times \frac{90}{100} = 450$$

According to the question,
 Let the marks obtained in the fifth (5th) subject = x
 $\therefore x + 82 + 97 + 88 + 91 = 450$
 $x + 358 = 450$
 $x = (450 - 358)$
 $x = 92$
 So he got 92 marks in the fifth subject

122. Two numbers are greater than the third number by 80% and 35% respectively. What is the ratio of two numbers?
 (a) 4 : 3 (b) 17 : 6
 (c) 8 : 5 (d) 8 : 3

SSC MTS 16/08/2019 (Shift-III)

Ans. (a) : Let third number = 100
 Then, First number = 180
 Second number = 135
 First number : Second number = 180 : 135 = 4 : 3

123. What is the value of 12.5% of 30% of 1440?
 (a) 64 (b) 44
 (c) 50 (d) 54

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) : According to the question,
 $\Rightarrow 1440 \times \frac{30}{100} \times \frac{125}{1000}$
 $\Rightarrow 144 \times \frac{3 \times 125}{1000} = 54$

124. A is 20% less than B. B is 10% less than C. C is 30% more than D. If D is 400, then what is the value of A?
 (a) 374.4 (b) 368.6
 (c) 382.2 (d) 354.2

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : Given that—
 $D = 400$
 $\therefore C = 400 \times \frac{130}{100} = 520$
 $\therefore B = 520 \times \frac{90}{100} = 468$
 $\therefore A = 468 \times \frac{80}{100} = 374.4$

125. If X is 80% more than Y, then Y is how much percentage less than X?
 (a) 61.33% (b) 80%
 (c) 33.3% (d) 44.44%

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Percentage decrease in y as compared to x.
 $= \left(\frac{80}{100+80} \right) \times 100$
 $= \frac{80}{180} \times 100 = 44.44\%$

126. Rohit multiply a number by 2 instead of dividing the number by 2. Resultant number is what percentage of the correct value?
 (a) 200% (b) 300%
 (c) 50% (d) 400%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : Let Initial number = x

$$\text{Intended percentage} = \frac{\text{Wrong number}}{\text{Right number}} \times 100$$

$$= \frac{2x}{\frac{x}{2}} \times 100 = 400\%$$

127. Sujatha spends 18% of her monthly income on house seat, 40% of the income on groceries and 55% of the remaining on her children education and others. If her only savings is Rs. 4,725 then her expenditure on 'education and others' is:

- (a) Rs. 5,885 (b) Rs. 5,755
 (c) Rs. 5,875 (d) Rs. 5,775

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (d) : ∴ Monthly Savings of Sujata = 4725

Let Sujata's monthly income = ₹ P
 According to the question,

$$\therefore P \times \frac{(100-18-40)}{100} \times \frac{(100-55)}{100} = 4725$$

$$P \times \frac{42}{100} \times \frac{45}{100} = 4725$$

$$P = \frac{4725 \times 10^4}{42 \times 45} = 25000$$

Education and other expenses =

$$25000 \times \frac{42}{100} \times \frac{55}{100} = 5775 \text{ Rs.}$$

128. X is 35% less than Y, Z is 40% more than the sum of X and Y. By what percent is Z more than two times X (correct to one decimal place?)

- (a) 75.4% (b) 77.7%
 (c) 75.8% (d) 78.1%

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : Let, Y = 100, X = 65

$$Z = (X + Y) \times \frac{140}{100} = (X + Y) \times \frac{7}{5} = 165 \times \frac{7}{5}$$

$$Z = 33 \times 7 = 231$$

According to the question,

$$\text{Percentage more} = \frac{Z-2X}{2X} \times 100$$

$$= \frac{231-130}{130} \times 100 = \frac{101}{130} \times 100$$

$$= \frac{1010}{13} = 77.69\% = 77.70\% \text{ (Approx)}$$

129. A is 60% more than B, C is 35% less than D and D is 30% more than A, Which of the following is true?

- (a) 169 B = 125 C (b) 25 B = 13 C
 (c) 13 B = 25 C (d) 125 = 169 C

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : According to the question,

$$B \times \frac{160}{100} = A$$

$$B \times \frac{160}{100} \times \frac{130}{100} = D$$

$$B \times \frac{160}{100} \times \frac{130}{100} \times \frac{65}{100} = C$$

$$169B = 125C$$

130. A and B obtained 441 marks and 558 marks, respectively. If B got 62% marks, then percentage of marks obtained by A is:

- (a) 49 (b) 52
(c) 48 (d) 51

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : The marks obtained by A and B are 441 and 558 respectively and B has got 62% marks
According to the question,

$$558 = 62\% \Rightarrow 1 = \frac{62}{558}\%$$

$$\therefore 441 = \left(\frac{62}{558} \times 441\right)\% = 49\%$$

(II) Problems based on Percentage Change

131. A person's salary was increased by 50% and subsequently decreased by 50%. How much percentage does he loss or gain?

- (a) Loss of 25% (b) Gain of 50%
(c) Loss of 30% (d) Gain of 20%

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (a) Loss percentage = $\frac{x^2}{100}$

$$= \frac{(50)^2}{100}$$

$$= 25\%$$

132. A person's salary was decreased by 50% and subsequently increased by 50%. By what much per cent does his salary increase or decrease?

- (a) Decreased 18% (b) Increase 15%
(c) Increase 20% (d) Decrease 25%

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (d) Salary decrease percentage

$$= -50 + 50 - \frac{50 \times 50}{100} = -25\%$$

Where (-) shows decrease

133. If decreasing 120 by x% gives the same result as increasing 40 by x%, then x% of 210 is what percent less than (x + 20)% of 180?

- (a) 18 (b) $16\frac{2}{3}$
(c) $33\frac{1}{3}$ (d) 20

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (b) : When x% is subtracted from the number 120 and x% is added to the number 40, then.

$$120(100-x) = 40(100+x)$$

$$\frac{100-x}{100+x} = \frac{40}{120}$$

$$\frac{100-x}{100+x} = \frac{1}{3}$$

$$300 - 3x = 100 + x$$

$$4x = 200$$

$$x = 50$$

According to the question.

$$210 \text{ of } 50\% = \frac{210}{100} \times 50 = 105$$

$$\text{And } 180 \text{ of } (50+20)\% = \frac{180}{100} \times 70 = 126$$

$$\text{Intended Percent} = \frac{21}{126} \times 100 = \frac{1}{6} \times 100$$

$$= 16\frac{2}{3}\%$$

134. Gaurav earns ₹800 per day. After some weeks, he earns ₹960 per day. What is the percentage increase in his daily earnings?

- (a) 18% (b) 20%
(c) 16% (d) 14%

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) :

	after some weeks	
Gaurav earns →	800	: 960
	↑	
	increase = 160	→

So, Increase % = $\frac{160}{800} \times 100 = 20\%$

135. The price of a commodity increases by 28%. However, the expenditure on it increases by 12%. What is the percentage increase or decrease in its consumption?

- (a) 16% increase (b) 12.5% decrease
(c) 12.5% increase (d) 16% decrease

SSC CHSL 05/08/2021 (Shift-I)

Ans. (b) :

	Original price	New price
Expenditure	(100	128)
	100	112)

$$\text{Required \% decrease} = \frac{128-112}{128} \times 100 = 12.5\%$$

136. A reduction of 20% in the rate of sugar enables Sudhir to get 6 kg more sugar from ₹960. What is the reduced rate of sugar per kg?

- (a) ₹ 35 (b) ₹ 36
(c) ₹ 32 (d) ₹ 40

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : $20\% = \frac{1}{5}$
 Expenditure = Price (P) \times Consumption (C)

$\therefore P \rightarrow 5 : 4$

$C \rightarrow 4 : 5$



$1 \rightarrow 6 \text{ kg}$

Reduced rate of sugar per kg = $\frac{960}{6 \times 5} = ₹32/\text{kg}$

137. The price of sugar is increased by 20%. By what percentage must one cut down on the consumption of sugar, so that no extra amount has to be incurred on sugar?

- (a) 80% (b) $16\frac{2}{3}\%$
 (c) 20% (d) $83\frac{1}{3}\%$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (b) : Required deduction % = $\left(\frac{x}{100+x} \times 100\right)\%$
 $= \frac{20}{120} \times 100 = 16\frac{2}{3}\%$

138. Price of diesel increased from Rs. 45/litre of Rs. 50/litre. How much should the consumption of diesel be reduced (in %) so as to increase expenditure by only 5% ?

- (a) 5.5 (b) 5
 (c) 4 (d) 4.5

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Let the consumption of diesel be x litres.

$\therefore \text{Price} \times \text{Consumption} = \text{Expenditure}$

$\therefore 45 \times x = \text{Expenditure} \dots\dots (i)$

again new price \times consumption = Expenditure

$$50 \times y = 45x \times \frac{105}{100}$$

$$y = \frac{45x \times 105}{100 \times 50}$$

$$y = 0.945x$$

Percentage reduction in consumption

$$= \left(\frac{x - 0.945x}{x}\right) \times 100$$

$$= \left(\frac{0.055x}{x}\right) \times 100 = \boxed{5.5\%}$$

Trick:

Expenditure $\rightarrow 20 : 21$

Price $\rightarrow 45 : 50 = 9 : 10$

$$\therefore \text{Expenditure} \rightarrow \frac{20}{9} : \frac{21}{10}$$

$$= 200 : 189$$

$$\text{Required decrease \%} = \frac{11}{200} \times 100 = 5.5\%$$

139. The price of oil is increased by 20%. However, its consumption decreased by $8\frac{1}{3}\%$. What is the percentage increase or decrease in the expenditure on it ?

- (a) Decrease by 10% (b) Decrease by 5%
 (c) Increase by 5% (d) Increase by 10%

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Price $\rightarrow 5 : 6$

Consumption $\rightarrow 12 : 11$

$\therefore \text{Expenditure} = \text{Price} \times \text{Consumption}$

$\therefore \text{Expenditure} \rightarrow 60 : 66$
 $= 10 : 11$

$$\% \text{ Increase in expenditure} = \frac{1}{10} \times 100 = 10\%$$

140. Basir's working hours per day were increased by 15% and his wages per hour were increased by 20%. By how much percent did his daily earnings increase ?

- (a) 36 (b) 35
 (c) 38 (d) 40

SSC CGL (Tier-II) 13-09-2019

Ans. (c) :

Percentage increase in daily income

$$= 15 + 20 + \frac{15 \times 20}{100} = 38\%$$

141. A number is first increased by 16% and then increased by 14%. The number, so obtained, is now decreased by 30%. What is the net increase or decrease percent in the original number (nearest to an integer)?

- (a) 9% decrease (b) No increase or decrease
 (c) 7% decrease (d) 6% increase

SSC CGL (Tier-II) 11-9-2019

Ans. (c) Let initial number = 100

According to the question-

$$\text{Last number} = 100 \times \frac{116}{100} \times \frac{114}{100} \times \frac{70}{100}$$

$$= 92.568$$

$$(\text{decrease})\% = \frac{(100 - 92.568)}{100} \times 100 = 7.432 \approx 7\%$$

142. Raghav spends 80% of his income. If his income increases by 12% and the savings decrease by 10%, then what will be the percentage increase in his expenditure ?

- (a) 17.5 (b) 22
 (c) 16 (d) 20.5

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : Let Income of Raghav = ₹100

	Income	Expenditure	Saving
Initial	100	80	20
later	112	94	18

Increase in expenditure

$$\% = \frac{(94 - 80)}{80} \times 100 = \frac{14 \times 5}{4} = \frac{70}{4} = 17.5\%$$

143. A's salary is 35% more than B's salary. How much percent is B's salary less than that of A's? (correct to the nearest integer)
- (a) 26% (b) 20%
(c) 17.5% (d) 35%

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : Percentage reduction of B's Salary as compared to A.

$$= \left(\frac{35}{100+35} \right) \times 100$$

$$= \left(\frac{35}{135} \right) \times 100$$

$$= 25.9\%$$

$$\approx 26\%$$

144. A number is first increased by 40% and then decreased by 25%, again increased by 15% and then decreased by 20%. What is the net increase/decrease percent in the number
- (a) 7.2% decrease (b) 6.4% increase
(c) 3.4% increase (d) 3.4% decrease

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Let initial number = 100

$$\therefore \text{Last number} = 100 \times \frac{140}{100} \times \frac{75}{100} \times \frac{115}{100} \times \frac{80}{100}$$

$$= 96.6$$

$$\text{Intended decrease \%} = 100 - 96.6 = 3.4\%$$

145. If A's salary is 60% more than B's salary, then by what percentage is B's salary less than that of A?
- (a) 47.7% (b) 37.5%
(c) 33.3% (d) 45%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) : Let salary of B = ₹100

Let A's Salary is 60% more than B's.

$$\frac{100+60}{100} \times 100 = 160$$

$$\text{Percentage of B} = \frac{160-100}{160} \times 100$$

$$= \frac{60}{16} \times 100$$

$$= \frac{75}{2} = 37.5\%$$

Hence B's salary is 37.5% less than A's salary.

146. A is 75% less than B and C is 75% of the difference between A and B. C is what percentage more than A?
- (a) 100 (b) 125
(c) 75 (d) 90

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) Let B = 16

$$\therefore A:B:C = 4:16:9$$

$$\text{Required increase \%} = \frac{5}{4} \times 100 = 125\%$$

147. If A's salary is 30% more than B's salary, then by what percentage is B's salary less than that of A? (correct to one decimal place)
- (a) 25% (b) 19.7%
(c) 17.5% (d) 23.1%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : \because A's salary is 30% more than B's salary.

\therefore Percentage decrease in B's salary =

$$\left(\frac{30}{100+30} \right) \times 100$$

$$= \frac{300}{13} \%$$

$$= 23.07\%, \approx 23.1\%$$

148. A number is decreased by 30% then increased by 30% the further decreased by 10%. What is the net increase or decrease percent in the number? (Correct to the nearest integer)
- (a) Decrease of 19% (b) Decrease of 18%
(c) Increase 19% (d) Increase 18%

SSC CHSL (Tier-I) 04/07/2019 (Shift-III)

Ans. (b) : Let the number be = 100

According to the question,

$$\text{New number} = 100 \times \frac{70}{100} \times \frac{130}{100} \times \frac{90}{100}$$

$$\text{New number} = 81.9$$

$$\text{Decrease \%} = 100 - 81.9$$

$$\text{Decrease \%} = 18.1 \approx 18\%$$

149. A number is increased by 30% then decreased by 25% then further increased by 25%. What is the net increase/decrease in the number? (Correct to the nearest integer)
- (a) Increase 21% (b) Increase 22%
(c) Decrease 22% (d) Decrease 21%

SSC CHSL 04/07/2019 (Shift-II)

Ans. (b) : Let number = 100x

According to the question,

$$\text{After obtain number} = 100x \times \frac{130}{100} \times \frac{75}{100} \times \frac{125}{100} = \frac{975x}{8}$$

$$\text{Increase} = \frac{975x}{8} - 100x = \frac{175x}{8}$$

$$\text{Required increase \%} = \frac{175x}{8} \times \frac{1}{100x} \times 100 = 21.87$$

$$\approx 22$$

150. A number is increased by 30% then decreased by 30% then further decreased by 30%. What is the net decrease or increase percent in the number? (Correct to the nearest integer)
- (a) Decrease of 36% (b) Increase of 40%
(c) Increase of 36% (d) Decrease of 40%

SSC CHSL 05/07/2019 (Shift-II)

Ans. (a) : Let the number = 100

According to the question,

$$\text{New Number} = 100 \times \frac{130}{100} \times \frac{70}{100} \times \frac{70}{100} = 63.7$$

$$\text{Decrease \%} = 100 - 63.7$$

$$= 36.3 \approx 36\%$$

151. A number is decreased by 30% then increased by 30% then further increased by 30%. What is the net decrease or increase percent in the number? (Correct to the nearest integer)

- (a) Decrease of 18% (b) Decrease of 19%
(c) Increase of 18% (d) Increase of 19%

SSC CHSL (Tier-I) 05/07/2019 (Shift-I)

Ans. (c) : Let number be 100

According to the question,

$$100 \times \left(\frac{100-30}{100}\right) \left(\frac{100+30}{100}\right) \left(\frac{100+30}{100}\right)$$

$$= 100 \times \frac{70}{100} \times \frac{130}{100} \times \frac{130}{100}$$

$$= \frac{7 \times 13 \times 13}{10}$$

$$= 118.3$$

The resultant number is greater than the original number so there is an increase.

$$\therefore \text{Percentage increase} = \frac{118.3-100}{100} \times 100$$

$$= 18.3\% \approx 18\%$$

152. If the numerator of a fraction is increased by 15% and denominator is decreased by 20%, then the fraction, so obtained, is $\frac{17}{65}$. What is the original fraction?

- (a) $\frac{272}{1495}$ (b) $\frac{267}{1495}$
(c) $\frac{281}{1495}$ (d) $\frac{278}{1495}$

SSC CHSL -16/10/2020 (Shift-III)

Ans. (a) : Let Original fraction = $\frac{p}{q}$

According to the question,

$$\frac{p \times 115}{q \times 80} = \frac{17}{65}$$

$$\frac{p \times 115}{q \times 80} = \frac{17}{65}$$

$$\frac{p}{q} = \frac{17}{65} \times \frac{80}{115}$$

$$\frac{p}{q} = \frac{272}{1495}$$

153. A number is increased first by 20% and then it is decreased by 10%. What is the percentage change in the number?

- (a) 8% decrease (b) 10% decrease
(c) 10% increase (d) 8% increase

SSC MTS 10-10-2017 (Shift-III)

Ans. (d) : Let number = 100

Increase by 20%

$$\text{Number} = \frac{100 \times 120}{100} = 120$$

Now decrease by 10%

$$\text{Number} = \frac{120 \times 90}{100} = 108$$

$$\text{Change in number} = 108 - 100 = 8$$

$$\text{Percentage increase} = \frac{8}{100} \times 100 = 8\%$$

OR

$$\text{Respectively percentage change} = \pm x \pm y \pm \frac{xy}{100}$$

$$= 20 - 10 - \frac{20 \times 10}{100}$$

$$= 20 - 12 = 8\%$$

Hence there will be an increase of 8%.

154. A is 15% more than B. How much in percent B is less than A?

(Two places of decimal)

- (a) 9.17% (b) 16.14%
(c) 13.04% (d) 6.14%

SSC MTS 06/08/2019 (Shift-I)

Ans. (c): A B

$$115 \quad 100$$

$$\Rightarrow \frac{(A-B)}{A} \times 100$$

$$\Rightarrow \frac{15}{115} \times 100 = 13.04\%$$

155. Manish's salary is half of Ravi's salary. Ravi's salary is how much percentage more than Manish's Salary?

- (a) 100% (b) 25%
(c) 50% (d) 75%

SSC MTS 08/08/2019 (Shift-II)

Ans. (a) : Ravi : Manish = 2 : 1

$$\text{Required \%} = \frac{2-1}{1} \times 100$$

$$= \frac{1}{1} \times 100$$

$$= 100\%$$

156. The length and the breadth of a cuboid are increased by 10% each, whereas the height is reduced by 10%. By how much did the volume changes?

- (a) 10 decrease (b) 8.9 increase
(c) 8.9 decrease (d) 10% increase

SSC MTS 16/08/2019 (Shift-I)

Ans. (b): Let the length, breadth, height of cuboid = 10 cm, 10 cm and 10 cm.

$$\text{Length} \times \text{breadth} \times \text{height} = \text{volume}$$

$$\text{Increasing} = 10 \times 10 \times 10 = 1000$$

$$\begin{array}{ccc} \downarrow +10\% & \downarrow +10\% & \downarrow -10\% \\ \text{On change} = 11 & \times 11 & \times 9 = 1089 \end{array}$$

$$\text{Increasing\%} = \frac{1089-1000}{1000} \times 100 = \frac{89}{10} = 8.9\%$$

157. Sanjay scored 75 out of 150 marks in his mid-term exam and 105 out of 150 in his annual exam. The percentage increase in his marks is:
 (a) 30% (b) 45%
 (c) 50% (d) 40%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : Number obtained by Sanjay in half yearly examination = 75
 Number obtained by Sanjay in annual examination = 105

∴ Percentage increase in Sanjay's number

$$= \frac{105 - 75}{75} \times 100$$

$$= \frac{30}{75} \times 100$$

$$= 40\%$$

158. If the area of the base of a cone is increased then it becomes 1.96 times of original area. then the area is increased by:

- (a) 141% (b) 40%
 (c) 96% (d) 100%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : Area of first cone = 1cm^2
 Area of second cone = 1.96cm^2

∴ Percentage increase in area of cone = $\frac{1.96 - 1}{1} \times 100$

$$= \frac{0.96}{1} \times 100 = 96\%$$

159. Three numbers A, B and C are in the ratio of 2 : 3 : 5. If each number is increased by 20%, 40% and 60% respectively, then what will be the new ratio?

- (a) 12 : 17 : 35 (b) 12 : 21 : 40
 (c) 13 : 21 : 33 (d) 15 : 21 : 40

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (b) :

Let the numbers be 20, 30 & 50 respectively.

∴ New ratio = $20 \times \frac{120}{100} : 30 \times \frac{140}{100} : 50 \times \frac{160}{100}$

$$= 24 : 42 : 80$$

$$= 12 : 21 : 40$$

(III) Problems based on Percentage Change in Area and Volume

160. The Length and the breadth of a rectangle are made to increase and decrease respectively, by 8% and 10%. What is the percentage increase or decrease in its area?

- (a) Decrease by 1.8% (b) Increase by 1.8%
 (c) Increase by 2.8% (d) Decrease by 2.8%

SSC CGL (Tier-I) 11/04/2022 (Shift-II)

Ans. (d) Required percentage = $8 - 10 - \frac{8 \times 10}{100}$

$$= -2 - 0.8$$

$$= -2.8\%$$

Decrease = 2.8%

161. The radius of a spherical balloon is inflated from 7cm to 10.5 cm. The percentage increase in its surface area is:

- (a) 150% (b) 125%
 (c) 120% (d) 135%

SSC CGL (Tier-II) 03/02/2022

Ans : (b)



Required percentage = $\frac{3.5}{7} \times 100$

$$= 50\%$$

Percentage increase in surface area = $50\% + 50\% + \frac{50 \times 50}{100}\%$

$$= 125\%$$

162. The radius of a spherical balloon is inflated from 3.5 cm to 4.9 cm by pushing air into it. What is the percentage increase in the volume of the original balloon?

- (a) 173.6% (b) 174.4%
 (c) 74.4% (d) 73.6%

SSC CGL (Tier-II) 29/01/2022

Ans : (b) Volume of sphere = $\frac{4}{3} \pi r^3$

$\Rightarrow V \propto r^3$

$(3.5)^3 : (4.9)^3$

$3.5 \times 3.5 \times 3.5 = 4.9 \times 4.9 \times 4.9$

125 : 343

Percentage increase = $\frac{218}{125} \times 100$

= 174.4%

163. If the radius of a cylinder is decreased by 20% and the height is increased by 20% to form a new cylinder, then the volume will be decreased by:

- (a) 20.5% (b) 32.2%
 (c) 23.2% (d) 22.3%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : -20%, -20%, 20%

Percentage change in volume.

$$= x + y + z + \frac{xy + yz + zx}{100} + \frac{xyz}{(100)^2}$$

$$= -20 - 20 + 20 + \frac{400 - 400 - 400}{100} + \frac{8000}{10000}$$

$$= -20 - 4 + 0.8 = 23.2\%$$

(+) sign indicates an increase while the (-) sign indicates decrease.

164. If the length of a rectangle increases by 50% and the breadth decreases by 25%, then what will be the percent increase in its area?

- (a) 15% (b) 17.5%
 (c) 12.5% (d) 25%

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : Increase area of rectangle =

$$= \left(50 - 25 - \frac{50 \times 25}{100} \right) \%$$

$$= (25 - 12.5) \%$$

$$= 12.5 \%$$

165. If each side of a rectangle is decreased by 11%, then its area will decrease by :

- (a) 20.79% (b) 24.31%
(c) 25% (d) 21.13%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : Let length of rectangle = ℓ
Breadth of rectangle = b
Area of rectangle = $\ell \times b$
According to the question, there are 11% decrease in the length and breadth of rectangle
Hence, Formula $-x - y + \frac{xy}{100}$

$$= -11 - 11 + \frac{11 \times 11}{100}$$

$$= -22 + 1.21 = -20.79$$

Hence the area of rectangle decreased by 20.79%

166. If the radius of a cylinder is decreased by 40% and the height is increased by 60% to form a new cylinder, then the volume will be decreased by:

- (a) 41.5% (b) 32.4%
(c) 40.5% (d) 42.4%

SSC MTS 06/10/2021 (Shift-I)

Ans. (d) : According to the question,
Increase or Decrease % = $\pm x \pm y \pm \frac{xy}{100}$
On reducing 40% radius

$$\Rightarrow -40 - 40 + \frac{40 \times 40}{100} \quad \left(\begin{array}{l} - = \text{Decreased} \\ + = \text{Increased} \end{array} \right)$$

$$\Rightarrow -80 + 16 = -64$$

At 60% increase in height

$$= -64 + 60 - \frac{64 \times 60}{100}$$

$$= -4 - \frac{192}{5}$$

$$= -42.4 \%$$

Hence, volume will be decreased by -42.4%

167. If the radius of a circle is increased by 19%, they by what percentage will its area increase?

- (a) 27.89% (b) 32.85%
(c) 11.91% (d) 41.61%

SSC MTS 26/10/2021 (Shift-I)

Ans. (d) : According to the question,

$$\text{Increase \%} = x + y + \frac{xy}{100}$$

$$= 19 + 19 + \frac{19 \times 19}{100}$$

$$= 38 + \frac{361}{100}$$

$$= 38 + 3.61$$

$$= 41.61 \%$$

168. If the length of a rectangle is increased by 80%, what would be the percentage decrease (correct to one place of decimal) in the width to maintain the same area?

- (a) 44.4% (b) 42.5%
(c) 40.2% (d) 43.5%

SSC MTS 26/10/2021 (Shift-I)

Ans. (a) : According to the question,

$$\text{Required \% decrease in width} = \frac{x}{100 + x} \times 100$$

$$= \frac{80}{180} \times 100$$

$$= \frac{4}{9} \times 100$$

$$= \frac{400}{9} = 44.4 \%$$

169. If the length of a rectangle is increased by 12% and the breadth is decreased by 10%, then the ratio of the areas of the original rectangle and the changed rectangle is:

- (a) 125 : 126 (b) 126 : 125
(c) 1 : 2 (d) 25 : 26

SSC MTS 27/10/2021 (Shift-I)

Ans. (a) : Let the length and breadth of rectangle = 100 units each.
Area of original rectangle = $100 \times 100 = 10000$
According to the question,
On increasing the length of rectangle by 12%, then new length = 112
And on decreasing the breadth of rectangle by 10% then new breadth = 90
Area of changed rectangle = $112 \times 90 = 10080$
Area of original rectangle : Area of changed rectangle
10000 : 10080
125 : 126

170. If the length of a rectangle is increased by 40%, and the breadth is decreased by 20%, then the area of the rectangle increases by x%. Then the value of x is:

- (a) 20 (b) 12
(c) 16 (d) 8

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-I)

Ans. (b) :

$$\text{Increase in area of rectangle (x)} = 40 - 20 - \frac{40 \times 20}{100}$$

$$x = 12 \%$$

171. If the radius of a right circular cylinder is decreased by 10%, and the height is increased by 20%, then the percentage increase/decrease in its volume is:

- (a) 2.8% Increase (b) 1.8% Increase
(c) 1.8% Loss (d) 2.8% Loss

SSC CGL (Tier-I)-2019 - 05/03/2020 (Shift-II)

Ans. (d) : Volume of cylinder = $\pi r^2 h$
 Equivalent percentage = $x + y + z + \frac{xy + yz + zx}{100} + \frac{xyz}{(100)^2}$
 Percentage change in volume =
 $-10 - 10 + 20 + \frac{100 - 200 - 200}{100} + \frac{2000}{10000}$
 $= -3 + 0.2 = -2.8\%$
 Hence, Percentage decrease in volume = 2.8%

172. If radius of a circle is decreased by 11%, then the total decrease in the area of the circle is given as:

- (a) 20.79% (b) 19.50%
 (c) 20.50% (d) 21%

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (a) : Percentage decrease in area%
 $= -11 - 11 + \frac{121}{100}$
 $= -22 + 1.21 = -20.79$
 Where (-decrease)

173. If each side of a square is decreased by 17%, then by what percentage does its area decrease?

- (a) 31.11% (b) 25%
 (c) 30.79% (d) 44.31%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : Given
 Percentage decrease in each side of a square = 17%
 Hence percentage decrease in area of square
 $= -17 - 17 + \frac{17 \times 17}{100}$
 $= -34 + 2.89$
 $= -31.11\%$
 Hence percentage decrease in area = 31.11%

174. Each side of a rectangular field is increased by 10%. Then the percentage increase in the area of the field is:

- (a) 21% (b) 10%
 (c) 15% (d) 18%

SSC CHSL –19/03/2020 (Shift-III)

Ans. (a) : Percentage increase in the area of the field =
 From Formula $\left[\left(x + y + \frac{xy}{100} \right) \% \right]$
 $\left(10 + 10 + \frac{10 \times 10}{100} \right) \%$
 $= (20 + 1) \% = 21\%$

175. If the length of a rectangle is increased by 12% and the breadth is decreased by 8%, the net effect on the area is:

- (a) decrease by/3.04% (b) decrease by/2.6%
 (c) increase by/3.04% (d) increase by/2.6%

SSC CHSL –18/03/2020 (Shift-I)

Ans. (c) : Required % = $\left(x - y - \frac{xy}{100} \right)$
 $= 12 - 8 - \frac{12 \times 8}{100}$
 $= 4 - 0.96$
 $= 3.04$
 \therefore Net effect on the area = 3.04% Increase

176. If the radius of a perpendicular circular cone is decreased by 10% and its height is increased by 40% then what is the percentage increase or decrease in its volume?

- (a) 13.4% Decrease (b) 1.34% Decrease
 (c) 1.34% Increase (d) 13.4% Increase

SSC MTS 20/08/2019 (Shift-I)

Ans. (d) : Radius of cone (r) = 10% h = 40%
 Radius of cone = $\left(-2r - \frac{r^2}{100} \right)$
 $= \left(2 \times 10 - \frac{(-10)^2}{100} \right)$
 $= -20 + \frac{100}{100} = -19$
 $= -x + y - \frac{xy}{100}$
 $= -19 + 40 - \frac{19 \times 40}{100}$
 $= 21 - \frac{38}{5}$
 Increase% = 21 - 7.6 + 13.4%

177. If the diameter of a circle increases by 15%, then what will be the percentage increase in its area?

- (a) 35.75% (b) 30.3%
 (c) 25% (d) 32.25%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : \therefore 15% increase in diameter
 \therefore 15% increase in radius also will be.
 Percentage increase in area % = $\left(x + y + \frac{xy}{100} \right) \%$
 $= 15 + 15 + \frac{225}{100}$
 $= 32.25\%$

178. If the side of a square increases by 20%, then what will be percent increase in its perimeter?

- (a) 44% (b) 20%
 (c) 80% (d) 40%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (b) : If the side of a square is increased by 20% then its perimeter also increase by 20%.

179. The length of a rectangle is increased by 10% and the breadth is increased by 25%. What is the percentage change in its area?

- (a) Decrease of 37.5% (b) Decrease of 25%
 (c) Increase of 25% (d) Increase of 37.5%

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) ∴ Change percentage = $\left(x + y + \frac{xy}{100}\right)$

Where increase in both x and y
 ∴ Percentage change in area

$$= \left(10 + 25 + \frac{10 \times 25}{100}\right)$$

$$= 35 + \frac{5}{2} = 35 + 2.5$$

$$= 37.5\% \text{ Increase}$$

(IV) Problems based on Population

180. The population of a city increased by 30% in the first year and decreased by 15% in the next year. If the present population is 11,050 then the population 2 years ago was:

- (a) 10,050 (b) 99,000
 (c) 10,000 (d) 99,500

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (c) : Let 2 years ago population is P.

$$A = P \left(1 + \frac{R_1}{100}\right) \left(1 - \frac{R_2}{100}\right)$$

$$11050 = P \left(1 + \frac{30}{100}\right) \left(1 - \frac{15}{100}\right)$$

$$11050 = P \times \frac{13}{10} \times \frac{17}{20}$$

$$P = 50 \times 10 \times 20 = 10000$$

181. The population of town B is 300% more than that of town A. For the next two years, the population of A increases by x% per year and that of B decreases by the same percentage per year. After 2 years, if the population of A and B become equal, then the value of x is ____.

- (a) 40 (b) 30 $\frac{2}{3}$
 (c) 25 (d) 33 $\frac{1}{3}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) Let the population of town A = 100

Then, Population of town B = $100 + 100 \times \frac{300}{100} = 400$

According to the question,

$$100 \times \frac{(100+x)}{100} \times \frac{(100+x)}{100} = 400 \times \frac{(100-x)}{100} \times \frac{(100-x)}{100}$$

$$(100+x)^2 = 2^2 (100-x)^2$$

$$100+x = 2(100-x)$$

$$100+x = 200-2x$$

$$3x = 200-100 = 100$$

$$x = 33\frac{1}{3}\%$$

182. The sum of the number of male and female students in an institute is 100. If the number of male students is x, then the number of female students becomes x% of the total number of students. Find the number of male students.

- (a) 65 (b) 45
 (c) 50 (d) 60

SSC CHSL –18/03/2020 (Shift-II)

Ans. (c) : Number of total student = 100

Number of student = x

According to the question,

Number of female students = $100 \times \frac{x}{100} = x$

∴ x + x = 100 ⇒ x = 50

Hence, number of students = 50

183. One year ago the population of village was 72,000. Due to migration this decreases to 8% per year. What is the present population?

- (a) 68138 (b) 60940
 (c) 66240 (d) 61098

SSC MTS 20/08/2019 (Shift-III)

Ans. (c) : Let present population = P

$$= 72000 \left(1 - \frac{8}{100}\right)$$

$$= 72000 \left(1 - \frac{2}{25}\right)$$

$$= 72000 \left(\frac{23}{25}\right)$$

$$= 66240$$

184. The population of a town increases at the rate of 15% per annum. If the present population is 108445 of town, then what was the population 2 years ago?

- (a) 72000 (b) 79000
 (c) 82000 (d) 85000

SSC MTS 9-10-2017 (Shift-I)

Ans : (c) Let 2 years ago population is P.

Formula $A = P \left(1 + \frac{R}{100}\right)^t$

$$108445 = P \left(1 + \frac{15}{100}\right)^2$$

$$P = 108445 \left(\frac{100}{115}\right)^2$$

$$P = 108445 \times \frac{20}{23} \times \frac{20}{23}$$

$$P = 82,000$$

185. The population of a town is increased by 15% in the first year and 8% in the second year, but decreased by 12 $\frac{1}{2}$ % in the third year. If the population at the end of the third year is 26,082, find the original population of town.

- (a) 24,000 (b) 28,000
 (c) 25,000 (d) 30,000

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (a) : Let, the original population of the city = x

According to the question,

$$x \times \frac{115}{100} \times \frac{108}{100} \times \frac{87.5}{100} = 26082$$

$$x \times \frac{23}{20} \times \frac{27}{25} \times \frac{7}{8} = 26082$$

$$x = \frac{26082 \times 400}{4347} = 24000$$

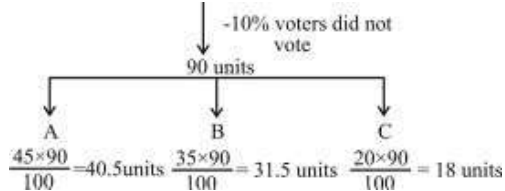
(V) Problems based on Election

186. In an election, there were three candidates: A, B and C. 10% of the eligible voters did not vote. Out of those who voted, 45% voted for A, 35% voted for B and the remaining 20% voted for C. 30% of the votes polled for A and 20% of the votes polled for B were later deemed invalid, while all the votes polled for C were deemed valid. If A got 882 more valid votes than B did, how many valid votes did C receive?

- (a) 5020 (b) 5040
(c) 5050 (d) 5060

SSC CHSL 27/05/2022 (Shift- II)

Ans. (b) : Let total voters = 100 units



According to the question:-

Total valid votes of A – Total valid votes of B = 882

$$\frac{40.5 \times (100 - 30)}{100} - \frac{31.5 \times (100 - 20)}{100} = 882$$

$$28.35 - 25.20 = 882$$

$$3.15 \text{ units} = 882$$

$$1 \text{ unit} = 280$$

$$\therefore \text{Total valid votes received by C} = 18 \text{ units} = 18 \times 280$$

$$\Rightarrow \boxed{5040}$$

187. In an election between two candidates, 5% of the registered voters did cast their vote. 10% of the votes were found to be either invalid or of NOTA. The winning candidate received 60% votes in his favour and won the election by 17271 votes. Find the number of registered voters.

- (a) 90525 (b) 100000
(c) 101000 (d) 102500

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (c) Let, number of registered voters = x

According to the question,

Winner = 60%

Losser = 40%

$$\therefore x \times \frac{95}{100} \times \frac{90}{100} \times \left(\frac{60}{100} - \frac{40}{100} \right) = 17271$$

$$\Rightarrow x \times \frac{95}{100} \times \frac{90}{100} \times \frac{20}{100} = 17271$$

$$\Rightarrow x \times \frac{95}{100} \times \frac{9}{10} \times \frac{1}{5} = 17271$$

$$\Rightarrow x = \frac{909 \times 1000}{9}$$

$$\therefore \boxed{x = 101000}$$

Hence, option (c) is correct.

188. In an election, the votes cast for two candidates were in the ratio 4 : 9. If the successful candidate received 984321 votes, then the total polled were:

- (a) 1712597 (b) 1421797
(c) 1912577 (d) 1571279

SSC MTS 13/10/2021 (Shift-I)

Ans. (b) : Let the vote received by first candidate = 4x

Vote received by second candidate = 9x

According to the question,

$$9x = 984321$$

$$x = 109369$$

$$\text{Number of total votes} = 4x + 9x$$

$$= 13x$$

$$= 13 \times 109369$$

$$= 1421797$$

189. 16% of the voters did not cast their votes in an election between two candidates. 10% of the votes polled were found to be invalid. The successful candidate got 60% of valid votes and won by a margin of 567 votes. The number of voters enrolled in the voter list is

- (a) 3000 (b) 3750
(c) 2500 (d) 3570

SSC MTS 27/10/2021 (Shift-I)

Ans. (b) : Let total votes = x

According to the question,

$$x \times \frac{84}{100} \times \frac{90}{100} \left(\frac{60}{100} - \frac{40}{100} \right) = 567$$

$$x \times \frac{84}{100} \times \frac{90}{100} \left(\frac{20}{100} \right) = 567$$

$$x = 25 \times 50 \times 3$$

$$x = 3750$$

190. Chamanlal, Arshad and Jagit Singh contested an election. All the votes polled were valid. Arshad got 35% of the total votes. For every 35 votes Chamanlal got 14 votes. The winner got 4950 more votes than the person who received the least number of votes. Find the total number of votes polled.

- (a) 99000 (b) 33000
(c) 13378 (d) 38000

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (b) : Let, total number of votes polled = A

$$\text{Arshad got votes} = A \times 35\% = A \times \frac{35}{100} = \frac{7A}{20}$$

$$\text{Chamanlal got votes} = \frac{A}{35} \times 14 = \frac{2A}{5}$$

$$\therefore \text{Jagit Singh got votes} = A - \left(\frac{7A}{20} + \frac{2A}{5} \right)$$

$$= \frac{A}{4}$$

So, Jagit got least number of votes and Chamanlal got maximum number of votes.

Then,

$$\frac{2A}{5} = \frac{A}{4} + 4950$$

$$\Rightarrow \frac{2A}{5} = \frac{A + 19800}{4}$$

$$\Rightarrow 8A = 5A + 99000$$

$$\Rightarrow 3A = 99000$$

$$\therefore A = 33000$$

Hence, total number of votes polled = 33000

- 191.** In the consistency 55% of the total number of voters are males and the rest are females. If 40% of the males are illiterate and 60% of the females are illiterate, then by what percentage is the number of illiterate females more than that of the illiterate males (correct to one decimal place)?

- (a) 22.7% (b) 16.4%
(c) 21.5% (d) 20.8%

SSC CHSL 04/08/2021 (Shift-III)

Ans. (a) :

Let the total numbers of votes = 100

Number of males = 55

Number of females = 45

According to the question,

$$\text{Number of illiterate males} = 55 \times \frac{40}{100} = 22$$

$$\text{Number of illiterate females} = 45 \times \frac{60}{100} = 27$$

$$\text{Required \%} = \frac{5}{22} \times 100 = 22.72\%$$

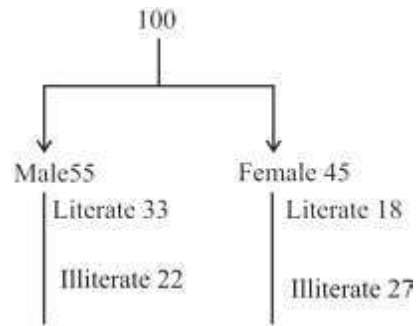
- 192.** In a constituency, 55% of the total number of voters are males and the rest are females. If 40% of the males are illiterate and 40% of the females are literate, then by what percent is the number of literate males more than that of illiterate females?

- (a) $18\frac{2}{9}$ (b) $18\frac{2}{11}$
(c) $22\frac{2}{9}$ (d) $22\frac{9}{11}$

SSC CGL (Tier-II) 11-9-2019

Ans. (c) :

Let, Total number of voters = 100



$$\text{Required \%} = \frac{6}{27} \times 100 = 22\frac{2}{9}\%$$

- 193.** Elections were held in a society to elect a chairman. There were only two candidates A and B. Candidate B got 25% less votes than candidate A. The number of members who did not cast the vote was same as the number of votes that candidate B got. By how many votes did A win if the society had 20,000 members.

- (a) 6000 (b) 4000
(c) 8000 (d) 2000

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Let A got x votes.

B got $\frac{3x}{4}$ Vote.

Number of members who did not vote = $\frac{3x}{4}$

$$\therefore x + \frac{3x}{4} + \frac{3x}{4} = 20000$$

$$x + \frac{3x}{2} = 20000$$

$$\frac{5x}{2} = 20000$$

$$x = 8000$$

Obtained vote of B = 6000

Hence, A won by 2000 votes.

- 194.** In an election, candidate X got 70% of the overall valid votes. If 20% of the overall votes were declared invalid and the total numbers of votes is 640000, then find the number of valid votes polled in favour of the candidate.

- (a) 358400 (b) 400000
(c) 450000 (d) 358000

SSC CHSL -18/03/2020 (Shift-III)

Ans. (a): Total valid votes polled by candidate X.

$$= 640000 \times \frac{80}{100} \times \frac{70}{100}$$

$$= 358400$$

(VI) Problems based on Income, Expenditure and Savings

195. A person saves $33\frac{1}{3}\%$ of his income. If the saving increases by 22% and the expenditure increases by 10%, then the percentage increase in his income is:
- (a) 18% (b) 14%
(c) 16% (d) 22%

SSC CGL (Tier-II) 03/02/2022

Ans. (b) Let total income of a person is = ₹300.

Income	=	Expenditure	+	Savings
300	=	200	+	100
		+10%		+22%
342	=	220	+	122

Percentage increase in income = $\frac{42}{300} \times 100 = 14\%$

196. Radha saves x% of her income. If her income increases by 28% and the expenditure increases by 20%, then her savings increase by 40%. What is the value of x?
- (a) 35 (b) 40
(c) 50 (d) 25

SSC CGL-(Tier-I) 2308/2021 (Shift I)

Ans. (b) : Let, Radha's income is 100.
Income = Expenditure + Savings
 $100 = 100 - x + x$
According to the question,
 $128 = (100 - x) \times \frac{120}{100} + \frac{x \times 140}{100}$
 $128 = (100 - x) \times \frac{6}{5} + \frac{x \times 7}{5}$
 $128 = \frac{600 - 6x}{5} + \frac{7x}{5}$
 $640 = 7x - 6x + 600$
 $x = 640 - 600$
 $x = 40$

197. A person saves 25% of his income. If his income increases by 20% and his saving remains the same, then what will be the increased percentage of his expenditure?
- (a) 20 (b) 26
(c) 30 (d) $26\frac{2}{3}$

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) : Let Income = ₹100
Income = Expenditure + Savings
 $100 = 75 + 25$
 $+20\% \downarrow \quad \downarrow +20$
 $120 = 95 + 25$

Increased percentage of his expenditure = $\frac{20}{75} \times 100$
 $= 26\frac{2}{3}\%$

198. The expenditure on food is 35% of the income of a particular family. If the income is raised by 30%, then how much percentage (to the nearest whole number) of food expenditure is less than the initial percentage to keep the food expenditure unchanged?
- (a) 2 (b) 23
(c) 17 (d) 20

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : ∵ Initial expenditure = 35%
Income = Expenditure + Savings
 $100 = 35 + 65$
If income is increased by 30% and food expenditure is unchanged, $130 = 35 + 95$
Final expenditure % = $\frac{35}{130} \times 100 = 27\%$
Required percentage = $\frac{35 - 27}{35} \times 100 = 23\%$

199. Renu spends 68% of her income. When her income increases by 40%, she increases her expenditure by 30%. Her savings are increased by:
- (a) 37.98% (b) 62.5%
(c) 51.6% (d) 61.25%

SSC CHSL 12/08/2021 (Shift-I)

Ans. (d) : Income = Expenditure + Savings
Let → $100 = 68 + 32$
 $\downarrow +40\% \quad \downarrow +30\%$
 $140 = 88.4 + 51.6$
 $\frac{51.6 - 32}{32} \times 100 = \frac{19.6}{32} \times 100 = 61.25\%$ increased

200. Mohan's income is 40% more than Shyam's income. Shyam's income is what percentage less than Mohan's income?
- (a) $28\frac{2}{7}\%$ (b) $28\frac{5}{7}\%$
(c) $28\frac{3}{7}\%$ (d) $28\frac{4}{7}\%$

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) : Mohan : Shyam = 7 : 5 (income)
According to the question,
Required less percentage = $\frac{2}{7} \times 100\%$
 $= 28\frac{4}{7}\%$

201. Savita spends 20% of her monthly income on groceries, 15% of the remaining on rent and then 60% of the left over on children's education and others. If she saves ₹9,792 a month, then how much (in ₹) does she spend on rent?
- (a) 3,960 (b) 4,320
(c) 4,450 (d) 4,200

SSC CHSL 19/08/2021 (Shift-II)

Ans. (b) : Let Savita's income = 100x

According to the question,

$$\text{Spent on groceries by Savita} = 100 \times \frac{20}{100} = 20x$$

$$\text{Spent on rent by Savita} = 80x \times \frac{15}{100} = 12x$$

$$\begin{aligned} \text{Spent on children's education and others} \\ = 68x \times \frac{60}{100} = 40.8x \end{aligned}$$

$$\begin{aligned} \text{Savings} &= (100 - 20 - 12 - 40.8)x \\ &= 27.2x \end{aligned}$$

$$\therefore 27.2x = 9792 \text{ (given)}$$

$$x = 360$$

$$\text{Spent on rent by Savita (12x)} = 12 \times 360 = 4320$$

202. Ramesh saves $26\frac{2}{3}\%$ of his monthly salary.

When his expenses are increased by 20%, he is able to save ₹4,080 per month. His monthly salary is:

- (a) ₹ 35,000 (b) ₹ 38,000
(c) ₹ 34,000 (d) ₹ 30,000

SSC CHSL 09/082021 (Shift-II)

Ans. (c) : Let the monthly salary of Ramesh = 100x

$$\text{Savings} = 100 \times \frac{80}{3} \times \frac{1}{100} = \frac{80}{3}x$$

$$\text{Expenditure} = 100 - \frac{80}{3} = \frac{220}{3}x$$

After increasing 20% then expenditure

$$= \frac{220x}{3} \times \frac{120}{100} = 88x$$

$$\text{Then savings} = 100 - 88 = 12x$$

$$12x = 4080$$

$$x = 340$$

$$100x = 100 \times 340 = ₹34000$$

Hence, monthly salary of Ramesh = ₹34000

203. If A's income is 60% less than B's income, then B's income is what percentage more than that of A's income?

- (a) 150% (b) 80%
(c) 120% (d) 40%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let Income of B = 100%

$$\therefore \text{Income of A} = 40\%$$

$$\text{Percentage Required} = \frac{100 - 40}{40} \times 100$$

$$= 150\%$$

Hence, the Income of B is 150% more than that of A.

204. The income of Raju is 20% more than his expenditure. If his income increases by 60% and his expenditure increases by 70%, then by what percent does his savings increase or decrease?

- (a) It decreases by 2% (b) It decreases by 10%
(c) It increases by 10% (d) It increases by 2%

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (c) :

Let Income of Raju = 120

Expenditure of Raju = 100

Saving = Income – Expenditure

$$\begin{array}{ccc} \text{In Initial} & \Rightarrow & 20 = 120 - 100 \\ & & \begin{array}{cc} +60\% \downarrow & \downarrow +70\% \\ \text{Final Savings} & \Rightarrow & 22 = 192 - 170 \end{array} \end{array}$$

$$\text{Percentage increase in saving of Raju} \% = \frac{22 - 20}{20} \times 100$$

$$= \frac{2}{20} \times 100$$

$$= 10\%$$

205. Sudha saves 15% of her income. If her expenditure increases by 20% and savings increase by 60%, then by what percent has income increased?

- (a) 26 (b) 24
(c) 35 (d) 30

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (a) : Let Income = ₹100

In Initial	Saving	Expenditure
------------	--------	-------------

	15	85
--	----	----

	+60% ↓	↓ +20%
--	--------	--------

In last	24	102
---------	----	-----

$$\text{Income in last} = 24 + 102 = 126$$

$$\text{Percentage increase} = \frac{126 - 100}{100} \times 100 = 26\%$$

206. When the price of an item was reduced by 20%, then its sale increased by x%. If there is an increase of 60% in the receipt of the revenue, then the value of x is:

- (a) 120 (b) 100
(c) 96 (d) 80

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (b) : Let the price of an article be Rs. 100 initially and sale of the article is 100.

$$\therefore \text{Revenue receipt} = 100 \times 100 = 10000 \text{Rs.}$$

$$\text{New revenue} = 80 \times (100 + x)$$

$$10000 \times \frac{160}{100} = 80 \times (100 + x)$$

$$200 = 100 + x$$

$$x = 100$$

207. The income of A is 50% more than that of B. If the income of A is increased by 40% and the income of B is increased by 90%, then the percentage increase in their combined income will be :

- (a) 70 (b) 60
(c) 64 (d) 55

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (b)

Income in initially	A	B
	150	100
	+40% ↓	↓ 90%
Income in last	210	190
∴ Combined income =	150 + 100 = ₹250	
Combined income in later =	210 + 190 = ₹400	
∴ Percentage increase =	$\left(\frac{400-250}{250}\right) \times 100$	
	$= \frac{150}{250} \times 100 = 60\%$	

208. Surbhi spends 75% of her income. If her income increases by 20% and savings decrease by 1%, then the percentage increase in her expenditure is:

- (a) 2.7 (b) 27
(c) 2.2 (d) 22

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (b) : Let

Surbhi's income = 100x Rs.

Expenditure incurred by Surbhi = 75x Rs.

Saving incurred by Surbhi = 100x – 75x
= 25x

New income after increase in 20% = 120x Rs.

New saving after 1% reduction = $25x \times \frac{(100-1)}{100}$

$$= \frac{99x}{4} \text{ ₹.}$$

Hence expenditure = $120x - \frac{99x}{4} = \frac{381x}{4}$

Hence percentage increase in expenditure

$$= \frac{\left(\frac{381x}{4} - 75x\right)}{75x} \times 100$$
$$= \left(\frac{381x - 300x}{4 \times 75x}\right) \times 100$$
$$= \frac{81x}{4 \times 75x} \times 100$$
$$= 27\%$$

209. The price of sugar is increased by 18%. A person wants to increase the expenditure by 12% only. By what percent correct to one decimal place, should he decrease his consumption? (nearest to one decimal places)

- (a) 5.3% (b) 6%
(c) 5.1% (d) 5.6%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (c) : Let the old price of Sugar = 100 Rs.

Old consumption of Sugar = 100 kg

∴ Price × Consumption = Total Price

$$100 \times 100 = 10000$$

According to the question,

$$118 \times x = 10000 \times \frac{112}{100}$$

$$x = \frac{112}{118} \times 100 = 94.9 \text{ kg}$$

$$\therefore \text{Percentage decrease} = 100 - 94.9 = 5.1\%$$

210. The price of sugar is increased by 17%. A person wants to increase his expenditure by 8% only. By what percent should he decrease his consumption, (nearest to one decimal place)?

- (a) 8.3% (b) 7.9%
(c) 8.1% (d) 7.7%

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) :

Let initially consumption = 100 kg and Price is 100

∴ Price × consumption = Total price

Let after Price Increasing the consumption of Sugar x kg.

After increasing the price of sugar and the person expenditure.

$$117 \times x = 10000 \times \frac{108}{100} = 100 \times 108$$

$$x = \frac{100 \times 108}{117} = 92.30$$

$$\therefore \text{Total percent of decrease Sugar consumption}$$
$$= \frac{100 - 92.30}{100} \times 100$$
$$= 7.7\%$$

211. The price of sugar is increased by 22%. A person wants to increase his expenditure by 12% only. By what percent should he decrease his consumption (nearest to one decimal place)?

- (a) 8.2% (b) 10%
(c) 8.6% (d) 7.8%

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (a) : Let the old cost of Sugar is 100 Rs. and the old consumption of Sugar is 100 kg.

∴ Price × Consumption = Total Price

$$100 \times 100 = 10000 \text{ Rs.}$$

Price × Consumption = Total Price

$$122 \times x = 10000 \times \frac{112}{100}$$

$$x = \frac{112}{122} \times 100 = 91.8 \text{ kg}$$

$$\therefore \text{decrease \%} = \frac{100 - 91.8}{100} \times 100 = 8.2\%$$

212. The price of sugar is increased by 24%. A person wants to increase his expenditure by 18% only. By approximately what percent should he decrease his consumption?

- (a) 5.1% (b) 4.8%
(c) 4.6% (d) 5.3%

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (b) : Let the price of sugar in before = 100Rs.

According to question,

The price of sugar after increasing 24% = 124Rs.

∴ Person increase 18% of expenditure and hence new Expenditure of person = 118

$$\text{Thus decrease Expenditure \%} = \frac{124-118}{124} \times 100$$

$$= \frac{6}{124} \times 100 = 4.8\%$$

213. The income of A is 60% less than that of B, and the expenditure of A is equal to 60% of B's expenditure. If A's income is equal to 70% of B's expenditure, then what is the ratio of the savings of A and B?

- (a) 3 : 8 (b) 4 : 7
(c) 5 : 9 (d) 2 : 15

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) : Let income of B = 100x Rs.
Income of A = 40x Rs.

Let expenditure of B = 100 y Rs.
Expenditure of A = 60y Rs.

$$\therefore 40x = 70y$$

$$\frac{x}{y} = \frac{7}{4}$$

$$\begin{aligned} \text{Ratio of saving of A and B} &= \frac{40x - 60y}{100x - 100y} = \frac{2x - 3y}{5x - 5y} \\ &= \frac{2 \times 7 - 3 \times 4}{5 \times 7 - 5 \times 4} = \frac{2}{15} = 2 : 15 \end{aligned}$$

214. Sonu saves 15% of her income. If her income increases by 20% and she still saves the same amount as before, then what is the percentage increase in her expenditure? (correct to one decimal place)

- (a) 22.8 (b) 24.2
(c) 23.8 (d) 23.5

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d) : Income = Expenditure + Saving

$$\text{Initially} \rightarrow 100 = 85 + 15$$

$$\text{Later} \rightarrow 120 = 105 + 15$$

Percentage increase in expenditure

$$\% = \frac{20}{85} \times 100 = 23.5\%$$

215. Anu spends 68% of her monthly income. If her monthly income increases by 20% and her monthly savings increase by $9\frac{3}{8}\%$, then the percentage increase in her monthly expenditure is:

- (a) 22% (b) 20%
(c) 25% (d) 32%

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (c) : Monthly income = expenditure + saving

$$\begin{array}{l} 100 = 68 + 32 \\ +20\% \downarrow \quad \quad \quad \downarrow +9\frac{3}{8}\% = 3 \\ 120 = 85 + 35 \end{array}$$

Percentage increase in monthly expenditure

$$= \frac{17}{68} \times 100 = 25\%$$

216. A, B and C spend 80%, 85% and 75% of their incomes, respectively. If their savings are in the ratio 8 : 9 : 20 and the difference between the incomes of A and C is ₹18,000, then the income of B is :

- (a) ₹24,000 (b) ₹36,000
(c) ₹27,000 (d) ₹30,000

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Let the income of A, B and C be x, y and z respectively. = 8 : 9 : 20

$$x \text{ of } 20\% : y \text{ of } 15\% : z \text{ of } 25\% = 8 : 9 : 20$$

$$4x : 3y : 5z = 8 : 9 : 20$$

In comparing, $x = 2, y = 3, z = 4$

$$2 \text{ unit difference of A and C income} = 18000$$

$$3 \text{ unit} = 27000$$

Thus income of B = 27000Rs.

217. Monika spends 72% of her income. If her income increases by 20% and savings increase by 15%, then her expenditure increases by : (correct to 1 decimal place)

- (a) 20.2% (b) 20.8%
(c) 19.8% (d) 21.9%

SSC CGL (Tier-II) 13-09-2019

Ans. (d) :

Income	Expenditure	Savings
₹100	₹72	₹28
New Income	New expenditure	New savings
₹120	₹120-32.2 = 87.8	₹32.2

$$\begin{aligned} \text{Increase in Expenditure \%} &= \frac{15.8}{72} \times 100 \\ &= 21.9\% \end{aligned}$$

218. A spends 65% of his income. His income is increased by 20.1% and his expenditure is increased by 25%. His savings :

- (a) Increase by 5% (b) Decrease by 5%
(c) Increase by 11% (d) Decrease by 11%

SSC CGL (Tier-II) 12-09-2019

Ans. (c) :

Income = Expenditure + Saving

$$100 = 65 + 35$$

$$\begin{array}{l} +20.1\% \left(\quad \right) +25\% \left(\quad \right) \\ \downarrow \quad \quad \quad \downarrow \\ 120.10 = 81.25 + \boxed{38.85} \end{array}$$

$$\begin{aligned} \text{Increase in savings} &= \frac{3.85}{35} \times 100 \\ &= 11\% \end{aligned}$$

219. Ramesh spends 40% of his monthly salary on food 18% on house rent 12% on entertainment and 5% on conveyance. But due to a family function he has to borrow Rs. 16,000 from a money lender to meet the expenses of Rs. 20,000. His monthly salary is:

- (a) 18,000 (b) 15,000
(c) 16,000 (d) 16,500

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Total Expenditure by Ramesh

$$= (40\% + 18\% + 12\% + 5\%) = 75\%$$

$$\therefore \text{Remaining Income} = 100\% - 75\% = 25\%$$
According to question,

$$25\% = 20000 - 16000 = 4000 \text{ Rs.}$$

$$100\% = \frac{4000}{25} \times 100 = 16000 \text{ Rs.}$$
thus the monthly income of Ramesh = 16000Rs.

220. The monthly salary of a person was ₹75,000. He used to spend on Family Expenses (E), Taxes (T), Charity (C) and rest were his savings. E was 60% of the income, T was 20% of E, and C was 15% of T. When his salary got raised by 40%, he maintained the percentage level of E, but T became 30% of E and C became 20% of T. The ratio of the savings of his earlier salary to that of his present salary is:
(a) 337 : 325 (b) 655 : 644
(c) 644 : 655 (d) 325 : 337

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) : Initially monthly salary of person = ₹75000
Expenditure of family (E) = $75000 \times \frac{60}{100} = 45000 \text{ Rs.}$
Tax (T) = $45000 \times \frac{20}{100} = 9000 \text{ Rs.}$
Charity (C) = $9000 \times \frac{15}{100} = 1350 \text{ Rs.}$
Total Expenditure = 55350Rs.
Increase = 75000 - 55350 = 19650Rs.
the changed monthly salary of person = $75000 \times \frac{140}{100} = 105000 \text{ Rs.}$
Family Expenditure (E) = $105000 \times \frac{60}{100} = ₹63000$
Tax (T) = $63000 \times \frac{30}{100} = 18900 \text{ Rs.}$
Charity (C) = $18900 \times \frac{20}{100} = 3780 \text{ Rs.}$
Total Expenditure = 85680 Rs.
Savings = 105000 - 85680 = 19320 Rs.
 \therefore Required Ratio = 19650 : 19320 = $\boxed{655 : 644}$

221. A man spends 75% of his income. If his income increases by 28% and his expenditure increases by 20%, then what is the increase or decrease percentage in his savings?

- (a) 13% increase (b) 13% decrease
(c) 52% decrease (d) 52% increase

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : Let the Income of person = ₹100
Expenditure = ₹75
Savings = ₹25
New Income = ₹128
Increase in Expenditure = $75 \times \frac{20}{100} = 15$
And New Expenditure = 75 + 15 = 90
Now Savings = 128 - 90 = 38
Intended, decreasing or increasing [%] = $\frac{38 - 25}{25} \times 100 = 52\%$

222. When the price of sugar increased by 28%, a family reduced its consumption per month such that the expenditure on sugar was only 12% more than the earlier one. If the family consumed 18.4 kg sugar per month earlier, then what is its new consumption of sugar per month?
(a) 15.8 kg (b) 16.6 kg
(c) 15.75 kg (d) 16.1 kg

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) Price $\rightarrow 100 : 128 = 25 : 32$
Expenditure $\rightarrow 100 : 112 = 25 : 28$
 \therefore Expenditure = Price \times Consumption
Consumption $\rightarrow \frac{25}{25} : \frac{28}{32} = 8 : 7$
 \therefore 8 Unit = 18.4 kg
1 Unit = 2.3 kg
7 Unit = 16.1 kg
New monthly expenditure = 16.1 kg

223. A man spends $\frac{2}{3}$ rd of his income. If his income increases by 14% and the expenditure increases by 20%, then the percentage increase in his savings will be:
(a) 6% (b) 2%
(c) 1% (d) 4%

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (b) : Let the initially income = 300
Income = Expenditure + Savings
300 = 200 + 100
342 = 240 + 102
Increase % of savings = $\frac{2}{100} \times 100 = 2\%$

224. A person can save 25% of his income. If his income increases by 20% and still he saves the same amount as before, the percentage increase in his expenditure is _____.
(a) $25\frac{1}{2}$ (b) $26\frac{2}{3}$
(c) 24 (d) 25

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) Let the income of person = ₹100
According to question,

Income	Expenditure	Saving
100	75	25
New Income	New Expenditure	New saving
120	95	25

Increase % of expenditure = $\frac{95-75}{75} \times 100$
 $= \frac{20}{75} \times 100 = 26\frac{2}{3}\%$

225. The ratio of expenditure and savings of a person is 5:3. If the income increases by 20% and the expenditure increase by 10%, then the person's savings increase by:

- (a) $13\frac{2}{3}\%$ (b) $36\frac{2}{3}\%$
(c) $3\frac{1}{3}\%$ (d) $30\frac{1}{3}\%$

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) Let the Income of person = 800
Income = Expenditure + Savings
In starting, 800 = 500 + 300
In after, 960 = 550 + 410
Savings = 410 - 300 = 110
Intended% Increase in Savings = $\frac{110}{300} \times 100 = 36\frac{2}{3}\%$

226. A man spends 72% of his income. If his income increases by 28% and his expenditure increase by 25% then what is the percentage increase or decrease in his saving ? (nearest to one decimal places)

- (a) Decrease of 26.9% (b) Increase of 38.4%
(c) Increase of 35.7% (d) Decrease of 26.3%

SSC CHSL (Tier-I) 01/07/2019 (Shift-III)

Ans. (c) : Let Income = ₹100
Expenditure = $100 \times \frac{72}{100} = ₹72$
Savings = $100 - 72 = ₹28$
Increase expenditure = $100 \times \frac{128}{100} = ₹128$
Increase expenditure = $72 \times \frac{125}{100} = ₹90$
New Savings = $128 - 90 = ₹38$
Increase in Savings = $38 - 28 = ₹10$
Increase % = $\frac{10}{28} \times 100$
Increase % = 35.7%

227. The income of Renu is 10% less than the income of Sudha, and the income of Sudha is 10% more than ₹3,000. The income of Renu is:

- (a) ₹3,300 (b) ₹3,070
(c) ₹2,700 (d) ₹2,970

SSC CHSL -26/10/2020 (Shift-II)

Ans. (d) : Income of Sudha = $3000 \times \frac{110}{100} = ₹3300$
According to question,
Income of Renu = $3300 \times \frac{90}{100} = ₹2970$

228. A woman earns ₹1,000/day. After some weeks, she earns ₹1,160/day. By how much percentage did her earnings increase?

- (a) 18% (b) 15%
(c) 16% (d) 17%

SSC CHSL -19/03/2020 (Shift-II)

Ans. (c) : Income of woman in before = 1000 Perday
And after income = 1160 Perday
Increase income = $1160 - 1000 = ₹160$
Increase % of income = $\frac{160}{1000} \times 100 = 16\%$

229. Sachin's income is 25% more than Dileep's income. By how much percentage is Dileep's income less than Sachin's income?

- (a) 22% (b) 18% (c) 15% (d) 20%

SSC CHSL -17/03/2020 (Shift-I)

Ans. (d) : Let the Income of Sachin = 125
Income of Dileep = 100
 \therefore Decrease% = $\frac{25}{125} \times 100 = 20\%$

230. Richa invests in mutual funds a sum of ₹559968, which is 19% of her annual income. What is her monthly income?

- (a) ₹445600 (b) ₹145600
(c) ₹245600 (d) ₹345600

SSC CHSL -20/10/2020 (Shift-III)

Ans : (c) According to question,
Annual Income $\times \frac{19}{100} =$ Invest funds
Annual Income = $\frac{559968 \times 100}{19}$
Annual Income = 2947200
 \therefore Monthly Income = $\frac{2947200}{12} = ₹245600$

231. Ravinder invests 3750 which is equal to 15% of his monthly salary in a medical insurance policy. Later he invests 25% and 8% of his monthly salary on a child education policy and mutual funds, respectively. The total amount left with him is:

- (a) ₹8000 (b) ₹13000
(c) ₹15000 (d) ₹12000

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b) 15% = 3750
 $100\% = \frac{3750}{15} \times 100 = 25000$
 \therefore Total Expenditure = 15% + 25% + 8% = 48%
Remains = 52%
Total remains fund = $25000 \times \frac{52}{100} = 250 \times 52 = ₹13000$

232. Bala decided to donate 10% of his salary to PM Care fund. On the day of donation, he changed his mind and donated ₹1,800 which was 60% of what he had decided earlier. How much is his salary?

- (a) ₹36,000 (b) ₹32,000
(c) ₹30,000 (d) ₹40,000

SSC CHSL -21/10/2020 (Shift-I)

Ans. (c) Let the Income of Bala = ₹x

$$\text{According to question, } x \times \frac{10}{100} \times \frac{60}{100} = 1800$$

$$x = ₹30000$$

233. If the price of a commodity is decreased by 30% and its consumption is increased by 10% then what will be the percentage increase or decrease in the expenditure of the commodity?

- (a) 23% decrease (b) 23% increase
(c) 17% increase (d) 17% decrease

SSC MTS 9-10-2017 (Shift-III)

Ans : (a) Increase/decrease % = $x \pm y \pm \frac{xy}{100}$

$$= -30 + 10 - \frac{30 \times 10}{100}$$

$$= -30 + 10 - 3$$

$$= -23$$

decrease % = 23

234. A man saves 30% of his income in 1 year. If he wants to save the same amount in 8 months, then by how much percentage should he increase his monthly savings?

- (a) 20 (b) 30
(c) 40 (d) 50

SSC MTS 9-10-2017 (Shift-I)

Ans : (d) Let the annual income of person = ₹ 1200

$$\therefore \text{Annual Savings} = \frac{1200 \times 30}{100} = 360$$

$$\therefore \text{Monthly Savings} = \frac{360}{12} = ₹ 30$$

The person want saving 360 Rs. in 8 month, then his monthly savings = $\frac{360}{8} = ₹ 45$

$$\therefore \text{Required \%} = \frac{45 - 30}{30} \times 100$$

$$= \frac{15}{30} \times 100 = 50\%$$

235. A man spends 80% of his income and saves the rest. If his income and spending both increase by 10, then what is the percentage change in his savings?

- (a) 10% increase (b) 5% decrease
(c) 5% increase (d) 15% decrease

SSC MTS 9-10-2017 (Shift-I)

Ans : (a) Let the income of person = ₹ 100

$$\therefore \text{Savings of person} = ₹ 20$$

$$10\% \text{ Income of person after increasing} = \frac{100 \times 110}{100} = ₹ 110$$

$$\text{Saving of person after increasing } 10\% = \frac{20 \times 110}{100} = ₹ 22$$

$$\therefore \text{Saving in intended increasing} = \frac{(22 - 20)}{20} \times 100$$

$$= \frac{2}{20} \times 100 = 10\%$$

236. Incomes of X and Y are in the ratio of 5 : 3. Their expenditures are in the ratio 9 : 5. If both save Rs. 1600 at the ends of the month, then what is the income (in Rs) of X?

- (a) 18000 (b) 16000
(c) 9600 (d) 14000

SSC MTS 10-10-2017 (Shift-III)

Ans. (b) : Let the Income of X is 5a and expenditure is 9b

$$\text{Income of Y} = 3a \text{ Rs. and expenditure} = 5b \text{ Rs.}$$

According to question,

$$5a - 9b = 1600 \quad \dots(i)$$

$$3a - 5b = 1600 \quad \dots(ii)$$

$$(\text{eq. (i)} \times 5 - \text{eq. (ii)} \times 9)$$

$$25a - 45b = 8000$$

$$27a - 45b = 14400$$

$$\begin{array}{r} - \\ + \\ - \end{array}$$

$$-2a = -6400 \Rightarrow 2a = 6400$$

$$a = 3200$$

$$\text{Income of X} = 5 \times 3200 = \text{Rs. } 16000$$

237. If the price of a commodity is decreased by 40% and its consumption is increased by 30%, then what will be the percentage increase in the expenditure of the commodity?

- (a) 22% decrease (b) 22% increase
(c) 12% increase (d) 12% decrease

SSC MTS 10-10-2017 (Shift-II)

Ans. (a) : Expenditure of increase % of things

$$= -40 + 30 - \frac{40 \times 30}{100}$$

$$= -10 - 12$$

$$= -22$$

$$= 22\% \text{ decrease}$$

238. Aman's annual income has increased by Rs. 20 lakhs but the tax on income that he has to pay has reduced from 20% to 16%. He now pays the same amount of tax as earlier. What is his new total income (in Rs. lakhs)?

- (a) 100 (b) 120
(c) 80 (d) 60

SSC MTS 09/08/2019 (Shift-I)

Ans. (a) : Let new Income = x lakhs

$$\text{then Initially income} = (x - 20) \text{ lakhs}$$

According to question,

$$(x - 20) 20\% = x \times 16\%$$

$$(x - 20) 5 = 4x$$

$$5x - 100 = 4x$$

$$5x - 4x = 100$$

$$x = 100 \text{ lakhs}$$

239. If the price of a commodity is decreased by 30% and its consumption is increased by 40%, then what will be the percentage increase or decrease in the expenditure of the commodity?
 (a) 2% decrease (b) 2% increase
 (c) 12% increase (d) 12% decrease

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : The commodity price decreased x percent and consumption increase by y%

$$\text{Increase/decrease\%} = -x + y - \frac{xy}{100}$$

$$\text{Decrease/increase\%} = -30 + 40 - \frac{30 \times 40}{100}$$

$$= 10 - 12$$

$$= -2$$

(-) is show the expenditure decreasing.

Thus decrease in expenditure = 2%

240. A spends 80% of her income. When her income is increased by 30%, she increases her expenditure by 30%. By what percentage are her savings increased or decreased?

- (a) Increase of 50% (b) Decrease of 50%
 (c) Decrease of 30% (d) Increase of 30%

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d): Let,

Income ₹ 100

Expenditure ₹ 80

$$\therefore \text{Savings} = 100 - 80 = ₹ 20$$

After increase

Income = 130

Expenditure = 104

$$\text{Savings} = 130 - 104 = ₹ 26$$

$$\therefore \text{Percentage increase in savings} = \frac{6}{20} \times 100 = 30\%$$

(VII) Problems based on Pass/Fail Candidates in an Examination

241. In an examination, B obtained 20% more marks than those obtained by A, and A obtained 10% less marks than those obtained by C. D obtained 20% more marks than those obtained by C. By what percentage are the marks obtained by D more than those obtained by A?

- (a) $33\frac{1}{3}\%$ (b) $13\frac{1}{3}\%$
 (c) $43\frac{1}{3}\%$ (d) $23\frac{1}{3}\%$

SSC CGL (Tier-II) 03/02/2022

Ans : (a) According to the question,

A	B	C	D
90	108	100	120

$$\text{Required percentage} = \frac{30}{90} \times 100$$

$$= 33\frac{1}{3}\%$$

242. Geeta scored 30% and failed by 50 marks, while Sandeep who scored 45% marks, got 25 marks more than the minimum marks required to pass the examination. How many marks did Vimal get if he scored 64% marks?

- (a) 500 (b) 320
 (c) 436 (d) 256

SSC CHSL 12/04/2021 (Shift-I)

Ans : (b) According to the question,

$$(45-30)\% = 50+25$$

$$15\% = 75$$

$$100\% = \frac{75}{15} \times 100 = 500$$

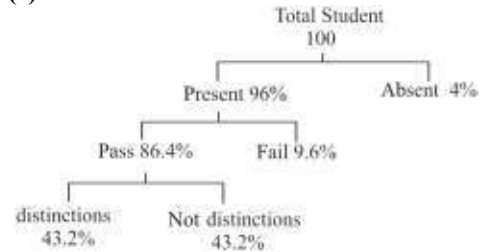
$$\text{Vimal marks} = 500 \times \frac{64}{100} = 320$$

243. In a school, 4% of the students did not appear for the annual exams. 10% of the students who appeared for the exams could not pass the exam. Out of the remaining students, 50% got distinction marks and 432 students passed the exam but could not get distinction marks. The total number of students in the school is:

- (a) 960 (b) 878
 (c) 1000 (d) 1200

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (c) :



$$43.2\% \rightarrow 432$$

$$1\% \rightarrow 10$$

$$100\% \rightarrow 1000$$

Note- the commission has considered option (b) is correct.

244. In an examination, Anita scored 31% marks and failed by 16 marks. Sunita scored 40% marks and obtained 56 marks more than those required to pass. Find the minimum marks required to pass.

- (a) 311 (b) 264
 (c) 394 (d) 710

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (b) :

$$\begin{array}{ccc} -16 & & +56 \\ \hline & \text{Fail} & \end{array}$$

$$(40 - 31)\% \rightarrow (56 + 16)$$

$$9\% \rightarrow 72$$

$$1\% \rightarrow 8$$

$$100\% \rightarrow 800$$

$$\begin{aligned} \text{Minimum marks} &= 800 \times \frac{31}{100} + 16 \\ &= 264 \end{aligned}$$

245. Ravi scores 72% marks in examinations. If these are 360 marks, then the maximum marks are:

- (a) 350 (b) 450
(c) 400 (d) 500

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (d) : $\because 72\% \rightarrow 360$

$$4\% \rightarrow 20$$

$$100\% \rightarrow 500$$

\therefore Maximum marks = 500

246. If 35% are the passing marks. A student gets 200 marks yet fails by 24 marks. What is the maximum marks?

- (a) 820 (b) 550
(c) 640 (d) 680

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :

Let the maximum marks = x

According to question,

$$x \times \frac{35}{100} = 200 + 24$$

$$x = \frac{224 \times 100}{35}$$

$$x = 640$$

247. A student gets 22 marks more in French than what she got in German. Her German marks are 28% of the sum of her French and German marks. What are her French marks?

- (a) 14 (b) 36
(c) 18 (d) 42

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

Let the student's score in German = x

And score of student in French = x + 22

According to question,

$$x = (x + x + 22) \times \frac{28}{100}$$

$$100x - 56x = 22 \times 28$$

$$x = \frac{22 \times 28}{44}$$

$$x = 14$$

Thus the total score of French = x + 22

$$= 14 + 22$$

$$= 36$$

248. In an exam of 300 marks a student gets 75 marks. If she had scored 6 more marks she would have attained passing percentage. What is the passing percentage?

- (a) 25 (b) 30
(c) 35 (d) 27

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Maximum mark % = $\left(\frac{75+6}{300}\right) \times 100$

$$= 27\%$$

249. 40% are the passing marks. A student gets 250 marks yet fails by 38 marks. What is the maximum marks?

- (a) 720 (b) 750
(c) 800 (d) 840

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : Let maximum marks = 100

According to question,

The passing score % = score of the student

$$40\% = 250 + 38$$

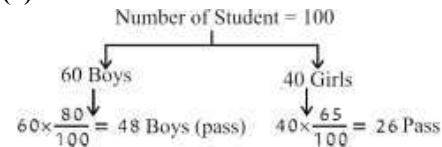
$$100\% = \frac{288}{40} \times 100 = 720.$$

250. In a school, 60% of the number of students are boys and the rest are girls. If 20% of the number of boys failed and 65% of number of girls passed the examination, then the percentage of the total number of students who passed is:

- (a) 72 (b) 74
(c) 68 (d) 78

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b)



Total pass students = 48 + 26 = 74

251. In an examination there are 800 boys and 600 girls. 40% boys and 60% girls passed the examination. The percentage (correct to two decimal places) of failed students from the total students is:

- (a) 52.34% (b) 50.36%
(c) 51.43% (d) 53.57%

SSC MTS 14/08/2019 (Shift-III)

Ans. (c) : Total No. of boys = 800

$$\text{No. of boys are fail} = 800 \times \frac{60}{100} = 480$$

Total No. of girls = 600

$$\text{No. of girls are fail} = 600 \times \frac{40}{100} = 240$$

$$\text{Required age percent} = \left(\frac{480 + 240}{800 + 600}\right) \times 100$$

$$= \frac{720}{1400} \times 100 = 51.43\%$$

252. In an exam, A gets 20% less than the passing marks and B gets 20% more than passing marks. If the sum of marks obtained by A and B is equal to maximum marks. What is the ratio of passing marks to maximum marks?

- (a) 1 : 4 (b) 1 : 1
(c) 2 : 1 (d) 1 : 2

SSC MTS 09/08/2019 (Shift-II)

Ans. (d) : Score required for passing's = x

Total Score = y

$$A \rightarrow x \times \frac{80}{100} = \frac{4x}{5}$$

$$B \rightarrow x \times \frac{120}{100} = \frac{6x}{5}$$

According to question,

$$\frac{4x}{5} + \frac{6x}{5} = y$$

$$\frac{10x}{5} = y$$

$$\frac{x}{y} = \frac{1}{2}$$

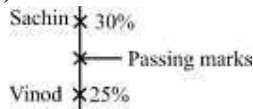
$$x : y = 1 : 2$$

253. In an examination, Vinod scored 25% of marks and failed by 10 marks. Sachin scored 30% of marks, which were 20 marks more than the passing marks. Find the total marks of the examination.

- (a) 500 (b) 750
(c) 800 (d) 600

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) :



According to the question,

$$(30\% - 25\%) \rightarrow (10 + 20)$$

$$5\% \rightarrow 30$$

$$\therefore 100\% \rightarrow 30 \times 20 = 600$$

Hence, the total marks of the examination = 600

(VIII) Miscellaneous

254. A sum of ₹2,130 is to be divided into three parts. The second part is 60% of the first and the ratio of the first to third part is 5 : 7. What are the parts (in ₹)?

- (a) 426, 710, 994 (b) 710, 426, 994
(c) 994, 710, 426 (d) 710, 994, 426

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) : I II III

$$5x \quad 5x \times \frac{60}{100} = 3x \quad 7x$$

According to the question:-

$$5x + 3x + 7x = 2130$$

$$15x = 2130$$

$$x = 142$$

Hence,

$$I = 5x = 5 \times 142 = ₹710$$

$$II = 3x = 3 \times 142 = ₹426$$

$$III = 7x = 7 \times 142 = ₹994$$

255. The price of sugar is increased by 17%, A person wants to increase his expenditure by 5% only. By approximately what percent should he decrease his consumption?

- (a) 9.9 (b) 10.9
(c) 10.3 (d) 10.7

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c): Increase % of Price = 17%

Increase % of Expenditure = 5%

Consumption decrease% =

$$\frac{\text{Increase \% in price of things} - \text{Increase \% in Expenditure}}{100 + \text{Increase \% in things value}} \times 100$$

$$= \frac{17 - 5}{100 + 17} \times 100$$

$$= \frac{12}{117} \times 100$$

$$= 10.256\%$$

$$= 10.3\%$$

256. A, B and C donate 8%, 7% and 9%, of their salaries, respectively to a charitable trust. The salaries of A and B are same and the difference between their donations is ₹259. The total donation of A and B is ₹1,185 more than that of C. the total donation of A and C is what percentage of the total salaries of A, B and C? (Correct to one decimal place)

- (a) 7.1% (b) 5.8%
(c) 6.2% (d) 6.4%

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (b) : Let the salary of A, B, C is respectively x, x and z respectively.

$$\frac{8x}{100} - \frac{7x}{100} = 259$$

$$x = 25900$$

$$25900 \times \frac{15}{100} = z \times \frac{9}{100} + 1185$$

$$3885 - 1185 = z \times \frac{9}{100}$$

$$2700 = z \times \frac{9}{100}$$

$$z = 30000$$

$$\text{A's donation} = 25900 \times \frac{8}{100} = 2072$$

$$\text{Required \%} = \left(\frac{2072 + 2700}{2 \times 25900 + 30000} \right) \times 100$$

$$= \frac{4772}{81800} \times 100$$

$$= 5.8\%$$

257. A student multiplied a number by 4/5 instead of 5/4. What is the percentage error in the calculation ?

- (a) 16 (b) 25
(c) 36 (d) 20

SSC CGL (Tier-II) 9-3-2018

Ans. (c): Let the number = x

$$\text{error} = \frac{5x}{4} - \frac{4x}{5} = \frac{9x}{20}$$

$$\text{Average error} = \frac{\frac{9x}{20}}{\frac{5x}{4}} \times 100$$

$$= 36\%$$

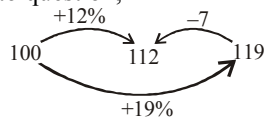
258. If the price of petrol increases by 19%, and Sunita intends to spend only an additional 12% on petrol, by what percent should she reduce the quantity of petrol purchased (nearest to an integer) ?

- (a) 8 (b) 5
(c) 6 (d) 7

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Let the price of Petrol = 100 Rs.
Expenditure = 100 Rs.

∴ According to question,



$$\therefore \text{Reduction \%} = \frac{7}{119} \times 100 = 5.88 = 6$$

259. In an entrance examination at different centres a total of 25, 30, 40, 45, 60 and 100 students appeared. The pass percentages of the different centres are 20%, 30%, 35%, 40%, 50% and 75% respectively. The pass percentage of the entrance examination is: (correct to the nearest integer)

- (a) 50% (b) 53%
(c) 43% (d) 59%

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (a) : Total No. of student

$$= 25 + 30 + 40 + 45 + 60 + 100$$

$$= 300$$

No. of student are pass

$$= \left(25 \times \frac{20}{100}\right) + \left(30 \times \frac{30}{100}\right) + \left(40 \times \frac{35}{100}\right) + \left(45 \times \frac{40}{100}\right) + \left(60 \times \frac{50}{100}\right) + \left(100 \times \frac{75}{100}\right)$$

$$= 5 + 9 + 14 + 18 + 30 + 75$$

$$= 151$$

$$\text{Entrance exam pass\%} = \frac{151}{300} \times 100$$

$$= 50.33$$

$$\approx 50\%$$

260. The price of diesel is increased by 26%. A person wants to increase his expenditure by 15%. By what percentage, correct to one decimal place, should he decrease his consumption?

- (a) 6.5% (b) 8.7%
(c) 9.5% (d) 7.2%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Let the initial price of Diesel is 100x.

After Increase the cost is = 126x

Initial expenditure on diesel by person = 100x

Increase in expenditure = 115x

Thus reduce % in consumption =

$$\left(\frac{126x - 115x}{126x}\right) \times 100$$

$$= \frac{11}{126} \times 100$$

$$= 8.7\%$$

261. Rice is now being sold at ₹29 per kg. During the last month, its cost was ₹25 per kg. By how much percentage should a family reduce its consumption, so as to keep the expenditure the same as before? (correct to nearest integer)

- (a) 14% (b) 13%
(c) 15% (d) 12%

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : Before After

₹ 25 ₹ 29

difference = (29 - 25) = 4

$$\text{Required \%} = \frac{4}{29} \times 100 = 13.79\%$$

$$\approx 14\%$$

262. The price of diesel increased by 16%. A person wants to increase his expenditure on diesel by 10% only. By what percentage, correct to one decimal place, should he reduce his consumption?

- (a) 3.7% (b) 4.5%
(c) 6.5% (d) 5.2%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : Let the Initially cost of diesel is 100 and consumption is also Rs. 100.

Price of diesel after Increase = ₹116

Consumption after increasment = ₹110

$$\therefore \text{Reduce \% of consumption} = \left(\frac{116 - 110}{116}\right) \times 100$$

$$= \frac{6}{116} \times 100$$

$$= 5.17$$

$$= 5.2 \text{ (approx)}$$

263. If the word PHOTOGRAPH is spelt with 'F' in place of 'PH', then what would be the percentage reduction in the number of letters?

- (a) 10% (b) 20%
(c) 25% (d) 18%

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (b) The total number letters in PHOTOGRAPH=10

In place of PH, the F is placed then FOTOGRAF word number of letter is 8.

reduce in number of letters = 10 - 8 = 2

$$\text{Reduce \%} = \frac{2}{10} \times 100 = 20\%$$

264. The total number of males and females in a town is 70,000. If the number of males is increased by 6% and that of the females is increased by 4%, then the total numbers of males and females in the town would become 73520. What is the difference between the number of males in the town, in the beginning?

- (a) 1800 (b) 1500
(c) 1400 (d) 2000

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Let the no of males = x
No of females = (70000 – x)
According to question,
$$\frac{x \times 106}{100} + \frac{(70000 - x) \times 104}{100} = 73520$$
$$\frac{106x + 7280000 - 104x}{100} = 73520$$
$$2x + 7280000 = 7352000$$
$$2x = 72000$$
$$x = 36000$$
Thus the no. of male and female is 36000, 34000.
difference = 2000

265. If A is 48% more than B and C is 60% less than sum of A and B, then A is what percentage more than C? (Correct to one decimal place)

- (a) 49.8 (b) 50.2
(c) 49.2 (d) 50.8

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c)

A	B	C	
↓	↓	↓	
148	100	248	$\times \frac{40}{100}$
↓	↓	↓	
1480	1000	992	

Intended Increase % = $\frac{488}{992} \times 100 = 49.2\%$

266. In a test consisting of 140 questions, a candidate correctly answered 70% of the first 80 questions. What percentage of the remaining questions does the candidate need to correctly answer to score 60% in the test?

- (a) $46\frac{2}{3}\%$ (b) $45\frac{1}{3}\%$
(c) 35% (d) 40%

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a) Candidate take 60% mark in 140 question.
 $\therefore 140 \times \frac{60}{100} = 84$ will be correct answer
In according to student 70% question are correct in 80 question
 $\therefore 80 \times \frac{70}{100} = 56$ correct question

\therefore Total remaining question = 140 – 80 = 60 question
For all remaining question correct right answer %

$$= \frac{84 - 56}{60} \times 100$$

$$= 46\frac{2}{3}\%$$

267. Two times of A's salary is five times of B's salary and four times of B's salary is twice C's salary. What is A's salary if C's salary is ₹1,600?

- (a) ₹ 2,000 (b) ₹ 3,000
(c) ₹ 2,500 (d) ₹ 2,600

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a)
Salary of A = ₹ x
Salary of B = ₹ y
Salary of C = ₹ z = ₹ 1600
According to question,
 $2 \times x = 5 \times y$ ----- (i)
And $4 \times y = 2 \times z$ ----- (ii)
 $4y = 2 \times 1600$
 $y = ₹ 800$
From eq. (i)
 $2 \times x = 5 \times 800$
 $x = ₹ 2000$

268. Two persons A and B are paid a total of ₹2,040 per week by their employer. If B is paid 140 percent of the sum paid to A, then how much is A paid per week?

- (a) ₹ 850 (b) ₹ 820
(c) ₹ 750 (d) ₹ 800

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a) : Total spend amount = ₹ 2040
Let amount A = ₹ x
thus amount B = 2040 – x
According to question,
 $x \times \frac{140}{100} = 2040 - x$
 $140x = 204000 - 100x$
 $240x = 204000$
 $x = ₹ 850$

269. A is 40% more than B and B is 60% less than C. If C is 60% more than D, then which of the following is true?

- (a) C is 60% more than B
(b) A is 54% less than C
(c) B is 36% less than D
(d) D is 10.4% more than A

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) Let C = 100

A	B	C	D
$= 40 \times \frac{140}{100}$	$= 100 \times \frac{40}{100}$	= 100	$= 100 \times \frac{100}{160}$
= 56	= 40	= 100	= 62.5

- (a) C is 60% more than B = $40 \times \frac{160}{100} = 64 \neq C$
- (b) A is 54% less than C = $100 \times \frac{46}{100} = 46 \neq A$
- (c) B is less than 36% to D = $62.5 \times \frac{64}{100} = 40 = B$
- (d) D is 10.4% more than A = $56 \times \frac{110.4}{100} = 61.82 \neq D$

270. If 66⅔% of 75% of one-eighth of a certain number is 179, then 33⅓% of three-fourth of that number is:

- (a) 716 (b) 787.6
(c) 537 (d) 859.2

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) Let the number be x.

$$66\frac{2}{3}\% = \frac{2}{3}$$

$$x \times \frac{1}{8} \times \frac{75}{100} \times \frac{2}{3} = 179$$

$$x = 179 \times 16 = 2864$$

thus, $2864 \times \frac{3}{4} \times \frac{1}{3} = 716$

271. In an office, 70% of the total number of employees are females. 80% of the total number of employees, including 85 males, got promotion. If there are 105 female employees, then what percentage of female employees got promotion?

- (a) 30% (b) 35%
(c) 40% (d) $33\frac{1}{3}\%$

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (d) Given the,

70% of the total employees in the office are female and total number of female is = 105

$$\therefore \text{Total employees in office} = \frac{105}{70} \times 100$$

$$= 150 \text{ employees}$$

According to question,

\therefore 80 of the employees in the office including 85 men got promotion.

\therefore 80% total employees = $150 \times \frac{80}{100} = 120$ Promoted employees

\therefore Woman employees promoted = $120 - 85 = 35$ female employees

\therefore Percentage of female employees promoted =

$$100 \times \frac{35}{105} = 33\frac{1}{3}\%$$

272. In a test consisting of 120 questions, Anuradha answered 65% of the first 60 questions correctly. What percentage of the remaining questions does she need to answer correctly to score 75% in the test?

- (a) 80 (b) 90
(c) 84 (d) 85

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) 75% of 120 question

$$= 120 \times \frac{75}{100} = 90 \text{ question}$$

65% of 60 question

$$= 60 \times \frac{65}{100} = 39 \text{ question}$$

Remaining correct answer = $90 - 39 = 51$

No. of remaining question = $120 - 60 = 60$

$$\therefore \text{Intended \%} = \frac{51}{60} \times 100 = 85\%$$

273. 2000 employees are assigned to complete a project. At the end of the first year, 15% of the number of employees are decreased and at the end of the second year again 10% of the number of employees are decreased. However, to complete the project in time, the number of employees are increased by 10% at the end of third year. What was the number of employees working during the fourth year?

- (a) 1786 (b) 1683
(c) 1783 (d) 1685

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b) : The number of employees work in fourth year

$$= 2000 \times \frac{(100-15)}{100} \times \frac{(100-10)}{100} \times \frac{(100+10)}{100}$$

$$= 2000 \times \frac{85}{100} \times \frac{90}{100} \times \frac{110}{100}$$

$$= 1683$$

274. The monthly salary of a person was ₹50,000. He used to spend on Family expenses (E), Taxes (T), Charity (C), and the rest were his savings. E was 60% of the income, T was 20% of E, and C was 15% of T. When his salary got raised by 40%, he maintained the percentage level of E, but T becomes 30% of E and C becomes 20% of T. The difference between the two savings (in ₹) is:

- (a) 128 (b) 220
(c) 130 (d) 250

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : Phase-I

$$\text{Expenditure of E} = 50000 \times \frac{60}{100} = 30000$$

$$\text{Expenditure of T} = 30000 \times \frac{20}{100} = 6000$$

$$\text{Expenditure of C} = 6000 \times \frac{15}{100} = 900$$

First savings according of question =
 $(50000 - 36900) = 13100$

Pharse - II

Expenditure of E = $70000 \times \frac{60}{100} = 42000$

Expenditure of T = $42000 \times \frac{30}{100} = 12600$

Expenditure of C = $12600 \times \frac{20}{100} = 2520$

Second saving = $(70000 - 57120) = 12880$

\therefore Difference between both savings. =
 $(13100 - 12880) = ₹220$

275. Rita's income is 15% less than Richa's income. By what percent is Richa's income more than Rita's income?

- (a) $14\frac{11}{17}\%$ (b) $15\frac{11}{17}\%$
 (c) $17\frac{11}{17}\%$ (d) $16\frac{11}{17}\%$

SSC CHSL -15/10/2020 (Shift-III)

Ans. (c) : Intended percent = $\left(\frac{15}{100-15} \times 100\right)$
 $= \frac{1500}{85}$
 $= 17\frac{11}{17}\%$

276. The average pass percentage of girls in class XII examination in a school is 80 and that of boys is 75. The average pass percentage in class XII of that school is 76.5. Find the percentage of the number of boys in class XII of the school.

- (a) 70% (b) 65%
 (c) 72% (d) 60%

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (a) : Let, the number of boys and girls in the school be x and y respectively.

According to the question,

$$80y + 75x = 76.5(x + y)$$

$$80y + 75x = 76.5x + 76.5y$$

$$3.5y = 1.5x \Rightarrow x : y = 7 : 3$$

then the percentage of the number of boys

$$= \frac{7}{10} \times 100 = 70\%$$

277. The number of seats in a cinema hall is increased by 20% and the price of a ticket is also increased by 8%. What is the percentage increase in the revenue collected?

- (a) 30 (b) 29.6
 (c) 28 (d) 28.4

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b) : Required increase% =

$$20 + 8 + \frac{20 \times 8}{100} = 29.6\%$$

278. The tax on a commodity diminishes by 14% and its consumption increases by 10%.

- (a) Decreases by 9.5%
 (b) Decreases by 6.5%
 (c) Decreases by 5.4%
 (d) Decreases by 7.4%

SSC CHSL 09/06/2022 (Shift- I)

Ans. (c) : \therefore Revenue = Commodity \times Consumption

According to the question,

$$\left. \begin{array}{l} R_I \rightarrow 50 \times 10 = 500 \\ R_{II} \rightarrow 43 \times 11 = 473 \end{array} \right\} -27$$

$$\left\{ \because 14\% \rightarrow \frac{-7}{50}, 10\% \rightarrow \frac{+1}{10} \right\}$$

$$\text{So, effective Revenue} = \frac{27}{500} \times 100$$

$$= \frac{27}{5} = 5.4\% \text{ (decrease)}$$

279. The value of an equipment depreciates by 20% each year. If the difference between the prices at the end of 3rd and 4th year is Rs. 3,328, then what is the price of the equipment at the end of the second year?

- (a) Rs. 17,400 (b) Rs. 16,640
 (c) Rs. 20,800 (d) Rs. 18,600

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (c) : Let, the initial price be x.

$$\text{Price after 3 years} = x \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5}$$

$$= \frac{64x}{125}$$

$$\text{Price after 4 years} = x \times \left(\frac{4}{5}\right)^4 = \frac{256}{625}x$$

According to the question,

$$\therefore \frac{64x}{125} - \frac{256x}{625} = 3328$$

$$\frac{320x - 256x}{625} = 3328$$

$$\frac{64x}{625} = 3328$$

$$x = ₹ 32500$$

\therefore Price of equipment for the second year =

$$32500 \times \left(\frac{4}{5}\right)^2$$

$$= 32500 \times \frac{16}{25} = 325 \times 64 = ₹20800$$

Profit and Loss

(I) Problems based on Profit and Loss

1. 40% of the cost price of an article is equal to 30% of its selling price. The approximate percentage of profit or loss on the cost price is:
 (a) 44.44% profit (b) 42.22% loss
 (c) 35.55% loss (d) 33.33% profit

SSC CHSL 08/06/2022 (Shift- II)

Ans. (d) : According to the question,
 40% of CP = 30% of SP

$$\frac{CP}{SP} = \frac{30}{40} = \frac{3}{4} \Rightarrow +1$$

$$\therefore \text{Profit}\% = \frac{1}{3} \times 100 = 33.33\%$$

2. A shopkeeper marks his articles at 30% above the cost price and allows the purchaser a discount of 20% for cash buying. What profit percent does he make?
 (a) 4% (b) 9%
 (c) 6% (d) 5%

SSC CHSL 09/06/2022 (Shift- I)

Ans. (a) :

$$P/L\% = \pm \left(M - D - \frac{M \times D}{100} \right) \% \rightarrow \text{by formula}$$

$$\therefore = \left(30 - 20 - \frac{30 \times 20}{100} \right) \%$$

$$= (10 - 6) \% = + 4\%$$

Hence, Profit percent = 4%

3. A shopkeeper claims that he is selling sugar at Rs. 27/kg which cost him Rs. 30/kg, but he gives 750 grams instead of 1000 grams. What is his profit or loss percentage?
 (a) 10% loss (b) 705% profit
 (c) 2.5% loss (d) 20% profit

SSC CHSL 08/06/2022 (Shift- II)

Ans. (d) : According to the question,

$$\begin{array}{l} 1\text{kg} \rightarrow 30\text{Rs} \xrightarrow{+6\text{Rs}} \\ 750\text{g} \rightarrow 27\text{Rs} \searrow \\ 1\text{kg} \rightarrow 27/750 \times 1000 = 36\text{Rs} \end{array}$$

$$\text{Hence, profit}\% = \frac{6}{30} \times 100 = 20\%$$

4. Subir claimed to sell his items at only 5% above the cost of production, but used a weight that had 1 kg written on it, though it actually weighed 960 grams. What was the actual profit percentage earned by Subir?

- (a) 9.125% (b) 9.375%
 (c) 9.25% (d) 9.5%

SSC CHSL 27/05/2022 (Shift- II)

Ans. (b) : Let the cost price of his item of 1 kg (1000g) = ₹1000

$$\therefore \text{SP of his item} \Rightarrow 1000 \times \frac{100+5}{100} = ₹1050$$

According to the question:-

His 1 kg = 960 grams \Rightarrow ₹960

Cost price of 960 grams \Rightarrow ₹960

Selling price of 960 grams \Rightarrow ₹1050

$$\therefore \text{Profit}\% = \frac{1050 - 960}{960} \times 100 \Rightarrow \frac{90}{960} \times 100 \Rightarrow \frac{150}{16} \Rightarrow 9.375\%$$

5. A shopkeeper bought toffees at a rate of 10 for ₹15 and sold them at a rate of 16 for ₹40. Find his profit percentage. (correct to two decimal places)

- (a) 65.05% (b) 33.33%
 (c) 50.55% (d) 66.67%

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (d) $\left(\begin{array}{l} 10 \times 16 \rightarrow 15 \times 16 \\ 16 \times 10 \rightarrow 40 \times 10 \end{array} \right)$

$$\begin{array}{l} 160 \rightarrow 240 \text{ CP} \\ 160 \rightarrow 400 \text{ SP} \end{array} \rightarrow \text{Profit } 160$$

$$\text{Profit percentage} = \frac{160}{240} \times 100$$

$$= 66.67\%$$

6. A shopkeeper bought 40 pieces of an article at a rate of 50 per item. He sold 35 pieces with 20% profit. The remaining 5 pieces were found to be damaged and he sold them with 10% loss. Find his overall profit percentage.

- (a) 30% (b) 32.5%
 (c) 16.25% (d) 10%

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (c) Total cost of 40 pieces = $40 \times 50 = ₹2000$

$$\begin{aligned} \text{Total selling price} &= 35 \times 50 \times \frac{120}{100} + 5 \times 50 \times \frac{90}{100} \\ &= 2100 + 225 \\ &= ₹2325 \end{aligned}$$

$$\therefore \text{Profit}\% = \frac{325}{2000} \times 100 = 16.25\%$$

7. A shopkeeper marks an article at a price 20% higher than its cost price and allows 10% discount. Find his gain percentage.

- (a) 9.5% (b) 8%
(c) 9% (d) 10%

SSC CGL (Tier-I) 13/04/2022 (Shift-II)

Ans : (b) $\text{Gain}\% = \left(M - D - \frac{M \times D}{100} \right)\%$

Where, M = Maximum marked price
D = Discount

So, $\text{Gain}\% = \left(20 - 10 - \frac{20 \times 10}{100} \right)$
 $= 10 - 2$
 $= 8\%$

8. A shopkeeper bought 60 pencils at a rate of 4 for ₹5 and another 60 pencils at a rate of 2 for ₹3. He mixed all the pencils and sold them at a rate of 3 for ₹4. Find his gain or loss percentage.

- (a) Profit $3\frac{1}{8}\%$ (b) Loss $3\frac{1}{33}\%$
(c) Profit $2\frac{7}{8}\%$ (d) Loss $2\frac{7}{8}\%$

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b)

$4 \rightarrow ₹5$
 $(2) \times 2 \text{ (₹3)} \times 2$
 $4 \rightarrow ₹6$
 $\text{CP of 8 article} = 6 + 5 = ₹11$
 $\therefore \text{CP} \rightarrow (8 \rightarrow 11 \text{ Rs}) \times 3 = 24 \rightarrow ₹33$
 $\text{SP} \rightarrow (3 \rightarrow 4 \text{ Rs}) \times 8 = 24 \rightarrow ₹32$
 $\therefore \text{Loss}\% = \frac{1}{33} \times 100 = 3\frac{1}{33}\%$

9. A shopkeeper bought a table for ₹4,600 and a chair for ₹1,800. He sells the table with 10% gain and the chair with 6% gain, Find the overall gain percentage.

- (a) $7\frac{9}{4}$ (b) $8\frac{7}{8}$
(c) 18 (d) 16

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (b)

CP	→	4600	:	1800
		23	:	9
P%	→	10%	:	6%

Overall gain% = $\frac{230 + 54}{32} = \frac{284}{32} = \frac{71}{8} = 8\frac{7}{8}$

10. Aditya sells two wrist watches from his personal collection for ₹12,600 each. On the first watch, he gains 26% and on the second, he loses 10%. Find the overall gain or loss percentage.

- (a) Gain of 16% (b) Gain of 5%
(c) Loss of 5% (d) Gain of 12%

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(b) Given that—

Selling price (SP) of each wrist watch – ₹12,600
 Profit% = 26%
 Loss% = 10%

According to the question,
Cost Price (CP) of two wrist watches

$$= 12600 \times \frac{100}{126} + 12600 \times \frac{100}{90}$$

$$= 10,000 + 14,000$$

$$= ₹ 24,000$$

$$\therefore \text{Total SP} = 12,600 + 12,600$$

$$= 25,200$$

$$\therefore \text{Required profit}\% = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

$$= \frac{25200 - 24000}{24000} \times 100$$

$$= \frac{1200}{24000} \times 100 = 5\%$$

Hence, option (b) is correct.

11. A person sold an article at a loss of 18%. Had he sold it for ₹960 more, he would have gained 12%. If the article is sold for ₹3,840, then how much is the profit percentage?

- (a) 15% (b) 24%
(c) 20% (d) 21%

SSC CGL (Tier-I) 11/04/2022 (Shift-III)

Ans. (c) Let, CP = 100

According to the question,

SP ₁ = 82	}	30 → 960
SP ₂ = 112		1 → 32

$$\therefore \text{CP} = 32 \times 100 = 3200$$

$$\text{SP} = 3840$$

$$\text{Profit} = 3840 - 3200 = 640$$

$$\text{Profit}\% = \frac{640}{3200} \times 100$$

$$= 20\%$$

12. In a medical transaction, 17 times the cost price is equal to 8 times the sum of the cost price and the selling price. What is the gain or loss percentage?

- (a) Loss 15% (b) Gain 17.5%
(c) Gain 12.5% (d) Loss 30%

SSC CGL (Tier-II) 03/02/2022

Ans : (c) $17\text{CP} = 8(\text{CP} + \text{SP})$

$$17\text{CP} = 8\text{CP} + 8\text{SP}$$

$$9\text{CP} = 8\text{SP}$$

$$\frac{\text{CP}}{\text{SP}} = \frac{8}{9} \text{ Profit} = 1$$

$$\text{Profit}\% = \frac{1}{8} \times 100\%$$

$$= 12.5\%$$

13. An article is sold at a certain price. If it is sold at $33\frac{1}{3}\%$ of this price, there is a loss of

$33\frac{1}{3}\%$. What is the percentage profit if the article is sold at 80% of its original selling price?

- (a) 60% (b) 50%
(c) 70% (d) 40%

SSC CGL (Tier-II) 29/01/2022

Ans. (a) Let the original SP = 300

$$\text{Then, New SP} = \frac{300 \times 100}{300} = 100$$

According to the question,

$$\text{CP} = 100 \times \frac{100}{66\frac{2}{3}} \left[\text{loss of } 33\frac{1}{3}\% \right]$$

$$\text{CP} = 150$$

When the article is sold at 80% of the original

$$\text{SP} = 300 \times \frac{80}{100} = 240$$

$$\begin{aligned} \text{Required profit \%} &= \frac{240 - 150}{150} \times 100 \\ &= \frac{90}{150} \times 100 = 60\% \end{aligned}$$

14. 52 oranges are bought for ₹119.60 and sold at the rate of ₹41.40 per dozen. The profit percentage is:

- (a) 60% (b) 45%
(c) 50% (d) 40%

SSC MTS 18/10/2021 (Shift-I)

Ans. (c) CP of 52 oranges = ₹119.60

$$\text{CP of 1 orange} = \frac{119.60}{52} = ₹2.3$$

$$\text{SP of 12 oranges} = ₹41.40$$

$$\text{SP of 1 oranges} = \frac{41.40}{12} = ₹3.45$$

$$\begin{aligned} \text{Profit\%} &= \frac{3.45 - 2.3}{2.3} \times 100 \\ &= \frac{1.150}{2.3} = 50\% \end{aligned}$$

15. A man sells 30 apples for the cost price of 40 apples. His profit percentage (correct to two places of decimal) is:

- (a) 33.33% (b) 25.00%
(c) 30.67% (d) 40.33%

SSC MTS 08/10/2021 (Shift-I)

Ans. (a) According to the question:-

C.P. of 40 apples = S.P. of 30 apples

$$\frac{\text{CP}}{\text{SP}} = \frac{30}{40}$$

$$\begin{aligned} \therefore \text{Profit} &= \text{S.P.} - \text{C.P.} \\ &= 40 - 30 \\ &= 10 \end{aligned}$$

$$\begin{aligned} \text{Profit\%} &= \frac{10 \times 100}{30} \\ &= \frac{1000}{30} = 33.33\% \end{aligned}$$

16. The marked price of an article is Rs. 400. After allowing a discount of 20% on the marked price, a shopkeeper makes a loss of Rs. 48. His loss percentage is:

- (a) $14\frac{1}{23}\%$ (b) $13\frac{1}{23}\%$
(c) $15\frac{1}{23}\%$ (d) $17\frac{1}{23}\%$

SSC MTS 14/10/2021 (Shift-I)

Ans. (b) According to the question,

$$\text{S.P.} = 400 \times \frac{80}{100} = 320$$

$$\text{Loss} = \text{C.P.} - \text{S.P.}$$

$$48 = \text{C.P.} - 320$$

$$\text{C.P.} = 368$$

$$\begin{aligned} \text{Loss\%} &= \frac{368 - 320}{368} \times 100 \\ &= \frac{4800}{368} \end{aligned}$$

$$= 13\frac{1}{23}\%$$

17. The selling price of an article is Rs. 2,300 and profit percentage is 25%. If the article is sold again for Rs 1,656, then what is the loss/gain percentage?

- (a) Loss 10% (b) Gain 6.25%
(c) Loss 6.5% (d) Gain 10%

SSC MTS 14/10/2021 (Shift-I)

$$\text{Ans. (a)} : \text{C.P.} = \frac{\text{S.P.} \times 100}{(100 \pm \text{Profit/loss\%})}$$

According to the question,

$$\frac{2300 \times 100}{(100 + 25)} = \frac{1656 \times 100}{(100 \pm P/L\%)}$$

$$100 \pm P/L = \frac{1656 \times 125}{2300}$$

$$100 \pm P/L = 90$$

$$L = 10\%$$

18. A man bought 2 articles for Rs. 3,000 each. He sold one article at 5% profit and the other at 10% loss. What is the total profit or loss percentage?

- (a) Loss 2.5% (b) Loss 10%
(c) No profit no loss (d) Profit 2.5%

SSC MTS 14/10/2021 (Shift-I)

Ans. (a) Total Cost Price (CP) of both articles = 3000 + 3000

$$\text{CP} = ₹ 6000$$

$$\text{Total Selling Price (SP)} = 3000 \times \frac{105}{100} + 3000 \times \frac{90}{100}$$

$$= 3150 + 2700$$

$$= 5850$$

$$\begin{aligned} \text{Total loss\%} &= \frac{(6000 - 5850)}{6000} \times 100 \\ &= \frac{150}{6000} \times 100 \\ &= 2.5\% \text{ loss} \end{aligned}$$

19. The marked price of an article is ₹400. After allowing a discount of 20% on the marked price, a shopkeeper makes a profit of ₹48. His gain percentage is:

- (a) $15\frac{11}{17}\%$ (b) $19\frac{11}{17}\%$
(c) $17\frac{11}{17}\%$ (d) $14\frac{11}{17}\%$

SSC MTS 13/10/2021 (Shift-I)

Ans. (c) : Given:- Marked Price = ₹ 400
Discount = 20%
 $\therefore \text{SP} = \frac{\text{MP} \times (100 - D\%)}{100}$
Selling Price = $400 \times \frac{80}{100}$
= ₹ 320
Cost Price = 320 - 48
= ₹ 272
Profit % = $\frac{(320 - 272)}{272} \times 100$
= $\frac{48}{272} \times 100$
= $17\frac{11}{17}\%$

20. The list price of a motorcycle is 20% more than its cost price. It is sold at a discount of 30%. Find the dealer's loss percentage.

- (a) 14% (b) 16%
(c) 10% (d) 12%

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : Let CP = ₹100
MP = ₹120
 $\text{SP} = 120 \times \frac{70}{100} = 84$
Loss percentage = $\frac{100 - 84}{100} \times 100 = 16\%$

21. A shopkeeper bought a computer for ₹42,000 and a printer for ₹3,000. If he sold both the items together for ₹51,750, then his profit percentage is:

- (a) 15% (b) $17\frac{2}{9}\%$
(c) $14\frac{1}{4}\%$ (d) $23\frac{2}{14}\%$

SSC MTS 27/10/2021 (Shift-I)

Ans. (a) : According to the question,
Total cost price = ₹42000 + ₹3000 = ₹45000
S.P = ₹51750

$$\begin{aligned} \text{Profit\%} &= \frac{51750 - 45000}{45000} \times 100 \\ &= \frac{6750}{45000} \times 100 \\ &= \frac{675}{45} = 15\% \end{aligned}$$

22. The cost price of an article is 25% less than its selling price. What is the profit or loss percentage?

- (a) 33.33%, loss (b) 66.67, profit
(c) 33.33%, profit (d) 66.67%, loss

SSC MTS 22/10/2021 (Shift-I)

Ans. (c) : Let Selling Price = x

$$\begin{aligned} \therefore \text{Cost price} &= x \times \frac{75}{100} = \frac{3x}{4} \\ \text{Profit} &= \text{SP} - \text{CP} \\ &= x - \frac{3x}{4} \\ &= \frac{x}{4} \\ \text{Profit Percentage} &= \frac{\frac{x}{4}}{\frac{3x}{4}} \times 100 \\ &= \frac{x \times 100 \times 4}{4 \times 3x} \\ &= \frac{100}{3} = 33.33\% \end{aligned}$$

23. Three articles are bought at ₹180 each. One of them is sold at a loss of 10%. If the other two articles are sold so as to gain 25% on the whole transaction, then what is the gain percentage on the two articles?

- (a) 30% (b) 42.5%
(c) 37.5% (d) 45%

SSC MTS 12/10/2021 (Shift-I)

Ans. (b) : Total cost price = $180 \times 3 = ₹ 540$
Let, profit percentage of two articles = x
 $\frac{180 \times 90}{100} + \frac{360(100 + x)}{100} = \frac{540 \times 125}{100}$
 $18 \times 9 + \frac{360(100 + x)}{100} = 540 \times \frac{5}{4}$
 $9 + \frac{100 + x}{5} = \frac{75}{2}$
 $2(45 + 100 + x) = 75 \times 5$
 $2x = 375 - 290$
 $x = \frac{85}{2} = 42.5\%$

24. If selling price of 75 articles is equal to cost price of 60 articles, then the approximate loss or gain percent is :

- (a) Profit of 25% (b) No profit no loss
(c) Loss of 30% (d) Loss of 20%

SSC CGL–(Tier-I) 24/08/2021 (Shift I)

Ans. (d) : According to the question:-

$$75 \text{ SP} = 60 \text{ CP}$$

$$\frac{\text{SP}}{\text{CP}} = \frac{4}{5}$$

$$\text{Loss\%} = \frac{1}{5} \times 100 = 20\%$$

25. Radha purchased a computer table for ₹10000 and a centre table for ₹5000. She sold computer table with 8% profit. With what profit percent should she sell the centre table so as to gain 10% on the whole transaction ?

- (a) 12% (b) 10%
(c) 14% (d) 18%

SSC CGL–(Tier-I) 16/08/2021 (Shift-II)

Ans. (c) : Given,

Cost price of computer table = ₹ 10,000

Cost price of centre table = ₹ 5,000

According to the question,

$$\begin{aligned} \text{Selling price of computer table} &= 10,000 \times \frac{108}{100} \\ &= 10800 \end{aligned}$$

$$\begin{aligned} \text{Total Cost Price} &= 10000 + 5000 \\ &= 15000 \end{aligned}$$

$$\begin{aligned} \text{SP of both articles to gain 10\%} &= 15000 \times \frac{110}{100} \\ &= 16500 \end{aligned}$$

$$\begin{aligned} \therefore \text{Selling price of centre table} &= 16500 - 10800 \\ &= ₹5700 \end{aligned}$$

$$\begin{aligned} \text{Profit \% on centre table} &= \frac{5700 - 5000}{5000} \times 100 \\ &= \frac{700}{5000} \times 100 \\ &= 14\% \end{aligned}$$

Hence, option (c) is right answer.

26. A shopkeeper allows 16% discount on every item. Even after giving the discount, he makes a profit of 8%. If he gives 8% discount instead of 16% on an item marked for ₹1800, then what will be his profit percent ? (correct to 2 decimal places) :

- (a) 19 (b) 18.31
(c) 18 (d) 18.29

SSC CGL–(Tier-I) 16/08/2021 (Shift III)

Ans. (d) : SP of article after 16% discount

$$= 1800 \times \frac{84}{100} = 1512$$

$$\text{Now, CP of the article} = \frac{1512}{108} \times 100 = 1400$$

SP of article after 8% discount instead of 16%

$$= \frac{1800 \times 92}{100} = 1656$$

$$\text{Now, Profit \%} = \frac{1656 - 1400}{1400} \times 100$$

$$= \frac{256}{1400} \times 100$$

$$= 18.285\%$$

$$\approx 18.29\%$$

27. On selling an article for ₹246.80, the gain is 20% more than the amount of loss incurred on selling it for ₹216. If the article is sold for ₹220.75, then what is the gain/loss percent (correct to nearest integer)?

- (a) Profit 7% (b) Loss 5%
(c) Loss 4% (d) Profit 3%

SSC CGL (Tier-I) 16/08/2021 (Shift I)

$$\text{Ans. (c) : } \because \text{Profit} = \text{Loss} \times \frac{6}{5} \left(\because 20\% = \frac{1}{5} \right)$$

According to Question

$$(246.80 - \text{CP}) \times 5 = (\text{CP} - 216) \times 6$$

$$11 \text{ CP} = 5 \times 246.80 + 6 \times 216$$

$$11 \text{ CP} = 2530$$

$$\text{CP} = 230$$

$$\therefore \text{SP} = ₹ 220.75, \text{CP} = ₹ 230$$

$$\therefore \text{Loss \%} = \frac{9.25}{230} \times 100$$

$$= 4.02$$

$$= 4\% \text{ (approximately)}$$

28. Some fruits are bought at 15 for ₹140 and an equal number of fruits at 10 for ₹120. If all the fruits are sold at ₹132 per dozen, then what is the profit percent in the entire transaction ?

- (a) $3\frac{1}{8}$ (b) $4\frac{1}{2}$
(c) $2\frac{1}{4}$ (d) 3

SSC CGL–(Tier-I) 13/08/2021 (Shift I)

Ans. (a) :

Fruits C.P.

$$15 \times 2 \rightarrow 140 \times 2 \text{ (No. of fruits should be equal)}$$

$$10 \times 3 \rightarrow 120 \times 3$$

$$60 \rightarrow 640$$

According to the question,

Fruits S.P.

$$[12 \times 5 \rightarrow 132 \times 5] \text{ (Fruits be equal)}$$

$$60 \rightarrow 660$$

$$\text{Required profit \%} = \frac{660 - 640}{640} \times 100$$

$$= \frac{100}{32}$$

$$= 3\frac{1}{8}\%$$

29. A man buys goods for ₹8,000. He sells 30% of those goods at a profit of 12% and 40% of the remaining goods at a profit of 25%. At what profit percentage should he sell the remaining goods to gain 30% in entire transaction (correct to one decimal place)?

- (a) 42.6% (b) 46.2%
(c) 48.4% (d) 31.6%

SSC CHSL 19/04/2021 (Shift-I)

Ans. (b) : Let total goods = 100

According to the question,

$$30 \times 12 + 28 \times 25 + 42 \times x = 100 \times 30$$

$$360 + 700 + 42x = 3000$$

$$42x = 1940$$

$$x\% = 46.19\%$$

Hence, profit percentage = 46.19% \approx 46.2%

30. By selling an article for ₹ 1,170 Elisa suffers as much loss as she would have gained by selling it at a profit of 22%. if she sells it for ₹ 1,450, then her profit/loss per cent (correct up to one decimal place) is

- (a) Profit, 3.3 (b) Loss, 3.3
(c) Loss, 26.2 (d) Profit 26.2

SSC CHSL 04/08/2021 (Shift-I)

Ans. (b) : Cost price of the article = $\frac{1170 \times 100}{78} = 1500$

$$\text{Loss}\% = \frac{\text{CP} - \text{SP}}{\text{CP}} \times 100$$

$$= \frac{1500 - 1450}{1500} \times 100$$

$$= \frac{50}{1500} \times 100$$

$$= 3.3\%$$

31. By selling 92 kg of wheat, a person gains the selling price of 12 kg of it. His gain percentage is:

- (a) 16% (b) 12%
(c) 15% (d) 18%

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : 92 SP - 92 CP = 12SP

$$80 \text{ SP} = 92 \text{ CP}$$

$$\frac{\text{SP}}{\text{CP}} = \frac{92}{80} = \frac{23}{20}$$

$$\text{Profit} = 3$$

$$\text{Gain percentage} = \frac{3}{20} \times 100 = 15\%$$

32. The marked price of an article is ₹660. A shopkeeper allows a discount of 20% and still gets a profit of 10%. If he sells it for ₹470, his profit or loss percent, correct to two decimal places will be:

- (a) Profit 3.06% (b) Loss 5.43%
(c) Profit 7.59% (d) Loss 2.08%

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) : CP (100+P%) = MP (100-D%)

$$\text{CP} \times 110 = 660 \times 80$$

$$\text{CP} = 6 \times 80 = 480$$

\therefore If he sells it for 470

$$\text{Loss} = 480 - 470 = 10$$

$$\text{Then, Loss}\% = \frac{10}{480} \times 100 = \frac{100}{48} = 2.08\%$$

33. A shopkeeper bought pens at the rate of ₹1,350 for 15 dozen pens and sold them at the rate of ₹495 for 5 dozen pens. His profit or loss is:

- (a) Profit 10% (b) Loss 10%
(c) Loss 15% (d) Profit 15%

SSC CHSL 04/08/2021 (Shift-II)

Ans. (a) : \therefore Cost Price of 15 dozen pens = ₹1350

So, Cost Price of 5 dozen pens = ₹450

Selling Price of 5 dozen pens = ₹495

$$\text{Profit}\% = \frac{495 - 450}{450} \times 100$$

$$= \frac{45}{450} \times 100 = 10$$

Therefore, the required profit percent will be 10%.

34. Gaurav bought some articles at 5 for ₹6 and sold them at 10 for ₹11. His loss percentage is:

- (a) $8\frac{2}{3}\%$ (b) $7\frac{1}{3}\%$
(c) $8\frac{1}{3}\%$ (d) $7\frac{2}{3}\%$

SSC CHSL 10/08/2021 (Shift-II)

Ans. (c) : CP of 1 article = $\frac{6}{5} = 1.2$

$$\text{SP of 1 article} = \frac{11}{10} = 1.1$$

$$\text{Loss}\% = \frac{0.1}{1.2} \times 100$$

$$= 8\frac{1}{3}\%$$

35. The marked price of an article is ₹480. A person buys it at two successive discounts of 15% and 10%. He sells it at a profit of 25%. What is his profit (in ₹)?

- (a) 95.40 (b) 90.60
(c) 91.80 (d) 93.20

SSC CHSL 04/08/2021 (Shift-III)

Ans. (c) : Marked price of article = ₹480

Cost price after successive discount,

$$= ₹480 \times \frac{85}{100} \times \frac{90}{100} = ₹367.2$$

$$\text{Selling price of an article at 25\% profit} = 367.2 \times \frac{125}{100}$$

$$= ₹459$$

$$\text{Required profit} = 459 - 367.2 = ₹91.80$$

36. By selling a car for ₹6,32,500, a showroom owner makes a profit of 15%. If he sold the car ₹8,10,000, then what would be the profit percentage (correct to one decimal place)?
- (a) 41.5% (b) 51.4%
(c) 47.3% (d) 44.8%

SSC CHSL 10/08/2021 (Shift-III)

Ans. (c) : Given, :-

$$SP_1 = 6,32,500$$

$$\text{Profit} = 15\%$$

$$CP = ? \quad \therefore \left\{ CP = \frac{SP \times 100}{(100 + P\%)} \right\}$$

$$CP = \frac{6,32,500 \times 100}{115}$$

$$= 5,50,000$$

According to the question,

$$SP_2 = 8,10,000, CP = 5,50,000$$

$$\text{Profit} = 8,10,000 - 5,50,000$$

$$= 2,60,000$$

$$\text{Profit \%} = \frac{2,60,000}{5,50,000} \times 100$$

$$= 47.27 \approx 47.3\%$$

37. A bought an article for ₹4,800 and sold it at a loss of 30%. With this manner, he bought another article and sold it at a gain of 60%. What was his overall gain/loss?

- (a) Gain 10% (b) Loss 18%
(c) Loss 15% (d) Gain 12%

SSC CHSL 05/08/2021 (Shift-II)

Ans. (d) : According to the question,

$$\text{Net Profit/Loss \%} \Rightarrow \text{Profit \%} + \text{Loss \%} + \frac{\text{Profit \%} \times \text{Loss \%}}{100}$$

$$= 60 - 30 + \frac{(+60) \times (-30)}{100} \quad \left\{ \begin{array}{l} \text{Profit} = + \\ \text{Loss} = - \end{array} \right\}$$

$$= 60 - 30 - 18$$

$$= [+12\% \text{ gain}]$$

38. A shopkeeper marks his goods 25% above the cost price. Then, he allows a 40% discount on it. What is the percentage loss?

- (a) 20% (b) 30%
(c) 15% (d) 25%

SSC CHSL 11/08/2021 (Shift-III)

Ans. (d) : According to the question :-

Let the Cost Price of an article = 100%

$$MP = 125\%$$

$$SP = \frac{125 \times (100 - 40)}{(100)}$$

$$SP = \frac{125 \times 60}{100} = 75\%$$

$$\text{Loss \%} = 100\% - 75\% \\ = 25\%$$

39. A shopkeeper bought 95 dozen oranges at ₹4.50 each. 7 dozen oranges were rotten and so were discarded. He sold the remaining oranges at ₹78 per dozen. What is his profit or loss per cent (to the nearest integer)

- (a) Loss, 45% (b) Profit, 34%
(c) Loss, 34% (d) Profit, 45%

SSC CHSL 12/08/2021 (Shift-II)

Ans. (b) : According to the question:-

$$\text{Cost Price of 95 dozen oranges} = 95 \times 12 \times 4.5 = ₹5130$$

∴ 7 dozen oranges got rotten

$$\therefore \text{Remaining oranges} = 95 - 7 = 88 \text{ dozen}$$

$$\text{Selling price of 88 dozen oranges} = 88 \times 78 = ₹6864$$

$$\text{Profit} = 6864 - 5130 = 1734$$

$$\text{Profit \%} = \frac{1734}{5130} \times 100$$

$$= 33.8 \approx 34\% \text{ profit}$$

40. A shopkeeper bought 40 dozen eggs at ₹1.40 each. 80 eggs were broken in transportation. He sold the remaining eggs at ₹1.60 each. What is his profit or loss per cent?

- (a) Profit, $4\frac{16}{21}$ (b) Loss, $3\frac{19}{27}$
(c) Profit, $3\frac{19}{27}$ (d) Loss, $4\frac{16}{21}$

SSC CHSL 13/04/2021 (Shift-II)

Ans. (d) : According to the question,

$$\text{Cost price of 40 dozen egg} = 40 \times 12 \times 1.40 = ₹672$$

∴ 80 egg were broken ⇒

$$\therefore \text{Remaining egg} = 40 \times 12 - 80$$

$$= 480 - 80 = 400$$

$$\text{Selling price of 400 egg at ₹1.60 each} \Rightarrow 400 \times 1.6 \Rightarrow ₹640$$

$$\text{Loss} = 672 - 640 = ₹32$$

$$\text{Loss \%} = \frac{32}{672} \times 100$$

$$= \frac{100}{21} = 4\frac{16}{21}\%$$

41. A shopkeeper sells two refrigerator sets at the same price. He gains 40% on one refrigerator and losses 40% on the other. What is his net loss percentage in the whole transaction?

- (a) 16% (b) 14%
(c) 18% (d) 12%

SSC CHSL 12/04/2021 (Shift-II)

Ans : (a) We know that:- For x% gain and x% loss

$$= +x - x + \frac{-x \cdot x}{100} \quad \left(\begin{array}{l} + = \text{gain} \\ - = \text{loss} \end{array} \right)$$

$$\Rightarrow \frac{-x^2}{100} \% = \text{Loss \%} \quad \text{Loss \%} = \frac{(40)^2}{100} = 16\%$$

42. The marked price of a table is ₹3,000, which is 25% above the cost price. It is sold at a discount of 20% on the market price. What is the profit or loss percent?

(a) Loss, 5% (b) Profit, 10%
(c) No profit, no loss (d) Profit, 15%

SSC CHSL 12/08/2021 (Shift-II)

Ans. (c) : Let the CP of table = 100 units

$$\therefore \text{MP} = 125 \text{ units} \rightarrow ₹3000$$

$$1 \text{ unit} = \frac{3000}{125} = 24$$

$$\text{CP} \Rightarrow 100 \text{ units} = 2400$$

According to the question:-

$$\text{SP} = \frac{\text{MP} \times (100 - D\%)}{100}$$

$$\text{SP} = \frac{3000 \times (100 - 20)}{100}$$

$$\frac{3000 \times 80}{100} = 2400$$

$$\therefore \text{CP} = \text{SP} \rightarrow 2400 = 2400$$

Hence, there is no profit, no loss,

43. Suresh purchased a computer table for ₹9,000 and a center table for ₹4,000. He sold the computer table with 8% profit. With what profit percentage should he sell the centre table so has to gain 10% on the whole transaction?

(a) 15 (b) 12
(c) 14 (d) 14.5

SSC CHSL 09/08/2021 (Shift-II)

Ans. (d) : CP of computer table = ₹9,000

Profit = 8%

$$\text{SP of computer table} = \frac{9000 \times (100 + 8)}{100}$$

$$\text{SP} = \frac{9000 \times 108}{100} = ₹9720$$

$$\text{Total CP} = 9000 + 4000 = ₹13000$$

For gain of 10% in whole transaction

$$\text{SP} = \frac{13000 \times 110}{100}$$

$$\Rightarrow ₹14300$$

$$\therefore \text{SP of center table} = 14300 - 9720 = ₹4580$$

$$\text{CP of center table} = ₹4000$$

$$\text{Profit} = \text{SP} - \text{CP}$$

$$= 4580 - 4000$$

$$= ₹580$$

$$\text{Profit}\% = \frac{580}{4000} \times 100$$

$$= \frac{58}{4} = 14.5\%$$

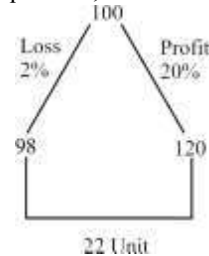
44. A dealer sold article at a loss of 2%. If he sold it for ₹44 more, he would have gained 20%. Find the cost price of the article.

(a) ₹300 (b) ₹400
(c) ₹250 (d) ₹200

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : The cost price of the article is Rs 100.

According to the question,



$$22 \text{ unit} = ₹ 44$$

$$1 \text{ unit} = ₹ 2$$

$$\text{So the cost price of the article} = 100 \text{ unit} \\ = 2 \times 100 = ₹200$$

Trick-

$$(2 + 20)\% = ₹ 44$$

$$22\% = ₹ 44$$

$$1\% = ₹ 2$$

$$100\% = ₹ 200$$

45. A man sells two articles at ₹9,975 each. He gains 5% on one article and loses 5% on the other. Find his overall gain or loss.

(a) ₹50 Loss (b) ₹60 Loss
(c) ₹50 Profit (d) ₹60 Profit

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : If the selling price of the two articles is the

same then man will always suffer a loss of $\frac{x^2}{100}\%$

$$\text{Loss}\% = \frac{5^2}{100} = 0.25\%$$

$$\text{Total Cost Price} = \frac{100}{99.75} \times (2 \times 9975) = ₹20000$$

$$\text{Total Selling Price} = 2 \times 9975 = ₹19950$$

$$[\text{Loss} = \text{CP} - \text{SP}]$$

$$= 20000 - 19950 = 50$$

$$\text{Loss} = ₹50$$

46. If the selling price of 40 articles is equal to the cost price of 50 articles, then the percentage loss or gain is:

(a) 25% gain (b) 25% loss
(c) 20% gain (d) 20% loss

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (a) :

Percentage gain

$$= \frac{\text{No. of purchased articles} - \text{No. of sold articles}}{\text{No. of sold articles}} \times 100$$

$$= \frac{50 - 40}{40} \times 100 = 25\%$$

Trick-
 $40SP = 50CP$
 $\frac{SP}{CP} = \frac{50}{40} = \frac{5}{4}$
 $\text{Profit}\% = \frac{1}{4} \times 100 = 25\%$

47. Sudhir purchased a laptop for ₹42,000 and a scanner-cum-printer for ₹8,000. He sold the laptop for a 10% profit and the scanner-cum-printer for a 5% profit. What is his profit percentage?

- (a) 15% (b) $9\frac{2}{5}\%$
 (c) $9\frac{1}{5}\%$ (d) $7\frac{1}{2}\%$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (c) : Cost price of laptop and scanner cum printer = 42000 + 8000 = 50,000

$$\begin{aligned} \text{Profit} &= 42000 \times \frac{10}{100} + 8000 \times \frac{5}{100} \\ &= 4200 + 400 = ₹4600 \\ \text{Profit}\% &= \frac{4600}{50000} \times 100 = 9\frac{1}{5}\% \end{aligned}$$

48. A man sold two gifts at ₹30 each. On one gift he gained 18%, and on the other gift he lost 18%. What is his overall gain/loss (in ₹) ?

- (a) ₹2.50 Loss (b) ₹1.75 Gain
 (c) ₹2.00 Loss (d) ₹2.00 Gain

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (c) : Total Selling Price = ₹ 60

$$\text{Total Cost Price} = \frac{100}{118} \times 30 + \frac{100}{82} \times 30 = ₹62$$

(Approximately)

∴ Loss = ₹2

49. Ram makes a profit of 30% by selling an article. What would be the profit percent if it were calculated on the selling price instead of the cost price? (Correct to one decimal place)

- (a) 20.1% (b) 24.2%
 (c) 23.1% (d) 22.4%

SSC CGL (Tier-I)-2019 – 09/03/2020

Ans. (c) : Let, Cost Price of article = ₹100

Selling price = ₹130

The profit percent if it were calculated on the selling price % = $\frac{30}{130} \times 100 = 23.1\%$

50. If the selling price is tripled and cost price doubled the profit would become 65%. What is the percent profit (in %) ?

- (a) 20 (b) 15
 (c) 25 (d) 10

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let Cost Price is ₹x and Selling Price is ₹y.

According to the question–

$$\text{Cost Price} = 2x$$

$$\text{Selling Price} = 3y$$

$$\text{Profit}\% = \frac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$$

$$65 = \frac{3y - 2x}{2x} \times 100$$

$$26x = 60y - 40x$$

$$66x = 60y$$

$$\frac{x}{y} = \frac{10}{11}$$

$$\begin{aligned} \text{Profit}\% &= \frac{1}{10} \times 100 \\ &= 10\% \end{aligned}$$

51. On a certain item profit is 120%. If the cost price increases by 10% then what will be the new profit margin (in %) if selling price remains the same?

- (a) 50 (b) 60
 (c) 100 (d) 90

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Let, cost price of the article is = ₹ 100

According to the question–

Cost price	Selling price
100	100 + 120
10	220
110	

$$\begin{aligned} \text{New profit}\% &= \frac{220 - 110}{110} \times 100 \\ &= 100\% \end{aligned}$$

52. A wholesaler sells a watch to a retailer at a profit of 8% and the retailer sells it to a customer at a profit of 12%. If the customer pays ₹ 8,448 what had it cost (approximately) to the wholesaler (in ₹) ?

- (a) 6984 (b) 6082
 (c) 7120 (d) 7022

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Let the wholesaler bought watch in ₹ x.

According to the question–

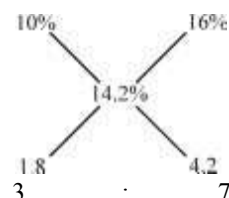
$$\begin{aligned} x \times \frac{108}{100} \times \frac{112}{100} &= 8448 \\ x &= ₹ 6984 \end{aligned}$$

53. A trader had 2000 kg of rice. He sold a part of it at 10% profit and the rest at 16% profit, so that he made a total profit of 14.2%. How much rice (in kg) did he sell at 10% profit.

- (a) 1400 (b) 600
 (c) 800 (d) 1000

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :



The quantity of rice sold by the seller at a profit of 10%
 $= \frac{3}{10} \times 2000 = 600 \text{ kg}$

54. A person buys 80 kg of rice and sells it at a profit of as much money as he paid for 30 kg. His profit percent is :

- (a) $27\frac{3}{11}$ (b) 35
 (c) $37\frac{1}{2}$ (d) 40

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Let the Cost Price of 1 kg of rice = ₹ 1
 Cost Price of 80 kg rice = ₹ 80
 Profit = ₹ 30

$$\text{Profit \%} = \frac{30}{80} \times 100 = 37\frac{1}{2}\%$$

55. An article was sold at a profit of 14%. Had it been sold for ₹121 less, a loss of 8% would have been incurred. If the same article would have been sold for ₹536.25, then the profit/loss per cent would have been ?

- (a) Profit, 5% (b) Loss, 2.5%
 (c) Loss, 5% (d) Profit, 2.5%

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : Let the cost price of the article = 100%
 $(14 + 8)\% = ₹121$
 $22\% = 121$
 $2\% = ₹11.$

$$\text{CP} \Rightarrow 100\% = ₹550$$

$$\text{Loss} = 550 - 536.25 = 13.75$$

$$\text{Loss\%} = \frac{13.75}{550} \times 100 = 2.5\%$$

56. An article is sold at a certain price. If it is sold at 80% of this price, then there will be a loss of 10%. What is the percentage profit when the article is sold at the original selling price ?

- (a) 15 (b) $12\frac{1}{2}$
 (c) 12 (d) $15\frac{1}{2}$

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let the original Selling Price = ₹ 100
 New selling price = ₹ 80

$$\text{Cost price} = \frac{80 \times 100}{90} = ₹ \frac{800}{9}$$

According to the question,

$$\therefore \text{Profit \%} = \frac{100 - \frac{800}{9}}{\frac{800}{9}} \times 100$$

$$= \frac{100}{800} \times 100 = \frac{25}{2} = 12\frac{1}{2}\%$$

57. Sujata marks an article 36% above the cost price and allows a 40% discount on the marked price. The loss percentage is :

- (a) 15 (b) 4
 (c) 16.8 (d) 18.4

SSC CGL (Tier-II) 12-09-2019

$$\text{Ans. (d) : Profit/loss \%} = \left(M - D - \frac{M \times D}{100} \right) \%$$

Where M = Mark Percentage above the cost price

D = Discount

Profit/Loss

$$\% = \left(36 - 40 - \frac{36 \times 40}{100} \right) = -4 - 14.4 = -18.4\%$$

\therefore Loss % = 18.4% [where (-) sign shows loss]

58. When an article is sold at its marked price, it gives a profit of 25%. If a discount of 9.6% is allowed on the marked price, the profit percent will be :

- (a) 15.4 (b) 15
 (c) 13 (d) 16.6

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Let CP = 100

$$\therefore \text{MP} = 125$$

According to the question,

$$\text{CP} (100+P) = \text{MP} (100-D)$$

$$100 \times (100+P) = 125 \times 90.4$$

$$4(100+P) = 5 \times 90.4$$

$$400 + 4P = 452$$

$$4P = 52$$

$$P = 13\%$$

59. Radha marks her goods 25% above the cost price. She sells 35% of goods at the marked price, 40% at 15% discount and the remaining at 20% discount. What is her overall percentage gain ?

- (a) 12.75 (b) 10
 (c) 11.75 (d) 11.25

SSC CGL (Tier-II) 11-9-2019

Ans. (d) : Let, number of goods = 100

Price of each goods = ₹100

Cost Price = ₹10000

Marked Price of each goods = ₹125

According to Question

$$\text{Selling price} = 35 \times 125 + 40 \times 125 \times \frac{85}{100} + 25 \times 125 \times \frac{80}{100}$$

$$= 125 \times [35 + 34 + 20]$$

$$= 125 \times 89 = ₹11125$$

$$\text{Overall profit percentage} = \frac{1125}{10000} \times 100 = 11.25\%$$

60. 35% of goods were sold at a profit of 65%, while the remaining were sold at x% loss. If the overall loss is 12%, then what is the value of x ? (correct to one decimal place)

- (a) 51.8 (b) 50.6
 (c) 53.5 (d) 52.4

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Let, Number of goods = 100
 And, Price of each goods = ₹1
 ∴ From the question,

$$\frac{35 \times 165}{100} + \frac{65 \times (100 - x)}{100} = 88$$

$$5775 + 6500 - 65x = 8800$$

$$65x = 3475$$

$$x = 53.46 \approx 53.5$$

61. On a certain item profit is 150%. If the cost price increases by 25% what will be the new profit margin (in %)?

- (a) 25 (b) 50
 (c) 100 (d) 75

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Let the Cost Price of the item = ₹100
 Selling price after 150% profit = ₹ 250
 According to the question,

$$\text{Cost Price after increase of 25\%} = ₹125$$

$$\text{New profit \%} = \frac{(250 - 125)}{125} \times 100 = 100\%$$

62. The cost of 25 items is the same as the revenue earned by selling x items. Find x, if the profit made in the transaction is 25%.

- (a) 25 (b) 16.67
 (c) 20 (d) 32

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : CP (Cost Price) of 25 items = SP (Selling Price) of x items

$$\frac{CP}{SP} = \frac{x}{25}$$

$$\text{Profit \%} = \left(\frac{25 - x}{x} \right) \times 100$$

$$25 = \left(\frac{25 - x}{x} \right) \times 100$$

$$x = 100 - 4x$$

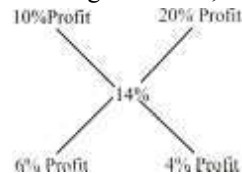
$$x = 20$$

63. A grain trader has 100 bags of rice. He sold some bags at 10% profit and rest at 20% profit. His overall profit on selling these 100 bags was 14%. How many bags did he sell at 20% profit?

- (a) 40 (b) 50
 (c) 60 (d) 70

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : From the Alligation Rule,



Ratio of bags = 6:4 = 3 : 2

Hence, the number of bags sold at 20%

$$\text{profit} = 100 \times \frac{2}{5} = 40$$

64. The profit margin on a sofa set is 100%. If the cost price of the sofa set falls by 20%, then what will be the new profit margin (in %)?

- (a) 150 (b) 120
 (c) 200 (d) 180

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Let, the Cost Price of the sofa set = ₹ 100

∴ Profit = ₹ 100

Selling Price = ₹200

Later, the Cost Price of the sofa set = ₹ 80

$$\therefore \text{Profit} = 200 - 80 = ₹ 120$$

$$\text{Profit margin in \%} = \frac{120}{80} \times 100 = 150\%$$

65. If the selling price of 50 articles is equal to the cost price of 42 article, then what is the approximate loss or profit percentage?

- (a) 10% Loss (b) 20% Profit
 (c) 16% Loss (d) 8% Profit

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) : SP of 50 articles = CP of 42 articles

$$\frac{SP}{CP} = \frac{42}{50} = \frac{21}{25} \rightarrow 4 \text{ loss}$$

$$\therefore \text{loss \%} = \frac{4}{25} \times 100 = 16\%$$

66. By selling an article for ₹1,134. Anu suffers as much loss as she would have gained by selling it at 10% profit. If she sells it for ₹ 1354.50, then her profit percentage is ?

- (a) 9 (b) 8.4
 (c) 7.5 (d) 8

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c) Let, the Cost Price of the article = ₹ x

According to the question,

$$x - 1134 = x \times \frac{10}{100}$$

$$100x - 113400 = 10x$$

$$90x = 113400$$

$$x = ₹1260$$

New Selling Price = ₹1354.50

$$\text{Profit} = 1354.5 - 1260 = 94.5$$

$$\text{Profit \%} = \frac{94.5}{1260} \times 100 = 7.5\%$$

67. I purchase 100 kg of tea and sell it for a profit to the extent of what I would have paid for 40kg. What is my profit percentage?

- (a) 20% (b) 25%
 (c) 40% (d) 30%

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) Total quantity of tea = 100kg

Profit = Cost of 40 kg tea

$$\text{Profit percentage} = \frac{40}{100} \times 100 = 40\%$$

68. Sujata sold 75% of her goods at a profit of 24% and the remaining at a loss of 40%. What is her gain/loss percentage on the whole transaction?

- (a) 7.5% Loss (b) 10% Profit
(c) 9% Loss (d) 8% Profit

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) Suppose the total number of goods is 100 and the purchase price of each item is ₹ 1

$$\begin{aligned} \text{Total Selling Price} &= 75 \times \frac{124}{100} + 25 \times \frac{60}{100} \\ &= 93 + 15 = ₹108 \end{aligned}$$

$$\begin{aligned} \therefore \text{Profit percentage} &= \frac{8}{100} \times 100 \\ &= 8\% \end{aligned}$$

69. An article was sold at a certain price. Had it been sold at 4/5 of that price, there would have been a loss of 10%. At what profit percentage was the article sold initially?

- (a) 10 (b) 12.5
(c) 15 (d) 10.5

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) Let Selling Price (SP) = ₹x

According to the question,

$$\text{Cost Price (CP)} = \frac{4x}{5} \times \frac{100}{90} = \frac{8x}{9}$$

$$\begin{aligned} \text{Initially profit \%} &= \frac{(\text{SP} - \text{CP})}{\text{CP}} \times 100 = \frac{\left(x - \frac{8x}{9}\right)}{\frac{8x}{9}} \times 100 \\ &= \frac{x}{8x} \times 100 \\ &= 12.5\% \end{aligned}$$

70. A trader buys an article at 80% of its marked price and sells at 10% discount on its marked price. His percentage profit is:?

- (a) 10½ (b) 15
(c) 10 (d) 12½

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Let, Marked Price = ₹100

Cost Price of article = ₹80

Selling Price of article = ₹90

$$\text{Profit \%} = \frac{90 - 80}{80} \times 100$$

$$= \frac{10}{80} \times 100 = 12\frac{1}{2}\%$$

71. Anu purchased a car and then sold it. If the ratio of the cost price and selling price is 10 : 11, then the profit percentage is:

- (a) 15% (b) 18%
(c) 10% (d) 20%

SSC CHSL –26/10/2020 (Shift-II)

Ans. (c) : Cost Price : Selling Price = 10 : 11

$$\text{Profit \%} = \frac{1}{10} \times 100 = 10\%$$

72. The profit made by selling an article for ₹13,400 is equal to the amount of loss incurred on selling the same article at ₹11,600. What will be the profit (in ₹) if it is sold for ₹14,750?

- (a) 2,000 (b) 2,520
(c) 2,500 (d) 2,250

SSC CHSL –26/10/2020 (Shift-III)

Ans. (d) : Let, the Cost Price of the article = ₹x

Profit = Selling Price – Cost Price

$$\text{Profit} = 13,400 - x$$

Loss = Cost Price – Selling Price

$$= x - 11600$$

According to the question

$$13400 - x = x - 11600$$

$$\text{Cost Price (x)} = \frac{13400 + 11600}{2} = 12500$$

$$\text{Profit} = 14750 - 12500$$

$$\text{Profit} = ₹ 2250$$

73. Prem purchased an old printer for ₹3,200 and spent ₹600 on its repair. He sold it for ₹4,280. His profit percent is closest to: (correct upto two decimal places)

- (a) 12.63% (b) 18.45%
(c) 15.78% (d) 16.92%

SSC CHSL –19/10/2020 (Shift-III)

Ans. (a) : Cost Price (CP) = 3200 + 600 = ₹3800

Selling Price (SP) = ₹4280

$$\text{Profit} = 4280 - 3800 = 480$$

$$\begin{aligned} \therefore \text{Profit \%} &= \frac{480}{3800} \times 100 \\ &= 12.63\% \end{aligned}$$

74. If the gain is one-fifth of the selling price, then the gain percentage is:

- (a) 16% (b) 20%
(c) 80% (d) 25%

SSC CHSL –16/10/2020 (Shift-I)

Ans. (d) : Let, the Selling Price of the article = ₹x

$$\therefore \text{Profit} = \frac{x}{5}$$

$$\begin{aligned} \therefore \text{Cost Price of article} &= x - \frac{x}{5} \\ &= \frac{4}{5}x \end{aligned}$$

$$\begin{aligned} \therefore \text{Profit percentage} &= \frac{\frac{x}{5}}{\frac{4x}{5}} \times 100 \\ &= 25\% \end{aligned}$$

Trick–

$$\frac{\text{Profit}}{\text{Selling Price}} = \frac{1}{5}$$

$$\text{Cost Price} = 4$$

$$\therefore \text{Profit\%} = \frac{1}{4} \times 100 = 25\%$$

75. The cost price of 12 pens is equal to the selling price of 8 pens. The profit percentage is:

- (a) 45% (b) 55%
(c) 40% (d) 50%

SSC CHSL –14/10/2020 (Shift-I)

Ans. (d) : $12 \text{ CP} = 8 \text{ SP}$

$$\frac{\text{CP}}{\text{SP}} = \frac{2}{3}$$

$$\text{Profit \%} = \left(\frac{3-2}{2} \right) \times 100 = 50\%$$

76. A sells an item at 20% profit to B, B sells the same at 10% profit to C and receives ₹1,32,000.0 Had C purchased the same item from A, he would have spent 5% less than what he spent with B. What profit would A have made then?

- (a) ₹24,540 (b) ₹25,540
(c) ₹24,450 (d) ₹25,400

SSC CHSL -13/10/2020 (Shift-I)

Ans. (d) : Let CP of the item for A = ₹100

$$A(100) \xrightarrow{+20\%} B(120) \xrightarrow{+10\%} C(132)$$

$$132 \text{ unit} \rightarrow ₹ 132000$$

$$1 \text{ unit} \rightarrow ₹ 1000$$

If C purchased the same from A,

$$\text{He spent} = 132 \times \frac{95}{100} = 125.4 \text{ unit}$$

$$\text{Then profit of A} = 125.4 - 100 = 25.4 \text{ unit} \\ = 25.4 \times 1000 = ₹25400$$

77. List price of a bike is 15% more than its cost price. It is sold at a discount of 20%. Find the dealer's loss or profit percentage.

- (a) Profit 8% (b) Profit 9%
(c) Loss 9% (d) Loss 8%

SSC CHSL -12/10/2020 (Shift-I)

Ans. (d) : Let, the Cost Price of the bike = ₹ 100

$$\therefore \text{List price} = ₹ 115$$

\therefore gives 20% discount on list price.

$$\therefore \text{Selling Price} = \frac{115 \times 80}{100} = ₹ 92$$

$$\therefore \text{Loss} = 100 - 92 = ₹ 8$$

$$\therefore \text{Loss percentage} = \frac{\text{Loss}}{\text{Cost Price}} \times 100$$

$$= \frac{8}{100} \times 100 = 8\%$$

Trick-

M = Marked Price %, D = discount%

$$\text{Por L\%} = \left(M - D - \frac{M \times D}{100} \right) \%$$

$$= 15 - 20 - \frac{15 \times 20}{100}$$

$$= -5 - 3 = -8\%$$

$$\text{L\%} = 8\%$$

78. A tradesman marks his products 35% above the cost price and allows his customer 15% reduction on their bills. What percentage of profit does he make?

- (a) 14.75 (b) 14
(c) 14.25 (d) 14.10

SSC CHSL -18/03/2020 (Shift-III)

Ans. (a) Let, the Cost Price of the product = ₹100

Marked Price = ₹135

$$\text{Selling Price} = 135 \times \frac{85}{100} = ₹114.75$$

$$\text{Profit percentage} = \frac{14.75}{100} \times 100 = 14.75\%$$

79. The profit made by selling an article for ₹8,800 is equal to the amount of loss incurred on selling the same article for ₹7,200. What will be the profit percent, if it was sold for ₹9,600?

- (a) 20% (b) 18%
(c) 25% (d) 15%

SSC CHSL -21/10/2020 (Shift-III)

Ans. (a) Let, the Cost Price of the article is ₹ x.

$$\text{Profit} = \text{Selling Price} - \text{Cost Price} = 8800 - x$$

$$\text{Loss} = \text{Cost Price} - \text{Selling Price} = x - 7200$$

$$8800 - x = x - 7200$$

$$x = \frac{8800 + 7200}{2} = 8000$$

$$\text{Profit} = \text{Selling Price} - \text{Cost Price}$$

$$\text{Profit} = 9600 - 8000 = 1600$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost Price}} \times 100 = \frac{1600}{8000} \times 100 = 20\%$$

80. A person bought 60 books for ₹60 each. He sold 50 of them at a loss of 4%. At what percent profit should he sell the remaining books so that he gains 5% in the entire transaction?

- (a) 30% (b) 50%
(c) 40% (d) 60%

SSC CHSL -20/10/2020 (Shift-III)

Ans : (b) Ratio of number of books $\rightarrow 50 : 10 = 5 : 1$

Let he should sell the remaining books at a profit of x%

$$\therefore 5 \times (-4) + 1 \times x = 6 \times 5$$

$$\Rightarrow x = 50\%$$

81. If the cost price of 25 articles is equal to the selling price of 35 articles find the profit/loss percentage.

- (a) Profit - 18.93% (b) Loss - 28.57%
(c) Profit - 28.57% (d) Loss - 18.93%

SSC CHSL -17/03/2020 (Shift-II)

Ans. (b) : If the cost price of x articles is equal to the selling price of y articles, then profit/loss percentage is-

$$= \left(\frac{x-y}{y} \times 100 \right)$$

$$= \frac{25-35}{35} \times 100$$

$$= \frac{-10 \times 100}{35}$$

$$= \frac{-200}{7}$$

$$= -28.57$$

$$= 28.57\% \text{ Loss [where (-) sign shows loss\%]}$$

82. The cost price of 15 pens is equal to the selling price of 20 pens. The loss or profit percentage is:

- (a) 20% loss (b) 25% loss
(c) 25% profit (d) 20% profit

SSC CHSL -15/10/2020 (Shift-I)

Ans. (b)

Cost Price of 15 Pens = Selling Price of 20 Pens

$$15 \times CP = 20 \times SP$$

$$CP : SP = 4 : 3$$

$$\therefore \text{Loss percentage} = \frac{1}{4} \times 100 = 25\%$$

83. If chairs are bought at Rs 1500 each and sold at Rs 1200 each, then what will be the loss percentage?

- (a) 10% (b) 20%
(c) 25% (d) 35%

SSC MTS 9-10-2017 (Shift-II)

Ans. (b) :

$$\text{Loss percentage} = \frac{\text{Cost Price} - \text{Selling Price}}{\text{Cost Price}} \times 100$$

$$= \frac{1500 - 1200}{1500} \times 100$$

$$= \frac{300}{1500} \times 100 = 20\%$$

84. By selling 50 metres of cloth, a person gains the cost price of 20 metres of cloth. What is his gain percent?

- (a) 40 (b) 25
(c) 20 (d) 10

SSC MTS 9-10-2017 (Shift-I)

Ans : (a) Profit% = $\frac{20}{50} \times 100 = 40\%$

85. By selling an article for Rs 360 there is a loss of 10%. What is the cost price (in Rs) of the article?

- (a) 324 (b) 450
(c) 400 (d) 380

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : Let, the Cost Price of article = ₹ x

$$\text{Loss} = 10\%$$

$$\text{Cost Price} \left(\frac{100 - \text{Loss \%}}{100} \right) = \text{Selling Price}$$

$$x \times \left(\frac{100 - 10}{100} \right) = 360$$

$$x \times \frac{90}{100} = 360$$

$$x = ₹400$$

86. If the ratio of the cost price and selling price of an article is 4:5, then what will be the profit percentage?

- (a) 25 (b) 35
(c) 40 (d) 50

SSC MTS 10-10-2017 (Shift-II)

Ans. (a) : Let, the Cost Price of article = ₹ 4x

And, Selling Price = ₹ 5x

$$\text{Profit} = 5x - 4x = ₹x$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost price}} \times 100$$

$$= \frac{x}{4x} \times 100 = 25\%$$

87. If chairs are bought at 600 each and sold at 500 each, then what will be the profit percentage.

- (a) 12.53 (b) 16.66
(c) 18.52 (d) 21.62

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) : Loss = Cost price - Selling price

$$\text{Loss} = 600 - 500$$

$$\text{Loss} = ₹ 100$$

$$\text{Loss percentage} = \frac{100}{600} \times 100 = 16.66\%$$

88. If a shopkeeper buys a dozen chair for ₹ 7200 and sells each chair for ₹ 708, what will be his profit percentage ?

- (a) 18% (b) 16%
(c) 14% (d) 12%

SSC MTS 7-10-2017 (Shift-I)

Ans. (a) : Cost price of 12 chairs = ₹ 7200

$$\text{Cost price of 1 chair} = \frac{7200}{12}$$

$$CP = ₹ 600$$

According to the question,

$$\text{Profit percentage} = \frac{SP - CP}{CP} \times 100$$

$$= \frac{708 - 600}{600} \times 100$$

$$\text{Profit percentage} = \frac{108}{600} \times 100$$

$$= 18\%$$

89. If the cost price of 8 articles is equal to the selling price of 6 articles, then what is the profit percentage?

- (a) 25% (b) 37.5%
(c) 33.33% (d) 20%

SSC MTS 11-10-2017 (Shift-I)

Ans: (c)

According to the question,

$$8CP = 6SP$$

$$\frac{CP}{SP} = \frac{6}{8} = \frac{3}{4}$$

$$\text{Profit \%} = \frac{1}{3} \times 100$$

$$= 33.33\%$$

90. If Ram buys a dozen table for ₹ 8000 and sells each table for ₹ 800, what will be his profit percentage?

- (a) 10% (b) 15%
(c) 20% (d) 25%

SSC MTS 7-10-2017 (Shift-I)

Ans. (c) : CP of a dozen table = ₹ 8000

$$\text{CP of 1 table} = \frac{8000}{12}$$

$$\text{CP} = ₹ 666.667$$

$$\text{Profit} = \text{SP} - \text{CP}$$

$$= 800 - 666.667$$

$$= 133.33$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$

$$= \frac{133.33}{666.667} \times 100$$

$$= 20\% \text{ Approximately}$$

91. The cost price of camera is 90% of the selling price of camera. Profit percent is:

(a) $11\frac{1}{9}\%$ (b) 10%

(c) 12% (d) $9\frac{1}{11}\%$

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) : Let, the Selling Price of camera = ₹100

$$\text{Then Cost Price} = \frac{100 \times 90}{100} = ₹ 90$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost Price}} \times 100 = \frac{10}{90} \times 100\% = \frac{100}{9}\%$$

$$\text{Profit \%} = 11\frac{1}{9}\%$$

92. The cost price of 21 cycles is equal to the selling price of 20 cycles. What is profit or loss percent in selling of a cycle?

(a) Profit 20% (b) Loss 20%
(c) Loss 5% (d) Profit 5%

SSC MTS 20/08/2019 (Shift-III)

Ans. (d) : ∵ 21 CP = 20 SP

$$\frac{\text{CP}}{\text{SP}} = \frac{20}{21}$$

$$\therefore \text{SP} > \text{CP}$$

$$\therefore \text{Profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100\%$$

$$= \frac{21 - 20}{20} \times 100\% = 5\%$$

93. Ajay sold an article of ₹ 84 at a loss of 30%. If he sells the same article at ₹ 120, then what will be his profit or loss percentage?

(a) 10% loss (b) 10% loss
(c) 20% profit (d) No profit no loss

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : Let, Cost Price = CP

$$\therefore \text{CP} \times \frac{70}{100} = 84$$

$$\text{CP} = ₹ 120$$

$$\therefore \text{CP} = \text{SP} = ₹ 120$$

Hence in this situation the seller will have neither NO Profit no loss

94. 30 dozens walnut was bought in ₹ 14,400 and 32 packet walnut (in each packet 20 walnut) was bought in ₹ 57,600. If the walnuts are mixed together and sold at ₹ 432 (in one packet 5 walnut) then how much was the profit percent?

(a) 10% (b) 15%
(c) 20% (d) 25%

SSC MTS 16/08/2019 (Shift-III)

Ans. (c) : 30 dozen = 30 × 12 = 360 (Walnut)

32 packet (20 Walnut in one packet)

$$32 \times 20 = 640 \text{ Walnut}$$

According to the question,

Cost price of 1000 walnut (CP) = (14400 + 57600) = 72000

∴ Selling price of 5 walnut = 432

$$\therefore \text{Selling price of 1000 walnut} = \frac{432 \times 1000}{5} = ₹ 86400$$

$$\text{Profit} = 86400 - 72000 = ₹ 14400$$

$$\text{Profit percentage} = \frac{14400}{72000} \times 100 = 20\%$$

95. A scooter is bought at ₹30000 and ₹3000 is spent on its maintenance. The scooter is sold at ₹39600 What is the profit percent?

(a) 15% (b) 25%
(c) 20% (d) 10%

SSC MTS 14/08/2019 (Shift-I)

Ans. (c) : Total Cost Price of scooter = 30000 + 3000 = ₹33000

Selling price of scooter = ₹39600

$$\text{Profit percentage} = \left(\frac{39600 - 33000}{33000} \right) \times 100$$

$$= \frac{6600}{33000} \times 100$$

$$= 20\%$$

96. Cost price of an article is ₹ 1440 and its selling price is ₹ 1800. What is the profit percentage?

(a) 15% (b) 25%
(c) 20% (d) 12.5%

SSC MTS 19/08/2019 (Shift-I)

Ans. (b) : Cost Price (C.P) = ₹1440

Selling Price (S.P) = ₹1800

$$\text{Profit} = \text{SP} - \text{CP}$$

$$= 1800 - 1440$$

$$\text{Profit} = ₹ 360$$

$$\therefore \text{Profit percentage} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{360}{1440} \times 100 = 25\%$$

97. If 20% of the goods are sold at 50% profit, 40% of the goods at 20% loss, 20% of the goods at 5% loss and the remaining at no loss or no profit, then the overall profit percentage:

(a) 5% (b) 8%
(c) 4% (d) 1%

SSC MTS 09/08/2019 (Shift-II)

Ans. (d) : Ratio of number of goods
 $= 20\% : 40\% : 20\% : 20\%$
 $= 1 : 2 : 1 : 1$
 Overall profit percentage =
 $\frac{50 \times 1 - 20 \times 2 - 5 \times 1 + 1 \times 0}{5} = \frac{5}{5} = 1\%$

- 98. If the selling price of an article is $\frac{3}{4}$ times its cost price, the profit/loss percent is:**
 (a) 25% profit (b) 25% loss
 (c) $33\frac{1}{3}\%$ profit (d) $33\frac{1}{3}\%$

SSC MTS 14/08/2019 (Shift-III)

Ans. (b) : According to the question,
 Selling Price of article = $\frac{3}{4} \times$ Cost Price of article
 $SP = \frac{3}{4} CP$
 $SP : CP = 3 : 4$
 $\therefore CP > SP$
 \therefore It will be loss $\Rightarrow 4 - 3 = 1$
 Loss percentage = $\frac{1}{4} \times 100 = 25\%$

- 99. A shopkeeper purchased 120 pears for ₹15 each. However, 10 pears were rotten and thrown away. The remaining sold at ₹18 each. What will be the percentage profit?**
 (a) 20% (b) 10%
 (c) 50% (d) 30%

SSC MTS 14/08/2019 (Shift-III)

Ans. (b) : Total Cost Price of 120 pears =
 $(CP) = 120 \times 15 = ₹1800$
 \therefore 10 pears were rotten,
 Total Selling Price of remaining 110 pears =
 $(SP) = 110 \times 18 = ₹1980$
 Profit = $(1980 - 1800) = ₹180$
 Profit percentage = $\frac{180}{1800} \times 100$
 $= 10\%$

- 100. An article is sold for 6500 so as to earn a profit of 4%. Second article whose cost price is ₹3750, is sold at a loss of 4%. What is the overall gain or loss percent in the whole transaction.**
 (a) Gain 4% (b) Loss 1%
 (c) Loss 4% (d) Gain 1%

SSC MTS 05/08/2019 (Shift-I)

Ans. (d) : Selling Price of first article = ₹6500
 Profit = 4%
 Cost Price of the first article = $6500 \times \frac{100}{104} = ₹6250$
 Cost Price of second article = ₹3750
 Loss = 4%
 Selling Price of second article = $3750 \times \frac{96}{100} = ₹3600$
 Cost Price of both articles = $6250 + 3750 = ₹10000$

Selling Price of both articles = $6500 + 3600 = ₹10100$
 Profit percentage = $\left(\frac{10100 - 10000}{10000} \right) \times 100$
 $= \frac{100}{10000} \times 100 = 1\%$

- 101. By selling an article for ₹300, a person incurred a loss of 6.25%. What is his profit, if it is sold for ₹352.**
 (a) ₹ 38 (b) ₹ 42
 (c) ₹ 32 (d) ₹ 28

SSC MTS 22/08/2019 (Shift-II)

Ans. (c) Selling Price of article = ₹ 300, Loss = 6.25%
 Cost Price of article = $300 \times \frac{100}{(100 - 6.25)}$
 $= 300 \times \frac{100}{93.75}$
 $= ₹ 320$

By Selling an article for ₹ 352 then,
 Profit = $352 - 320 = ₹ 32$

Trick-

$6.25\% = \frac{1}{16}$
 $CP : SP = 16 : 15$
 $\downarrow \times 20 \quad \downarrow \times 20$
 $320 \quad 300$
 Profit = $352 - 320$
 $= ₹ 32$

- 102. A shopkeeper allows 10% discount on the marked price of an article and still gains 17%. If he gives 15% discount on the marked price, then his profit percent is :**
 (a) 12% (b) 10.5%
 (c) 12.5% (d) 10%

SSC MTS 22/08/2019 (Shift-II)

Ans. (b) : Trick- Let P% = x

$\frac{MP}{CP} = \frac{100 + P\%}{100 - D\%}$
 $\frac{100 + 17}{100 - 10} = \frac{100 + x}{100 - 15}$
 $\frac{117}{90} = \frac{100 + x}{85}$
 $\frac{13}{2} = \frac{100 + x}{17}$
 $200 + 2x = 221$
 $x = 10.5\%$

- 103. By selling 30 articles, a shopkeeper gains the selling price of 9 articles. His gain percent is :**
 (a) 30 (b) 39
 (c) $42\frac{6}{7}$ (d) $40\frac{3}{5}$

SSC MTS 22/08/2019 (Shift-II)

Ans. (c) : SP of 30 articles – CP of 30 articles = SP of 9 articles

SP of 21 articles = CP of 30 articles

$$\frac{SP}{CP} = \frac{30}{21}$$

$$\text{Profit percentage} = \frac{30-21}{21} \times 100 = \frac{9}{21} \times 100$$

$$= 42\frac{6}{7}\%$$

Trick–

$$30SP - 30CP = 9SP$$

$$21SP = 30CP$$

$$\frac{SP}{CP} = \frac{30}{21} = \frac{10}{7}$$

$$\text{Profit}\% = \frac{3}{7} \times 100 = 42\frac{6}{7}\%$$

104. Selling price of an article is $\frac{8}{7}$ of cost price.

What is the profit percentage?

- (a) $\frac{100}{9}$ (b) $\frac{100}{11}$
 (c) $\frac{100}{8}$ (d) $\frac{100}{7}$

SSC MTS 02/08/2019 (Shift-I)

Ans. (d) \therefore Selling Price = $\frac{8}{7}$ × Cost Price

$$\frac{\text{Selling Price}}{\text{Cost Price}} = \frac{8}{7}$$

$$\text{Profit percentage} = \frac{8-7}{7} \times 100\% = \frac{100}{7}\%$$

105. The ratio of the selling price to the cost price in a transaction is 4:5. If the selling price is ₹ 80, then how much is the loss?

- (a) ₹ 16 (b) ₹ 15 ₹
 (c) ₹ 20 ₹ (d) ₹ 30 ₹

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) : Selling price : Cost price = 4 : 5

$$\therefore 4 \text{ unit} = ₹ 80$$

$$\therefore 1 \text{ unit} = ₹ 20$$

$$\text{Loss} = 5 - 4 = 1 \text{ unit} = 1 \times 20 = ₹ 20$$

106. The cost price of an article is $\frac{6}{7}$ of its selling price. What will be the profit or loss percentage?

- (a) 16.67 % Loss (b) 14.28 % Loss
 (c) 16.67 % Profit (d) 14.28 % Profit

SSC MTS 08/08/2019 (Shift-II)

Ans. (c) : Cost Price = $\frac{6}{7}$ × Selling Price

$$\frac{\text{Cost Price}}{\text{Selling Price}} = \frac{6}{7}$$

\therefore Selling Price > Cost Price
 Profit % = $\frac{(\text{Selling Price} - \text{Cost Price})}{\text{Cost Price}} \times 100\%$

$$= \frac{7-6}{6} \times 100\%$$

$$= \frac{100}{6}\%$$

$$= 16.67\% \text{ Profit}$$

107. The profit earned on an article is 25%. If profit is calculated on the selling price, then what will be the profit percentage?

- (a) 30 (b) 10
 (c) 20 (d) 50

SSC MTS 08/08/2019

Ans. (c) :

$$\text{Profit} = 25\% = \frac{1 \rightarrow \text{Profit}}{4 \rightarrow \text{CP}}$$

$$\boxed{SP = CP + P}$$

According to the question,

$$\text{Profit calculated on the selling price} = \frac{1}{5} \times 100 = 20\%$$

108. If the ratio of the cost price and selling price of an article is 5 : 4, then what will be the loss percentage?

- (a) 20 (b) 25
 (c) 30 (d) 50

SSC MTS 11-10-2017

Ans. (a) : Let the Cost Price of an article = 5x and Selling Price = 4x

$$\text{Loss} = \text{Cost price} - \text{Selling price} = 5x - 4x = x$$

$$\text{Loss Percentage} = \frac{\text{Loss}}{\text{Cost Price}} \times 100$$

$$= \frac{x}{5x} \times 100 = 20\%$$

Trick–

$$CP : SP = 5 : 4$$

$$\text{Loss}\% = \frac{1}{5} \times 100$$

$$= 20\%$$

109. If the profit made by a merchant on selling 45 m of cloth is equal to the selling price of 5 m of cloth, then his profit percentage is:

- (a) 9.09% (b) 12.5%
 (c) 11.11 (d) 10%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (b) : Selling price of 1 article = ₹ 1

$$\text{Profit} = ₹ 5$$

$$\text{Selling price} = ₹ 45$$

$$\text{Cost price} = 45 - 5 = ₹ 40$$

$$\therefore \text{Profit percentage} = \frac{5}{40} \times 100 = 12.5\%$$

110. Rajaram purchased a certain amount of wheat. If he sold one-fourth of the wheat at a profit of 12%, then the profit percent he needs to make on the remaining wheat to make an overall profit of 15% is:

(a) 18% (b) 16%
(c) 15% (d) 20%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (b) Let he needs to make $x\%$ profit on the remaining wheat.

Ratio of amount of wheat = 1 : 3

∴ According to the question,

$$1 \times 12 + 3x = 4 \times 15$$

$$12 + 3x = 60$$

$$3x = 60 - 12$$

$$3x = 48$$

$$x = 16\%$$

111. Out of 100 articles, 25 articles were sold at 25% profit and the remaining articles were sold at 25% loss. What will be the total loss percentage?

(a) 15 (b) 12.5
(c) 20 (d) 10

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : Ratio of the articles = 25 : 75 = 1 : 3

$$\text{Overall profit/loss percentage} = \frac{1 \times 25 - 3 \times 25}{4} = -\frac{50}{4}$$

$$\text{Overall loss \%} = 12.5\%$$

112. Selling price of first article is ₹ 960 and cost price of second article is ₹ 960. If there is a profit of 20% on first article and loss of 20% on second article, then, what will be the total loss?

(a) ₹ 36 (b) ₹ 24
(c) ₹ 20 (d) ₹ 32

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Selling price of first article = ₹ 960

$$\text{Cost price of first article} = \frac{960 \times 100}{120} = ₹ 800$$

$$\text{Cost price of second article} = ₹ 960$$

$$\text{Selling price of second article} = \frac{960 \times 80}{100} = ₹ 768$$

$$\text{Total cost price} = 800 + 960 = ₹ 1760$$

$$\text{Total selling price} = 960 + 768 = ₹ 1728$$

$$\begin{aligned} \text{Hence, loss} &= \text{cost price} - \text{selling price} \\ &= 1760 - 1728 \\ &= ₹ 32 \end{aligned}$$

113. Selling price and cost price of an article are ₹1333 and ₹2150. What will be the loss percentage?

(a) 38% (b) 61.30%
(c) 48% (d) 54.4%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : Loss = 2150 - 1333 = ₹ 817

$$\begin{aligned} \text{Loss \%} &= \frac{817}{2150} \times 100 \\ &= 38\% \end{aligned}$$

114. Rohan purchased tables at the rate of ₹ 275 per table. If he sells 16 tables for ₹ 5060, then what will be the profit percentage?

(a) 13.04% (b) 16%
(c) 15% (d) 12.5%

SSC GD Constable 11/02/2019 (Shift-II)

$$\text{Ans. (c) Selling price of a table} = \frac{5060}{16} = ₹ 316.25$$

$$\text{Profit \%} = \frac{316.25 - 275}{275} \times 100$$

$$= \frac{41.25}{275} \times 100 = 15\%$$

115. Selling price and cost price of an article are in the ratio of 7 : 5. What will be the profit/loss percentage?

(a) 40% Profit (b) 28.5% Profit
(c) 20% Loss (d) 14.28% Loss

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (a) : SP : CP = 7 : 5

$$\text{Profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

$$\text{Profit percentage} = \frac{2}{5} \times 100 = 40\%$$

116. Selling price of first article is ₹ 470 and cost price of second article is ₹ 470. If there is a loss of 20% on first article and profit of 20% on second article, then what will be the overall profit or loss percentage?

(a) 2.22% Loss (b) 4% Profit
(c) No profit No Loss (d) 1.80% Loss

SSC GD Constable 14/02/2019 (Shift-II)

$$\text{Ans. (a) : SP}_1 = 470, \quad \text{CP}_1 = 470 \times \frac{100}{80} = ₹ 587.5$$

$$\text{CP}_2 = 470, \quad \text{SP}_2 = 470 \times \frac{120}{100} = ₹ 564$$

$$\text{CP (Cost Price) of both articles} = 587.5 + 470 = ₹ 1057.5$$

$$\text{SP (Selling Price) of both articles} = 470 + 564 = ₹ 1034$$

In the whole transaction, there is a loss.

$$\begin{aligned} \text{Loss \%} &= \frac{1057.5 - 1034}{1057.5} \times 100 \\ &= 2.22\% \end{aligned}$$

117. The marked price of an article is 28% higher than its cost price. Find the profit or loss percentage if the shopkeeper gives 25% discount.

(a) Loss 5% (b) Profit 5%
(c) Profit 4% (d) Loss 4%

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : Let, Cost Price of article = 100

Then Marked Price of article = 128

$$\frac{\text{CP}}{\text{MP}} = \frac{100 - D}{100 \pm P/L}$$

$$\Rightarrow \frac{100}{128} = \frac{75}{100 \pm x} \Rightarrow 100 \pm x = 96$$

$$\Rightarrow x = -100 + 96 = -4 \text{ (Loss)}$$

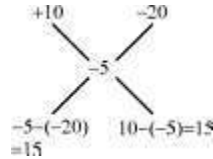
Hence, there will be a loss of 4%

118. A shopkeeper bought 1000 kg of rice, a part of which was sold at 10% profit and the remaining at 20% loss; on the whole, the loss was 5%. What is the quantity of rice that was sold at 20% loss?

- (a) 500 kg (b) 400 kg
(c) 550 kg (d) 600 kg

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (a):



Ratio = 15 : 15 = 1 : 1

∴ Quantity sold at 20% Loss = $1000 \times \frac{1}{2} = 500\text{kg}$

119. When calculated over the selling price, the profit percentage on selling an article is 25%. What is the actual profit percentage

- (a) $36\frac{2}{3}\%$ (b) 30%
(c) $33\frac{1}{3}\%$ (d) 35%

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (c) : $25\% = \frac{1 \rightarrow \text{Profit}}{4 \rightarrow \text{Selling Price}}$

∴ Cost Price = 3 (∵ 4-1=3)

∴ Actual Profit = $\frac{4-3}{3} \times 100$
 $= \frac{1}{3} \times 100 = 33\frac{1}{3}\%$

(II) Problems based on Finding Cost Price

120. The selling price of a mobile phone is ₹59,620 and it was sold at 8.4% profit. The cost price (in ₹) of the mobile phone is:

- (a) 52,000 (b) 55,000
(c) 45,000 (d) 50,000

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (b) Cost Price = $\frac{59620 \times 100}{108.4}$
 $= ₹55000$

121. An article is sold at a profit of $13\frac{1}{4}\%$. Had it been sold for ₹76.70 more, then profit would have been $16\frac{1}{5}\%$. 50% of the cost price of the article (in ₹) is:

- (a) 1,250 (b) 2,500
(c) 1,300 (d) 1,500

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (c) Let, the Cost Price of the article be ₹ 100%
According to the question,

$$16\frac{1}{5}\% - 13\frac{1}{4}\% = \left(\frac{324 - 265}{20}\right)\%$$

$$= \frac{59}{20}\%$$

$$\Rightarrow \frac{59}{20}\% = 76.70$$

$$\Rightarrow 1\% = \frac{76.70 \times 20}{59}$$

$$\Rightarrow 1\% = 26$$

$$\Rightarrow 100\% = 2600$$

$$\therefore 50\% \text{ of the cost price} = \frac{50}{100} \times 2600$$

$$= ₹1300$$

122. The marked price of an item is ₹5,800. If Ravi earns a profit of 25% after allowing a discount of 20%, then the cost price of the item is:

- (a) ₹3,625 (b) ₹3,724
(c) ₹3,720 (d) ₹3,712

SSC MTS 18/10/2021 (Shift-I)

Ans. (d) : Marked Price of an item = ₹5800

Discount = 20%

Profit = 25%

$$\therefore \text{CP} = \frac{\text{MP} \times (100 - D\%)}{(100 + P\%)}$$

$$\text{Cost Price of item} = 5800 \times \frac{80}{125}$$

$$= \frac{58 \times 8 \times 1000}{125}$$

$$= 58 \times 8 \times 8$$

$$= ₹3712$$

123. The marked price of an article is Rs. 4450. If a person earns a profit of 15% after allowing a discount of 15%, then the cost price (in Rs.) correct to the nearest integer) of the article is:

- (a) 3289 (b) 3378
(c) 3189 (d) 3498

SSC MTS 26/10/2021 (Shift-I)

Ans. (a) : According to the question,

We know that :-

$$\text{CP} = \frac{\text{MP} \times (100 - D\%)}{(100 + P\%)}$$

$$\text{CP} = \frac{4450 \times 85}{115}$$

$$= ₹3289.13 = 3289$$

124. The sum of the cost price of two bikes is Rs 50000. The first bike was sold at a profit of 20%, and the second bike at a loss of 20%. If the selling prices are the same, what is the cost price (in Rs.) of the first bike that was sold?

- (a) 20000 (b) 25000
(c) 30000 (d) 27500

SSC MTS 26/10/2021 (Shift-I)

Ans. (a) Let CP of first bike = ₹x
 CP of second bike = ₹(50000-x)
 According to the question:-

$$\therefore x \times \frac{120}{100} = (50000 - x) \times \frac{80}{100}$$

$$\frac{6}{5}x = (50000 - x) \times \frac{4}{5}$$

$$\frac{6}{5}x + \frac{4}{5}x = 40000$$

$$2x = 40000$$

$$x = ₹20000$$

Hence, Cost Price of first bike is ₹20000

125. An almirah was sold at a profit of 15%. If its cost had been 5% less and it had been sold for ₹1,470 less, then the profit would have been 10%. What is the cost price of the almirah?

- (a) ₹14,000 (b) ₹29,400
 (c) ₹16,100 (d) ₹2,94,000

SSC MTS 11/10/2021 (Shift-I)

Ans. (a) : Let, $CP_1 = x$
 According to the question,

$$SP_1 = \frac{115x}{100} = \frac{23x}{20}$$

$$CP_2 = x \times \frac{95}{100} = \frac{19x}{20}$$

$$SP_2 = \frac{19x}{20} \times \frac{110}{100} = \frac{209x}{200}$$

According to the question:-

$$\therefore \frac{23x}{20} - \frac{209x}{200} = 1470$$

$$\frac{230x - 209x}{200} = 1470$$

$$21x = 1470 \times 200$$

$$x = ₹14000$$

126. A shopkeeper marked every item 25% above the cost price and allowed 10% discount. Shruti being a regular customer got 5% additional discount on the bill and paid ₹2394 for the item purchased. What is the cost price of the item (in ₹) ?

- (a) 2240 (b) 2440
 (c) 2220 (d) 2420

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (a) : Let the CP of an item = 100 units
 \therefore MP = 125 units
 We know that,
 For successive discount, net effective discount

$$= D_1 + D_2 - \frac{D_1 D_2}{100}$$

$$= 10 + 5 - \frac{10 \times 5}{100} = 14.5\%$$

$$\therefore \text{SP of an item after discount} = \frac{125 \times (100 - 14.5)}{100}$$

$$= 106.87 \text{ units}$$

$$\therefore \text{SP} \Rightarrow 106.87 \text{ units} = ₹2394$$

$$1 \text{ unit} = ₹22.4$$

$$\text{CP} = 100 \text{ units} = 100 \times 22.4$$

$$= ₹2240$$

127. Surbhi sold an article for ₹176 after giving 12% discount on its marked price. Had she not given any discount; she would have earned a profit of 25%. What is the price (in ₹) of the article ?

- (a) 150 (b) 165
 (c) 160 (d) 145

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (c) : Let Marked Price of an article is 100.
 According to the question,

$$\frac{\text{MP}}{\text{SP}} = \frac{100 \xrightarrow{\times 2} 200}{88 \xrightarrow{\times 2} 176}$$

$$\text{CP} \times \frac{125}{100} = 200$$

$$\text{CP} = 160$$

128. A trader bought two articles for ₹490. He sold one at a loss of 20% and the other at a profit of 16%. If the selling price of both articles is same, then the cost price (in ₹) of the article sold at 20% loss is :

- (a) 310 (b) 300
 (c) 290 (d) 280

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (c) : According to the question,

When SP is same,

Let $CP_1 = x$

$CP_2 = (490 - x)$

$$\text{Then, } x \times \frac{80}{100} = (490 - x) \times \frac{116}{100}$$

$$20x = 490 \times 29 - 29x$$

$$49x = 490 \times 29$$

$$x = 290$$

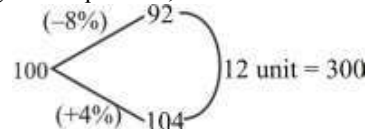
129. Hari suffered a loss of 8% by selling an article. If he had sold it for ₹300 more, he would have made a profit of 4%. Find his CP (in ₹).

- (a) 2400 (b) 2250
 (c) 2575 (d) 2500

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (d) : Let CP of article is 100.

According to the question,



$$1 \text{ unit} = \frac{300}{12}$$

$$\text{CP of articles} = \frac{300 \times 100}{12}$$

$$= ₹2500$$

130. The marked price of an article is ₹2720. If a shopkeeper sold the article at 15% loss after giving 25% discount, then the cost price (in ₹) of the article is :

- (a) 2000 (b) 2400
(c) 1800 (d) 1200

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (b) : Marked Price of article = ₹2720

According to the question-

We know that,

$$CP(100 - \text{Loss}\%) = MP(100 - D\%)$$

$$CP(85) = 2720 \times (75)$$

$$= \frac{2720 \times 75}{85}$$

$$= 160 \times 15$$

$$= ₹2400$$

131. The marked price of an article is ₹1,360. If a shopkeeper sold the article at 15% loss after giving 25% discount, then the cost price of the article is:

- (a) ₹1,400 (b) ₹1,200
(c) ₹1,600 (d) ₹1,500

SSC CHSL 11/082021 (Shift-II)

Ans. (b) : Marked Price of article = ₹1360

According to the question-

$$\therefore \text{Cost Price of article} = \frac{1360 \times 75 \times 100}{100 \times 85}$$

$$= \frac{1360 \times 15}{17}$$

$$= ₹1200$$

132. Vijay bought a fridge and a washing machine together for ₹38,200. He sold the fridge at a profit of 15% and washing machine at a loss of 24% and both are sold at the same price. The cost price of the washing machine is:

- (a) ₹26,000 (b) ₹24,000
(c) ₹22,000 (d) ₹23,000

SSC CHSL 11/082021 (Shift-II)

Ans. (d) : Let the CP of fridge and washing machine be x and (38200-x) respectively.

According to the question,

$$\text{Then, } x \times \frac{115}{100} = (38,200 - x) \times \frac{76}{100}$$

$$115x = 38,200 \times 76 - 76x$$

$$191x = 38200 \times 76$$

$$x = 200 \times 76$$

$$x = 15200$$

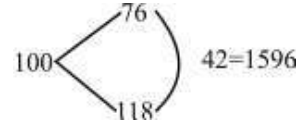
$$\text{CP of washing machine} = 38,200 - 15200 \\ = ₹23000$$

133. An article was sold at a loss of 24%. If it were sold for ₹ 1,596 more, then there would have been a gain of 18%. The cost price of the article is:

- (a) ₹ 3,400 (b) ₹ 3,600
(c) ₹ 3,800 (d) ₹ 4,200

SSC CHSL 05/08/2021 (Shift-III)

Ans. (c) : Let the CP of article = 100



$$42 \text{ units} = 1596$$

$$1 \text{ unit} = 38$$

$$100 \text{ units} = 3800$$

134. By selling a pen for ₹26, a man loses one-fourteenth of what it costs him. The cost price of the pen is:

- (a) ₹ 27 (b) ₹ 39
(c) ₹ 38 (d) ₹ 28

SSC CHSL 06/082021 (Shift-II)

Ans. (d) : SP = ₹26

Loss is $\frac{1}{14}$ of CP

$$\therefore CP = 14, L = 1, SP = 13$$

$$\text{Then, } 13 \rightarrow ₹26$$

$$1 \rightarrow ₹2$$

$$CP = 14 \rightarrow 14 \times 2 = ₹28$$

135. On selling 38 balls at ₹2,240, there is a loss equal to the cost price of 6 balls. The cost price of a ball is equal to:

- (a) ₹80 (b) ₹50
(c) ₹60 (d) ₹70

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (d) : 38 SP = (38-6) CP

$$38SP = 32 CP = 2240$$

$$CP = \frac{2240}{32} = ₹70$$

136. Sushma bought 6 tables and 12 chairs for ₹12,000. She sold the tables at a profit of 15% and the chairs at a loss of 10%. If her total gain was ₹300, then the total cost of the tables was:

- (a) ₹5,400 (b) ₹6,000
(c) ₹5,000 (d) ₹4,800

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-I)

Ans. (b): Let the Cost Price of a table is ₹ x and the Cost price of a chair is ₹ y.

According to the question,

$$6x + 12y = 12000 \quad \dots\dots\dots(i)$$

$$6x \times \frac{15}{100} + 12y \times \left(\frac{-10}{100}\right) = 300$$

$$\Rightarrow \frac{90x}{100} - \frac{120y}{100} = 300$$

$$\text{or, } 9x - 12y = 3000 \quad \dots\dots\dots(ii)$$

From equation (i) + equation (ii),

$$15x = 15000$$

$$\text{Hence, } x = 1000$$

$$\text{Total Cost Price of the tables} = 6x = ₹ 6000$$

137. One-third of goods are sold at a 15% profit, 25% of the goods are sold at a 20% profit and the rest at a 20% loss. If the total profit of ₹ 138.50 is earned on the whole transaction, then the value (in ₹) of the goods is:

- (a) ₹8,587 (b) ₹8,310
(c) ₹7,756 (d) ₹8,030

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (b) : Suppose value of goods = ₹ x
Rest/remaining part of goods

$$= x - \left(\frac{x}{3} + \frac{x}{4} \right) = \frac{5x}{12}$$

According to the question,

$$\frac{1}{3}x \times \frac{15}{100} + \frac{1}{4}x \times \frac{20}{100} - \frac{5x}{12} \times \frac{20}{100} = 138.5$$

$$\frac{x}{20} + \frac{x}{20} - \frac{x}{12} = 138.5$$

$$\frac{x}{60} = 138.5$$

$$x = ₹8310$$

138. An article was sold at a gain of 16%. If it had been sold for ₹36 more, the gain would have been 20%. The cost price of the article is:

- (a) ₹810 (b) ₹862
(c) ₹720 (d) ₹900

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (d) : ∵ (20 – 16)% → ₹36

$$4\% \rightarrow ₹36$$

$$100\% \rightarrow ₹900$$

139. A manufacture sells cooking gas stoves to shopkeepers at 10% profit, and in turn they sell the cooking gas stoves to customer to earn 15% profit. If a customer gets a cooking gas stove for ₹7,590, then what is its manufacturing cost?

- (a) ₹5,000 (b) ₹5,090
(c) ₹6,500 (d) ₹6,000

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (d) :

Let manufacturing cost of a gas stove = 100 units
Cost Price for shopkeeper = 110 units

$$\text{Cost Price for customer} = 110 \times \frac{115}{100} = \frac{11 \times 23}{2}$$

$$\therefore \frac{11 \times 23}{2} \rightarrow 7590$$

$$1 \text{ unit} \rightarrow 60$$

$$100 \text{ units} \rightarrow ₹6000$$

140. An article was sold at a gain of 18%. If it had been sold for ₹49 more, then the gain would have been 25%. The cost price of the article is:

- (a) ₹890 (b) ₹700
(c) ₹650 (d) ₹570

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (b) : (25 – 18)% → 49 Rupees

$$7\% \rightarrow 49 \text{ Rupees}$$

$$1\% \rightarrow 7 \text{ Rupees}$$

$$100\% \rightarrow 700 \text{ Rupees}$$

The cost price of the article = 700 Rupees

141. A car dealer purchased an old car for ₹1,08,500 and spent some amount on its maintenance. He sold it for ₹1,56,250, thereby earning a profit of 25%. How much money did he spend on the maintenance of the car?

- (a) ₹16,500 (b) ₹47,750
(c) ₹20,625 (d) ₹8,687.5

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (a) : Suppose he spent ₹x on the repairing of the car.

$$\therefore \text{Cost Price of the car} = ₹(108500 + x)$$

$$\text{Selling Price} = (108500 + x) \times \frac{125}{100}$$

$$156250 = (108500 + x) \times \frac{5}{4}$$

$$125000 - 108500 = x$$

$$x = ₹16,500$$

142. A miner sells a diamond to a trader at a profit of 40% and the trader sells it to a customer at a profit of 25%. If the customer pays ₹ 56 lakhs to buy the diamond, what had it cost the miner (in ₹ lakhs) ?

- (a) 30 (b) 28
(c) 25 (d) 32

SSC CGL (Tier-II) 21-02-2018

Ans. (d) :

Let Cost Price of the diamond for miner is ₹ x.

According to the question,

$$x \times \left(\frac{100 + 40}{100} \right) \times \left(\frac{100 + 25}{100} \right) = 56 \text{ lakhs}$$

$$x = 56 \times \frac{100}{140} \times \frac{100}{125}$$

$$x = 32 \text{ lakhs}$$

Trick–

Miner : Trader = (5 : 7) × 4

Trader : Customer = (4 : 5) × 7

Miner : Trader : Customer = 20 : 28 : 35

35 unit = 56 lakhs

5 unit = 8 lakhs

20 unit = 32 lakhs

143. A two-wheeler dealer sells a scooter for ₹ 46,000 and makes some loss. If he had sold it for ₹ 58,000 his profit would have been double his loss. What was the cost price (in ₹) of the scooter ?

- (a) 52000 (b) 54000
(c) 48000 (d) 50000

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Let loss on selling it in ₹46000 = x

Profit on selling it in ₹ 58000 = ₹2x

According to the question–

$$(x + 2x) = 58000 - 46000$$

$$\Rightarrow 3x = 12000$$

$$\Rightarrow x = ₹4000$$

Hence Cost Price of the scooter = 46000 + 4000

$$= ₹50000$$

144. A villager buys a goat and a sheep together for Rs 14250. He sold the sheep at a profit of 10% and the goat at a loss of 20%. If he sold both the animals at the same price, then what was the cost price of the cheaper animal?

- (a) 8250 (b) 6600
(c) 7500 (d) 6000

SSC CGL (Tier-II) 19-02-2018

Ans. (d)

Let the Cost Price of sheep = ₹x
Cost Price of goat = ₹ (14250-x)
According to the question,

$$x \times \frac{110}{100} = (14250-x) \times \frac{80}{100}$$

$$11x = 14250 \times 8 - 8x$$

$$19x = 14250 \times 8$$

$$x = \frac{14250 \times 8}{19} = ₹ 6000$$

Hence Cost Price of the cheaper animal = ₹6000

145. A used car dealer sells a car for ₹ 7.6 lakhs and makes some loss. If he had sold it for ₹ 9.2 lakhs his profit would have been thrice his loss. What was the cost price of the car (in ₹ lakhs) ?

- (a) 8.5 (b) 8.75
(c) 8.25 (d) 8

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : Suppose cost price = ₹x

According to the question,
 $3(x-7.6) = (9.2-x)$
 $3x - 22.8 = 9.2 - x$
 $4x = 32$
 $x = 8$ lakh

146. By selling 21 pots at ₹ 2,520, there is a loss equal to the cost price of 3 pots. Find the cost price (in ₹) of each pot.

- (a) 140 (b) 150
(c) 160 (d) 180

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Selling price of a pot = $\frac{2520}{21} = ₹120$

21 CP - 21 SP = 3 CP
18CP = 21SP

$$\frac{CP}{SP} = \frac{7}{6}$$

∴ 6 unit = ₹ 120

∴ 7 unit = ₹ 140

Cost price of each pot = ₹ 140

147. If a shopkeeper sells a mixer at ₹ 11,400 then he suffers a loss of 5%. At what price (in ₹) should he sell the mixer to gain 10% ?

- (a) 9845 (b) 10909
(c) 13200 (d) 11913

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Selling price = $11400 \times \frac{100}{95} \times \frac{110}{100}$
= ₹ 13200

148. Anu sold an article for ₹480 at some profit. Had she sold it for ₹400, then there would have been a loss equal to one-third of the initial profit. What was the cost price of the article ?

- (a) ₹430 (b) ₹450
(c) ₹420 (d) ₹425

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : As per question,

Suppose profit on selling the article for ₹ 480 = ₹ x

Then loss on selling it for ₹ 400 = ₹ $\frac{x}{3}$

According to the question,

$$480 - x = 400 + \frac{x}{3}$$

$$1440 - 3x = 1200 + x$$

$$4x = 240$$

$$x = 60$$

∴ Cost price = 480 - x = 480 - 60 = ₹420

149. At a village trade fair a man buys a horse and a camel together for ₹ 51,250. He sold the horse at a profit of 25% and the camel at a loss of 20%. If he sold both the animals at the same price, then the cost price of the cheaper animal was ₹ _____.

- (a) 6600 (b) 7500
(c) 25000 (d) 20000

SSC CGL (Tier-II) 17-2-2018

Ans. (d) : Let the cost price of a horse = ₹ x

Then cost price of a camel = ₹ (51250 - x)

According to the question-

Selling price of horse = Selling price of camel

$$x \times \left(\frac{100+25}{100} \right) = (51250-x) \times \left(\frac{100-20}{100} \right)$$

$$125x = 4100000 - 80x$$

$$(\text{Cost price of horse}) x = \frac{4100000}{205} = 20000$$

$$\text{Cost price of camel} = 51250 - 20000 = 31250$$

∴ Cost price of the cheaper animal = ₹20000

150. An item is sold for ₹ 7130 making a 15% profit. What is the cost price (in ₹) of this item ?

- (a) 6000 (b) 6125
(c) 6250 (d) 6200

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Cost price of the item = $\left(\frac{100}{100+15} \right) \times 7130$

$$= \frac{100}{115} \times 7130$$

$$= ₹6200$$

151. A shopkeeper has announced 40% rebate on the price of TV sets at the time of sale. If a purchaser needs to have a rebate of ₹26,400, then how many TV sets each costing ₹6,000 should he purchase?

- (a) 8 (b) 9
(c) 12 (d) 11

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (d) : Suppose the total cost price of T.V. Set = ₹ x
According to the question,

$$x \times \frac{40}{100} = 26400$$

$$x = ₹ 66000$$

Cost price of a T.V. Set = ₹ 6000

$$\text{Total number of T.V. Sets} = \frac{66000}{6000} = 11$$

152. Raghu sold an article for ₹180 after allowing a 20% discount on its marked price. Had he not allowed any discount, he would have gained 20%. What is the cost price of the article?

- (a) ₹192.80 (b) ₹187.50
(c) ₹190.40 (d) ₹188.60

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (b) The article was sold for ₹ 180 after allowing a 20% discount.

$$\therefore \text{Marked price of article} = \frac{180}{80} \times 100 = ₹225$$

Raghu gains 20% by selling the article/item for ₹ 225

$$\text{Hence cost price} = \frac{225}{120} \times 100 = ₹187.5$$

153. An article is sold at a profit of 30%. If both cost price and selling price of the article are decreased by ₹100, the profit now would be 45%. The original cost price of the article is:

- (a) ₹400 (b) ₹250
(c) ₹300 (d) ₹500

SSC CHSL –26/10/2020 (Shift-I)

Ans. (c) : Let the cost price of the article = ₹x

$$\therefore \text{Selling price} = \frac{130x}{100} = ₹\frac{13}{10}x$$

$$\text{Profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

$$45 = \frac{\left(\frac{13x}{10} - 100\right) - (x - 100)}{(x - 100)} \times 100$$

$$45(x - 100) = \left(\frac{13}{10}x - 100 - x + 100\right) \times 100$$

$$45x - 4500 = 30x$$

$$15x = 4500$$

$$x = ₹300$$

154. Ravi sells a chair to Mohan at a profit 10% and Mohan sells it to Govind at a profit 20%. If Govind pays ₹1,320 for it. Then the cost price for Ravi is:

- (a) ₹800 (b) ₹1,000
(c) ₹980 (d) ₹900

SSC CHSL –19/03/2020 (Shift-I)

Ans. (b) : Let the cost price of a chair for Ravi = ₹x.

∴ According to the question,

$$\frac{x \times 110}{100} \times \frac{120}{100} = 1320$$

$$\frac{x \times 11}{10} \times \frac{12}{10} = 1320$$

$$x = \frac{1320 \times 10 \times 10}{11 \times 12}$$

$$x = ₹1000$$

155. An article was sold at a loss of 12%. If it was sold for ₹630 more, then there would have been a gain of 6%. Find the cost price of the article.

- (a) ₹3500 (b) ₹2800
(c) ₹2500 (d) ₹3000

SSC CHSL –20/10/2020 (Shift-I)

Ans: (a) Let the cost price of article = 100%

As per question,

$$\therefore (12\% + 6\%) = 630$$

$$18\% = 630$$

$$100\% = \frac{630 \times 100}{18} = 3500$$

$$\therefore \text{Cost price of article} = ₹ 3500$$

156. Malti bought a TV for ₹8800 including GST at 10%. What is the original cost of the TV?

- (a) ₹8800 (b) ₹7920
(c) ₹8000 (d) ₹9600

SSC CHSL –20/10/2020 (Shift-I)

Ans : (c) Let CP = 100%

$$\text{GST} = 10\%$$

$$\text{Total CP including GST} = 8800$$

$$110\% = 8800$$

$$100\% = 8000$$

Hence original cost price of TV = ₹8000

157. On selling 26 balls for ₹1,350, there is a loss equal to the cost price of eight balls. The cost price of a ball is:

- (a) ₹75 (b) ₹70
(c) ₹65 (d) ₹60

SSC CHSL –21/10/2020 (Shift-II)

Ans. (a) ∴ SP of 26 balls = CP of 18 balls = 1350

$$\text{Cost price of a ball} = \frac{1350}{18} = ₹75$$

158. Sohan purchased an old scooter, and sold it for ₹28,000 thus gaining a 12% profit on the cost price. The cost price of the scooter is:

- (a) ₹25,000 (b) ₹27,000
(c) ₹26,000 (d) ₹30,000

SSC CHSL –19/03/2020 (Shift-III)

Ans. (a) : Let the cost price of the scooter is x.

Let Selling price of scooter = ₹ 28000

$$\therefore \text{According to the question} \frac{x \times 112}{100} = 28000$$

$$\text{or } x = \frac{28000 \times 100}{112} \Rightarrow x = 25000$$

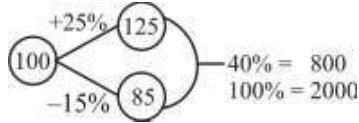
Hence the cost price of the scooter is ₹25000.

159. A man sold his furniture at a 25% gain. Had he sold it at 15% loss, he would have received ₹800 less. Find cost price of the furniture.

- (a) ₹1,500 (b) ₹2,000
(c) ₹2,500 (d) ₹3,000

SSC CHSL -15/10/2020 (Shift-III)

Ans. (b) : Let the cost price is 100.



160. An article is sold at 20% profit instead of 5% loss, the man gains Rs 120 more. What is the cost price?

- (a) 480 (b) 720
(c) 1020 (d) 1080

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) : Suppose cost price is ₹ x.
According to the question,

$$\frac{120x}{100} - \frac{95x}{100} = 120$$

$$\frac{25x}{100} = 120$$

$$25x = 12000$$

$$x = 480$$

Cost price of the article is = ₹ 480

Trick-

$$(20 + 5)\% = ₹ 120$$

$$25\% = 120$$

$$5\% = ₹ 24$$

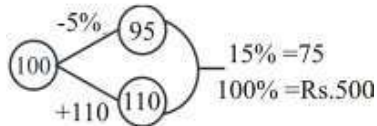
$$100\% = ₹ 480$$

161. An article is sold at 10% profit instead of 5% loss, the man gains Rs 75 more. What is the cost price (in Rs) of that article?

- (a) 250 (b) 200
(c) 500 (d) 225

SSC MTS 11-10-2017 (Shift-I)

Ans : (c) Let the cost price of the article = ₹ 100



162. The profit earned on selling an article at ₹ 720 is half of the loss incurred on selling the same article at ₹ 360. What is the cost price of the article?

- (a) ₹ 540 (b) ₹ 600
(c) ₹ 480 (d) ₹ 420

SSC MTS 08/08/2019 (Shift-III)

Ans. (b) : ∵ P = SP - CP

$$P = 720 - CP \quad \text{-----(i)}$$

$$\text{And } L = CP - SP$$

$$L = CP - 360 \quad \text{-----(ii)}$$

According to the question,

$$P = \frac{L}{2}$$

$$(720 - CP) = \frac{1}{2}(CP - 360)$$

$$1440 - 2CP = CP - 360$$

$$3CP = 1800$$

$$CP = 600$$

163. An article is sold at $14\frac{2}{7}\%$ profit. What is the ratio of the selling price to the cost price?

- (a) 7 : 5 (b) 8 : 7
(c) 8 : 5 (d) 7 : 6

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Let the cost price is 100x.

According to the question,

$$\therefore \text{Selling price} = 100x \times \frac{\left(100 + 14\frac{2}{7}\right)}{100}$$

$$= \frac{800x}{7}$$

$$\text{Hence selling price : cost price} = \frac{800x}{7} : 100x$$

$$= 8 : 7$$

Trick-

$$14\frac{2}{7}\% = \frac{1 \rightarrow P}{7 \rightarrow CP}$$

$$SP : CP = 8 : 7$$

164. Parikh sold his pen at a profit of ₹ 11. He calculated the profit percentage on selling price and found it to be 25%. The cost price (in ₹) of the pen is:

- (a) ₹33 (b) ₹24
(c) ₹36 (d) ₹44

SSC MTS 13/08/2019 (Shift-II)

Ans. (a) : Profit = 25% = $\frac{1}{4}$

$$\text{Selling price} = 4 \text{ unit}$$

$$\text{Cost price} = 3 \text{ unit}$$

$$\therefore 1 \text{ unit} \rightarrow 11$$

$$\therefore \text{Cost Price} = 3 \text{ unit} \rightarrow \boxed{33\text{Rs.}}$$

165. If an article is sold at 23% profit instead of 14% profit, then the profit would be ₹ 189 more. What is the cost price?

- (a) ₹ 2100 (b) ₹ 2105
(c) ₹ 2340 (d) ₹ 1800

SSC MTS 13/08/2019 (Shift-II)

$$\text{Ans. (a) : Cost price} \times \left[\frac{123}{100} - \frac{114}{100} \right] = 189$$

$$\text{Cost price} \times \frac{9}{100} = 189$$

$$\text{Cost price} = 2100$$

166. A sold his pen at a profit of ₹13. He calculated the profit percentage on selling price and found it to be 20%. The cost price (in ₹) of the pen is:

- (a) 52 (b) 65
(c) 39 (d) 13

SSC MTS 13/08/2019 (Shift-III)

Ans. (a) ∴ Profit on selling price = 20%
Let selling price = ₹ 100
Profit = ₹ 20
Cost price = 80
Original profit percentage on cost price
 $= \frac{20}{80} \times 100\% = 25\%$
According to the question,
∴ 25% → ₹ 13
∴ 100% → $\frac{13}{25\%} \times 100\% = ₹ 52$

167. The ratio of cost price and selling price of an article is c : d. If d is 150% of c then the percentage of profit on cost price is:

- (a) 150% (b) 50%
(c) 100% (d) 75%

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) ∴ CP : SP = c : d
According to the question,
∴ $d = c \times \frac{150}{100}$
 $\frac{c}{d} = \frac{2}{3}$
∴ CP : SP = 2 : 3
Profit percentage = $\frac{(3-2)}{2} \times 100\%$
 $= 50\%$

168. An object 1 is sold at ₹ 180. The other object 2 is sold at ₹ 240. There is 20% profit on object 1 and 20% loss on object 2. What is the total cost price of both the objects?

- (a) ₹ 450 (b) ₹ 480
(c) ₹ 520 (d) ₹ 400

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) :
Cost price of object 1 = $180 \times \frac{100}{120} = ₹150$
Cost price of object 2 = $240 \times \frac{100}{80} = ₹300$
The total price of both objects = $(150 + 300) = ₹450$

169. A certain quantity of rice was bought for Rs. X and sold for Rs. Y, thereby earning a profit of 25%. Had the cost price been 20% less and the selling price been Rs. 58 less, a profit of 20% would have been earned. Find the value of X.

- (a) 250 (b) 200
(c) 300 (d) 400

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (b): Let, CP = 100, SP = 125
According to the question,

$$CP = 80, SP = \frac{80 \times 120}{100} = 96$$

$$125 - 96 = 58$$

$$\therefore 29 = 58$$

$$\therefore 1 \text{ unit} = 2$$

Hence, Initial price of Rice = ₹200

170. By selling an article 9/11 of its actual selling price, a trader incurs a loss of 10%. What will be the profit percentage, if the article is sold for 5% less than its actual selling price?

- (a) 5 (b) $4\frac{1}{2}$
(c) $5\frac{1}{2}$ (d) 4

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b) : Let, the actual selling price = ₹ 11

$$\text{Loss of } 10\% = \frac{9}{10} \text{ here cost price} = ₹ 10$$

When the article is sold at 5% less than the original selling price.

$$\text{Then selling price} = 11 \times \frac{95}{100} = ₹ 10.45$$

$$\begin{aligned} \text{Required profit percentage} &= \frac{SP - CP}{CP} \times 100 \\ &= \frac{10.45 - 10}{10} \times 100 \\ &= \frac{45}{10} = \frac{9}{2} = 4\frac{1}{2} \end{aligned}$$

(III) Problems based on Finding Selling Price

171. A book is sold for ₹1,554 by allowing a discount of 26% on its marked price. Find the marked price of the book.

- (a) ₹1,854 (b) ₹2,100
(c) ₹1,750 (d) ₹2,000

SSC CHSL 30/05/2022 (Shift- III)

Ans. (b) ∴



So,

$$37 \text{ units} \rightarrow ₹1554$$

$$50 \text{ unit} \rightarrow \frac{1554 \times 50}{37} = 42 \times 50$$

Hence, Marked Price = $42 \times 50 = ₹2100$

172. The profit earned by selling an article for ₹832 is equal to the loss incurred when the article is sold for ₹448. What should be the selling price (in ₹) to make a profit of 10%

- (a) 750 (b) 715
(c) 640 (d) 704

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (d) Given, Selling price on profit = Rs. 832
Selling Price at loss = Rs. 448
According to the question,
SP at profit – CP = CP – SP at loss
 $\Rightarrow 832 - CP = CP - 448$
 $\Rightarrow 2 \times CP = 832 + 448$
 $\Rightarrow CP = Rs. 640$

Now the selling price for making 10% profit

$$SP = CP \left(\frac{100 + P\%}{100} \right)$$

$$\Rightarrow SP = 640 \times \left(\frac{100 + 10}{100} \right)$$

$$\Rightarrow SP = 640 \times \frac{110}{100}$$

$$\Rightarrow SP = Rs. 704$$

Hence, the selling price of the article for making 10% profit should be Rs. 704.

- 173. When an article is sold for Rs. 388, there is a loss of 3%. What is the selling price (in Rs.) of the article, if it is sold at a gain of 8%?**

- (a) 412 (b) 444
(c) 432 (d) 460

SSC MTS 26/10/2021 (Shift-I)

Ans. (c) : Given,

$$SP \text{ at } 3\% \text{ loss} = 388$$

$$CP = \frac{388}{97} \times 100$$

$$CP = 400$$

\therefore Article sells at 8% profit

$$\therefore SP = 400 \times \frac{108}{100}$$

$$SP = ₹432$$

- 174. Kavita purchased fabric worth ₹800 for a dress, and spent ₹350 on embroidery and stitching. If she sold the dress at a profit of 20%, then the selling price is?**

- (a) ₹1,220 (b) ₹1,380
(c) ₹1,500 (d) ₹1,310

SSC MTS 11/10/2021 (Shift-I)

Ans. (b) : According to the question:-

$$\text{Total expenditure on dress by Kavita} = 800 + 350 = ₹1150$$

$$SP \text{ at } 20\% \text{ profit} = \frac{1150 \times 120}{100}$$

$$= ₹1380$$

- 175. A person sold an article at a loss of 12%. Had he sold it at a gain of 10.5%, he would have got ₹112.50 more. What is the original selling price (in ₹) of the article?**

- (a) 440.00 (b) 560.00
(c) 552.50 (d) 500.00

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Let,

$$CP = 100$$

$$SP \text{ at a loss of } 12\% = 88$$

$$SP \text{ at a gain of } 10.5\% = 110.5$$

According to the question,

$$110.5\% - 88\% = ₹112.50$$

$$22.5\% = ₹112.50$$

$$\text{Original selling price [at loss of } 12\%] \text{ } 88\% = \frac{112.50}{22.5} \times 88 = ₹440.00$$

- 176. Rakesh sold a car for ₹5,00,000 at a 28% profit. At what price should he sell it to get a 32% profit?**

- (a) ₹5,15,620 (b) ₹5,15,625
(c) ₹5,15,630 (d) ₹5,15,615

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : Required price = $500000 \times \frac{100}{128} \times \frac{132}{100}$
 $= ₹515625$

- 177. A shopkeeper purchased 10 chairs at the rate of Rs 1,450 per chair and spent Rs. 600 as cartage. For how much should he sell each chair to earn 10% profit?**

- (a) ₹ 2,225 (b) ₹ 1,661
(c) ₹ 1,595 (d) ₹ 1,645

SSC MTS 20/10/2021 (Shift-I)

Ans. (b) : Total expenditure on chairs = $1450 \times 10 + 600$
 $= 15100$

Total selling price of chair after 10% gain.

$$= \left[\frac{15100}{100} \times (100 + 10) \right] = 16610$$

$$\text{Selling price of each chairs} = \frac{16610}{10} = ₹1661$$

- 178. By selling an article for ₹640, a person loses 15% of its selling price. At what price (in ₹) should he sell it to gain 15% on its cost price?**

- (a) 832 (b) 846.40
(c) 835 (d) 836.60

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (b) : Let CP = 115, SP = 100

$$\therefore 100 \rightarrow ₹640$$

$$115 \rightarrow \frac{640 \times 115}{100}$$

$$\therefore SP \text{ at } 15\% \text{ profit} = \frac{640 \times 115}{100} \times \frac{115}{100}$$

$$= ₹846.40$$

- 179. By selling an article for ₹131.25, a trader gains as much percent as the number representing the cost price of the article. In order to earn 40% profit, at what price (in ₹) should he sell the article ?**

- (a) 140 (b) 105
(c) 75 (d) 100

SSC CGL-(Tier-I) 18/08/2021 (Shift II)

Ans. (b) : Let the CP of the article is ₹x.

$$\text{Profit} = \text{SP} - \text{CP}$$

$$x \times \frac{x}{100} = 131.25 - x$$

$$x = \frac{131.25 - x}{x} \times 100$$

$$x^2 = 13125 - 100x$$

$$x^2 + 100x - 13125 = 0$$

$$x^2 + (175 - 75)x - 13125 = 0$$

$$x^2 + 175x - 75x - 13125 = 0$$

$$x(x + 175) - 75(x + 175) = 0$$

$$(x + 175)(x - 75) = 0$$

$$x = ₹ 75$$

$$\text{CP} = ₹ 75$$

$$\text{SP at 40\% Profit} = \frac{75 \times 140}{100}$$

$$= \frac{75}{5} \times 7$$

$$= ₹105$$

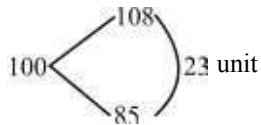
180. A.T.V. is sold at 8% gain. if it sold for ₹2553 less; there would have been loss of 15%. To gain 18%, the selling price (in ₹) of T.V. would be :

(a) 13098 (b) 15000

(c) 9102 (d) 11100

SSC CGL-(Tier-I) 18/08/2021 (Shift III)

Ans. (a) : Let the CP of article = 100



$$23 \text{ unit} = 2553$$

$$1 \text{ unit} = 111$$

$$100 \text{ unit} = 11100$$

Hence, To gain 18% the selling price of

$$\text{T.V.} = 11100 \times \frac{(100+18)}{100}$$

$$= 11100 \times \frac{118}{100} = ₹13098$$

181. Sulekha bought 36 kg of sugar for ₹1,040. She sold it at a profit equal to the selling price of 10 kg of it. What is the selling price (in ₹) for 5 kg of sugar?

(a) 235 (b) 215

(c) 200 (d) 220

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c) Cost price of sugar = $\frac{1040}{36}$ /kg

Then profit is equal to selling price 10 kg of sugar = 36 - 10 = 26 kg

$$\text{SP of 1 kg} = \frac{1040}{26} = ₹40$$

$$\text{SP of 5 kg} = 5 \times 40 = ₹200$$

182. By selling an article for ₹3150, a shopkeeper earns 5% profit. For how much money should he sell the article in order to gain 8%?

(a) ₹3180 (b) ₹3200

(c) ₹3240 (d) ₹3250

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : SP at 5% profit = ₹3150

$$\text{CP} = 3150 \times \frac{100}{105} = ₹3000$$

$$\text{Then, SP at 8\% profit} = 3000 \times \frac{108}{100} = ₹3240$$

Hence, on gain of 8%, article should be sold at ₹3240.

183. In festival season, a shopkeeper allows a discount of 10% on every item. Even after giving the discount, he makes a profit of 20%. If he does not give any discount, then what will be his profit percent? (Correct to 2 decimal places)

(a) 33 (b) 25

(c) 33.33 (d) 33.43

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (c) : We know that,

$$\frac{\text{MP}}{\text{CP}} = \frac{100 + P\%}{100 - D\%}$$

$$\frac{\text{MP}}{\text{CP}} = \frac{100 + 20}{100 - 10}$$

$$\frac{\text{MP}}{\text{CP}} = \frac{4}{3} + 1$$

∴ According to the question, MP = SP

$$\therefore \text{Profit \%} = \frac{1}{3} \times 100 = 33.33\%$$

184. When an article is sold for ₹438, there is a loss of 27%. To gain 23%, it should be sold for ₹x. What is the value of x?

(a) ₹ 600 (b) ₹ 837

(c) ₹ 678 (d) ₹ 738

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) : Let the CP of an article = 100%

At loss of 27%, SP = ₹438------(Given)

$$\therefore 73\% \rightarrow 438$$

$$1\% \rightarrow \frac{438}{73}$$

$$\Rightarrow \text{CP} = \frac{100 \times 438}{73}$$

∴ To gain 23%, SP is 123%

$$123\% \rightarrow \frac{123 \times 438}{73} = 123 \times 6 = 738$$

Then, the value of x = ₹738

185. Ram sold a plot for ₹6,55,000 at 20% loss. For what price should he sell the plot to gain 15% profit?

(a) ₹6,41,562.50 (b) ₹9,41,562.50

(c) ₹8,41,562.50 (d) ₹7,41,562.50

SSC CHSL 11/08/2021 (Shift-III)

Ans. (b) : According to the question,

$$\therefore 80\% = 6,55,000$$

$$\therefore 100\% = 818750$$

$$\begin{aligned} \text{Price of plot when it sold at 15\% profit} &= 818750 \times \frac{115}{100} \\ &= 941562.5 \end{aligned}$$

186. By selling an article for ₹670, a man loses 15%. AT what price (in) should he sell it in order to make a profit of 15%?

- (a) 23560 (b) 11730
(c) 13370 (d) 18590

SSC CHSL 15/04/2021 (Shift-II)

Ans. (b) According to the question,

$$85\% = 8670$$

$$1\% = \frac{8670}{85}$$

$$\begin{aligned} \text{SP on 15\% profit} &= 115 \times \frac{8670}{85} \\ &= \text{Rs. } 11,730 \end{aligned}$$

187. If a person sells a ceiling fan for ₹557.75, then he gets a 15% profit. To get a 20% profit, at what amount should he sell the fan?

- (a) ₹ 572 (b) ₹ 589
(c) ₹ 596 (d) ₹ 582

SSC CHSL 06/082021 (Shift-II)

Ans. (d) : Selling price = ₹557.75 -----(Given)

$$\text{Profit \%} = 15\%$$

$$\text{Cost price} = \frac{557.75 \times 100}{115} = ₹485$$

\therefore SP at 20% profit,

$$\begin{aligned} &= 485 \times \frac{120}{100} \\ &= 582 \end{aligned}$$

188. Anil bought two articles A and B at a total cost of ₹10,000. He sold the article A at 15% profit and the article B at 10% loss. In the whole deal, he made no profit or no loss. Find the selling price of the article A.

- (a) ₹4,500 (b) ₹4,600
(c) ₹5,400 (d) ₹4,200

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the cost price of A = x

$$\therefore \text{Cost price of B} = (10000 - x)$$

On selling the article A at 15% profit then selling price

$$\text{of article A} = x \times \frac{115}{100}$$

On selling the article B at 10% loss then selling price

$$\text{of the article} = (10000 - x) \times \frac{90}{100}$$

According to the question,

$$x \times \frac{115}{100} + (10000 - x) \times \frac{90}{100} = 10000$$

$$\begin{aligned} \frac{115x}{100} + \frac{900000}{100} - \frac{90x}{100} &= 10000 \\ x &= 4,000 \end{aligned}$$

$$\text{Hence selling price of A} = x \times \frac{115}{100}$$

$$= 4000 \times \frac{115}{100}$$

$$= 40 \times 115$$

$$= ₹4,600$$

189. The selling price of one article after allowing a discount of 15% on its cost price, is the same as the selling price of another article after allowing a discount of 25% on its cost price. If the sum of the cost prices of both the articles is ₹640, then find the selling price of each article.

- (a) ₹250 (b) ₹280
(c) ₹255 (d) ₹340

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : According to the question,

$$CP_1 \times 85\% = CP_2 \times 75\%$$

$$CP_1 \times \frac{17}{20} = CP_2 \times \frac{15}{20}$$

$$CP_1 \times 17 = CP_2 \times 15$$

$$\frac{CP_1}{CP_2} = \frac{15}{17}$$

$$\text{Total cost price} = ₹640$$

$$\therefore 32 \text{ unit} = 640$$

$$1 \text{ unit} = 20$$

$$\text{Cost price of the first article} = 15 \times 20 = 300$$

$$\text{Selling price} = 300 \times \frac{17}{20} = ₹255$$

190. A person sold an article at a loss of 8%. Had he sold it at a gain of 10.5% he would have received ₹ 92.50 more. To gain 12% he should have sold it for :

- (a) ₹ 580 (b) ₹ 560
(c) ₹ 540.50 (d) ₹ 537.40

SSC CGL (TIER-I)-2018 – 06.06.2019

Ans. (b) : $-8\% \xrightarrow{+18.5\%} 10.5\%$

$$18.5\% = ₹92.50$$

$$\therefore 112\% = \frac{92.5}{18.5} \times 112 = ₹560$$

Hence he should have sold it at ₹ 560. for 12% gain

191. A person sold 25 articles for ₹ 2,500 and incurred a loss of 10%. How many articles should he sell for ₹2,400 to make a profit of 20%?

- (a) 16 (b) 18
(c) 15 (d) 20

SSC CGL (TIER-I)-2018 – 07.06.2019

Ans. (b)

$$\frac{SP_1}{(100 \pm P/L\%) \times n_1} = \frac{SP_2}{(100 \pm P/L\%) \times n_2}$$

$$\frac{2500}{25} = \frac{2400}{n}$$

$$\frac{2500}{25 \times 90} = \frac{2400}{120 \times n}$$

$$n = 18 \text{ Articles}$$

192. A dealer sold 6 sewing machines for ₹ 63,000 with a profit of 5%. For how much should he sell 8 machines if he intends to earn 15% profit?

- (a) ₹69,300 (b) ₹92,400
(c) ₹88,200 (d) ₹92,000

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (d) : Selling price of a machine

$$= \frac{63000}{6} = \text{Rs. } 10500$$

$$\text{Cost price} = \frac{100}{105} \times 10500 = \text{Rs. } 10000$$

∴ Selling price of a machine for 15% profit

$$= 10000 \times \frac{115}{100} = 11500 \text{ ₹.}$$

∴ Selling price of 8 machines = ₹ 92000

193. A person sells an article at 10% below its cost price. Had he sold it of ₹ 332 more, he would have made a profit of 20%. What is the original selling price (In ₹) of the article?

- (a) ₹1,328 (b) ₹1,028
(c) ₹ 896 (d) ₹996

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (d) : Let cost price of article = 100unit

Original selling price of article = 90 unit

New selling price of article = 120unit

30 Unit → 332

∴ 90 Unit → ₹996

194. Reema sold 48 articles for ₹2,160 and suffered a loss of 10%. How many articles should she sell for ₹2,016 to earn a profit of 12%?

- (a) 28 (b) 40
(c) 32 (d) 36

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (d) :

$$\text{Cost price of 48 articles} = 2160 \times \frac{100}{90} = \text{Rs. } 2400$$

$$\text{Cost price of an article} = \frac{2400}{48} = 50$$

Selling price of an article for 12% profit =

$$50 \times \frac{112}{100} = 56$$

$$\text{Number of articles} = \frac{2016}{56} = 36$$

195. If a stall sells a pizza at ₹ 200 he makes 20% loss if he wants to make 10% profit then at what price (in ₹) should he sell ?

- (a) 250 (b) 300
(c) 275 (d) 325

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : Cost price = $200 \times \frac{100}{80}$

$$= ₹250$$

Selling price of the commodity after taking 10% profit

$$\text{on the cost price} = \frac{250 \times 110}{100}$$

$$\Rightarrow ₹275$$

Trick–

$$80\% = ₹ 200$$

$$5\% = \frac{25}{2}$$

$$110\% = ₹ 275$$

196. An oil refinery buys oil at Rs 3600 per barrel. There is 10% wastage. If the refinery wants to earn 5% profit then at what price should it sell including 8% tax on selling price? (in Rs per barrel)

- (a) 3674 (b) 3711
(c) 4219 (d) 4536

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : Price of one barrel oil = ₹ 3600

10% of the oil is wasted, then the price of one barrel of

$$\text{oil} = 3600 \times \frac{100}{90}$$

$$= 4000$$

According to the question,

$$\text{New cost price of oil} = 4000 \times \frac{105}{100} \times \frac{108}{100}$$

$$= ₹ 4536 \text{ Per barrel}$$

197. A vender sells a coconut at Rs 24 and suffers 24% loss. If he wants to make 14% profit, then at what price (in ₹) should he sell?

- (a) 32 (b) 30
(c) 36 (d) 28

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Let the cost price of coconut = ₹x

According to the question–

$$x \times \frac{(100 - 24)}{100} = 24$$

$$x = 24 \times \frac{100}{76}$$

$$\text{Selling price after 14% profit} = 24 \times \frac{100}{76} \times \frac{114}{100}$$

$$= ₹ 36$$

Trick–

$$76\% = ₹ 24$$

$$19\% = ₹ 6$$

$$114\% = ₹ 36$$

198. A trader buys jowar at ₹ 30 per kg. 20% of the grain gets wasted. He plans to sell the remaining grain so that he makes 40% overall profit. At what price (in ₹ per kg) should he sell the grain ?

- (a) 48 (b) 50
(c) 52.5 (d) 47.5

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let total grain = 100 kg
Cost price = $30 \times 100 = ₹3000$
After 20% grain gets wasted
remaining grain = 80kg
Suppose he should sell the remaining grains at ₹ x per kg.

Total Selling price = ₹ 80 x

As per question,

$$\therefore 80x = 3000 \times \frac{140}{100}$$

$$x = \frac{30 \times 140}{80} = ₹52.5$$

199. If a vendor sells a watermelon at ₹ 69 he makes 8% loss. If he wants to make 16% profit then at what price (in ₹) should he sell ?

- (a) 91 (b) 83
(c) 87 (d) 79

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : As per question

∴ At 8% loss (100-8) % = 92% of selling price = ₹ 69

At 16% profit 116% of selling price = $\frac{69}{92} \times 116 = ₹87$

Therefore, he should sell watermelon for ₹ 87.

200. Oil equal to 20% of the weight of groundnut is extracted in a mill. The matter left after extraction is sold as cattle feed at the rate of ₹ 12.5/kg. The groundnuts are bought at ₹ 20/kg. The processing cost is ₹ 5/kg. At what price (₹ per kg) should the oil be sold to earn 20% profit on total costs (Total cost = Cost of groundnuts and Processing costs)?

- (a) 250 (b) 150
(c) 200 (d) 100

SSC CGL (Tier-II) 17-2-2018

Ans. (d) : Suppose total weight of groundnut = 100 kg
Total oil extracted from groundnut

$$= 100 \times \frac{20}{100} = 20 \text{ kg}$$

Substances after extraction = $100 - 20 = 80 \text{ kg}$

Total price of groundnut = $100 \times (20+5) = 2500$

Total price after 20% profit

$$= 2500 \times \frac{120}{100} = ₹3000$$

Total value of the substance = $80 \times 12.5 = ₹1000$

∴ Required price of oil according to the question = $\frac{3000 - 1000}{20} = ₹ 100 \text{ kg.}$

201. If a vendor sells a coconut at ₹ 14.4 he makes 10% loss. If he wants to make 25% profit, then at what price (in ₹) should he sell?

- (a) 18 (b) 20
(c) 16 (d) 22

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : Selling price of coconut = 14.4

$$\text{Cost price of coconut} = 14.4 \times \frac{100}{(100-10)} = ₹16$$

$$\text{Selling price after 25\% profit} = 16 \times \frac{(100+25)}{100} = ₹ 20$$

202. Cost of 4 pens, 6 note books and 9 files is ₹ 305. Cost of 3 pens, 4 notebooks and 2 files is ₹ 145. What is the cost (in Rs) of 5 pens, 8 notebooks and 16 files?

- (a) 415 (b) 465
(c) 440 (d) Cannot be determined

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : 4 Pens + 6 Notebooks + 9 files = 305 (i)

3 Pens + 4 Notebooks + 2 Files = 145 (ii)

On multiplying by 2 in equation (i)

8 Pens + 12 Notebooks + 18 files = 610 (iii)

From the equation (iii) to equation (ii)

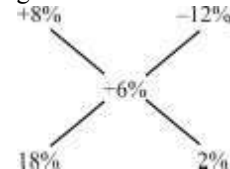
5 Pens + 8 Notebooks + 16 files = $610 - 145 = ₹ 465$

203. Sudha bought 80 articles at the same price. She sold some of them at 8% profit and the remaining at 12% loss resulting in an overall profit of 6%. The number of items sold at 8% profit is :

- (a) 64 (b) 72
(c) 60 (d) 70

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : By allegation rate



Ratio = 18 : 2 = 9 : 1

Hence the number of articles sold at 8% profit

$$= 80 \times \frac{9}{10} = 72$$

Trick-

Let x articles sell at 8% Profit

$$x \times 8\% - (80 - x) \times 12\% = 80 \times 6$$

$$2x - 240 + 3x = 120$$

$$5x = 360$$

$$x = 72$$

204. A person sells an article at 16% below its cost price. Had he sold it for ₹33 more, he would have gained 14%. To gain 25%, he should sell the article for :

- (a) ₹135 (b) ₹130.5
(c) ₹137.5 (d) ₹128

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Let the cost price = 100%
 At Loss of 16% $SP_1 = 84\%$ of cost price
 At Profit of 14% $SP_2 = 114\%$ of cost price
 $\therefore SP_2 - SP_1 = 33$
 $(114 - 84)\% = 33$
 $30\% = 33$
 $100\% = \frac{33}{30} \times 100 = 110$
 \therefore Profit of 25% on SP = $110 \times \frac{125}{100}$
 $= 110 \times \frac{5}{4} = ₹137.5$

- 205.** When an article is sold for ₹ 355 there is a loss of 29%. To gain 21%, it should be sold for :
 (a) 605 (b) 629.20
 (c) 635 (d) 580.80
SSC CGL (Tier-II) 11-9-2019

Ans. (a) :
 $71\% = ₹ 355$
 $1\% = ₹ 5$
 $121\% = 121 \times 5 = ₹ 605$
 Hence selling price of the article = ₹ 605

- 206.** The profit on selling an article for ₹1,100 is equal to three times the amount of loss on selling it for ₹700. To gain 12.5%, the article must be sold for:
 (a) ₹900 (b) ₹787.50
 (c) ₹877.50 (d) ₹956
SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) Let the cost price of the article is x.
 According to the question,
 $(1100 - x) = (x - 700) \times 3$
 $x = 800$
 Hence the cost price of the article is ₹ 800
 Selling price of the item at 12.5% profit = $800 \times \frac{112.5}{100}$
 $= ₹900$

- 207.** Mangoes are bought at a rate of ₹10,000 per ton. If one-third of the total mangoes are sold at a loss of 4%, then at what price (per ton) should the remaining mangoes be sold so as to gain 30% on the whole transaction?
 (a) ₹ 13,500 (b) ₹ 15,000
 (c) ₹ 14,700 (d) ₹ 14,600
SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c) : Suppose remaining mangoes are sold at x% profit.
 According to the question,
 $\frac{10000}{3} \times \frac{(100 - 4)}{100} + \frac{10000 \times 2}{3} \times \frac{(100 + x)}{100}$
 $= 10000 \times \frac{(100 + 30)}{100}$
 $\frac{96}{3} + \frac{(100 + x) \times 2}{3} = 130$
 $96 + 200 + 2x = 390$

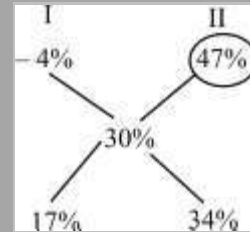
$$2x = 94$$

$$x = 47$$

$$\text{Price of mangoes (per ton)} = 10000 \times \frac{(100 + 47)}{100}$$

$$= ₹14700$$

Trick–



Ratio of Part = 1 : 2
 Selling price (per ton) of remaining mangoes
 $= 10000 \times \frac{147}{100}$
 $= ₹ 14700$

- 208.** By selling an article for ₹600, a shopkeeper makes a profit of 20%. At what price should he sell the article to incur a loss of 20%?
 (a) ₹600 (b) ₹500
 (c) ₹300 (d) ₹400
SSC CHSL –17/03/2020 (Shift-III)

Ans. (d) : Let the cost price of the article = ₹ x
 \therefore Selling price of the article at 20% profit = ₹ 600
 $\therefore \frac{x \times 120}{100} = 600$
 $x = \frac{600 \times 100}{120}$
 $x = ₹500$
 \therefore Selling price of the article at 20% loss
 $= \frac{500 \times (100 - 20)}{100}$
 $= \frac{500 \times 80}{100}$
 $= ₹400$

Trick–

$$120\% = ₹ 600$$

$$20\% = ₹ 100$$

$$80\% = ₹ 400$$

- 209.** The percentage profit earned by selling a mobile for ₹12,000 is equal to the percentage loss incurred by selling the same mobile for ₹9,000. At what price should the mobile be sold to make 20% profit.
 (a) ₹18,800 (b) ₹12,600
 (c) ₹15,400 (d) ₹16,200
SSC CHSL –19/10/2020 (Shift-I)

Ans. (b) : \therefore As per question,
 $100 \times \left(\frac{12000 - CP}{CP} \right) = \left(\frac{CP - 9000}{CP} \right) \times 100$
 $2CP = ₹21000$
 $CP = ₹10500$

∴ Selling price of mobile for a profit of 20%

$$= 10500 \times \frac{120}{100}$$

$$= ₹12600$$

210. The cost price of 33 books is the same as the selling price of 'x' books. If the profit is 10%, then the value of 'x' is:

- (a) ₹30 (b) ₹20
(c) ₹40 (d) ₹10

SSC CHSL -16/10/2020 (Shift-III)

Ans. (a) : ∵ Profit on books = 10%

$$\therefore \text{Selling price of } x \text{ books} = \frac{x \times 110}{100}$$

According to the question, $\frac{x \times 110}{100} = 33$

$$x = \frac{33 \times 100}{110}$$

Hence $x = 30$

Trick-

$$33 \text{ CP} = x \text{ SP}$$

$$\frac{\text{CP}}{\text{SP}} = \frac{x}{33}$$

$$\therefore 110\% = 33$$

$$10\% = 3$$

$$x = 100\% = ₹ 30$$

211. Salma buys an article and then sells it for ₹810. If she loses 10%, then at what price should she sell it to gain 4%?

- (a) ₹900 (b) ₹729
(c) ₹864 (d) ₹936

SSC CHSL -16/10/2020 (Shift-II)

Ans. (d) : Let the cost price of the article = x

According to the question,

$$\frac{x \times (100 - 10)}{100} = ₹810$$

$$\frac{x \times 90}{100} = 810$$

$$x = \frac{810 \times 100}{90}$$

$$x = ₹900$$

∴ Selling price of the article at 4% profit

$$= \frac{900 \times 104}{100}$$

$$= ₹936$$

Trick-

$$90\% = ₹ 810$$

$$1\% = ₹ 9$$

$$104\% = ₹ 936$$

212. If a saree is sold for ₹3,060, the seller will face 15% loss, at what price should he sell the saree to gain a 20% profit?

- (a) ₹4,320 (b) ₹4,650
(c) ₹3,440 (d) ₹3,600

SSC CHSL -15/10/2020 (Shift-II)

Ans. (a) : Let the cost price of the saree is x .

According to the question, selling price of the saree at 15% loss.

$$\frac{x \times (100 - 15)}{100} = ₹3060$$

$$\frac{x \times 85}{100} = ₹ 3060$$

$$x = \frac{3060 \times 100}{85}$$

New selling price of the saree at 20% profit

$$= \frac{3060 \times 100}{85} \times \frac{120}{100}$$

$$= \frac{3060 \times 24}{17}$$

$$= 180 \times 24$$

$$= ₹ 4320$$

Trick-

$$85\% = ₹ 3060$$

$$5\% = ₹ 180$$

$$120\% = 180 \times 24 = ₹ 4320$$

213. The difference between the selling prices of some articles if sold for ₹12 per article instead of ₹9 per article is ₹150. If the cost price of these articles is ₹250, then find the selling price of 21 articles if profit earned is 20%.

- (a) ₹125 (b) ₹130
(c) ₹136 (d) ₹126

SSC CHSL -14/10/2020 (Shift-II)

Ans. (d) : Let the total number of articles = x

$$12x - 9x = 150$$

$$3x = 150$$

$$x = 50$$

$$\text{Cost price of an article} = \frac{250}{50} = ₹5$$

$$\text{Selling price of an article} = \frac{120}{100} \times 5 = ₹6$$

$$\text{Selling price of 21 articles} = ₹126$$

214. A person purchases 40 items at ₹ 10 each. He sells a part of them at 25% profit and the remaining at 10% loss. The net profit is 4% in this transaction. The number of items he sold at a loss, is:

- (a) 24 (b) 16
(c) 22 (d) 18

SSC CHSL -13/10/2020 (Shift-I)

Ans. (a) : Let x articles be sold at a loss.

According to the question,

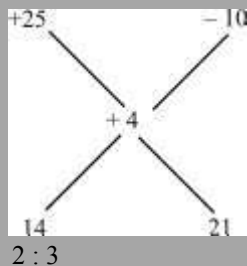
$$x \times \frac{90}{100} + (40 - x) \times \frac{125}{100} = 40 \times \frac{104}{100}$$

$$90x + 5000 - 125x = 4160$$

$$35x = 840$$

$$x = 24$$

Trick-



$$\text{Number of items} = 40 \times \frac{3}{5} = 24$$

215. Kishore had a loss of 20% on selling an article for ₹7,160. At what price should he have sold the item to make a profit of 30%.

- (a) ₹10,678 (b) ₹11,635
(c) ₹8,988 (d) ₹12,007

SSC CHSL -12/10/2020 (Shift-III)

Ans. (b) : Let the cost price of the article = ₹100
∴ There is a loss of 20% by selling it for ₹7160.

$$\therefore 80\% = ₹7160$$

$$\therefore 100\% = ₹8950 = \text{cost price}$$

$$\text{Profit}\% = 30\%$$

$$\text{Selling price} = ?$$

$$\text{Profit} = \frac{8950 \times 30}{100} = ₹2685$$

$$\therefore \text{Selling price} = \text{cost price} + \text{profit} \\ = 8950 + 2685 = ₹11635$$

Trick-

$$\text{SP} = 7160$$

$$\text{Required selling price} = 7160 \times \frac{100}{80} \times \frac{130}{100} \\ = ₹11635$$

216. Ram sold a motorcycle for ₹ 70000 at 25% profit. For what price should he sell a motorcycle to gain 30% profit?

- (a) ₹ 72,800 (b) ₹ 72,700
(c) ₹ 72,600 (d) ₹ 72,900

SSC CHSL -12/10/2020 (Shift-I)

Ans. (a) : ∴ Cost price of Motorcycle is 100%

$$\therefore \text{Selling price at 25\% profit} = 125\% \text{ of CP} = 70,000 = ₹70000$$

$$\therefore 1\% = \frac{70000}{125} = ₹560$$

$$\therefore 100\% = ₹56000$$

$$\text{To make 30\% profit, it has to be sold at 130\%.$$

$$\therefore 130\% \text{ of C.P.} = 560 \times 130 \\ = ₹72800$$

217. A chair was purchased for ₹785 and sold at a profit of 22%. What was the selling price?

- (a) ₹987.4 (b) ₹957.7
(c) ₹857.9 (d) ₹768.3

SSC CHSL -17/03/2020 (Shift-II)

Ans. (b) : Cost price of a chair = ₹785

$$\text{Profit} = 22\%$$

$$\therefore \text{Selling price of a chair} = \frac{785 \times 122}{100} \\ = ₹957.7$$

218. Sohan sold a plot ₹ 2,55,000 at a 15% loss. At what price should he sell the plot to gain a 10% profit?

- (a) ₹ 3,33,300 (b) ₹ 3,33,000
(c) ₹ 3,00,000 (d) ₹ 3,30,000

SSC CHSL -17/03/2020 (Shift-I)

$$\text{Ans. (d) : Cost Price (CP)} = 255000 \times \frac{100}{85} = ₹300000$$

$$\therefore \text{Selling price of the plot to get a profit of 10\%}$$

$$(\text{SP}) = 300000 \times \frac{110}{100} = ₹330000$$

219. Amit sold an article for ₹7000 and incurred a loss. Had he sold it for ₹8750, his gain would have been three-fourth of the amount of loss that he incurred. At what price should he sell the article to get 10% profit?

- (a) ₹8400 (b) ₹7800
(c) ₹8000 (d) ₹8800

SSC CHSL -20/10/2020 (Shift-II)

$$\text{Ans : (d) Loss} = (\text{CP} - 7000)$$

According to the question,

$$\text{Profit} = \text{Loss} \times \frac{3}{4}$$

$$4 \text{ Profit} = 3 \text{ Loss}$$

$$4(8750 - \text{CP}) = 3(\text{CP} - 7000)$$

$$35000 - 4\text{CP} = 3\text{CP} - 21000$$

$$7\text{CP} = 56000$$

$$\text{CP} = 8000$$

$$\therefore \text{Selling price to get a profit of 10\%} = \frac{8000 \times 110}{100} \\ = ₹8800$$

220. A man sold his bike for ₹25,000 at 25% profit. At what price would he have sold it if he had incurred a loss of 15%?

- (a) ₹18,000 (b) ₹16,000
(c) ₹17,000 (d) ₹19,000

SSC CHSL -19/03/2020 (Shift-II)

Ans. (c) : Let cost price of bike = x

According to the question,

$$\frac{x \times 125}{100} = 25000$$

$$x = \frac{25000 \times 100}{125}$$

$$= ₹20,000$$

Selling price of bike at 15% loss

$$= \frac{20,000(100-15)}{100}$$

$$= \frac{20,000 \times 85}{100}$$

$$= ₹17,000$$

Trick-

$$125\% = ₹ 25000$$

$$5\% = ₹ 1000$$

$$85\% = ₹ 17000$$

221. A man buys an article for ₹3,200 and sells it at a loss of 12%. What is the selling price of the article?

(a) ₹3,428 (b) ₹2,856

(c) ₹3,012 (d) ₹2,816

SSC CHSL -14/10/2020 (Shift-III)

Ans. (d) : Cost Price of the article

$$= \left(\frac{100 - 12}{100} \right) \times 3200$$

$$= 88 \times 32 = ₹ 2816$$

222. If Ravi sells an old scooter for ₹18,000, then his loss incurred is 10%. If he sells it to gain a profit of 15%, then the selling price is:

(a) ₹22,000 (b) ₹20,000

(c) ₹23,000 (d) ₹24,000

SSC CHSL -13/10/2020 (Shift-III)

Ans. (c) : Let the cost price of scooter = ₹x

$$\therefore \text{Selling price of scooter} = ₹18000$$

$$\therefore \text{Selling price of scooter after 10\% loss} =$$

$$\frac{x \times (100 - 10)}{100} = 18000$$

$$\frac{x \times 90}{100} = 18000$$

$$x = \frac{18000 \times 100}{90}$$

$$x = 20,000$$

$$\therefore \text{New selling price of scooter at 15\% profit.}$$

$$= \frac{x \times 115}{100}$$

$$= \frac{20000 \times 115}{100}$$

$$= ₹23000$$

223. By selling an article for Rs 416, a shopkeeper gains 30%. To gain 40% what should be the selling price (in rupees)?

(a) 426 (b) 448

(c) 472 (d) 442

SSC MTS 9-10-2017 (Shift-III)

Ans: (b) Let the cost price of the article = ₹ x

As per question,

$$\therefore x \times \left(\frac{100 + 30}{100} \right) = 416$$

$$x = \frac{416 \times 100}{130} = 320 \text{ Rs.}$$

$$\text{Selling price to get 40\% profit} = \frac{320 \times 140}{100} = 448$$

224. If the rice is sold at Rs 66 per kg, there would be a 10% loss. to earn a profit of 50% what should be the price of rice (in Rs per kg)?

(a) 110 (b) 105

(c) 108 (d) 112

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : Cost Price of rice = $\frac{\text{Selling Price} \times 100}{100 - \text{Loss\%}}$

$$= \frac{66 \times 100}{90}$$

$$\therefore \text{Selling Price of rice to get profit at 50\%}$$

$$= \frac{\text{Selling Price} \times (100 + \text{Profit\%})}{100}$$

$$= \frac{66 \times 100}{90} \times \frac{150}{100}$$

$$= ₹ 110$$

Trick-

$$90\% = 66 \text{ Rs}$$

$$30\% = 22 \text{ Rs}$$

$$150\% = 110 \text{ Rs}$$

225. The cost price of an article is ₹480. If it is to be sold at a profit of 12.5% What is the selling price of the article?

(a) ₹500 (b) ₹560

(c) ₹540 (d) ₹492.5

SSC MTS 13/08/2019 (Shift-I)

Ans. (c) :

$$\text{Selling price of the article} = \frac{\text{Cost Price} \times (100 + \text{profit\%})}{100}$$

$$= \frac{480 \times (100 + 12.5)}{100}$$

$$= \frac{480 \times 112.5}{100}$$

$$= ₹540$$

Trick-

$$12.5\% = \frac{1}{8}$$

CP : SP

$$8 \quad : \quad 9$$

$$\downarrow \times 60 \quad \downarrow \times 60$$

$$480 \quad 540$$

226. By selling an article for ₹320, a man incurs a loss of 20%. What should be the selling price of an article to gain 20%?

(a) ₹450 (b) ₹480

(c) ₹420 (d) ₹500

SSC MTS 02/08/2019 (Shift-I)

Ans. (b)

$$\text{Required selling price} = 320 \times \frac{100}{80} \times \frac{120}{100} = ₹480$$

227. After allowing a discount 12.5%, shopkeeper makes a profit of 25% on a bag. At what percent higher than the cost price did he mark the bag? (correct o nearest integer)

- (a) 35% (b) 43%
(c) 41% (d) 38%

SSC MTS 13/08/2019 (Shift-II)

Ans. (b) : Let the selling price = ₹ 100

$$\text{Cost Price} = 100 \times \frac{125}{100} = ₹125$$

$$\text{Marked Price} = \frac{125}{87.5} \times 100 = ₹142.85$$

$$\text{Mark up} = 142.85 - 100 = 42.85\% \approx \boxed{43\%}$$

228. A buys an article at ₹ 1800 and sells it after giving two successive discounts of 10% and 20%. What will be the selling price (in ₹) of the article?

- (a) 1296 (b) 1668
(c) 1728 (d) 1336

SSC MTS 09/08/2019 (Shift-I)

Ans. (a)

$$\begin{aligned} \text{Selling price} &= 1800 \times \frac{(100-10)}{100} \times \frac{(100-20)}{100} \\ &= 1800 \times \frac{90}{100} \times \frac{80}{100} \\ &= 18 \times 72 \\ &= ₹1296 \end{aligned}$$

229. An object is sold at 22.5% profit. What is the ratio of cost price and selling price?

- (a) 31 : 57 (b) 39 : 69
(c) 40 : 49 (d) 34 : 63

SSC MTS 05/08/2019 (Shift-III)

Ans. (c) :

Let the cost price of the article = ₹100

Selling price of the article = ₹122.50

According to the question,

$$\frac{\text{Cost Price}}{\text{Selling Price}} = \frac{100}{122.5} = \frac{1000}{1225}$$

$$\frac{\text{CP}}{\text{SP}} = \frac{40}{49}$$

$$\text{CP} : \text{SP} = 40 : 49$$

230. The cost price of the object is ₹1800. If the profit is 32%, then what is the selling price?

- (a) ₹ 2288 (b) ₹ 2376
(c) ₹ 2456 (d) ₹ 2496

SSC MTS 06/08/2019 (Shift-I)

Ans. (b) : Selling price of an article (SP) at 32% profit

$$= 1800 \times \frac{132}{100} = ₹ 2376$$

231. Sujata has sold 25 items for ₹1,250 and bears a 10% loss. How many items she should sold at ₹2600 so that she can obtain a profit of 17%?

- (a) ₹26
(c) ₹25

- (b) ₹40
(d) ₹42

SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : Selling price of 1 item = $\frac{1250}{25} = ₹50$

Cost Price of the article =

$$50 \times \frac{100}{90} = \frac{500}{9}$$

Selling price to get 17% profit

$$\frac{500}{9} \times \frac{117}{100} = ₹ 65$$

$$\text{Number of articles} = \frac{2600}{65} = ₹ 40$$

Trick—

Let n items should be sold.

$$\begin{aligned} \frac{1250}{25} &= \frac{2600}{n} \\ \frac{1250}{90} &= \frac{2600}{117} \\ \frac{1250}{25 \times 90} &= \frac{2600}{n \times 117} \\ n &= 40 \text{ items.} \end{aligned}$$

232. When an article is sold for Rs. 582 there is a loss of 3%. To gain 12%, it should be sold for.

- (a) Rs. 616 (b) Rs. 640
(c) Rs. 672 (d) Rs. 654

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (c) ∴ Selling price of article at 3% loss = ₹ 582

∴ Cost price of article

$$(\text{CP}) = 582 \times \frac{100}{97} = ₹600$$

Selling price of article at 12% profit

$$(\text{SP}) = 600 \times \frac{112}{100} = ₹672$$

(IV) Problems based on Buying and Selling of two items

233. A shopkeeper marks an article at such a price that after giving a discount of $12\frac{1}{2}\%$ on the marked price, he still earns a profit of 15%. If the cost price of the article is ₹385, then the sum of the marked price and the selling price (in ₹) of the article is:

- (a) 948.75 (b) 849.50
(c) 984.75 (d) 954.75

SSC CGL (Tier-II) 03/02/2022

Ans : (a) $\frac{\text{CP}}{\text{MP}} = \frac{100 - D\%}{100 + P\%}$

$$\frac{385}{\text{MP}} = \frac{100 - \frac{25}{2}\%}{100 + 15\%}$$

$$\frac{385}{MP} = \frac{175}{230}$$

$$MP = 506$$

$$SP = 506 \times \frac{100 - \frac{25}{2}}{100}$$

$$SP = 506 \times \frac{175}{200}$$

$$= 442.75$$

$$MP + SP = 506 + 442.75 = 948.75$$

234. A man sells two articles for 620 each, one at a profit of 24% and the other at a loss of 24%. What is his loss/profit percent in the whole transaction?

- (a) Loss, 12 (b) Loss, 5.76
(c) Profit, 5.76 (d) Profit, 12

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : From formula,

In such condition there is a loss of $\frac{x^2}{100}\%$

$$\text{Hence loss \%} = \frac{(24)^2}{100} = 5.76\%$$

235. Two articles are sold for ₹5,104 each. On one, the seller gains 16% and on the other, he loses 12%. What is his overall gain percent nearest to two decimal places?

- (a) 0.10% (b) 0.14%
(c) 0.12% (d) 0.08%

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) : $SP_1 = SP_2 = 5104$

$$\text{Total SP} = SP_1 + SP_2 = 5104 + 5104 = 10208$$

According to the question,

Total cost price (CP)

$$= CP_1 + CP_2 = \frac{5104 \times 100}{116} + \frac{5104 \times 100}{88}$$

$$= 100 \left(\frac{5104}{116} + \frac{5104}{88} \right)$$

$$= 100 (44 + 58) = 100 \times 102$$

$$= 10200 \text{ ₹.}$$

$$\therefore \text{Profit\%} = \frac{SP - CP}{CP} \times 100$$

$$= \frac{10208 - 10200}{10200} \times 100$$

$$= \frac{8}{102} = 0.078$$

$$= 0.08\%$$

236. Abhi bought two articles for ₹624. He sold one at a loss of 14% and the other at a profit of 14%. If the selling price of both the articles is equal, then the difference between their cost price (in ₹) is:

- (a) ₹87.36 (b) ₹89.68
(c) ₹89.64 (d) ₹88.84

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : $x \xrightarrow{-14\%} \quad SP \xleftarrow{+14\%} y$

$$\therefore \frac{x}{y} = \frac{114}{86} = \frac{57}{43}$$

$$(57 + 43) = 624 \text{ ₹.}$$

$$100 = 624 \text{ ₹.}$$

$$57 - 43 = 14 = \frac{624}{100} \times 14 = ₹87.36$$

237. Two articles are sold for ₹ 10,384 each. On one, the seller gains 18% and on the other, he loses 12%. What is his overall gain or loss?

- (a) ₹178 loss (b) ₹178 gain
(c) ₹168 gain (d) ₹168 loss

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (c) : Let the selling price = SP

Cost price = CP

$$\therefore SP_1 = SP_2 = ₹ 10384$$

$$\text{Total SP} = 20768 \text{ ₹}$$

$$CP_1 = 10384 \times \frac{100}{118} = \text{Rs.}8800$$

$$CP_2 = 10384 \times \frac{100}{88} = \text{Rs.}11800$$

$$\text{Total CP} = 8800 + 11800 = ₹ 20600$$

$$\text{Profit} = \text{SP} - \text{CP}$$

$$\therefore \text{Profit} = 20768 - 20600$$

$$= ₹168$$

Trick—

CP : SP

$$I \rightarrow (50 : 59) \times 22$$

$$II \rightarrow (25 : 22) \times 59$$

$$(22 \times 59) \text{ unit} = 10384$$

$$1 \text{ unit} = ₹ 8$$

$$\text{Profit} = (9 \times 22 - 3 \times 59)$$

$$= 21 \text{ units}$$

$$= ₹ 168$$

238. Two articles are sold for 9720/- each. On one, the seller gains 8% and on the other, he loses 10%. What is his overall gain or loss

- (a) Profit ₹ 380 (b) Profit ₹ 360
(c) Profit ₹380 (d) Profit ₹ 360

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (d) : Total selling price of two articles = 9720×2
= ₹ 19440

$$\text{Cost price of first article} = 9720 \times \left(\frac{100}{100+8} \right)$$

$$= 9720 \times \frac{100}{108}$$

$$= ₹9000$$

$$\text{Cost price of second article} = 9720 \times \left(\frac{100}{100-10} \right)$$

$$= 9720 \times \frac{100}{90}$$

$$= ₹ 10800$$

$$\text{Total cost price of two articles} = (9000 + 10800)$$

$$\begin{aligned} &= ₹ 19800 \\ \text{Hence total loss} &= (19800 - 19440) \\ &= ₹ 360 \end{aligned}$$

Trick-

CP : SP

$$I \rightarrow (25 : 27) \times 1 = 25 : 27$$

$$II \rightarrow (10 : 9) \times 3 = 30 : 27$$

$$\therefore 27 \text{ unit} = ₹ 9720$$

$$\text{Loss} = (3 - 2) \text{ unit} = ₹ 360$$

239. Two articles are sold ₹ 2508 each. On one, there is a gain of 14% and on the other, there is a loss of 12%. What is the overall gain or loss percent one decimal place?

- (a) 0.5% gain (b) 0.5% loss
(c) 0.7% loss (d) 0.7% gain

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (c) :

$$\text{Selling Price of two articles} = ₹ (2508 \times 2) = ₹ 5016$$

Cost Price of two articles

$$\begin{aligned} &= ₹ \left(\frac{100}{114} \times 2508 \right) + \left(\frac{100}{88} \times 2508 \right) \\ &= 2200 + 2850 \\ &= ₹ 5050 \end{aligned}$$

$$\text{Loss} = ₹ (5050 - 5016) = ₹ 34$$

$$\text{Loss \%} = \frac{34}{5050} \times 100 = 0.67 \approx 0.7\% \text{ Loss}$$

240. Two articles are sold for ₹ 10,005 each. On one, the seller gains 15% and on the other, he loses 13%. What is his overall gain or loss percent, correct to two decimal places?

- (a) 0.94% gain (b) 1.72% loss
(c) 1.42% gain (d) 0.94% loss

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (d) : Total selling price of two articles

$$= SP_1 + SP_2 = 10005 + 10005 = 20010 ₹.$$

Cost price of both articles

$$= CP_1 + CP_2 = 10005 \times \frac{100}{115} + 10005 \times \frac{100}{87}$$

$$= 100 \left(\frac{10005}{115} + \frac{10005}{87} \right)$$

$$= 100 (87 + 115) = 20200 ₹.$$

$$\therefore \text{Overall loss \%} = \frac{CP - SP}{CP} \times 100$$

$$= \frac{190}{20200} \times 100 = 0.94\%$$

Trick-

CP : SP

$$I \rightarrow (20 : 23) \times 87$$

$$II \rightarrow (100 : 87) \times 23$$

$$\text{Profit or loss} = (3 \times 87) - (13 \times 23)$$

$$= 261 - 299 = -38 = 38 \text{ loss}$$

$$\therefore (23 \times 87) \text{ unit} = ₹ 10005$$

$$1 \text{ unit} = ₹ 5$$

$$\begin{aligned} \text{Total cost price} &= (20 \times 87 + 100 \times 23) \text{ unit} \\ &= 4040 \text{ unit} \\ &= ₹ 20200 \end{aligned}$$

$$\text{Loss} = \frac{38}{20200} \times 100 = 0.94\%$$

241. Two articles are sold for ₹ 975 each on one the seller gains 30% and on the other, he loses 25%. What is the overall gain or loss percentage correct to one decimal place?

- (a) 4.9% loss (b) 4.9% gain
(c) 5.1% loss (d) 5.3% gain

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (a) : The cost price of the first article on which

$$\text{there is a profit of 30\%} = \frac{975}{130} \times 100 = ₹ 750$$

The cost price of the second article on which there is a

$$\text{loss of 25\%} = \frac{975}{75} \times 100 = ₹ 1300$$

$$\begin{aligned} \text{Hence total cost price of both articles} &= 750 + 1300 \\ &= ₹ 2050 \end{aligned}$$

$$\begin{aligned} \text{and total selling price of both articles} &= 975 + 975 \\ &= ₹ 1950 \end{aligned}$$

$$\begin{aligned} \text{Hence loss \%} &= \frac{100}{2050} \times 100 \\ &= 4.878\% \\ &= 4.9\% \text{ loss} \end{aligned}$$

242. Two articles are sold for ₹ 4,956 each. On one the seller gains 18% and on the other he loses 16%. What is this overall gain or loss percent to nearest one decimal place?

- (a) 1.9% loss (b) 21.% gain
(c) 2.1% loss (d) 1.9% gain

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (a)

Cost Price of first article

$$\begin{aligned} &= \frac{4956 \times 100}{(100 + \text{Profit}\%)} = \frac{4956 \times 100}{(100 + 18)} \\ &= \frac{4956 \times 100}{118} = ₹ 4200 \end{aligned}$$

Cost Price of second article

$$\begin{aligned} &= \frac{4956 \times 100}{(100 - \text{Loss}\%)} = \frac{4956 \times 100}{(100 - 16)} \\ &= \frac{4956 \times 100}{84} = ₹ 5900 \end{aligned}$$

$$\begin{aligned} \text{Total cost price} &= 4200 + 5900 \\ &= ₹ 10100 \end{aligned}$$

$$\begin{aligned} \text{Total selling price} &= 4956 \times 2 \\ &= ₹ 9912 \end{aligned}$$

$$\therefore \text{Loss\%} = \frac{10100 - 9912}{10100} \times 100$$

$$\begin{aligned} &= \frac{18800}{10100} = 1.861 \\ &\approx 1.9\% \end{aligned}$$

Second Method—If the selling price of the two articles is same, one article is sold at P% profit and the other at L% loss, then

$$(\text{Profit/loss})\% = \frac{100(P - L) - 2PL}{200 + P - L}\%$$

∴ From the question,

$$P = 18\%$$

$$L = 16\%$$

$$\therefore (\text{Profit/loss})\% = \frac{100(18 - 16) - 2 \times 18 \times 16}{200 + 18 - 16}$$

$$= \frac{100 \times 2 - 576}{202}$$

$$= \frac{200 - 576}{202}$$

$$= -\frac{376}{202}$$

$$= -1.861\% \text{ (Loss \%)}$$

$$\boxed{\text{Loss}\% \approx 1.9\%}$$

243. Two articles are sold for ₹ 962 each. On one the seller gains 30% and on the other he loses 26%. What is his overall gain or loss percentage, nearest to one decimal place?

- (a) 5.7% loss (b) 6.0% loss
(c) 5.7% gain (d) 6.0% gain

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (a) : Total selling price of both the articles = 962 + 962 = ₹1924

According to the question,

There is a profit of 30% on one article and a loss of 26% on the other.

Hence the cost price of both the articles

$$= \frac{962}{130} \times 100 + \frac{962}{74} \times 100$$

$$= 740 + 1300 = ₹2040$$

Cost Price > Selling Price (loss)

$$\therefore \% \text{Loss} = \frac{2040 - 1924}{2040} \times 100$$

$$= \frac{116}{2040} \times 100$$

$$= 5.7\%$$

Hence the seller incurs an overall loss of 5.7%.

244. Two articles are sold for ₹ 4,752 each one, the seller gains 32% and on the other he loses 28%. What is his overall gain or loss percentage correct to one decimal place?

- (a) 7.3% Profit (b) 7.3% Loss
(c) 6.8% Loss (d) 6.8% Profit

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (c): Total selling price of both articles

$$= 4752 + 4752 = ₹9504$$

Total cost price of both articles

$$= \frac{4752}{132} \times 100 + \frac{4752}{72} \times 100$$

$$= 3600 + 6600 = ₹10200$$

It is clear that cost price is more than the selling price.

$$\therefore \text{Loss \%} = \frac{10200 - 9504}{10200} \times 100$$

$$= \frac{696}{10200} \times 100$$

$$= 6.8\% \text{ loss}$$

245. A man buys two watches 'A' and 'B' at a total cost of ₹800. He sells both watches at the same selling price, and earns a profit of 18% on watch 'A' and incurs a loss of 22% on watch 'B'. What are the cost prices of the two watches? (two place after decimal).

(a) A = ₹350.32 and B = ₹450.68

(b) A = ₹317 and B = ₹483

(c) A = ₹220 and B = ₹580

(d) A = ₹318.37 and B = ₹481.63

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (d) : Let the cost price of watches A and B is x and y respectively.

$$x \times \frac{118}{100} = y \times \frac{78}{100}$$

$$\frac{x}{y} = \frac{39}{59}$$

$$\therefore 98 \rightarrow 800$$

$$\therefore 39 \rightarrow \frac{800}{98} \times 39 = 318.37$$

$$\text{Cost Price of A} = ₹318.37$$

$$\text{Cost Price of B} = ₹481.63$$

246. By selling 18 table fans for ₹11,664 a man incurs a loss of 10%. How many fans should be sell for ₹17,424 to earn 10% profit?

(a) 18 (b) 22

(c) 20 (d) 23

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (b) Cost Price of 18 table fans = $\frac{100}{90} \times 11664$

$$\text{Cost Price of 1 table fan} = \frac{10}{9} \times \frac{11664}{18} = 720$$

$$\text{Selling Price of 1 table fan} = 720 \times \frac{110}{100} = 72 \times 11$$

$$\therefore \text{Required number} = \frac{17424}{72 \times 11} = 22$$

Trick:

$$\frac{18 \times 90}{11664} = \frac{N \times 110}{17424}$$

$$\frac{18 \times 90}{11664} = \frac{N \times 110}{17424}$$

$$x = 22$$

247. A shopkeeper buys two books from ₹300. He sells the first book at a profit of 20% and the second book at a loss of 10%. What is the selling price of the first book, if, in the whole transaction there is no profit no loss?

- (a) ₹115 (b) ₹125
(c) ₹120 (d) ₹110

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (c) : Let the cost price of two books are x and (300-x) respectively.

$$\therefore x \times \frac{20}{100} = (300-x) \times \frac{10}{100}$$

$$2x = 300 - x$$

$$x = 100$$

$$\text{Selling Price of first book} = 100 \times \frac{120}{100} = ₹120$$

248. A shopkeeper purchased pens in bulk for ₹28 each. He sold each for ₹40. What was his profit percentage?

- (a) 38.75% (b) 48.12%
(c) 28.40% (d) 42.85%

SSC CHSL –17/03/2020 (Shift-II)

Ans. (d) : Cost price of each pen = ₹28

Selling price of each pen = ₹40

$$\therefore \text{Profit on each pen} = 40 - 28 = ₹12$$

$$\therefore \text{Profit percentage} = \frac{12}{28} \times 100$$

$$= \frac{300}{7}$$

$$= 42.85\%$$

249. A shopkeeper incurs 10% loss by selling a washing machine for Rs 16200. At what price should the washing machine be sold to earn 15% profit ?

- (a) ₹ 18700 (b) ₹ 19700
(c) ₹ 20700 (d) ₹ 20250

SSC MTS 7-10-2017 (Shift-I)

Ans. (c) : From the question,

$$90\% = 16200$$

$$100\% = \frac{16200}{90} \times 100 = 18000$$

$$115\% = \frac{18000 \times 115}{100} = ₹20700$$

250. Two articles were sold of ₹2400 each by a shopkeeper. The shopkeeper incurred no profit and no loss on the whole transaction. If one of the two articles sold at a profit of 20%, then what was the loss incurred on the other article?

- (a) ₹ 600 (b) ₹ 400
(c) ₹ 380 (d) ₹ 240

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) $SP_1 = SP_2 = ₹2400$

$$\text{Total selling price (SP)} = SP_1 + SP_2 = ₹4800$$

$$\text{Cost Price of first article} = CP_1$$

$$\therefore CP_1 \times \frac{120}{100} = 2400$$

$$CP_1 = ₹2000$$

\therefore The shopkeeper incurred neither profit nor loss.

$$\therefore CP_1 + CP_2 = SP = 4800$$

$$CP_2 = 4800 - 2000 = 2800$$

$$\text{Loss on second article} = 2800 - 2400 = 400$$

251. The cost price of two bikes is ₹ 40,000 one bike is sold at Rs 48,000. At what price the other bike must be sold to obtain a total profit of 25%?

- (a) ₹60000 (b) ₹48000
(c) ₹52000 (d) ₹50000

SSC MTS 16/08/2019 (Shift-III)

Ans. (c) : Total cost price (CP) = ₹80000

$$\text{Total selling price (SP)} = ₹80000 \times \frac{125}{100} = ₹100000$$

$$\text{Selling Price of second bike} = (100000 - 48000) = ₹52000$$

252. The sum of the cost prices of A and B is ₹1200. The sum of the selling prices of A and B ₹1390. If the profits earned on A and B are 10% and 20% respectively, then what is the ratio of the cost prices of A and B?

- (a) 5 : 7 (b) 5 : 9
(c) 7 : 13 (d) 6 : 11

SSC MTS 19/08/2019 (Shift-II)

Ans. (a) :

From the question,

$$A \times 100\% + B \times 100\% = 1200$$

$$A \times 10\% + B \times 10\% = 120 \text{--- (i)}$$

$$A \times 110\% + B \times 120\% = 1390 \text{--- (ii)}$$

Multiplying equation (i) by 12 and subtracting on equation (ii),

$$A \times 120\% + B \times 120\% = 1440$$

$$A \times 110\% + B \times 120\% = 1390$$

$$\underline{\hspace{1cm} - \hspace{1cm} - \hspace{1cm} -}$$

$$A \times 10\% = 50$$

$$A = 500$$

Putting the value of A in the equation (i),

$$B = 1200 - 500$$

$$B = 700$$

$$A : B = 500 : 700$$

$$= 5 : 7$$

253. Two objects are bought at the same price one is sold at 20% profit and the other is sold at 10% loss. Percent profit/loss is:

- (a) Loss/5% (b) Profit/5%
(c) Profit/10% (d) Loss /10%

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Two objects are bought at the same price.

One is sold at 20% profit and the other is sold at 10% loss.

Let the cost Price = ₹100

Then the selling price of first object = 120, S.P of second object = ₹90

Profit at the first object = ₹20

Loss at the second object = ₹10

Total profit = ₹10

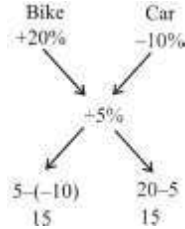
$$\text{then profit percentage} = \frac{10}{200} \times 100\%$$

$$\text{Profit\%} = 5\%$$

254. A person buys a bike and car at ₹500000. He sells the bike at 20% profit and car at 10% loss and he earns a profit of 5% in overall transaction. Price of bike (in ₹) is:
- (a) 180000 (b) 250000
(c) 200000 (d) 150000

SSC MTS 21/08/2019 (Shift-II)

Ans. (b) :



$$\text{Bike} : \text{Car} = 15 : 15 = 1 : 1$$

$$\begin{aligned} \text{Price of Bike} &= 500000 \times \frac{1}{2} \\ &= 250000 \end{aligned}$$

(V) Problems based on Buying and Selling of an Object at Special rate

255. A man bought a piece of land for ₹48,000. He sold two-fifth of it at a loss of 10%. At what gain percentage (rounded off to 1 decimal place) should he sell the remaining land to earn an overall profit of 42%?
- (a) 76.7% (b) 84.3%
(c) 79.5% (d) 89.8%

SSC CHSL 30/05/2022 (Shift- III)

Ans. (a) : ∵ A man sold two-fifth of land at loss of 10%

$\frac{2}{5} \rightarrow \text{Part}$ Where, 3 = Remaining part of the land
 $5 \rightarrow \text{Total land}$

According to the question,
 $-2 \times 10\% + 3 \times P\% = 5 \times 42\%$
 $3 \times P = 210 + 20$

$$P = \frac{230}{3} = 76.66\%$$

or,

$$\text{Required Profit}\% \approx 76.7\%$$

256. If an article is sold for ₹355, there is a loss of 29%. At what price (in ₹) should it be sold to gain 31% of profit?
- (a) 675 (b) 635
(c) 625 (d) 655

SSC CGL (Tier-II) 29/01/2022

Ans : (d) According to the question,

$$71\% \rightarrow ₹355$$

$$1\% \rightarrow ₹ \frac{355}{71}$$

$$\begin{aligned} &\text{To earn a profit of 31\%, article must be sold at} \\ &= \frac{355}{71} \times 131 \\ &= ₹655 \end{aligned}$$

257. Some fruits are bought at a rate of 11 for ₹100 and an equal number at a rate of 9 for ₹100. If all the fruits are sold at a rate of 10 for ₹100, then what is the gain or loss percent in the entire transaction?

- (a) 5% Profit (b) 1% Loss
(c) 1% Profit (d) 5% Loss

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

$$\begin{aligned} \text{Ans. (b): Cost Price of two fruits} &= \frac{100}{11} + \frac{100}{9} \\ &= \frac{900 + 1100}{99} = ₹ \frac{2000}{99} \end{aligned}$$

$$\text{Selling price of two fruits} = 2 \times \frac{100}{10} = ₹20$$

$$\text{Loss} = \frac{2000}{99} - 20 = ₹ \frac{20}{99}$$

$$\begin{aligned} \text{Loss \%} &= \frac{\frac{20}{99}}{\frac{2000}{99}} \times 100 = 1\% \end{aligned}$$

258. A vendor buys bananas at 9 for ₹ 8 and sells at 8 for ₹ 9. What will be the profit or loss (in %)?
- (a) 13.28% profit (b) 26.56% loss
(c) 26.56% profit (d) 13.28% loss

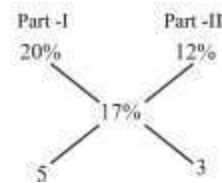
SSC CGL (Tier-II) 20-02-2018

	Objects	Price
Cost Price	$\rightarrow 9 \times 8$	$8 \times 8 \rightarrow 64$
Selling Price	$\rightarrow 8 \times 9$	$9 \times 9 \rightarrow 81$
Profit %	$= \frac{81 - 64}{64} \times 100$	
	$= 26.56\%$	

259. A grocer had 1600 kgs of wheat. He sold a part of it at 20% profit and the rest at 12% profit, so that he made a total profit of 17%. How much wheat (in kg) did he sell at 20% profit?
- (a) 600 kg (b) 1000 kg
(c) 800 kg (d) 1200 kg

SSC CGL (Tier-II) 21-02-2018

Ans. (b)



$$\begin{aligned} \text{Hence wheat sold at 20\% profit} &= 1600 \times \left(\frac{5}{5+3} \right) \\ &= 1000\text{kg} \end{aligned}$$

260. A vendor buys bananas at 4 for ₹ 3 and sells at 3 for ₹ 4. What will be the result ?

- (a) 43.75% profit (b) 77.7% loss
(c) 77.7% profit (d) 43.75% loss

SSC CGL (Tier-II) 21-02-2018

Ans. (c): From formula

$$\text{Profit \%} = \left(\frac{b^2 - a^2}{a^2} \right) \times 100\%$$

$$= \frac{4^2 - 3^2}{3^2} \times 100 = 77.77\%$$

261. A shopkeeper bought 120 quintals of wheat. 20% of it was sold at 25% loss. At what percent gain should he sell the rest to gain 25% on the whole transaction?

- (a) 35% (b) $37\frac{1}{2}\%$
(c) $36\frac{1}{2}\%$ (d) 40%

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Let the cost price of 1 quintal of wheat = ₹1

As per question,

Selling price of the whole deal should be
 $= 120 \times \frac{125}{100} = ₹150$

$$\therefore 20\% \text{ of } 120 = \frac{120 \times 20}{100} = 24 \text{ Quintals}$$

$$\therefore \text{Selling Price of } 20\% \text{ part at a loss of } 25\% = \frac{24 \times 75}{100} = ₹18$$

Selling Price of the remaining deal = $150 - 18 = ₹132$

Let the remaining deal be sold at a profit of x%.

$$96 \times \left(\frac{100 + x}{100} \right) = 132$$

$$100 + x = \frac{132 \times 100}{96} = 137.5$$

$$x = 37.5\%$$

262. An article is sold at a certain price. If it is sold at $33\frac{1}{3}\%$ of this price, there is a loss of

$33\frac{1}{3}\%$. What is the percentage profit when it is sold at 60% of the original selling price ?

- (a) 30 (b) $33\frac{1}{3}$
(c) 20 (d) $17\frac{1}{3}$

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : Let the certain price of the article = ₹300

$$\text{New selling price} = 300 \times \frac{60}{100} = 300 \times 33\frac{1}{2}\% = ₹100$$

As per question,

$$100\% - 33\frac{1}{3}\% = 66\frac{2}{3} \text{ of cost price} = ₹100$$

$$\therefore \text{Cost Price} = 100 \times \frac{3}{2} = ₹150$$

If the article is sold at 60% of the original selling price

$$\text{then selling price} = 300 \times \frac{3}{5} = ₹180$$

$$\text{Profit\%} = \frac{30}{150} \times 100 = 20\%$$

263. A vendor buys bananas at 7 for ₹ 6 and sells at 6 for ₹ 7. What will be the result ?

- (a) 36.1% loss (b) 26.5% profit
(c) 36.1% profit (d) 26.5% loss

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : a = 6 ₹, b = 7 ₹

$$\text{Profit (\%)} = \frac{b^2 - a^2}{a^2} \times 100$$

$$= \frac{49 - 36}{36} \times 100$$

$$= 36.1\% \text{ Profit}$$

264. A person sold a chair at a profit of 13%. Had he sold it for ₹607.50 more, he would have gained x%. If the cost price of the chair is ₹3750, then the value of x is:

- (a) 28.4 (b) 32
(c) 30 (d) 29.2

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (d) Cost price of the Chair = 3750 Rs.

Profit percentage if profit is 607.50 Rs.

$$\frac{607.50}{3750} \times 100 = 16.20\%$$

$$\text{Value of } x = 13\% + 16.2\% = 29.2\%$$

265. An oil merchant wants to make a minimum profit of ₹2,100 by selling 50 litres of oil he purchased at ₹236 per litre. For this, he adds a few litres of duplicate oil whose cost price is ₹180 per litre and sells at ₹250 per litre. How many litres of duplicate oil is needed for this purpose?

- (a) 16 litres (b) 18 litres
(c) 22 litres (d) 20 litres

SSC CHSL -13/10/2020 (Shift-II)

Ans. (d) : Cost Price of oil = ₹236 per litre

∴ The merchant wants to sell ₹250 per litre of oil.

$$\therefore \text{Profit} = 250 - 236 = ₹14 \text{ Per litre}$$

$$\text{Cost of 50 litres} = 14 \times 50 = ₹700$$

∴ Profit to be earned = ₹2100, Out of which ₹700 is earned.

$$\text{Remaining profit} = 2100 - 700 = ₹1400$$

Requirement of oil

$$= \frac{1400}{250 - 180} = \frac{1400}{70} = 20 \text{ liters}$$

266. Anil bought some articles at 6 for ₹8 and sold them at 10 for ₹12. His percentage loss or gain is:

- (a) 10% loss (b) 8% loss
(c) 8% profit (d) 10% profit

SSC CHSL -19/10/2020 (Shift-II)

Ans. (a) :

$$\text{CP of 1 article} = ₹ \frac{8}{6}$$

$$\text{SP of 1 article} = ₹ \frac{12}{10}$$

$$\therefore \text{Loss\%} = \frac{\frac{8}{6} - \frac{12}{10}}{\frac{8}{6}} \times 100 = \frac{\left(\frac{4}{3} - \frac{6}{5}\right)}{\left(\frac{4}{3}\right)} \times 100$$

$$= \frac{\left(\frac{2}{15}\right)}{\left(\frac{4}{3}\right)} \times 100 = 10\%$$

267. A person purchased 40 items at some price. He sold some items at a profit of 30% by selling them at a price equal to the cost price of 26 items. The remaining items are sold at 18% profit. The total profit percentage is:

- (a) 28% (b) 25%
(c) 24% (d) 27%

SSC CHSL -18/03/2020 (Shift-I)

Ans. (c) : Let the cost price of 1 item = ₹1

$$\therefore \text{Total cost price of 40 items} = ₹40$$

Suppose x items sold at the profit of 30%.

$$\therefore x \times \frac{130}{100} = 26 \Rightarrow x = 20$$

$$\text{Remaining item} = (40 - 20) = 20$$

∴ The remaining items are sold at 18% profit.

$$\therefore \text{S.P. of remaining 20 item} = 20 \times \frac{118}{100} = 23.6$$

$$\text{Total selling price} ₹(26 + 23.6) = 49.6$$

$$\text{Profit\%} = \frac{49.6 - 40}{40} \times 100$$

$$= \frac{9.6}{40} \times 100 = 24\%$$

268. If some articles are bought at Rs 10 each and sold at Rs 7 each, then what is the loss percentage?

- (a) 60 (b) 16.67
(c) 25 (d) 30

SSC MTS 9-10-2017 (Shift-I)

$$\text{Ans : (d) Required Loss\%} = \frac{(10 - 7)}{10} \times 100$$

$$= \frac{3}{10} \times 100 = 30\%$$

269. A retail sales person buys 22 kg of rice at the rate of ₹35 per kg and 13 kg rice at the rate of ₹30 per kg. When they mix both the varieties together and sold them at ₹40 per kg then how much is the profit obtained (nearest integer)?

- (a) 20 (b) 21
(c) 25 (d) 18

SSC MTS 21/08/2019 (Shift-II)

$$\text{Ans. (b) : CP of 22 kg rice} = 35 \times 22$$

$$= ₹770$$

$$\text{CP of 13 kg rice} = 30 \times 13 = ₹390$$

$$\text{Then CP of } (22 + 13) \text{ kg rice} = (770 + 390)$$

$$\text{CP of 35 kg rice} = ₹1160$$

$$\therefore \text{SP of 1 kg rice} = ₹40$$

$$\therefore \text{SP of 35 kg rice} = 40 \times 35$$

$$= ₹1400$$

$$\text{Profit\%} = \frac{1400 - 1160}{1160} \times 100$$

$$= \frac{240}{1160} \times 100$$

$$= 20.68\%$$

$$\approx 21\%$$

270. A person buys 15 objects at the rate of ₹70 per piece, 13 objects at the rate of ₹60 per piece and 12 objects at the rate of ₹65 per piece. what is the average price per piece in (₹)?

- (a) 65.25 (b) 63.25
(c) 65.00 (d) 65.75

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) : Cost of 15 objects at the rate of ₹70 per piece = $70 \times 15 = ₹1050$

$$\text{Cost of 13 objects at the rate of ₹60 per object} = 60 \times 13$$

$$= ₹780$$

$$\text{Cost of 12 objects at the rate of ₹65 per object} = 65 \times 12 = 780$$

The average price per piece

$$= \frac{1050 + 780 + 780}{40} = ₹65.25$$

271. Some toffees are bought at the rate of 11 for Rs. 10 and the same numbers at the rate of 5 of Rs.6, If the whole lot is sold at one rupee per toffee, then the gain/loss percent, correct to one decimal place, on the whole transaction is:

- (a) 5.2% loss (b) 5.2% gain
(c) 5.5% loss (d) 5.5% gain

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : On the first and second purchases,

Let the number of toffees (LCM of 11 and 5) = 55

According to the question,

$$\text{Total cost price} = (5 \times 10 + 11 \times 6) = ₹116$$

$$\text{and selling price} = 2 \times 55 \times 1 = ₹110$$

$$\text{Required \%} = \frac{116 - 110}{116} \times 100 (\because \text{SP} < \text{CP} \Rightarrow \text{Loss})$$

$$= \frac{6}{116} \times 100 = 5.2\%$$

(VI) Miscellaneous

272. On selling an article for ₹800, a person loses 20% of its selling price. At what price should he sell it to gain 25% on its cost price?

- (a) ₹1,250 (b) ₹1,152
(c) ₹1,280 (d) ₹1,200

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (d) :

$$SP = 800 \quad 20\% = \frac{1}{5} \rightarrow \text{Loss} \quad 5 \text{ unit} \rightarrow 800$$

$$\rightarrow SP \quad 1 \text{ unit} \Rightarrow 160$$

$$CP = 6 \quad CP = 6 \times 160 = ₹960$$

$$SP = CP \times 125\%$$

$$SP = \frac{960 \times 125}{100}$$

$$SP = ₹1200$$

273. Renu bought an article for ₹ 1240 and sold it at a loss of 25% with this amount, she bought another article and sold it at a gain of 40%. Her overall percentage profit is:

- (a) 12 (b) 5
(c) $6\frac{2}{3}$ (d) 15

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b)

$$CP = 1240$$

$$SP = 1240 \times \frac{75}{100}$$

$$SP = ₹930$$

$$SP = 930 \times \frac{140}{100}$$

$$SP = 186 \times 7 = ₹1302$$

$$\text{Overall percentage profit} = \frac{1302 - 1240}{1240} \times 100$$

$$= \frac{62}{1240} \times 100$$

$$= 5\%$$

274. A person sold an article at a loss of 15%. Had he sold it for ₹30.60 more, he would have gained 9%. To gain 10%, he should have sold it for:

- (a) ₹128.40 (b) ₹140.25
(c) ₹132 (d) ₹130

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (b) : Let the price of an article is ₹x.

According to the question.

$$x \times \frac{85}{100} + 30.60 = x \times \frac{109}{100}$$

$$30.60 = x \left[\frac{109}{100} - \frac{85}{100} \right]$$

$$30.60 = x \left[\frac{24}{100} \right]$$

$$x = \frac{3060}{24} = 127.5$$

To get 10% profit, the article should be sold for

$$\frac{127.5 \times 110}{100} = 140.25$$

$$= ₹140.25$$

Trick–

$$(15 + 9)\% = 30.60$$

$$24\% = 30.6$$

$$110\% = \frac{30.6}{24} \times 110$$

$$= ₹140.25$$

275. A person sells an article at a profit of 12%. If he had purchased it for 12% less and sold it for ₹ 9 less, he would have gained 27%. What is the original cost price of the article?

- (a) ₹4,500 (b) ₹3,750
(c) ₹4,000 (d) ₹4,250

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (b) : Let the original cost price of the article is = ₹100x

∴ Selling price of the article

$$= 100x \times \frac{(100+12)}{100} = ₹112x$$

According to the question,

$$\left[\frac{(112x - 9) - 88x}{88x} \right] \times 100 = 27$$

$$\Rightarrow \left[\frac{24x - 9}{88x} \right] \times 100 = 27$$

$$\Rightarrow \left[\frac{2400x - 900}{88x} \right] = 27$$

$$\Rightarrow 2400x - 900 = 2376x$$

$$\Rightarrow 24x = 900$$

$$\Rightarrow x = \frac{900}{24} = 37.5$$

Hence original cost of the article = 100x

$$= 100 \times 37.5$$

$$= ₹3,750$$

Trick–

Let CP of articles = 100

SP of articles = 112

Again, according to the question,

CP = 88

$$SP = 88 \times \frac{127}{100} = 111.76$$

0.24 unit = ₹ 9

$$100 \text{ unit} = \frac{9}{0.24} \times 100$$

$$= ₹3750$$

276. A bought an article for 5,400/- and sold it at a loss of 30% with this amount, he bought another article and sold it at a gain of 60%, What was his overall percentage gain or percentage loss?

- (a) 1.2% loss (b) 12% gain
(c) 12% loss (d) 1.2% gain

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (b) : CP = ₹5400

$$SP = 5400 \times \frac{70}{100} = ₹3780$$

This is the CP for another article.

$$\text{Now, } SP = 3780 \times \frac{160}{100} = 6048 \text{ ₹.}$$

$$\therefore \text{Profit \%} = \frac{6048 - 5400}{5400} \times 100$$

$$= \frac{648}{5400} \times 100 = 12\% \text{ gain}$$

277. Anu fixes the selling price of an article at 25% above its cost of production. If the cost of production goes up by 20% and she raises the selling price by 10%, then her percentage profit is (correct to one decimal place):

- (a) 15.2% (b) 13.8%
(c) 16.4% (d) 14.6%

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (d) : Let the cost of article = ₹100

Selling price = ₹125

New price = ₹120

$$\text{New selling price} = 125 \times \frac{110}{100} = ₹\frac{275}{2}$$

$$\text{New profit} = \frac{275}{2} - 120 = ₹\frac{35}{2}$$

$$\text{Profit \%} = \frac{35}{2 \times 120} \times 100 = 14.6\%$$

278. A sells an article to B at a loss of 20%, B sells it to C at a profit of 12.5% and C sells it to D at a loss of 8%. If D buys it for ₹248.40, then what is the difference between the loss incurred by A and C?

- (a) ₹36.80 (b) ₹38.40
(c) ₹42.60 (d) ₹39.20

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (b) :

$$100 \xrightarrow[-20\%]{\text{₹-20}} 80 \xrightarrow[+12.5\%]{\text{₹+10}} 90 \xrightarrow[-8\%]{\text{₹-7.2}} 82.8$$

(A) (B) (C) (D)

$$\therefore 82.8 \rightarrow 248.40$$

$$1 \rightarrow 3$$

Loss for A (20) → ₹60

Loss for C (7.2) → ₹21.6

Difference = 60 - 21.6 = ₹38.4

279. A person buys 5 tables and 9 chairs for ₹ 15,400. He sells the tables at 10% profit and chairs at 20% profit. If his total profit on selling all the tables and chairs is ₹ 2,080, what is the cost price of 3 chairs?

- (a) ₹1,890 (b) ₹1,860
(c) ₹1,740 (d) ₹1,800

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d) : Let, the cost price of table and chair be Rs. x and Rs. y respectively.

$$5x + 9y = 15400 \text{ -----(1)}$$

According to the question,

$$5x \times (10/100) + 9y \times (20/100) = 2080$$

$$5x/10 + 18y/10 = 2080$$

$$5x + 18y = 20800 \text{ -----(2)}$$

Subtract equation (1) from equation (2),

$$9y = 5400$$

$$3y = 1800$$

∴ Cost of 3 chairs are Rs. 1800.

280. Sudha sold an article to Renu for ₹576 at a loss of 20%. Renu spent a sum of ₹224 on its transportation and sold it to Raghu at a price which would have given Sudha a profit of 24%. The percentage of gain for Renu is:

- (a) 10.5% (b) 11.6%
(c) 12.9% (d) 13.2%

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (b) : Sudha sold an article to Renu for Rs. 576.

Cost price of the article for Sudha = Rs. 576 × (100/80) = Rs. 720.

Final cost price of the article for Renu = 576 + 224 = Rs. 800

SP for Renu = Rs. 720 × (124/100) = Rs. 892.8

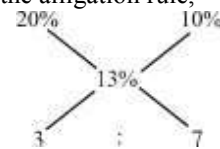
Profit percentage on the article for Renu = (92.8/800) × 100 = 11.6%

281. A wholesaler had 200 dozens of mangoes. He sold some of these mangoes at 20% profit and the rest at 10% profit, so that he made 13% profit on selling all the mangoes. How many mangoes (in dozens) did he sell at 20% profit?

- (a) 140 (b) 60
(c) 80 (d) 120

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : From the alligation rule,



Number of mangoes sold at the 20% profit

$$= \frac{3}{10} \times 200 = 60$$

282. When the price of an item was reduced by 25%, then its sale was increased by x%. If there is an increase of 20% in the receipt of the revenue, the value of x will be :

- (a) 50 (b) 45
(c) 60 (d) 75

SSC CGL (Tier-II) 11-9-2019

Ans. (c) :

Let,	Price	Sale	Revenue
	100	100	10000
	New price	New sale	New income
	75	$100 \times \frac{(100+x)}{100}$	12000

According to the question,

$$75 \times (100 + x) = 12000$$

$$100 + x = 160$$

$$x = 60$$

Trick-

Selling amount $\rightarrow 5 : 6$

Amount $\rightarrow 4 : 3$

$$\text{Selling} \rightarrow \frac{5}{4} : \frac{6}{3}$$

$$= 5 : 8$$

$$x\% = \frac{3}{5} \times 100$$

$$= 60\%$$

283. An article was sold at a loss of 13.5%. If it was sold for ₹ 1,104 more then there would have been a profit of 9.5%. The cost price of the article was:

- (a) ₹ 4,200 (b) ₹ 4,600
(c) ₹ 4,800 (d) ₹ 4,400

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Given,

$$(13.5\% + 9.5\%) = 1104$$

$$\Rightarrow 23\% = 1104$$

$$\therefore 100\% = \frac{1104}{23} \times 100$$

$$= 4800 \text{ ₹}$$

Hence the cost price of the article = ₹4800

284. A person sold an article at a loss of 16%. Had he sold it for ₹660 more, he would have gained 8%. If the article is sold at ₹3,080, then how much profit percentage is gained?

- (a) 20% (b) 15%
(c) 10% (d) 12%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : $(16\% + 8\%) = 660$

$$\Rightarrow 24\% = 660$$

$$\Rightarrow 100\% = \frac{660}{24} \times 100$$

$$\Rightarrow \text{cost price} = 2750$$

and selling price = 3080 (given)

$$\therefore \text{Percentage profit} = \left(\frac{3080 - 2750}{2750} \right) \times 100$$

$$= \frac{330}{2750} \times 100 = 12\%$$

285. A man bought an article and sold it at a gain of 10%. If he had bought the article at 20% less and sold it for ₹1,000 more, he would have made a profit of 40%. The earlier selling price of the article (in ₹) is:

- (a) 40,000 (b) 60,000
(c) 50,000 (d) 55,000

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d) : Let the cost price of the article = ₹100x

$$\text{Selling price at 10\% profit} = 100x \times \frac{110}{100} = ₹110x$$

$$\text{New selling price} = ₹(110x + 1000)$$

\therefore From the question,

$$80x \times \frac{(100 + 40)}{100} = 110x + 1000$$

$$\Rightarrow 80x \times \frac{140}{100} = 110x + 1000$$

$$\Rightarrow 112x = 110x + 1000$$

$$\Rightarrow 2x = 1000$$

$$\Rightarrow x = 500$$

$$\begin{aligned} \text{Hence the earlier selling price of the article} &= 110x \\ &= 110 \times 500 \\ &= ₹55000 \end{aligned}$$

Trick-

Let cost price of article = 100

Selling price of article = 110

New CP = 80

$$\text{New SP} = \frac{140}{100} = 112$$

$$(112 - 110) \text{ unit} = 1000$$

$$2 \text{ unit} = ₹ 1000$$

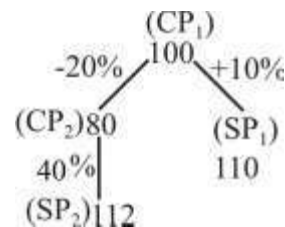
$$110 \text{ units} = ₹ 55000$$

286. A man bought an article and sold it at a gain of 10%. If he had bought the article at 20% less and sold it for ₹1,000 more, he would have made a profit of 40%. The cost price of the article (in ₹) is:

- (a) 50,000 (b) 60,000
(c) 40,000 (d) 25,000

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a)



According to the question, $(SP_2 - SP_1) = 2$

$$\therefore 2 \rightarrow 1000$$

$$\therefore 100 \rightarrow 50000$$

Selling price = ₹50,000

287. A person sold an article at a loss of 16%. Had he sold it for ₹660 more, he would have gained 8%. What should be the selling price (in ₹) to gain a profit of 12% ?

- (a) 3,200 (b) 2,970
(c) 2,750 (d) 3,080

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : $\because (16\% + 8\%) = 660$
 $\Rightarrow 24\% = 660$
 $\Rightarrow 100\% = \frac{660}{24} \times 100$
 $= ₹2750$

Hence cost price = ₹2750

\therefore Selling price = $2750 \times \left(\frac{100+12}{100} \right)$
 $= 2750 \times \frac{112}{100}$
 $= ₹3080$

288. On selling an article for ₹115, the gain is 20% more than the loss incurred on selling it for ₹104. If the article is sold for 130.80, then the profit percentage is:

- (a) 30 (b) 25
(c) 18 (d) 20

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) Let the cost price of the article = x

$$115 - x = (x - 104) \times \frac{120}{100}$$

$$575 - 5x = 6x - 624$$

$$1199 = 11x$$

$$x = ₹109$$

\therefore Percentage profit on selling the article for ₹130.80

$$= \frac{130.80 - 109}{109} \times 100$$

$$= 20\%$$

289. A sold a cycle to B at a profit of 20%. B sold the cycle to C at a profit of 30%. If C pays Rs 468 for cycle, then for how much (in Rs) A bought the cycle?

- (a) 320 (b) 400
(c) 300 (d) 280

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : Let A bought a cycle for ₹x.

$$\text{B's purchase price} = x \times \frac{120}{100} = ₹\frac{6x}{5}$$

$$\text{And C's purchase price} = \frac{6x}{5} \times \frac{130}{100} = ₹\frac{39x}{25}$$

According to the question,

$$\frac{39x}{25} = 468$$

$$39x = 468 \times 25 \Rightarrow x = 12 \times 25$$

$$x = ₹300$$

Trick-

$$A : B = 5 : 6$$

$$B : C = 10 : 13$$

$$A : C = 50 : 78 = \frac{25}{300} : \frac{39}{468} \times 12$$

290. An article is sold at 5% profit instead of 8% loss, the man gains Rs 260 more. What is the cost price (in Rs) of the article?

- (a) 1800 (b) 2000
(c) 1500 (d) 1400

SSC MTS 10-10-2017 (Shift-I)

Ans : (b) Let the cost price of the article = ₹ x
According to the question,

$$x \times \left(\frac{100+5}{100} \right) - x \times \left(\frac{100-8}{100} \right) = 260$$

$$\frac{x \times 105}{100} - \frac{x \times 92}{100} = 260$$

$$\frac{13x}{100} = 260$$

$$x = \frac{26000}{13} = 2000$$

$$x = ₹2000$$

Trick-

$$\therefore (8 + 5)\% = ₹ 260$$

$$13\% = ₹ 260$$

$$1\% = ₹ 20$$

$$100\% = ₹ 2000$$

291. If the profit is 10% then what will be the ratio of cost price to selling price respectively?

- (a) 10 : 9 (b) 10 : 11
(c) 10 : 13 (d) 4 : 5

SSC MTS 10-10-2017 (Shift-I)

Ans : (b) Profit = 10%

Let the cost price = ₹100

\therefore Selling price at the profit of 10% = ₹110

$$\therefore \text{Required ratio} = \frac{100}{110}$$

$$= 10 : 11$$

292. If the profit is 25%, then what will be the ratio of cost price to selling price respectively?

- (a) 3 : 5 (b) 4 : 5
(c) 2 : 3 (d) 5 : 6

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) : Let the cost price = ₹ 100

Profit = 25%

$$\therefore \text{Selling price} = \frac{100 \times 125}{100} = ₹ 125$$

$$\text{CP} : \text{SP} = 100 : 125 = 4 : 5$$

293. Sonu has sold the bike at 13.5% loss. If he sold it at ₹8900 more then he gets 31% profit. If he has sold at ₹20740 then what is his profit or loss?

- (a) Profit/3.9% (b) Profit /3.7%
(c) Loss/3.2% (d) Loss/3.7%

SSC MTS 21/08/2019 (Shift-III)

Ans. (b) : According to the question,

$$31\% - (-13.5) = 8900$$

$$(31+13.5)\% = 8900$$

$$44.5\% = 8900$$

$$\frac{445}{10}\% = 8900$$

$$\frac{89}{2}\% = 8900$$

$$1\% = 200$$

$$\therefore \text{Cost price } 100\% = ₹20000$$

$$\therefore 20740 > 20,000 \text{ (Profit)}$$

$$\therefore \text{Profit}\% = \frac{20740 - 20,000}{20,000} \times 100\%$$

$$= \frac{740}{200}\%$$

$$= \frac{37}{10}\%$$

$$= 3.7\%$$

294. Abhay sold his car at a loss of 30%. If he has sold his car on ₹950 more then he would obtain a profit of 8% what is the cost price of car?

- (a) ₹2500 (b) ₹3500
(c) ₹2000 (d) ₹1500

SSC MTS 20/08/2019 (Shift-III)

Ans. (a) : According to the question,

$$(30+8)\% = ₹950$$

$$38\% = ₹950$$

$$\therefore 100\% = \frac{950}{38} \times 100$$

$$= ₹2500$$

295. If two thirds of objects are sold at 25% profit 20% is sold at 20% loss and the remaining at 20% profit then the profit of ₹ 3,212 is made. What is the cost price of objects?

- (a) ₹ 18,600 (b) ₹ 21,400
(c) ₹ 21,600 (d) ₹ 20,000

SSC MTS 20/08/2019 (Shift-I)

Ans. (c) : Total number of articles is 100x and cost price is also 100x.

$$\left(100x \times \frac{2}{3}\right) \times \frac{125}{100} + \left(100x \times \frac{20}{100}\right) \times \frac{80}{100} + \frac{40x}{3} \times \frac{120}{100}$$

$$= \frac{250x}{3} + 16x + 16x$$

$$= \frac{250x + 48x + 48x}{3} = \frac{346x}{3}$$

$$\text{Profit} = \frac{346x}{3} - 100x = 3312$$

$$\frac{346x - 300x}{3} \Rightarrow \frac{46x}{3} = 3312$$

$$x = \frac{3312 \times 3}{46}$$

$$x = 72 \times 3$$

$$x = 216$$

$$\text{Cost Price of total article} = 100x = 216 \times 100 = ₹ 21600$$

296. The difference in selling prices of a article when sold at 15% profit and 17% loss is ₹96. If it is sold at 10% profit, then what is the selling price?

- (a) ₹345 (b) ₹360
(c) ₹315 (d) ₹330

SSC MTS 08/08/2019 (Shift-I)

Ans. (d) : Let the cost price of the article is x.

According to the question,

$$\frac{115x}{100} - \frac{83x}{100} = 96$$

$$\frac{32x}{100} = 96$$

$$x = \frac{9600}{32}$$

$$x = 300$$

$$\text{Selling price} = \frac{300 \times 110}{100} = ₹330$$

297. A Shopkeeper earns 400% profit on a transaction. If the cost price is increased by 100% and the selling price is unchanged then the ratio between new profit and selling price is?

- (a) 1 : 3 (b) 2 : 5
(c) 3 : 5 (d) 1 : 2

SSC MTS 14/08/2019 (Shift-I)

Ans. (c) : Let the cost price is 100.

∴ After making a profit of 400% on the cost price, the selling price of the article will be 500.

$$\text{Cost price} : \text{Selling price} = 100 : 500$$

∴ After 100% increase in the cost price, the cost price of the article will be 200.

$$200 : 500$$

$$\text{Profit} = 500 - 200 = 300$$

$$\text{Profit} : \text{Selling Price} = 300 : 500$$

$$= 3 : 5$$

298. An object is sold at 20% profit and further at 18% loss and the difference in values of selling price by doing so is ₹ 570. If the object is sold at 12% loss what is the selling price of an object?

- (a) ₹ 1760 (b) ₹ 1540
(c) ₹ 1320 (d) ₹ 1650

SSC MTS 06/08/2019 (Shift-I)

Ans. (c) : The cost price of the article (CP) = $\frac{570}{(20+18)} \times 100 = ₹ 1500$

Selling Price of the article (SP) = $1500 \times \frac{88}{100} = ₹ 1320$

299. For every ₹ 5 worth of revenue, a retailer earns ₹ 1. If the cost of the goods was ₹ 4800, then how much did he earn?

- (a) ₹ 600 (b) ₹ 900
(c) ₹ 1200 (d) ₹ 1120

SSC MTS 16/08/2019 (Shift-I)

Ans. (c)

∴ With a revenue of ₹5, the retailer earns ₹1. That is, he earns ₹1 at the cost of ₹4.

∴ He will earn ₹ $\frac{1}{4}$ on the cost of ₹1.

∴ At the cost of ₹ 4800 = $\frac{1}{4} \times 4800$
= ₹ 1200

300. A farmer sells wheat. He mixes the two types of wheat he grows. 30 kg of the first group costs him ₹900 and 20 kg of the other group costs him ₹1100. At what price per kg should he sell the mixture so as to earn 25% on his average cost?

- (a) ₹40 (b) ₹42
(c) ₹50 (d) ₹48

SSC MTS 14/08/2019 (Shift-II)

Ans. (c) :

Total cost price (CP) of the wheat = (900+1100) = 2000

Let, the selling price of the wheat per kg = x

According to the question,

$$50 \times x = 2000 \times \frac{125}{100}$$

$$50x = 2500$$

$$x = 50$$

Hence cost of the wheat = ₹ 50 per kg.

301. A buys a water cooler at some price and sells it to B at 20% profit. B sells it to C at 10% profit. If c bought it for ₹6666, then the cost price for B is:

- (a) ₹5400 (b) ₹6060
(c) ₹5600 (d) ₹6500

SSC MTS 13/08/2019 (Shift-I)

Ans. (b) : Let A buys a water cooler at ₹ 100x. According to the question,

Cost price of A	Cost price of B	Cost price of C
100 x	120x	132x

$$\therefore 132x = 6666$$

$$\therefore \text{Cost price of B} = 120 x = \frac{6666}{132} \times 120 = ₹6060$$

302. A purchased an article for ₹1400. He sold it to B at 25% profit. B sold it to C at 20% profit. C sold it to D at 15% loss. What is the cost price for D?

- (a) ₹ 1785 (b) ₹ 2025
(c) ₹ 1900 (d) ₹ 1665

SSC MTS 19/08/2019 (Shift-II)

Ans. (a)

Last price

$$= \text{First Price} \times \left(\frac{100 \pm P/L\%}{100}\right) \times \left(\frac{100 \pm P/L\%}{100}\right) \times \left(\frac{100 \pm P/L\%}{100}\right)$$

$$= 1400 \times \frac{125}{100} \times \frac{120}{100} \times \frac{85}{100}$$

$$= 1400 \times \frac{5}{4} \times \frac{6}{5} \times \frac{85}{100}$$

$$= 14 \times \frac{3}{2} \times 85$$

$$= 21 \times 85 = ₹ 1785$$

303. A sells an article to B at a 20% profit, B sells it to C at a 15% loss, C sells it to D at a 25% profit. If the difference between the profits of A and C is Rs. 49.50, then the cost price of the article for C is:

- (a) Rs. 918 (b) Rs. 900
(c) Rs. 909 (d) Rs. 954

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a) :

$$A(100 \text{ unit}) \xrightarrow{+20\%} B(120 \text{ unit}) \xrightarrow{-15\%} C(102 \text{ unit}) \xrightarrow{+25\%} D(127.5 \text{ unit})$$

$$\therefore (25.5 - 20) \text{ unit} \rightarrow 49.5 \text{ Rs}$$

$$5.5 \text{ unit} \rightarrow 49.5$$

$$1 \rightarrow 9$$

$$\text{Cost price of article for C} = 102 \text{ unit} = 102 \times 9 = 918 \text{ Rs}$$

304. Shopkeeper loses 16% when he sells an article for Rs. 2,730. If he sells it for Rs. 3,458, his loss/gain percentage is:

- (a) Loss 6% (b) Gain 6.4%
(c) Loss 6.4% (d) Gain 6%

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : As per question,

$$CP \times \frac{84}{100} = 2730$$

$$CP = \frac{2730 \times 100}{84} = ₹3250$$

$$\therefore \text{If SP} = ₹3458 \text{ then,}$$

$$\text{Profit \%} = \left(\frac{3458 - 3250}{3250}\right) \times 100 = \frac{208}{3250} \times 100$$

$$= 0.64 \times 100$$

$$= 6.4\%$$

10.

Discount

I. Problems based on Discount

1. A shopkeeper marks his goods 30% higher than the cost price and allows a discount of 10% on the marked price. In order to earn 6.5% more profit, what discount percent should he allow on the marked price ?
- (a) 4 (b) 5.5
(c) 6 (d) 5

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (d) : Let, the cost Price = ₹100
According to the question,
MRP = ₹ 130

$$\text{Selling Price after 10\% discount} = 130 \times \frac{90}{100} = ₹ 117$$

$$\text{Selling Price after 6.5\% more profit} = 117 + 100 \times \frac{6.5}{100} = 123.5$$

$$\therefore \text{New discount \%} = \frac{130 - 123.5}{130} \times 100$$

$$= \frac{6.5}{130} \times 100 = 5\%$$

So, option (d) is correct answer.

2. A pair of jeans marked at ₹960 is offered in a departmental store of ₹816. What is the percentage of discount given by the shopkeeper?
- (a) 17.64 (b) 17
(c) 15 (d) 16

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : MP = ₹960

$$SP = ₹816$$

$$SP = MP \times \frac{(100 - D\%)}{100}$$

$$816 = 960 \times \frac{(100 - D\%)}{100}$$

$$85 = (100 - D\%)$$

$$D = 15\%$$

3. If a pair of shoes marked at ₹350 is offered at ₹308, then what will be the discount percentage?

- (a) 14% (b) 13.6%
(c) 12% (d) 42%

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : Discount % = $\frac{MP - SP}{MP} \times 100$

$$= \frac{350 - 308}{350} \times 100 = \frac{42}{350} \times 100 = 12\%$$

4. One dozen notebooks quoted at ₹125 are available at 20% discount. How many notebooks can be bought for ₹75?

- (a) 10 (b) 6
(c) 9 (d) 8

SSC CHSL 04/08/2021 (Shift-I)

Ans. (c) : According to the question,

$$\therefore \text{Cost of one dozen notebooks} = \frac{125 \times 80}{100} = 100$$

$$\therefore \text{Cost of 1 notebook} = \frac{100}{12} = 8.33$$

$$\text{Total number of notebooks in ₹75} = \frac{75}{8.33} = 9.0036 = 9$$

5. An article was sold for ₹ 512 after giving two equal successive discounts on the marked price of ₹ 800. The percentage discount offered is:
- (a) 18% (b) 15%
(c) 20% (d) 16%

SSC CHSL 04/08/2021 (Shift-II)

Ans. (c) : Let discount percent is D.

According to the question,

$$MP \times \frac{(100 - D\%)}{100} \times \frac{(100 - D\%)}{100} = SP$$

$$800 \times \frac{(100 - D\%)}{100} \times \frac{(100 - D\%)}{100} = 512$$

$$(100 - D\%) \times (100 - D\%) = 6400$$

$$(100 - D\%)^2 = 6400$$

$$100 - D\% = 80$$

$$D = 20\%$$

6. In General store, an item with an MRP of ₹35600 is on the discount counter with a special price of ₹34888. What is the percentage of discount given for that item?

- (a) 1% (b) 4%
(c) 3% (d) 2%

SSC CHSL 12/04/2021 (Shift-II)

Ans : (d) MP = ₹35600

SP = ₹ 34888

$$\text{Discount \%} = \frac{\text{MP} - \text{SP}}{\text{MP}} \times 100$$

$$= \frac{35600 - 34888}{35600} \times 100$$

$$= \frac{712}{356}$$

$$= 2\%$$

7. The marked price of an article is ₹1000. After two successive discounts, it is sold for ₹600. If the first discount is x%, and the second discount is 25%, then what is the value of x?

- (a) 18% (b) 12%
(c) 20% (d) 25%

SSC CHSL 13/04/2021 (Shift-II)

Ans. (c) : Given:- MP = 1000 , SP = 600

According to the question,

$$1000 \times \frac{(100-x)}{100} \times \frac{(100-25)}{100} = 600$$

$$10 \times (100-x) \times \frac{3}{4} = 600$$

$$x = 20$$

Hence, first discount (x) ⇒ 20%

8. An umbrella is marked for ₹150 and sold for ₹138. The rate of discount is:

- (a) 9% (b) 6%
(c) 5% (d) 8%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : According to the question,

Marked Price of umbrella = ₹150

Selling Price of umbrella = ₹138

∴ Selling offer discount of ₹ 12.

$$\text{Hence, Discount \%} = \frac{12}{150} \times 100 = 8\%$$

9. An article is listed at ₹7,600 and the discount offered unit is 10%. What additional discount must be given to bring the net selling price to ₹5,814?

- (a) 10% (b) 8%
(c) 15% (d) 12%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : Let additional discount % = d%

$$\text{Now, } 7600 \times \left(\frac{100-10}{100}\right) \times \left(\frac{100-d\%}{100}\right) = 5814$$

$$76 \times 90 \times \frac{100-d\%}{100} = 5814$$

$$100 - d\% = \frac{5814 \times 10}{76 \times 9} = 85$$

$$d = 15\%$$

10. 1 bottle of honey costs ₹ 240 but a pack of 4 of the same bottles costs ₹ 768. What is the effective discount (in %) on the pack?

- (a) 16 % (b) 25 %
(c) 10% (d) 20 %

SSC CGL (Tier-II) 19-02-2018

Ans. (d):

∴ Costing of 1 bottle honey = ₹ 240

∴ Costing of 4 bottle honey = ₹ 4×240

$$= 960$$

Cost Price = ₹ 768 (given)

$$\text{Hence, effective discount} = \left(\frac{960-768}{960}\right) \times 100 = \frac{192}{960} \times 100$$

$$= 20\%$$

11. A ₹ 1000 box of cookies is offered at 10% discount and a ₹ 400 bar of chocolate is offered at 8% discount. If we buy 2 boxes of cookies and 3 bars of chocolate. What is the effective discount we get (in%)

- (a) 9 % (b) 9.25%
(c) 8.75 % (d) 8.5 %

SSC CGL (Tier-II) 19-02-2018

Ans. (b) : According to the question,

Costing of 2 cookies boxes and 3 chocolate bars =

$$= 2 \times 1000 + 3 \times 400$$

$$= ₹ 3200$$

$$\text{Total discount} = \frac{2 \times 1000 \times 10}{100} + \frac{3 \times 400 \times 8}{100}$$

$$= 200 + 96$$

$$= ₹ 296$$

$$\% \text{discount} = \frac{296}{3200} \times 100$$

$$= 9.25\%$$

12. If a website is selling smart phone at ₹ 18,000 which is marked at ₹ 25,000 then what is the discount (in %) at which the smart phone is being sold ?

- (a) 25% (b) 22%
(c) 28% (d) 20%

SSC CGL (Tier-II) 18-02-2018

$$\text{Ans. (c) : Discount \%} = \left(\frac{25000-18000}{25000}\right) \times 100\%$$

$$= \frac{7000}{25000} \times 100$$

$$= 28\%$$

13. If on an item there is 12% discount on the marked price of ₹ 10,000 but the item is sold at ₹ 8,360 only then what additional discount (in %) did the customer get ?

- (a) 6% (b) 7%
(c) 5% (d) 8%

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Market Price of the item = ₹10000

Selling Price = ₹8360

$D_1 = 12\%$

$D_2 = ?$

$$MP \times \left(\frac{100 - D_1}{100} \right) \times \left(\frac{100 - D_2}{100} \right) = SP$$

$$\frac{10000 \times (100 - 12) \times (100 - D_2)}{100 \times 100} = 8360$$

$D_2 = 100 - 95$

$D_2 = 5\%$

14. 1 bar of chocolate costs ₹ 80 but a box containing 6 bars of the same chocolate costs ₹ 400. What is the effective discount (in %) on the box ?

- (a) 20% (b) 16.67%
(c) 25% (d) 15%

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Cost of 6 chocolate bars at the rate of ₹ 80

Per chocolate = $80 \times 6 = ₹480$

Effective Discount = $480 - 400 = ₹80$

$$\text{Discount \%} = \frac{80}{480} \times 100 = 16.67\%$$

15. 1 packet of biscuits costs ₹ 16 but a pack of 4 of the same packet of biscuits costs ₹ 56. What is the effective discount (in %) on the pack?

- (a) 8% (b) 10%
(c) 7.5% (d) 12.5%

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

∴ Costing of 1 Packet biscuits = ₹16

∴ Costing of 4 Packet biscuits = $4 \times 16 = 64$

According to the question,

Costing of 4 Packet biscuits = 56

∴ Effective discount (%) on the packet

$$\% = \frac{64 - 56}{64} \times 100$$

$$= \frac{8}{64} \times 100$$

$$= 12.5\%$$

16. A ₹ 750 tin of cheese is offered at 8% discount and a ₹ 1,250 tin of butter at 20% discount. If we buy 5 tins of cheese and 3 tins of butter, what is the effective discount we get (in %) ?

- (a) 12% (b) 15%
(c) 14% (d) 16%

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : According to the question,

Costing of 1 tin of cheese = ₹750

∴ Costing of 5 tin of cheese = $5 \times 750 = ₹3750$

$$\begin{aligned} \text{Cost after 8\% discount} &= 3750 \times \frac{(100 - 8)}{100} \\ &= ₹3450 \end{aligned}$$

Costing of 1 tin of butter = ₹1250

Costing of 3 tin of butter = $3 \times 1250 = ₹3750$

Total cost after 20% discount

$$= 3750 \times \frac{(100 - 20)}{100} = 3000$$

Total costs = $3750 + 3750 = ₹7500$

Total cost after discount = $3450 + 3000 = ₹6450$

$$\text{Effective discount \%} = \frac{7500 - 6450}{7500} \times 100 = 14\%$$

17. On an item there is cash 5% discount on the marked price of ₹ 25,000. After giving an additional season's discount the item is sold at ₹ 20,900. How much was the season's discount (in %) ?

- (a) 11% (b) 10%
(c) 12% (d) 9%

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let the season's discount = x%

We know that-

$$\text{Marked Price} \times \left(\frac{100 - d_1}{100} \right) \times \left(\frac{100 - d_2}{100} \right) = \text{Selling Price}$$

$$25000 \times \frac{95}{100} \times \left(\frac{100 - x}{100} \right) = 20900$$

$$100 - x = \frac{20900 \times 2}{5 \times 95}$$

$$100 - x = 88$$

$$x = 12\%$$

18. The selling price of a smartphone is ₹ 9,600 if the discount on it is 20%. What would be the selling price (in ₹) of the smartphone if the discount on it was 25% ?

- (a) ₹10240 (b) ₹7680
(c) ₹1200 (d) ₹9000

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$\text{Marked Price of Smartphone} = 9600 \times \frac{100}{80} = ₹12000$$

$$\begin{aligned} \text{If discount is 25\%, then selling Price} &= 12000 \times \frac{75}{100} \\ &= ₹9000 \end{aligned}$$

19. If a watch is being sold at ₹ 7,225 which is marked at ₹ 8,500, then what is the discount (in %) at which the watch is being sold ?
- (a) 24% (b) 15%
(c) 25% (d) 20%

SSC CGL (Tier-II) 21-02-2018

Ans. (b): Given that,

Marked Price of watch = ₹8500

Selling Price of watch = ₹7225

$$\begin{aligned} \text{Discount on watch (\%)} &= \left(\frac{8500 - 7225}{8500} \right) \times 100 \\ &= \frac{1275}{8500} \times 100 \\ &= \boxed{15\%} \end{aligned}$$

20. On a machine there is 10% trade discount on the marked price of ₹ 2,50,000. But the machine is sold at ₹ 2,16,000 after giving a cash discount. How much is this cash discount (in %) ?
- (a) 5% (b) 4%
(c) 6% (d) 7%

SSC CGL (Tier-II) 21-02-2018

Ans. (b) :

Let cash discount be x%

Marked Price of Machine = ₹250000

According to the question,

$$\begin{aligned} 250000 \times \frac{(100-10)}{100} \times \left(\frac{100-x}{100} \right) &= 216000 \\ \left(\frac{100-x}{100} \right) &= \frac{216000}{2500 \times 90} \\ \left(\frac{100-x}{100} \right) &= \frac{24}{25} \\ (100-x) &= 96 \\ x &= 100 - 96 \\ \boxed{x = 4\%} \end{aligned}$$

21. If house tax is paid before the due date, one gets a reduction of 12% on the amount of the bill. By paying the tax before the due date, a person got a reduction of ₹2,100. The amount (in ₹) of house tax was:
- (a) ₹21,000 (b) ₹17,500
(c) ₹25,000 (d) ₹18,000

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : Let the amount of house tax is 100%
According to the question,
12% → 2100

$$\therefore 100\% \rightarrow \frac{2100}{12} \times 100 = 17500$$

Hence, amount of house tax = ₹17500

22. An article is marked at 100% above its cost price. After allowing two successive discounts of 5% and 20% respectively on the marked price, it sold at x% profit. What is the value of x?
- (a) 75 (b) 48
(c) 52 (d) 72

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) Let the Cost Price of the article = ₹100

Marked Price = ₹200

$$\text{Selling Price} = 200 \times \frac{95}{100} \times \frac{80}{100} = ₹152$$

Hence, Profit% (x) = 152 – 100 = 52%

23. An article is sold for ₹680 after two successive discounts of 20% and x% on its marked price. The marked price of the article is ₹1,000. What is the value of x?
- (a) 12.5 (b) 16
(c) 15 (d) 15.5

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c) According to the question,

$$\begin{aligned} 1000 \times \frac{80}{100} \times \frac{(100-x)}{100} &= 680 \\ 100 - x &= 85 \\ x &= 15\% \end{aligned}$$

24. The marked price of a washing machine is ₹7,200. If it is sold for ₹5512.50, after two successive discounts of x% each. The value of x is:
- (a) 12 (b) 10.5
(c) 12.5 (d) 15

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c) According to the question,

$$\begin{aligned} 7200 \times \frac{(100-x)}{100} \times \frac{(100-x)}{100} &= 5512.50 \\ (100-x) \times (100-x) &= \frac{5512.50 \times 100}{72} \\ (100-x)^2 &= 7656.25 \\ 100 - x &= 87.5 \\ x &= 12.5 \end{aligned}$$

25. If house tax is paid before the due date, one gets a reduction of 12% on the amount of the bill. By paying the tax before the due date, a person got a reduction of ₹2,100. The amount (in ₹) of house tax paid was:
- (a) 25,000 (b) 21,000
(c) 17,500 (d) 15,400

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d): Let the house tax is 100%

According to the question,

$$12\% = 2100$$

$$\therefore 100\% = \frac{2100}{12} \times 100$$

$$= ₹17500$$

$$\therefore \text{Amount of house tax paid} = 17500 - 2100 \\ = ₹15,400$$

26. If a shopkeeper sells an item that is marked as ₹3,685 for ₹2,845 then how much discount is he offering?

- (a) 29.52%
(b) 34.87%
(c) 26.59%
(d) 22.795%

SSC CHSL –19/10/2020 (Shift-III)

Ans. (d) : Suppose Marked Price = M, Discount% = D%

Selling Price = SP

$$\therefore SP = \frac{MP(100 - D)}{100}$$

$$2845 = \frac{3685 \times (100 - D\%)}{100}$$

$$\frac{284500}{3685} = (100 - D\%)$$

$$(100 - D\%) = 77.20488$$

$$D\% = 100 - 77.20488$$

$$D = 22.795\%$$

27. A person marks his 40 items at 20% above the cost price. He sells 10 items at a 10% discount and 20 items at a 15% discount on the marked price. What is the maximum discount (rounded off) he can offer on the remaining items if he still gets some profit?

- (a) 28% (b) 25%
(c) 26% (d) 21%

SSC CHSL –13/10/2020 (Shift-II)

Ans. (c) : Let, Cost Price of 40 article (CP) = ₹40

$$\text{Marked Price of 40 article (MP)} = 40 \times \frac{120}{100} = ₹48$$

Selling Price of 30 article (SP) =

$$10 \times \frac{120}{100} \times \frac{90}{100} + 20 \times \frac{120}{100} \times \frac{85}{100} \Rightarrow 10.8 + 20.4 \Rightarrow ₹31.2$$

\therefore It is clear that if 10 articles are sold at ₹ 8.80, it will occurred no profit and no loss.

Selling Price of 10 articles =

$$MP \frac{(100 - D)}{100} = 8.8 = 10 \times 1.2 \times \frac{(100 - D)}{100}$$

$$880 = 12 \times (100 - D)$$

Discount % = 26.67%

Hence, remaining articles will be sold at 26.67% discount to gets some profit.

28. The marked price and cost price of a book are ₹850 and ₹748, respectively. The discount in percentage is:

- (a) 10% (b) 15%
(c) 8% (d) 12%

SSC CHSL –13/10/2020 (Shift-III)

Ans. (d) : Suppose discount percentage on book be x%

\therefore Marked Price of book = ₹850

Cost Price of book = ₹748

$$\therefore \frac{850 \times (100 - x)}{100} = 748$$

$$100 - x = \frac{748 \times 100}{850}$$

$$100 - x = 88$$

$$x = 100 - 88$$

$$\therefore x = 12\%$$

IInd Method :

$$\text{Effective discount} = \frac{850 - 748}{850} \times 100 \\ = 12\%$$

29. Mohan offers to sell his articles at a discount of 20%, but the marks his articles by increasing the price of each by 35%. What percentage would his gain be?

- (a) 8% (b) 10%
(c) 9% (d) 7%

SSC CHSL –12/10/2020 (Shift-II)

Ans. (a) : Let, Cost Price of article = ₹100

\therefore Marked Price = ₹135

\therefore 20% discount given on Marked Price

$$\therefore \text{Discount} = \frac{135 \times 20}{100} = 27$$

$$\therefore \text{Selling Price} = 135 - 27 \\ = 108$$

$$\therefore \text{Profit \%} = 8\%$$

30. A discount of 30% on the marked price of a book enables Arun to get a pen worth ₹60 free. How much did Arun pay for the book?

- (a) ₹130 (b) ₹160
(c) ₹150 (d) ₹140

SSC CHSL –21/10/2020 (Shift-I)

Ans. (d) 30% = ₹60

$$1\% = 2$$

$$70\% = ₹140$$

$$\text{Amount paid by Arun} = ₹140.$$

31. The marked price of a toy is ₹450. After a certain discount on the marked price, the selling price of the toy is ₹405. The rate of discount is:

(a) 15% (b) 8%
(c) 10% (d) 12%

SSC CHSL –19/03/2020 (Shift-III)

$$\begin{aligned} \text{Ans. (c) : Rate of discount} &= \frac{450 - 405}{450} \times 100 \\ &= \frac{45}{450} \times 100 \\ &= 10\% \end{aligned}$$

32. A dealer marks his goods at 30% above the cost price. Then he allows 35% discount on it. What would be his loss percentage?

(a) 15.5% (b) 17.5%
(c) 16.5% (d) 18.5%

SSC CHSL –17/03/2020 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : Profit/Loss\%} &= 30 - 35 - \frac{30 \times 35}{100} \\ &= -5 - 10.5 = -15.5 \\ \text{Hence, Loss\%} &= 15.5\% \end{aligned}$$

33. In a grocery store, an item with an MRP of ₹1,100 is on a discount counter with a special price of ₹979. What is the percentage of discount given for that item?

(a) 10% (b) 11%
(c) 12% (d) 9%

SSC CHSL –15/10/2020 (Shift-II)

$$\begin{aligned} \text{Ans. (b) : Discount \%} &= \frac{1100 - 979}{1100} \times 100 \\ &= \frac{121}{11} = 11\% \end{aligned}$$

34. A blanket is sold for ₹680 at the discounts of 15% and 20%. Find the printed price of the blanket.

(a) ₹800 (b) ₹1000
(c) ₹900 (d) ₹950

SSC CHSL –15/10/2020 (Shift-III)

$$\begin{aligned} \text{Ans. (b) : Let, Marked Price of blanket is ₹ } x. \\ \text{According to the question,} \\ 680 &= x \times \left(\frac{100 - 15}{100} \right) \times \left(\frac{100 - 20}{100} \right) \\ 680 &= x \times \frac{85}{100} \times \frac{80}{100} \\ x &= \frac{680 \times 20 \times 5}{17 \times 4} \\ x &= ₹1000 \end{aligned}$$

35. What is the net discount (in %) for successive discounts of 30% and 50%?

(a) 65% (b) 70%
(c) 75% (d) 80%

SSC MTS 11-10-2017 (Shift-III)

$$\begin{aligned} \text{Ans. (a) : Net discount} &= \left(x + y - \frac{xy}{100} \right) \% \\ &= \left(30 + 50 - \frac{30 \times 50}{100} \right) \% \\ &= (80 - 15) \% \\ &= 65\% \end{aligned}$$

36. The marked price of an article is ₹ 900 and a customer pays ₹ 630 for it. What is the discount percentage?

(a) 30% (b) 35%
(c) 40% (d) 42%

SSC MTS 11-10-2017 (Shift-I)

Ans: (a)

$$\text{Discount percentage} = \frac{\text{Marked Price} - \text{Selling Price}}{\text{Marked Price}} \times 100$$

$$\begin{aligned} &= \frac{900 - 630}{900} \times 100 \\ &= \frac{270}{900} \times 100 = 30\% \end{aligned}$$

37. A person buys an object at ₹16. If he has to buy a dozen objects then he pays a total amount of ₹160. How much is the discount in percent when he buys a dozen of objects (in nearest integer)?

(a) 10% (b) 17%
(c) 12% (d) 22%

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Costing of an object = ₹ 16

Now, costing of a dozen article = $16 \times 12 = ₹ 192$

But paid amount for a dozen = ₹ 160

Discount = $192 - 160 = ₹ 32$

$$\text{Discount\%} = \frac{\text{Discount}}{\text{Marked Price}} \times 100\%$$

$$\text{Discount \%} = \frac{32}{192} \times 100 = 16.66\%$$

Nearest discount % = 17%

38. Marked price and cost price of an article are in ratio 5 : 4. If the profit earned by selling the article is 12.5%, then what is the discount percentage?

(a) 12.5% (b) 15%
(c) 8% (d) 10%

SSC MTS 05/08/2019 (Shift-I)

Ans. (d) : Given,
 Marked Price : Cost Price = 5 : 4
 Marked Price = 5x
 Cost Price = 4x
 Profit = 12.5%

$$\begin{aligned} \text{Selling Price} &= 4x \times \frac{(100+12.5)}{100} \\ &= \frac{4x \times 112.5}{100} \end{aligned}$$

Let, d% is the discount given on MP.
 According to the question,

$$\begin{aligned} 5x \times \left(\frac{100-d}{100} \right) &= 4x \times \frac{112.5}{100} \\ 500 - 5d &= 450.00 \\ 5d &= 50 \\ d &= 10 \end{aligned}$$

39. A vegetable seller bought 10 dozens of potatoes for ₹ 120, another 5 dozens for ₹ 50 and another 5 dozens for ₹ 30. He sold the potatoes for ₹ 9 a dozen. How much discount did he overall offer?

- (a) 11.11% (b) 5%
 (c) 7.5% (d) 10%

SSC MTS 16/08/2019 (Shift-I)

Ans. (d) : CP for vegetable seller

10 dozen	=	120
5 dozen	=	50
5 dozen	=	30
<hr/>		
Total dozen 20	=	₹200

∴ Average CP for 1 dozen potatoes = ₹10
 Sp for 1 dozen potato = ₹9

$$\begin{aligned} \therefore \text{Discount \%} &= \frac{10-9}{10} \times 100 \\ &= \frac{1}{10} \times 100\% \Rightarrow 10\% \end{aligned}$$

40. A shopkeeper sold an article for ₹180 by making a profit of 20%. The shopkeeper offered a discount of ₹30 on the market price. How much percent above the cost price the article is marked?

- (a) 30% (b) 35%
 (c) 40% (d) 25%

SSC MTS 09/08/2019 (Shift-II)

Ans. (c) : Cost Price = $180 \times \frac{100}{120} = ₹150$
 Marked Price = 180 + 30 = ₹ 210
 Effective % = $\frac{210-150}{150} \times 100 = 40\%$

41. The selling price of a product was equal to 50% of the marked price. Two successive discounts were offered on the product. If the first discount was 20% then how much was the other discount.

- (a) 37.5% (b) 33.33%
 (c) 30% (d) 25%

SSC MTS 14/08/2019 (Shift-I)

Ans. (a) : Let, MP of Product = ₹100
 Selling Price = ₹ 50

According to the question,

$$\therefore 100 \times \left(\frac{100-20}{100} \right) \times \left(\frac{100-d}{100} \right) = 50$$

$$\frac{4}{5} \times (100-d) = 50$$

$$100-d = \frac{250}{4} = 62.5$$

$$d = 37.5\%$$

42. A person buys a shirt in ₹ 1000 and a pair of pants in ₹ 2000. Discount on shirt and pant is 20% and 50% respectively. How much is the total discount?

- (a) 25% (b) 40%
 (c) 60% (d) 45%

SSC MTS 16/08/2019 (Shift-III)

Ans. (b) : Discount on a shirt of ₹ 1000 = 20%

∴ Discount on a pair of pants of ₹ 2000 = 50%

∴ Discount on a pants of ₹ 1000 = 25%

$$\begin{aligned} \text{Effective discount} &= 20 + 25 - \frac{20 \times 25}{100} = (45 - 5) = \\ &40\% \end{aligned}$$

43. Which of the following is the greatest among all?

- (a) 8% discount of marked price ₹ 400
 (b) 12% discount of marked price ₹ 240
 (c) 7% discount of marked price ₹ 500
 (d) 10% discount of marked price ₹ 320

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : (a) 8% discount of marked price ₹400

$$= 400 \times \frac{92}{100} = ₹368$$

(b) 12% discount of marked price ₹ 240

$$= 240 \times \frac{88}{100} = ₹211.2$$

(c) 7% discount of marked price ₹ 500

$$= 500 \times \frac{93}{100} = 5 \times 93 = ₹465$$

(d) 10% discount of marked price ₹ 320

$$= 320 \times \frac{90}{100} = ₹288$$

The Greatest among all is ₹ 465.

44. The marked price of a chair and a table are in the ratio 2 : 3 respectively. The shopkeeper gives 20% discount on the chair. If the combined discount on both the chair and the table is 26%, then what will be the discount given on the table?

- (a) 34% (b) 32%
(c) 30% (d) 28%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (c) : Let MP of a chair and a table ₹200 and ₹300. Total discount = $500 \times \frac{26}{100} = ₹130$

$$\text{Discount on chair} = 200 \times \frac{20}{100} = ₹40$$

$$\therefore \text{Discount on table} = 130 - 40 = ₹90$$

$$\text{Discount on table \%} = \frac{90}{300} \times 100 = 30\%$$

II. Problems based on Successive Discount

45. Find a single discount percentage equivalent to successive discounts of 10%, 20% and 25%.

- (a) 55% (b) 46%
(c) 20% (d) 18.3%

SSC CGL (Tier-I) 19/04/2022 (Shift-II)

Ans. (b) Let the price of the article be ₹ 100
Then a single discount equivalent to the discount series.

$$= \left(100 - \frac{100-10}{100} \times \frac{100-20}{100} \times \frac{100-25}{100} \times 100 \right) \%$$

$$= \left(100 - \frac{90}{100} \times \frac{80}{100} \times \frac{75}{100} \times 100 \right) \%$$

$$= (100 - 54) \%$$

$$= 46\%$$

46. The marked price of an article is 25% more than its cost price. If 10% discount is given on the marked price, then what is the profit percentage?

- (a) 10% (b) 12%
(c) 11.5% (d) 12.5%

SSC CHSL -21/10/2020 (Shift-II)

Ans. (d) We know that :-

$$\text{Profit/Loss \%} = \left(\pm x \pm y \pm \frac{x \times y}{100} \right) \%$$

$$\text{Profit \%} = 25 - 10 - \frac{25 \times 10}{100}$$

$$= 25 - 10 - 2.5$$

$$= 25 - 12.5$$

$$= 12.5\%$$

47. The marked price of an article is ₹ 530. After two successive discounts, it is sold for ₹ 396.44. If the first discount is 15%, and the second discount is x%, then what is the value of x?

- (a) 12.5 (b) 10
(c) 10.5 (d) 12

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (d) Marked Price of the article = ₹530

According to the question.

$$530 \times \frac{(100-15)}{100} \times \frac{(100-x)}{100} = 396.44$$

$$100 - x = \frac{396440}{53 \times 85}$$

$$100 - x = 88$$

$$x = 12\%$$

Hence, second discount is 12%.

48. A single discount equivalent to three simple discounts of 10%, 12% and 15% is.

- (a) 32.68% (b) 34.17%
(c) 37% (d) 35.36%

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) : Single equivalent discount of x%, y% and

$$z\% = -x - y - z + \frac{xy}{100} + \frac{yz}{100} + \frac{zx}{100} - \frac{xyz}{10000}$$

ATQ,

$$= -10 - 12 - 15 + \frac{120}{100} + \frac{180}{100} + \frac{150}{100} - \frac{1800}{10000}$$

$$= -37 + 1.2 + 1.8 + 1.5 - 0.18$$

$$= -37.18 + 4.5$$

$$\% = -32.68\%$$

Hence, single equivalent discount is 32.68%

49. If two successive discounts, each of 20% on the marked price of an article, are equal to a single discount of ₹331.20, then the marked price (in ₹) of the article is?

- (a) ₹645 (b) ₹920
(c) ₹1,200 (d) ₹750

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Equivalent discount of each 20% discount

$$= -20 - 20 + \frac{20 \times 20}{100}$$

$$= -36\%$$

According to the question $\therefore 36\% = 331.20$

$$\therefore 100\% = \frac{331.20}{36} \times 100$$

$$= 920$$

Hence, Marked Price = ₹ 920

50. If the single discount equivalent to successive discounts of 20% and x% is 24%, then the value of x is:

- (a) 5% (b) 8%
(c) 4% (d) 6%

SSC CHSL -14/10/2020 (Shift-II)

Ans. (a): Equivalent discount% = $x + y - \frac{xy}{100}$

$$24 = 20 + x - \frac{20x}{100}$$

$$4 = \frac{4x}{5}$$

$$x = 5$$

51. An article is sold for ₹612 after successive discount of 25% and x%. If the marked price of the article is ₹960, what is the value of x?

- (a) 15% (b) 14%
(c) 12% (d) 10%

SSC CGL (TIER-I)-2018 - 12.06.2019 (Shift-III)

Ans. (a) : According to the question,
Marked price of the article = 960
Selling Price after 25% discount
 $= \frac{960}{100}(100 - 25) = 720$

∴ According to the question,

Again, Price after x% discount

$$\frac{720}{100}(100 - x) = 612$$

$$100 - x = \frac{612 \times 10}{72}$$

$$100 - x = 85$$

$$x = 15$$

$$x = 15\%$$

52. After giving two successive discounts each of x%, on the marked price of an article total discount is ₹259.20. If the marked price of the article is ₹ 720, then the value of x is:

- (a) 18 (b) 25
(c) 24 (d) 20

SSC CGL (TIER-I)-2018 - 04.06.2019 (Shift-I)

Ans. (d) : Marked price of the article = 120
Selling Price after two equal and successive discounts

$$= \left(x + x - \frac{x \times x}{100} \right) \% \Rightarrow \left(2x - \frac{x^2}{100} \right) \%$$

$$720 \left(2x - \frac{x^2}{100} \right) \% = 259.20$$

$$2x - \frac{x^2}{100} = \frac{259.20}{720} \times 100$$

$$2x - \frac{x^2}{100} = \frac{2592}{7200} \times 100$$

$$2x - \frac{x^2}{100} = 36$$

$$200x - x^2 = 3600$$

$$x^2 - 200x + 3600 = 0$$

$$x^2 - 180x - 20x + 3600 = 0$$

$$x(x-180) - 20(x-180) = 0$$

$$(x-20)(x-180) = 0$$

$$\therefore x - 20 = 0, \quad [x = 180 \text{ (Invalid)}]$$

$$\boxed{x = 20}$$

53. The marked price of an article is ₹740. After two successive discounts of 15% and x%, it is sold for ₹566.10. What is the value of x?

- (a) 12 (b) 10
(c) 20 (d) 5

SSC CGL (Tier-I)-2019 - 04/03/2020 (Shift-II)

Ans. (b) : We know that:-

$$\text{Marked Price} \times \left(\frac{100 - D_1}{100} \right) \times \left(\frac{100 - D_2}{100} \right) = \text{Selling Price}$$

Price

$$740 \times \frac{85}{100} \times \left(\frac{100 - x}{100} \right) = 566.10$$

$$(100 - x) = \frac{56610}{37 \times 17}$$

$$100 - x = 90$$

$$x = 10$$

54. After allowing a discount of 15% on the marked price of an article, it was sold for ₹425. Had the discount not been given, the profit would have been 25%. What was the cost price (in ₹) of the article?

- (a) 325 (b) 450
(c) 500 (d) 400

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) : According to the question,

$$MP \times \frac{85}{100} = 425$$

$$MP = ₹500$$

If discount had not been given, (∴ SP = MP)

$$SP = ₹500$$

$$CP = \frac{500}{125} \times 100 = ₹400$$

55. What is a single discount (to the nearest whole number) equivalent to the successive discounts of 10%, 17% and 25%?

- (a) 45% (b) 43%
(c) 44% (d) 52%

SSC CHSL 16/04/2021 (Shift-I)

Ans. (c) : Equivalent successive discount of 10%, 17% and 25%

We know that :-

Formula -

$$\left(-x - y - z + \frac{xy}{100} + \frac{yz}{100} + \frac{zx}{100} - \frac{xyz}{10000}\right)\%$$

$$-10 - 17 - 25 + \frac{170}{100} + \frac{425}{100} + \frac{250}{100} - \frac{10 \times 17 \times 25}{10000}$$

$$-52 + 1.7 + 4.25 + 2.5 - 0.425$$

$$= 43.975 \approx 44\%$$

56. An article is sold for ₹372 after two successive discounts of 25% and 38% on its marked price. Total discount (in ₹) is:

- (a) 380 (b) 400
(c) 428 (d) 420

SSC CHSL 13/04/2021 (Shift-I)

Ans. (c) : Let marked price = x

According to the question,

$$x \times \frac{75}{100} \times \frac{62}{100} = 372$$

$$x = ₹800$$

$$\text{Discount} = 800 - 372 = ₹428$$

57. The successive discounts 18%, 10% and 15% are equivalent to a single discount of:

- (a) 41.32% (b) 37.27%
(c) 39.25% (d) 45.16%

SSC CHSL 05/08/2021 (Shift-II)

Ans. (b) : Single equivalent discount of 18%, 10% and 15%

$$= -18 - 10 - 15 + \frac{18 \times 10}{100} + \frac{10 \times 15}{100} + \frac{18 \times 15}{100} - \frac{18 \times 10 \times 15}{10000}$$

$$= -43 + 1.8 + 1.5 + 2.7 - 0.27$$

$$= -43 + 5.73$$

$$= -37.27\%$$

Hence, equivalent discount% = 37.27%

58. The marked price of an article is ₹ 550/-. A shopkeeper allows a discount of 20% and still gets a profit of 10%. If he sells in for 470/- , is profit percent will be:

- (a) 16% (b) 17.5%
(c) 18% (d) 16.8%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (b) : Given that,

Marked Price (MP) = ₹ 550

Selling Price (SP) = ₹ 470

We know that:-

$$\therefore \text{CP} (100 + P) = \text{MP} (100 - D)$$

Where, CP = Cost Price

D = Discount%

P = Profit %

$$\text{CP} (100 + 10) = 550 \times (100 - 20)$$

$$\text{CP} \times 110 = 550 \times 80$$

$$\text{CP} = ₹ 400$$

On selling the article at ₹470,

$$\text{Profit} = 470 - 400 = ₹70$$

$$\therefore \text{Profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

$$= \frac{70}{400} \times 100 = 17.5\%$$

59. An article is sold for ₹288 after successive discount of 25% and x%. If the marked price of the article is ₹ 480, what is the value of x?

- (a) 20% (b) 18%
(c) 16% (d) 15%

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (a) : Marked Price of article = ₹ 480

Selling Price of an article on discount of 25% and x% = ₹ 288.

According to the question,

$$\text{Hence, } 288 = 480 \times \left(\frac{100 - 25}{100}\right) \times \left(\frac{100 - x}{100}\right)$$

$$288 = 480 \times \left(\frac{75}{100}\right) \times \left(\frac{100 - x}{100}\right)$$

$$288 = 480 \times \frac{3}{4} \times \left(\frac{100 - x}{100}\right)$$

$$(100 - x) = \frac{288 \times 4 \times 100}{480 \times 3}$$

$$(100 - x) = \frac{96 \times 100}{120}$$

$$100 - x = 80$$

$$x = 100 - 80$$

$$x = 20$$

60. A successive discount of 20%, 10% and 15% is equivalent to single discount of?

- (a) 38.8% (b) 42.2%
(c) 44.5% (d) 43.5%

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (a) : 20%, 10%, 15%

$$\therefore \text{Equivalent discount} = \left(x + y - \frac{xy}{100}\right)\%$$

\therefore Equivalent discount

$$= \left(20 + 10 - \frac{20 \times 10}{100}\right) = (30 - 2) = 28\%$$

Now, single/equivalent discount of 28% & 15%.

$$= 28 + 15 - \frac{28 \times 15}{100}$$

$$= 43 - 4.2$$

$$= 38.8\%$$

61. Giving two successive discounts of 20% is same as giving one discount of %

- (a) 36%
 (b) 40%
 (c) 44%
 (d) 50%

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : According to the question,

$$\text{Equivalent discount \%} = 20 + 20 - \frac{20 \times 20}{100}$$

$$= 36\%$$

62. Giving two successive discounts of 60% is equal to giving one discount of%

- (a) 90% (b) 72%
 (c) 96% (d) 84%

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Single discount % = $\left(x + y - \frac{xy}{100}\right)\%$

$$= \left(60 + 60 - \frac{3600}{100}\right)$$

$$= 84\%$$

63. 15% discount is offered on a shirt marked at ₹ 1200. But the shirt is sold at ₹ 918 after giving a further cash discount. How much is this cash discount (in %) ?

- (a) 10%
 (b) 12%
 (c) 5%
 (d) 8%

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Let, cash discount % = x

According to the question,

$$1200 \times \frac{85}{100} \times \frac{100 - x}{100} = 918$$

$$\frac{12 \times 5 \times (100 - x)}{100} = 54$$

$$100 - x = 90$$

$$x = 10\%$$

64. Three successive discounts of 12%, 13% and 11% are equivalent to an approximate single discount of:

- (a) 40% (b) 32%
 (c) 42% (d) 35%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : We know that,

For three successive discount,

Single discount% =

$$\left(-x - y - z + \frac{xy}{100} + \frac{yz}{100} + \frac{zx}{100} - \frac{xyz}{10000}\right)\%$$

∴

$$-12 - 13 - 11 + \frac{12 \times 13}{100} + \frac{13 \times 11}{100} + \frac{11 \times 12}{100} - \frac{12 \times 13 \times 11}{10,000}$$

$$\Rightarrow -36 + 1.56 + 1.43 + 1.32 - 0.1761$$

$$= 31.8616 \approx 32\%$$

Hence, single discount = $\boxed{32\%}$

65. A single discount equivalent to three successive discounts of 8%, 15% and 12% is:

- (a) 17.5% (b) 68.816%
 (c) 35% (d) 31.184%

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) : Effective discount of 8% and 15%

$$8 + 15 - \frac{8 \times 15}{100} = 23 - 1.20 = 21.80\%$$

Again, equivalent discount of 21.80 and 12%

$$21.80 + 12 - \frac{21.80 \times 12}{100}$$

$$33.80 - 2.6160$$

$$= 31.184\%$$

66. Two successive discounts, each of x% on the marked price of an article, are equal to a single discount of ₹331.20. If the marked price of the article is ₹920, then the value of x is:

- (a) 18% (b) 15%
 (c) 20% (d) 25%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : ∴ MP : SP = 920 : 588.8

$$= 9200 : 5888$$

$$= 400 : 256$$

$$= 25 : 16$$

Since, both discounts % are same

Hence, ratio of MP and SP after discount

$$= \sqrt{25} : \sqrt{16}$$

$$= 5 : 4$$

$$\therefore x = \frac{1}{5} \times 100 = 20\%$$

67. The marked price of an article is ₹800. A retailer buys it for ₹540 after getting two successive discounts. The first discount is 25%. What is the second discount?

- (a) 12% (b) 10%
 (c) 8% (d) 15%

SSC CPO-SI - 12/12/2019 (Shift-I)

Ans. (b) Suppose second discount be $x\%$

According to the question,

$$800 \times \frac{75}{100} \times \frac{(100-x)}{100} = 540$$

$$(100-x) = \frac{540 \times 100 \times 100}{800 \times 75}$$

$$100-x = 90$$

$$x = 10\%$$

Hence second discount is 10%

68. On the marked price of ₹ 1,250 of an article, three successive discounts of 5%, 15% and 20% were offered. The amount (in ₹) of discount received by a customer is:

- (a) ₹807.50 (b) ₹450
(c) ₹442.50 (d) ₹950.25

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Given MP = ₹ 1250

SP after three successive discount of 5%, 15% and 20%

$$= 1250 \times \frac{95}{100} \times \frac{85}{100} \times \frac{80}{100}$$

$$= 807.5$$

Hence, discount receive by customer = $1250 - 807.5$
= ₹ 442.5

69. A person gets 30% and then 20% discount on his ₹1250 bill of food. How much does he has to pay?

- (a) ₹ 700 (b) ₹ 350
(c) ₹ 550 (d) ₹ 500

SSC CHSL (Tier-I) 03/07/2019

Ans. (a) : Effective discount %

$$= -30 - 20 + \frac{-30 \times -20}{100}$$

$$= -50 + \frac{600}{100}$$

$$= -44\%$$

∴ Person have to pay = $(100 - 44\%) = 56\%$

$$= \frac{1250 \times 56}{100}$$

$$= ₹ 700$$

Hence, person have to pay ₹ 700

70. The difference between the selling prices obtained after a single discount of 45% and two successive discounts of 30% and 15% on the marked price ₹12,000 of an article is:

- (a) ₹440 (b) ₹560
(c) ₹520 (d) ₹540

SSC CHSL -26/10/2020 (Shift-III)

Ans. (d): Effective discount of 30% & 15%

$$30 + 15 - \frac{30 \times 15}{100} = (45 - 4.5) = 40.50\%$$

According to the question,

$$\text{Difference} = 12000 \times \frac{4.5}{100} = ₹540$$

71. The marked price of a shirt was ₹1,800. A man bought the same shirt for ₹1,200 after getting two successive discounts. If the first discount was 12%, what was the second discount rate? (Correct to two decimal place)

- (a) 22.22% (b) 20.20%
(c) 25.25% (d) 24.24%

SSC CHSL -19/10/2020 (Shift-I)

Ans. (d) : Marked Price (MP) = ₹1800

Selling Price (SP) = ₹1200

Let, the second discount rate = D_2

According to the question,

$$\therefore \text{SP} = \frac{\text{MP}(100 - D_1)}{100} \times \frac{(100 - D_2)}{100}$$

$$1200 = 1800 \times \frac{(100 - 12)}{100} \times \frac{(100 - D_2)}{100}$$

$$100 \times 1200 = 18 \times 88 \times (100 - D_2)$$

$$(100 - D_2) = \frac{120000}{18 \times 88}$$

$$D_2 = 100 - 75.75 = 24.24\%$$

72. A single discount equivalent to a discount series of 5%, 10%, 15% and 20% is:

- (a) 43.86% (b) 41.86%
(c) 42.8% (d) 40.86%

SSC CHSL -20/10/2020 (Shift-III)

Ans : (b) Single equivalent discount

$$= \left[1 - \left(1 - \frac{a}{100} \right) \left(1 - \frac{b}{100} \right) \left(1 - \frac{c}{100} \right) \left(1 - \frac{d}{100} \right) \right] \times 100$$

$$= \left[1 - \left(1 - \frac{5}{100} \right) \left(1 - \frac{10}{100} \right) \left(1 - \frac{15}{100} \right) \left(1 - \frac{20}{100} \right) \right] \times 100$$

$$= \left[1 - \frac{19}{20} \times \frac{9}{10} \times \frac{17}{20} \times \frac{4}{5} \right] \times 100$$

$$= \left[1 - \frac{19 \times 9 \times 17}{5000} \right] \times 100$$

$$= \left(100 - \frac{2907}{50} \right)$$

$$= 100 - 58.14 = 41.86\%$$

73. If the difference between discount of 35% and two successive discounts of 20% on a certain bill is ₹ 3, then what is the amount (in ₹) of the bill?

- (a) ₹250 (b) ₹300
(c) ₹350 (d) ₹400

SSC MTS 9-10-2017 (Shift-I)

Ans: (b) Let amount be = ₹ x
 \therefore Amount after 35% discount = $\frac{x \times (100 - 35)}{100} = \frac{65x}{100}$
 \therefore Amount after two successive discounts of 20%
 $= \frac{x \times 80}{100} \times \frac{80}{100} = \frac{64x}{100}$
 According to the question,
 $\frac{65x}{100} - \frac{64x}{100} = 3$
 $x = 100 \times 3 = ₹ 300$

74. If the difference between discount of 30% and two successive discounts of 20% on a certain bill is ₹ 42 then what is the amount (in ₹) of the bill?

- (a) ₹400 (b) ₹300
 (c) ₹700 (d) ₹ 820

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : Let amount of the bill be = ₹ x
 Successive discount of 20% = $x + y - \frac{xy}{100}$
 $= 20 + 20 - \frac{400}{100} = 36\%$
 Amount after 30% discount = $\frac{x \times (100 - 30)}{100} = \frac{70x}{100}$
 According to the question,
 $\frac{70x}{100} - \frac{64x}{100} = 42$
 $6x = 42 \times 100$
 $x = ₹ 700$

75. The cost price of an object is ₹10,000. The object is sold at ₹ 7866 in three successive discounts to a retail sales person, in which first discount is 10% and the other is 8%. What is the third discount (in percent)?

- (a) 5% (b) 3%
 (c) 6.5% (d) 4.5%

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) : Let third discount (%) be x.
 According to the question,
 $\therefore 10000 \times \frac{90}{100} \times \frac{92}{100} \times \frac{(100 - x)}{100} = 7866$
 $100 - x = 95$
 $x = 5\%$

76. What is a single discount equivalent to two successive discounts of 10% and 15%?

- (a) 21.5% (b) 23.5%
 (c) 25% (d) 26.5%

SSC MTS 02/08/2019 (Shift-I)

Ans. (b) : Equivalent discount%
 $= x + y - \frac{xy}{100}$
 $= 10 + 15 - \frac{10 \times 15}{100}$
 $= 25 - 1.5 = 23.5\%$

77. Three merchants A, B and C, sell sewing machines at the same list price. Merchant A allows two successive discounts of 30% and 16%, merchant B allows two successive discounts of 20% and 26% and merchant C allows two successive discounts of 25% and 20%. Which merchant should a customer choose to get the maximum discount?

- (a) Merchant A
 (b) Merchant C
 (c) Either merchant B or merchant C
 (d) Merchant B

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a) : Total discount of A = $\left(30 + 16 - \frac{30 \times 16}{100}\right)$
 $= 46 - 4.8 = 41.2\%$

Total discount of B = $20 + 26 - \frac{20 \times 26}{100}$
 $= 46 - 5.2 = 40.8\%$

Total discount of C = $25 + 20 - \frac{20 \times 25}{100} = 40\%$

Hence, it is clear from above discount% that the dealer 'A' gives maximum discount.

78. The marked price of a washing machine is ₹ 18500. A dealer allows two successive discounts of 20% and x% on the marked price and sells it for ₹ 14060. What is the value of x?

- (a) 4 (b) 5
 (c) 10 (d) 6

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b) : According to the question,

$$18500 \times \frac{80}{100} \times \frac{100 - x}{100} = 14060$$

$$100 - x = \frac{14060 \times 100 \times 100}{18500 \times 80}$$

$$100 - x = 95$$

$$x = 5\%$$

III. Problems based on Marked Price

79. At what price should a shirt costing ₹ 602, be marked so that there is a profit of 10%, when it is sold by giving 14% discount on its marked price?

- (a) ₹ 700 (b) ₹ 770
 (c) ₹ 660 (d) ₹ 750

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

$$\text{Ans (b) : SP} = \frac{\text{CP} \times (100 + P)}{100}$$

$$\text{SP} = 602 \times \frac{110}{100} = \frac{602 \times 11}{10} \text{ ₹}$$

$$\therefore \text{SP} = \text{MP} \times (100 - D) / 100$$

$$\frac{602 \times 11}{10} = \frac{\text{MP} \times 86}{100}$$

$$602 \times 110 = \text{MP} \times 86$$

$$7 \times 110 = \text{MP}$$

$$\therefore \text{MP} = ₹770$$

80. A shopkeeper earns a profit of 17% on selling a book at 10% discount on the printed price. If the cost price is ₹500, then the printed price (in ₹) is:

- (a) 615 (b) 750
(c) 585 (d) 650

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (d) Given that—

Cost price (CP) of the book = ₹ 500

Profit (P) = 17%

Discount (D) = 10%

According to the question,

$$\therefore \frac{\text{MP}}{\text{CP}} = \frac{100 + P\%}{100 - D\%}$$

$$\Rightarrow \frac{\text{MP}}{500} = \frac{100 + 17}{100 - 10}$$

$$\Rightarrow \frac{\text{MP}}{500} = \frac{117}{90}$$

$$\Rightarrow \text{MP} = 500 \times \frac{117}{90}$$

$$\therefore \boxed{\text{MP} = ₹ 650}$$

81. The marked price of an object is 42% more than the cost price of an object. If on selling an object a profit of 20.7% is obtained, then the percent discount obtained on the marked price of an object is :

- (a) 15.6% (b) 16%
(c) 15% (d) 14.3%

SSC MTS 21/08/2019 (Shift-III)

Ans. (c): Let, Cost Price = 100x

$$\therefore \text{MP} = 142x$$

$$\text{And, SP} = 120.7x$$

$$\text{Discount\%} = \frac{142x - 120.7x}{142x} \times 100\%$$

$$= \frac{21.3x}{142x} \times 100\%$$

$$= 15\%$$

Trick:

Since profit or loss% is equivalent to mark up% and discount %

$$\frac{D \times 42}{100} = 42 - D - 20.7$$

$$\frac{42D}{100} + D = 21.3$$

$$142D = 2130$$

$$D = 15\%$$

82. A seller buys an item of marked price of ₹5000 at two successive discounts of 20% and 5%. He spends ₹200 on its repair and sells it ₹5000. His profit/loss percentage is:

- (a) 20% Loss (b) 25% Loss
(c) 25% Profit (d) 20% Profit

SSC CHSL 09/07/2019 (Shift-II)

Ans. (c) : Two successive discount on marked Price

$$= 5000 \times \frac{(100 - 20)}{100} \times \frac{(100 - 5)}{100}$$

$$= 5000 \times \frac{80}{100} \times \frac{95}{100} = ₹ 3800$$

Total Cost Price after repairing = 3800 + 200 = ₹ 4000

Profit = SP - CP

$$= 5000 - 4000 = ₹ 1000$$

$$\text{Profit \%} = \frac{1000}{4000} \times 100 = 25\%$$

83. A shopkeeper decides to increase the marked price of an item by 10%. What discount percent should he give on that item so that he can sell that item at the original marked price?

- (a) $9\frac{1}{2}\%$ (b) $9\frac{1}{11}\%$
(c) $8\frac{1}{9}\%$ (d) 10%

SSC CHSL 11/07/2019 (Shift-II)

$$\text{Ans. (b) : Effective \%} = \frac{100x}{100 + x}$$

$$= \frac{100 \times 10}{110} = 9\frac{1}{11}\%$$

84. A dealer allows his customer a discount of 18% and still gains 24%. If an article costs ₹ 1,560 to the dealer, what is its marked price (to the nearest ₹)?

- (a) 2,565 (b) 2,024
(c) 2,168 (d) 2,359

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(d) Given that –

Cost price (CP) of article = ₹1560

Profit (P) % = 24%

Discount (D) % = 18%

According to the formula –

$$\frac{MP}{CP} = \frac{100+P\%}{100-D\%}$$
$$\Rightarrow \frac{MP}{1560} = \frac{100+24}{100-18}$$
$$\Rightarrow MP = \frac{124}{82} \times 1560$$
$$\Rightarrow MP = 2359.02$$
$$\therefore MP \approx ₹2359$$

Hence, option (d) is correct.

- 85.** A shopkeeper marks his good at a price such that after giving a discount of 20%, he gains 25%. If the cost price of the article is ₹560, what will be its marked price (in ₹)?

- (a) 914 (b) 875
(c) 856 (d) 765

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) : According to the question,

$$\therefore CP(100+P\%) = MP(100-D\%)$$
$$560 \times (100+25\%) = MP(100-20\%)$$
$$560 \times 125 = MP \times 80$$
$$MP = \frac{560 \times 125}{80} = ₹875$$

- 86.** A retailer gives 40% discount on a certain article, to his customer. In this transaction he earns a profit of 25% on that article. If the article costs ₹4,320 to the retailer, what is its marked price (in ₹)?

- (a) 8,000 (b) 2,592
(c) 9,000 (d) 6,000

SSC MTS 22/10/2021 (Shift-I)

Ans. (c) : We know that,

$$\frac{MP}{CP} = \frac{100 \pm P/L\%}{100 - D\%}$$
$$\frac{MP}{4320} = \frac{100 + 25}{100 - 40}$$
$$\frac{MP}{4320} = \frac{125}{60} \Rightarrow MP = \frac{125 \times 4320}{60} \Rightarrow MP = ₹9000$$

- 87.** A shopkeeper earns 17% profit by selling an article at 10% discount on its marked price. If its cost price is ₹480, then the marked price (in ₹) of the article is:

- (a) 640 (b) 624
(c) 636 (d) 600

SSC CHSL 19/04/2021 (Shift-I)

Ans. (b) : We know that-

$$\frac{CP}{MP} = \frac{(100 - D\%)}{(100 + P\%)}$$
$$\frac{CP}{MP} = \frac{(100 - 10)}{(100 + 17)}$$
$$\frac{CP}{MP} = \frac{(90)}{(117)} \xrightarrow{\times 5.33} \frac{480}{624}$$

- 88.** The marked price of an article is ₹ x. After allowing two successive discounts of 20% and 16% on the marked price, it is sold for ₹ 504. What is the value of x?

- (a) 740
(b) 720
(c) 750
(d) 700

SSC CHSL 12/08/2021 (Shift-II)

Ans. (c) : According to the question,

$$x \times \frac{80}{100} \times \frac{84}{100} = 504$$
$$x = 750$$

- 89.** Two successive discounts of 40% and 20%, respectively, on the marked price of an article are equal to a single discount of ₹988. The marked price (in ₹) of the article is:

- (a) 2470 (b) 1900
(c) 2200 (d) 2070

SSC CHSL 15/04/2021 (Shift-II)

Ans : (b) Let the marked price of an article

$$\text{Equivalent discount of } x\% \text{ and } y\% = -x - y + \frac{x \times y}{100}$$

According to the question,

$$\text{Equivalent discount} = -40 - 20 + \frac{40 \times 20}{100}$$

$$= -60 + 8$$

$$= -52\%$$

$$\therefore 52\% = 988$$

$$1\% = 19$$

$$100\% = 1900$$

- 90.** An article is sold for ₹ 535.50 after two successive discount of 25% and 15%. What is the marked price of the article.

- (a) ₹ 840 (b) ₹ 820
(c) ₹ 800 (d) ₹ 830

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (a)

$$SP = MP \frac{(100-x)}{100} \times \frac{(100-y)}{100}$$

$$535.50 = MP \times \frac{(100-25)}{100} \times \frac{(100-15)}{100}$$

$$535.50 = MP \times \left(\frac{75}{100}\right) \left(\frac{85}{100}\right)$$

$$MP = \frac{535.50 \times 100 \times 100}{75 \times 85}$$

$$MP = ₹ 840$$

91. An article is sold for ₹612 after successive discounts of 25% and 15%. What is the marked price of the article?

- (a) ₹ 1000 (b) ₹ 960
(c) ₹ 940 (d) ₹ 980

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (b) : Let Marked Price of the article be ₹ x.

According to the question,

$$x \times \frac{85}{100} \times \frac{75}{100} = 612$$

$$x = \frac{612 \times 100 \times 100}{85 \times 75}$$

$$= ₹ 960$$

92. A trader allows a discount of 18% on the marked price of an article. How much percentage above the cost price must he mark it so as to get a profit of 6.6%?

- (a) 24% (b) 30%
(c) 25% (d) 28%

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (b) : Let CP of the article = ₹100

$$SP = ₹ 106.6$$

According to the question,

$$MP = 106.6 \times \frac{100}{82} = \frac{10660}{82} = ₹130$$

Hence, trader marks 30% above the cost price.

93. A furniture shopkeeper allows a discount of 16% on the marked price on the goods to his customer and still gains 20%. What is the marked price of a dining table, which costs the shopkeeper ₹11,900?

- (a) ₹15,000 (b) ₹12,376
(c) ₹16,000 (d) ₹17,000

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (d) Let Marked Price of the goods = 100 units

$$SP = 84 \text{ units}$$

$$CP = \frac{100}{120} \times 84 = 70 \text{ units}$$

$$\therefore 70 \text{ units} \rightarrow ₹11900$$

$$1 \text{ unit} \rightarrow 170$$

$$100 \rightarrow ₹17000$$

94. On a television of brand A the discount is 25% and on television of brand B the discount is 40%. The price of B after discount ₹ 2,250 greater than the price of A after discount. What is the marked price of A (in ₹) if marked price of B is ₹ 35,000 ?

- (a) ₹18750 (b) ₹21000
(c) ₹25000 (d) ₹17850

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : Let Marked Price of product A = x

According to the question,

$$35000 \times \frac{60}{100} - x \times \frac{75}{100} = 2250$$

$$21000 - \frac{3x}{4} = 2250$$

$$3x = 84000 - 9000$$

$$x = ₹25000$$

95. If 60% discount is offered on the marked price and selling price becomes equal to cost price then what was the % mark up ?

- (a) 100% (b) 250%
(c) 150% (d) 40%

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : Let, Marked Price = 100

$$SP = 40$$

$$CP = 40$$

$$\text{Effective \%} = \frac{60}{40} \times 100$$

$$= 150\%$$

96. The price of a product after getting 20% discount is ₹ 3024 which includes 5% tax on selling price. What was the marked price (in ₹) of the Product?

- (a) ₹3780 (b) ₹2742
(c) ₹3600 (d) ₹2880

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Let Marked Price of product be ₹x.

According to the question,

$$x \times \frac{80}{100} = 3024 \times \frac{100}{105}$$

$$x = 3024 \times \frac{100}{105} \times \frac{100}{80}$$

$$x = ₹ 3600$$

97. A shopkeeper allows 18% discount on the marked price of an article and still makes a profit of 23%. If he gains ₹18.40 on the sale of the article, then what is the marked price of the article?

- (a) ₹120 (b) ₹146
(c) ₹125 (d) ₹140

SSC CGL (Tier-II) 13-09-2019

Ans. (a) Let MP be ₹ 100x

$$SP = 100x \times \frac{82}{100} = 82x$$

$$CP = \frac{100}{123} \times 82x$$

According to the question,

$$82x - \frac{100}{123} \times 82x = 18.40$$

$$82x \times \frac{23}{123} = 18.40$$

$$x = \frac{18.40 \times 123}{82 \times 23} = 1.2$$

$$MP = 100x \Rightarrow 100 \times 1.2 = ₹120$$

98. The marked price of an article is ₹800 and it is sold at a discount of 19%. If there is a gain of 8%, then by what percent above the cost price was the article marked?

- (a) $36\frac{2}{3}\%$ (b) 27%
(c) 35% (d) $33\frac{1}{3}\%$

SSC CGL (Tier-II) 12-09-2019 (Shift-II)

Ans. (d) : Let, Marked Price be = x%

Since, Profit or loss% is equivalent to mark up % and discount%

$$\therefore 8 = x - 19 - \frac{19x}{100}$$

$$27 = \frac{81x}{100}$$

$$x = \frac{100}{81} \times 27 = 33\frac{1}{3}\%$$

99. On the marked price of ₹1,250 of an article, three successive discounts of 5%, 15% and 20% are offered. What will be the selling price (in ₹) after all discounts?

- (a) ₹950.25 (b) ₹1,000
(c) ₹975.75 (d) ₹807.50

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Selling Price after all discount

$$= 1250 \times \frac{95}{100} \times \frac{85}{100} \times \frac{80}{100}$$

$$= ₹807.50$$

100. After allowing 10% discount on the marked price of an article, a person makes a profit of 16%. If the cost price of the article is ₹648, then its marked price is:

- (a) ₹826.80 (b) ₹910.40
(c) ₹751.68 (d) ₹835.20

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d) Let Marked price of the article be x ₹

According to the question,

$$x \times \frac{(100-10)}{100} = 648 \times \frac{(100+16)}{100}$$

$$90x = 648 \times 116$$

$$x = \frac{72 \times 116}{10}$$

$$x = ₹835.20$$

101. After allowing a 10% discount on the marked price of an article, a dealer makes a profit of 5%. What is the marked price, if the cost price of the article is ₹300?

- (a) ₹320 (b) ₹400
(c) ₹350 (d) ₹375

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) $\frac{MP}{CP} = \frac{100 + P\%}{100 - D\%}$

$$\frac{MP}{300} = \frac{105}{90}$$

$$MP = ₹350$$

102. An article was sold for ₹98,496 after providing three successive discounts of 10%, 5% and 4% respectively on the marked price. What was the marked price?

- (a) ₹1,20,200 (b) ₹1,20,500
(c) ₹1,10,700 (d) ₹1,20,000

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d) Let, Marked Price of the article be x ₹

According to the question,

$$x \times \frac{(100-10)}{100} \times \frac{(100-5)}{100} \times \frac{(100-4)}{100} = 98496$$

$$x = \frac{98496 \times 1000000}{90 \times 95 \times 96}$$

$$x = ₹120000$$

103. There is a 15% discount on 8 shirt marked at ₹9,600. How many shirts can be bought with ₹5,100?

- (a) 3 (b) 6
(c) 4 (d) 5

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d)

Cost of 8 shirts = ₹ 9600

$$\text{Cost after 15\% discount} = 9600 \times \left(\frac{100-15}{100} \right) = 96 \times 85$$

$$= ₹ 8160$$

$$\text{Cost of 1 shirt} = \frac{8160}{8} = ₹1020$$

$$\text{Shirts bought in ₹ 5100} = \frac{5100}{1020}$$

$$= 5$$

104. If a discount of 10% is allowed on the marked price of an article, a shopkeeper gets a profit of 25%. If he offers a discount of 25% on the marked price of the same article, then his percentage profit/loss will be:

- (a) $4\frac{1}{2}$ Loss discount
 (b) $4\frac{1}{6}$ Profit discount
 (c) 4 Loss discount (d) 4 Profit discount

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b) We know that-

$$\therefore \frac{MP}{CP} = \left(\frac{100 + P\%}{100 - D\%} \right)$$

Let Profit or loss % be x%

According to the question,

$$\frac{MP}{CP} \Rightarrow \frac{100 + 25}{100 - 10} = \frac{100 + x}{100 - 25}$$

$$\frac{125}{90} = \frac{100 + x}{75}$$

$$600 + 6x = 625$$

$$x = \frac{25}{6} \Rightarrow \text{Hence, Profit is } 4\frac{1}{6}\%$$

105. A dealer allows 25% discount on the marked price of an article and gains 20%. If the cost price of the article increases by 20%, how much discount percentage should he allow on the marked price so as to earn the same percentage of profit as before?

- (a) 12% (b) 7.25%
 (c) 10% (d) 8.5%

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c) Let Marked Price of the article = ₹ 100

According to the question ,

MP	SP	CP
100	75	$75 \times \frac{100}{120}$

$$\text{New CP after 20\% increase} = \frac{100}{120} \times 75 \times \frac{120}{100} = 75$$

$$\text{New SP} = 75 \times \frac{120}{100} = 90$$

$$\therefore \text{Discount} = 100 - 90 = 10\%$$

106. A person bought an article at 30% discount on its marked price. The person then sold it at 30% profit for ₹427.70. What was the marked price of the article?

- (a) ₹470 (b) ₹480
 (c) ₹500 (d) ₹450

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a) Let Marked Price of the article was ₹ x.

ATQ,

$$\text{CP after 30\% discount} = x \times \frac{70}{100} = \frac{7x}{10}$$

Now, it is sold at 30% profit for ₹ 427.70

$$\therefore \text{SP} = \frac{7x}{10} \times \frac{130}{100} = 427.70$$

$$x = \frac{42770}{91}$$

$$x = ₹470$$

MP of the article = ₹ 470

107. There was 29% off on bags. A lady bought a bag and got 13% discount for paying in cash. She paid ₹ 617.70. What was the price tag (₹ in) on the bag?

- (a) ₹925 (b) ₹750
 (c) ₹800 (d) ₹1000

SSC CHSL 04/07/2019 (Shift-III)

Ans. (d) : Let MP of bags be x ₹

$$\text{Price after discount} = \frac{x \times (100 - 29)}{100} \times \frac{(100 - 13)}{100}$$

$$617.70 = x \times \frac{71}{100} \times \frac{87}{100}$$

$$x = \frac{61770 \times 100}{71 \times 87}$$

$$x = ₹ 1000$$

108. If the cost price of a book after 10% discount is ₹486, then the marked price of the book is:

- (a) ₹560 (b) ₹580
 (c) ₹600 (d) ₹540

SSC CHSL –14/10/2020 (Shift-I)

Ans. (d) : According to the question,

$$90\% = ₹486$$

$$100\% = \frac{486}{90} \times 100 = ₹540$$

∴ Marked Price of the book = ₹540

109. A shopkeeper pays 12% of the cost price as tax while purchasing an item whose cost is ₹500. He wants to earn a profit of 20% after giving a discount of 16% on the marked price. So, the marked price should be:

- (a) ₹800 (b) ₹960
 (c) ₹840 (d) ₹780

SSC CHSL –18/03/2020 (Shift-I)

$$\text{Ans. (a) : Total Cost Price (CP)} = 500 + 500 \times \frac{12}{100} = (500 + 60) = 560$$

$$\therefore \frac{CP}{MP} = \frac{(100 - D)}{(100 + P)}$$

$$\Rightarrow \frac{560}{MP} = \frac{(100 - 16)}{(100 + 20)}$$

$$\frac{560}{MP} = \frac{84}{120}$$

$$MP = \frac{560 \times 120}{84} = ₹800$$

110. A trader marks his goods in such a way that even after allowing 15% discount on marked price he still gains 27.5%. If the cost price of the goods is ₹200, then its marked price is:
- (a) ₹300 (b) ₹250
(c) ₹350 (d) ₹400

SSC CHSL –20/10/2020 (Shift-II)

Ans: (a) $\frac{CP \times (100 + P\%)}{100} = \frac{MP(100 - D\%)}{100}$

$$\frac{200 \times 127.5}{100} = \frac{MP \times 85}{100}$$

$$MP = \frac{20 \times 1275}{85}$$

$$MP = ₹300$$

111. An article was marked at ₹x and sold at a discount of (x-40)%. If the customer paid ₹(x-32), then find the marked price of the article.
- (a) ₹50 (b) ₹75
(c) ₹80 (d) ₹60

SSC CHSL –14/10/2020 (Shift-III)

Ans. (c) : Given, MP = ₹x

$$MP \times \left(\frac{100 - \text{Discount}\%}{100} \right) = SP$$

$$x \times \left(\frac{140 - x}{100} \right) = x - 32$$

$$140x - x^2 = 100x - 3200$$

$$x^2 - 40x - 3200 = 0$$

$$x^2 - 80x + 40x - 3200 = 0$$

$$x(x-80) + 40(x-80) = 0$$

$$(x-80)(x+40) = 0$$

$$\therefore x = ₹80$$

112. A mobile phone was sold for ₹31,500 after giving two successive discounts of 30% and 10% respectively. What was the marked price of the mobile?
- (a) ₹50,000 (b) ₹35,000
(c) ₹52,200 (d) ₹55,000

SSC CHSL –16/10/2020 (Shift-II)

Ans. (a) : Let Marked price of mobile phone be ₹ x

ATQ,

$$x \times \frac{(100 - 30)}{100} \times \frac{(100 - 10)}{100} = ₹31500$$

$$\frac{x \times 70}{100} \times \frac{90}{100} = 31500$$

$$\frac{x \times 7 \times 9}{100} = 31500$$

$$x = \frac{31500 \times 100}{7 \times 9}$$

Hence Marked Price (x) of the mobile = ₹50,000

113. If the discount offered on an article is 40%, then what will be the ratio of selling price and marked price.
- (a) 2 : 5 (b) 4 : 7
(c) 5 : 8 (d) 3 : 5

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : Let, Marked Price of article = MP
And, Selling Price = SP
According to the question,

$$\therefore SP = MP \times \frac{(100 - 40)}{100} \Rightarrow MP \times \frac{60}{100}$$

$$SP : MP = 3 : 5$$

114. The cost price of a pair of shoes is ₹ 12000. What should be the marked price (in ₹) on a pair of shoes such that after allowing a discount of 16%, the shopkeeper earns 12% profit?
- (a) ₹14,330 (b) ₹16,000
(c) ₹13,440 (d) ₹16,500

SSC MTS 09/08/2019 (Shift-I)

Ans. (b) : $\therefore \frac{MP}{CP} = \frac{100 + P\%}{100 - D\%}$

$$\frac{MP}{12000} = \frac{112}{84}$$

$$MP = \frac{112 \times 12000}{84}$$

$$= ₹16000$$

Hence, Marked Price of shoes = ₹16000

115. A trader allows two successive discount of 20% and 30% on selling an article. If he sells that article for ₹ 1400, then what is the marked price (in ₹) of the article?
- (a) ₹2500 (b) ₹2800
(c) ₹3000 (d) ₹3050

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : Let Marked Price of article = ₹ x

$$\therefore x \times \frac{(100 - 20)}{100} \times \frac{(100 - 30)}{100} = 1400$$

$$x = \frac{1400 \times 100 \times 100}{80 \times 70} = ₹2500$$

116. A shopkeeper sells a cooler at a discount of 15%. If he gives a discount of 19%, then he earns ₹ 332 less. What will be the marked price of the cooler?
- (a) ₹ 8100 (b) ₹ 8300
(c) ₹ 8700 (d) ₹ 8200

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : Let Marked Price of cooler be ₹x
According to the question,

$$\frac{19x}{100} - \frac{15x}{100} = 332$$

$$\frac{4x}{100} = 332$$

$$4x = 33200$$

$$x = ₹8300$$

117. After allowing three successive discount of 10%, 20% and 5% on the marked price of an article, it is sold for ₹ 2, 394. The cost price of the article is ₹ 2,500. It is sold at the marked price then the profit will be.

- (a) ₹ 960 (b) ₹ 950
(c) ₹ 1,050 (d) ₹ 1,000

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans. (d): We know that-

$$SP = MP \times \left(\frac{100 - D}{100} \right)$$

$$2394 = MP \times \frac{90}{100} \times \frac{80}{100} \times \frac{95}{100}$$

$$\frac{2394 \times 100 \times 100}{72 \times 95} = MP$$

$$\frac{266 \times 100 \times 100}{8 \times 95} = MP \Rightarrow MP = ₹3500$$

∴ According to the question,
Profit = MP - CP = 3500 - 2500
= ₹ 1000

IV. Problems based on Selling Price

118. A shopkeeper allows 28% discount on the marked price of an article and still makes a profit of 20%. If he gains ₹3080 on the sale of one article, then what is the selling price (in ₹) of the article?

- (a) 14880 (b) 18480
(c) 18840 (d) 10884

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (b) Profit = 20%

$$20\% \rightarrow \frac{1 \rightarrow P}{5 \rightarrow CP}$$

$$\therefore \text{Profit} = SP - CP = 6 - 5 = 1 \text{ unit} = ₹3080$$

$$1 \text{ Unit} = ₹3080$$

$$6 \text{ Units} = ₹18480$$

119. Market price of an article is ₹2600, which is 30% more than the cost price. If the profit is 45%, then what will be the selling price of the article?

- (a) ₹3100
(b) ₹3900
(c) ₹2700
(d) ₹2900

SSC MTS 08/08/2019 (Shift-I)

Ans. (d) : Let CP of the article x

According to the question,

$$\frac{130x}{100} = 2600$$

$$x = 2000$$

$$SP \text{ of the article} = \frac{2000 \times 145}{100}$$

$$= ₹ 2900$$

120. The marked price of a juicer mixer is ₹5500, and three successive discounts of 40%, 30% and 20% are given on this marked price. The selling price of the juicer mixer is:

- (a) ₹1868
(b) ₹1848
(c) ₹1858
(d) ₹1835

SSC CHSL 10/082021 (Shift-II)

Ans. (b) : According to the question,

$$SP = 5500 \times \frac{60}{100} \times \frac{70}{100} \times \frac{80}{100}$$

$$= 1848$$

121. What will be the selling price of an article if two successive discounts of 15% and 12% are offered on its market price of ₹ 25,500?

- (a) ₹21165 (b) ₹19,074
(c) ₹25,041 (d) ₹18,615

SSC CHSL 12/08/2021 (Shift-III)

$$\text{Ans. (b) : } SP \text{ of article} = 25,500 \times \frac{85}{100} \times \frac{88}{100}$$

$$= 255 \times 17 \times \frac{88}{20}$$

$$= 51 \times 17 \times 22$$

$$= ₹19074$$

122. The printed price on a Mathematics book is ₹ 550. If it is sold at two successive discounts of 20% and 30% then its selling price will be:

- (a) ₹ 308 (b) ₹ 312
(c) ₹ 310 (d) ₹ 305

SSC CHSL 15/04/2021 (Shift-III)

$$\text{Ans.(a) : } SP \text{ of article} = 550 \times \frac{80}{100} \times \frac{70}{100}$$

$$= 11 \times 4 \times 7$$

$$= ₹308$$

123. A dealer marks an article 40% above the cost price and sells it to a customer, allowing two successive discounts of 20% and 25% on the marked price. If he suffers a loss of ₹ 140, then the cost price (in ₹) of the article is:

- (a) ₹872 (b) ₹875
(c) ₹840 (d) ₹900

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b) : Let, Cost Price of an article = 100
MP = 140

According to the question,

$$SP = 140 \times \frac{80}{100} \times \frac{75}{100} = 84$$

$$\therefore \text{Loss} = 100 - 84 = 16$$

$$16 \rightarrow ₹140$$

$$4 \rightarrow 35$$

$$1 \rightarrow 35/4$$

$$100 \rightarrow ₹875$$

$$\therefore \text{CP} = ₹875$$

124. On the marked price of an article, the sum of selling prices with a discount of 35% and two successive discounts of 20% and 15%, is ₹1,995. The marked price of the article (in ₹) is:

- (a) 1,600 (b) 1,500
(c) 1,550 (d) 1,800

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : Let, Marked Price be ₹x.

Equivalent discount of 20% and 15% =

$$20 + 15 - \frac{20 \times 15}{100} = 32\%$$

\(\therefore\) According to the question,

$$x \times \left(\frac{100 - 35}{100} \right) + x \times \left(\frac{100 - 32}{100} \right) = 1995$$

$$\frac{65x}{100} + \frac{68x}{100} = 1995$$

$$133x = 1995 \times 100$$

$$x = ₹1500$$

125. A trader marks up his goods by 120% and offers 30% discount. What will be the selling price (in ₹) if the cost price is ₹ 750 ?

- (a) ₹1225 (b) ₹1080
(c) ₹1280 (d) ₹1155

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Given,

Cost Price of the article = 750

$$SP = 750 \times \left(\frac{100 + 120}{100} \right) \times \left(\frac{100 - 30}{100} \right)$$

$$= 750 \times \frac{220}{100} \times \frac{70}{100}$$

$$= ₹1155$$

126. A retailer marks up his goods by 150% and offers 40% discount. What will be the selling price (in ₹) if the cost price is ₹ 800 ?

- (a) ₹1200 (b) ₹1500
(c) ₹1000 (d) ₹2000

SSC CGL (Tier-II) 20-02-2018

Ans. (a): CP = 800

$$MP = 800 \times \frac{100 + 150}{100} = 2000$$

$$\text{Discount}\% = 40\%$$

$$SP = \frac{60}{100} \times 2000 = ₹1200$$

127. A retailer marks up his goods by 30% and offers 15% discount. What will be the selling price (In ₹) of an item sold by the retailer if its cost to the retailer is ₹ 1,000 ?

- (a) ₹1050 (b) ₹1105
(c) ₹805 (d) ₹1225

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Given, CP = ₹1000

According to the question,

$$\text{Mark Price of the article} = 1000 \times \frac{130}{100}$$

$$= ₹1300$$

$$SP = 1300 \times \frac{85}{100} = ₹1105$$

128. The selling price of an article is ₹ 816 if the discount on it is 15%. What would be the selling price of the article (in ₹) if the discount on it is 25%?

- (a) ₹750 (b) ₹720
(c) ₹800 (d) ₹700

SSC CGL (Tier-II) 17-2-2018

Ans. (b) : Selling Price (S) = ₹816

According to the question,

$$MP = 816 \times \frac{100}{(100 - 15)} = 816 \times \frac{100}{85}$$

$$= 960$$

$$\text{Selling price after 25\% discount} = 960 \times \frac{(100 - 25)}{100}$$

$$= 960 \times \frac{75}{100} = ₹720$$

129. On a marked price, the difference of selling prices with a discount of 35% and two successive discounts of 20% and 15%, is ₹ 504. The marked price of the article (in ₹) is:

- (a) ₹18000 (b) ₹16000
(c) ₹15500 (d) ₹16800

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (d) : Let, Marked Price of the article be ₹ x.
Equivalent discount of 20% and 15%

$$= 20 + 15 - \frac{15 \times 20}{100}$$

$$= 32\%$$

According to the question,

$$x \times \frac{35}{100} - x \times \frac{32}{100} = 504$$

$$\frac{3x}{100} = 504$$

$$x = ₹16800$$

130. The printed price of a cooker is ₹2,000, and discounts are 30%, 20% and 10%, respectively. Find the selling price of the cooker.

- (a) ₹1,002 (b) ₹1,006
(c) ₹1,004 (d) ₹1,008

SSC CHSL -19/10/2020 (Shift-II)

Ans. (d) : MP = ₹2000

∴ Selling price of cooker (SP)

$$= \text{MP} \left(\frac{100 - D_1}{100} \right) \left(\frac{100 - D_2}{100} \right) \left(\frac{100 - D_3}{100} \right)$$

$$= 2000 \times \frac{70}{100} \times \frac{80}{100} \times \frac{90}{100}$$

$$= 2 \times 7 \times 8 \times 9 = ₹1008$$

131. The marked price of a book is ₹900. What is the selling price of the book after giving two successive discounts each of 10% on it?

- (a) ₹820 (b) ₹729
(c) ₹749 (d) ₹800

SSC CHSL -19/03/2020 (Shift-I)

Ans. (b) : Equivalent discount of two successive discounts of 10%

$$= -10 - 10 + \frac{10 \times 10}{100}$$

$$= -19\% = 19\% \text{ Discount}$$

∴ Marked Price of book = ₹900

Selling price of book after 19% discount

$$= \frac{900 \times (100 - 19)}{100} = ₹ \frac{900 \times 81}{100} = ₹729$$

132. Paying ₹20 less than the marked price of an object a person obtains 25% discount. How much is the total amount paid by him (in ₹)?

- (a) ₹20 (b) ₹80
(c) ₹50 (d) ₹60

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : According to the question,

$$25\% = ₹20$$

$$\therefore \text{Marked Price} = 100\% = ₹80$$

$$\therefore \text{Amount Paid} = 80 - 20$$

$$= ₹60$$

133. Marked price of an article is ₹ 1500. If $16\frac{2}{3}\%$ discount is given, then what is the selling price?

- (a) ₹ 1000 (b) ₹ 1300
(c) ₹ 1250 (d) ₹ 1150

SSC MTS 19/08/2019 (Shift-I)

Ans. (c) : $16\frac{2}{3}\% = \frac{1 \rightarrow \text{Discount}}{6 \rightarrow \text{Mark Price}}$

$$\therefore \text{Selling price of the article} = 1500 \times \frac{5}{6} = ₹1250$$

134. Three successive discount of 20%, 20% and 30% are offered on an article. If the marked price of the article is ₹750. then what will be selling price?

- (a) ₹ 326 (b) ₹ 375
(c) ₹ 348 (d) ₹ 336

SSC MTS 08/08/2019 (Shift-II)

Ans. (d) : Selling Price of an article -

$$= 750 \times \frac{(100 - 20)}{100} \times \frac{(100 - 20)}{100} \times \frac{(100 - 30)}{100}$$

$$= 750 \times \frac{80}{100} \times \frac{80}{100} \times \frac{70}{100} \Rightarrow ₹336$$

V. Miscellaneous

135. An article is listed on ₹5,000 and two successive discounts of 12% and 12% are given on it. How much will the seller gain or loss if he gives a simple discount of 24%?

- (a) Loss ₹72 (b) Loss ₹64
(c) Profit ₹64 (d) Profit ₹72

SSC CHSL 05/08/2021 (Shift-III)

Ans. (a) : SP of article of equivalent discount

$$= 5000 \times \frac{88}{100} \times \frac{88}{100}$$

$$= 88 \times 44$$

$$= 3872$$

SP of article of only 24% discounts

$$= 5000 \times \frac{76}{100}$$

$$= 3800$$

$$\text{Loss} = 3872 - 3800$$

$$= ₹72$$

136. The price of an article is ₹ 40,000 is laid. A retailer offers 10% discount on first 62.5% price. He gives a discount of 4% on the remaining price, then what is the overall discount percentage given on the item?

- (a) 8.25% (b) 7.75%
(c) 8.5% (d) 8.0%

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (b): $40000 \times 62.5\% = 40000 \times \frac{5}{8} = 25000$

Total discount = $25000 \times \frac{10}{100} + 15000 \times \frac{4}{100}$
= $2500 + 600 = 3100$

Discount % = $\frac{3100}{40000} \times 100 = 7.75\%$

137. Anu allows a 20% discount on the marked price of an article and still makes a profit of 25%. If she gains ₹44.88 on the sale of the article, then the cost price of the article is:

- (a) ₹192.80 (b) ₹184.20
(c) ₹179.20 (d) ₹188.80

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (c) :

Let Marked Price = ₹ 100 units

Selling Price = ₹ 80 units

Cost Price = $\left(\frac{100}{100+25}\right) \times 80 = 64$ units

We know that

Profit = SP – CP

∴ Profit = 80 – 64 = 16 units

But 16 = ₹ 44.80

∴ $64 = \frac{44.8}{16} \times 64 = 179.2$

Hence, CP = ₹ 179.20

138. A man purchases 100 copies of a book from the publisher and gets a discount of 25%. He buys 50 copies from a retailer at a discount of 10%. He got an overall discount of:

- (a) 20% (b) 17.5%
(c) 16.5% (d) 35%

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (a) : Suppose, Cost Price of 1 book be = ₹1

Discount on 100 books = $100 \times \frac{25}{100} = ₹25$

Discount on 50 books = $50 \times \frac{10}{100} = ₹5$

Total discount = ₹30

Discount % = $\frac{30}{150} \times 100 = 20\%$

139. The marked price of an article is ₹ 315. It is sold for ₹ 288. If there is a loss of 4%, then by what percent above the cost is the article marked?

- (a) $6\frac{1}{2}\%$ (b) 5%
(c) $5\frac{1}{2}\%$ (d) 8%

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b): According to the question,

Cost Price of article = $\frac{100}{96} \times 288 = ₹300$

Required effective % = $\frac{315-300}{300} \times 100 = 5\%$

140. A shopkeeper marks his goods at 40% more than their cost price and allows a discount of 25% on the marked price. His gain or loss percent is :

- (a) 15% Profit (b) 5% Loss
(c) 10% Loss (d) 5% Profit

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (d) : Let CP = ₹100

MP = ₹140

SP = $140 \times \frac{75}{100} = ₹105$

Profit % = $\frac{(105-100)}{100} \times 100 \Rightarrow 5\%$

141. By how much above the cost price should an article be marked up for sale so that after allowing two successive discounts of 20% and 6.25% on it, a net gain of 20% is made on the cost?

- (a) $46\frac{1}{4}\%$ (b) 60%
(c) $66\frac{2}{3}\%$ (d) 50%

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (b) : Effective discount of 20% and 6.25%

= $20 + 6.25 - \frac{20 \times 6.25}{100}$

= $26.25 - 1.25 = 25\%$

Since, Profit % is the equivalent discount % and to marked %

Let Marked % = x

$20 = x - 25 - \frac{25x}{100}$

$45 = \frac{3x}{4}$

x = 60%

142. A shopkeeper sells an item for ₹492 after allowing 18% discount on its marked price. Had he not allowed any discount, he would have earned a profit of 20% on the cost price. What is the cost price of the item?

- (a) ₹600 (b) ₹500
(c) ₹640 (d) ₹540

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (b) : By,
$$S.P = \frac{M.P(100 \pm \text{Profit})}{100}$$

$$492 = M.P \times \frac{82}{100}$$

$$M.P = 600$$

We know that-

$$\frac{M.P}{C.P} = \frac{100 + P\%}{100 - D\%}$$

$$\frac{600}{C.P} = \frac{120}{100}$$

$$\Rightarrow C.P = ₹500$$

143. A dealer buys an article at a discount of 20% on its list price and marks it at 25% above the list price. If he allows a 20% discount on the new list price, then his profit percent is:

- (a) 24% (b) 25%
(c) 27% (d) 20%

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (b) : Let list Price be ₹ x.

$$CP = x \times \frac{80}{100} = \frac{4x}{5}$$

$$MP = x \times \frac{125}{100} = \frac{5x}{4}$$

$$SP \text{ after 20\% discount} = \frac{5x}{4} \times \frac{80}{100}$$

$$= \frac{5x}{4} \times \frac{4}{5} = x$$

$$\text{Profit\%} = \frac{SP - CP}{CP} \times 100$$

$$\text{Profit \%} = \frac{x - \frac{4x}{5}}{\frac{4x}{5}} \times 100$$

$$\text{Profit \%} = \frac{x}{5} \times \frac{5}{4x} \times 100$$

$$\boxed{\text{Profit \%} = 25}$$

144. What is the difference between a single discount of 30% and a single discount equivalent to two successive discounts of 25% and 5% being given on shopping of ₹ 2,000?

- (a) ₹25 (b) ₹15
(c) ₹20 (d) No difference

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (a) : Effective discount of 25% and 5%

$$= -25 - 5 + \frac{25 \times 5}{100}$$

$$= -30 + 1.25$$

$$= -28.75\%$$

$$= 28.75$$

$$\text{Difference} = 30 - 28.75$$

$$= 1.25\%$$

$$\text{Required difference (in ₹)} = 2000 \times \frac{1.25}{100} = ₹25$$

145. A person marked his goods at a price that would give him 40% profit. But he declared a sale and allowed 20% discount on the marked price. What is the profit percentage of the person in the whole transaction?

- (a) 30% (b) 12%
(c) 32% (d) 20%

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (b) : Let, Cost Price of the article = ₹100

$$MP = ₹140$$

$$SP = 140 \times \frac{80}{100} = ₹112$$

$$\therefore \text{Profit \%} = \frac{112}{100} \times 100 \Rightarrow 12\%$$

146. A shopkeeper marks the price of the article in such a way that after allowing 28% discount, he wants a gain of 12%. If the marked price is ₹ 224, then the cost price of the article is:

- (a) ₹144 (b) ₹168
(c) ₹196 (d) ₹120

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (a) : According to the question,

$$\text{Cost Price of the article} = 224 \times \frac{(100 - 28)}{100} \times \frac{100}{(100 + 12)}$$

$$= 224 \times \frac{72}{100} \times \frac{100}{112} = ₹144$$

147. If the selling price of an article is 8% more than the cost price and the discount offered is 10% on the marked price of the article, then what is the ratio of the cost price to the marked price?

- (a) 5 : 6 (b) 8 : 9
(c) 4 : 5 (d) 3 : 4

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (a) : Let cost price of the article = ₹100.

$$\text{Selling Price} = ₹108$$

$$\text{Marked Price} = 108 \times \frac{100}{90} = ₹120$$

$$\text{Required ratio} = 100 : 120 = 5 : 6$$

148. The marked price of an item is 25% above its cost price. A shopkeeper sells it, allowing a discount of $x\%$ on the marked price. If he incurs a loss of 8%, then the value of x is:

- (a) 25.2% (b) 25.6%
(c) 26.4% (d) 26.8%

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (c) : Let, Cost Price of the item = ₹ 100

Marked Price = ₹125

Selling Price = ₹ 92

Discount% = $125 - 92 = 33$

$$\text{Discount}\% = \frac{33}{125} \times 100$$

$$x = 26.4\%$$

149. A shopkeeper bought 80 kg of rice at a discount of 10%. Besides 1 kg rice was offered free to him on the purchase of every 20 kg rice. If he sells the rice at the marked price, his profit percentage will be?

- (a) $16\frac{2}{3}\%$ (b) $14\frac{2}{7}\%$
(c) $15\frac{1}{3}\%$ (d) $15\frac{3}{7}\%$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (a) : Let CP of 1 kg rice = ₹1

For shopkeeper, Cost Price of 80 kg rice

$$= 80 \times \frac{90}{100} = ₹72$$

But he get 4 kg rice free

Hence, he get 84 kg rice at ₹ 72

Selling Price = ₹ 84

$$\text{Profit} = \frac{12}{72} \times 100 = 16\frac{2}{3}\%$$

150. A shopkeeper marked a computer table for ₹7,200. He allows a discount of 10% on it and yet makes profit of 8%. What will be his gain percentage if he does NOT allow any discount?

- (a) 18% (b) 20%
(c) 9% (d) 2%

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

$$\text{Ans. (b) : SP} = 7200 \times \frac{90}{100}$$

$$\text{CP} = \frac{100}{108} \times \frac{7200 \times 90}{100} = 6000$$

If he does not allow discount

Profit = 7200 – 6000 = 1200

$$\text{Profit}\% = \frac{1200}{6000} \times 100 = 20\%$$

151. A shopkeeper marks the price of an article in such a way that after allowing a discount of 22%, he gets a gain of 11%. If the marked price is ₹888, then the cost price of the article is:

- (a) ₹550 (b) ₹895
(c) ₹624 (d) ₹782

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

$$\text{Ans. (c) : SP} = 888 \times \frac{78}{100}$$

$$\text{CP} = 888 \times \frac{78}{100} \times \frac{100}{111} = ₹ 624$$

152. A trader marks his goods at 60% above the cost price and allows a discount of 25%. What is his gain percent ?

- (a) 40% (b) 25%
(c) 30% (d) 20%

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

$$\text{Ans. (d) : Profit \%} = 60 - 25 - \frac{1500}{100} = 20\%$$

153. The cost price of goods, for a shopkeeper, was X. He marked them at 15% above the cost price. Finally, he sold the goods at a discount of 25%. 'What is his profit/loss percentage?'

- (a) 13.5% Profit (b) 13% Loss
(c) 12% Profit (d) 13.75% Loss

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (d) : Let, Cost Price of goods = ₹ 100

MP = ₹115

$$\text{SP} = 115 \times \frac{75}{100} = \frac{345}{4}$$

$$\text{CP} : \text{SP} = 100 : \frac{345}{4} = 80 : 69$$

$$\text{Loss} = 80 - 69 = 11$$

$$\text{Loss \%} = \frac{11}{80} \times 100 = 13.75\%$$

OR

$$\text{Profit/Loss \%} = 15 - 25 - \frac{375}{100}$$

$$= -10 - 3.75 = -13.75\%$$

154. If the cost price of an article is ₹ x. It is marked up by 100%. It is sold at ₹ 1,200 after giving 20% discount. What is value of x?

- (a) 750 (b) 1500
(c) 1000 (d) 2000

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : Let, Cost Price of article = ₹ x

$$\text{And, Marked Price} = x + x \times \frac{100}{100} = 2x$$

According to the question,

$$2x \times \frac{80}{100} = 1200$$

$$x = ₹ 750$$

155. A person marks his goods $x\%$ above the cost price and allows a discount of 30% on the marked price. If his profit is 5% , then the value of x will be :

- (a) 35 (b) 50
(c) 60 (d) 45

SSC CGL (Tier-II) 11-09-2019

Ans. (b) : Profit % = P

Mark up % = x

Discount % = D

According to the question,

$$P = M - D - \frac{M \times D}{100}$$

$$5 = x - 30 - \frac{30x}{100}$$

$$35 = \frac{70x}{100}$$

$$x = 50$$

156. A shopkeeper allows 28% discount on the marked price of an article and still makes a profit of 20% . If he gains ₹30.80 on the sale of one article, then what will be the cost price of the article?

- (a) ₹160 (b) ₹154
(c) ₹164 (d) ₹145

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Let Marked Price of article = ₹ 100x

$$\text{Selling Price} = 100x \times \frac{(100 - 28)}{100} = ₹ 72x$$

$$\text{Cost Price} = 72x \times \frac{100}{120} = ₹ 60x$$

$$\text{Profit} = 72x - 60x = 12x$$

According to the question,

$$\therefore 12x = 30.80$$

$$\therefore 60x = 154$$

157. The marked price of an article is ₹600. After giving 10% discount on marked price, the loss was ₹30. Find the loss percentage.

- (a) 7.50% (b) 7.25%
(c) 6.25% (d) 6.50%

SSC CHSL 01/07/2019 (Shift-III)

Ans. (c) : MP = ₹600, Loss = ₹30

$$\text{Price after 25\% discount} = 600 \times \frac{(100 - 25)}{100}$$

$$= 600 \times \frac{75}{100}$$

$$= ₹450$$

$$\text{CP} = 450 + 30$$

$$\text{CP} = ₹480$$

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100$$

$$\text{Loss \%} = \frac{30}{480} \times 100$$

$$\text{Loss \%} = 6.25\%$$

158. After giving a 10% discount on the marked price of an item, it is sold for ₹360. If the discount is not given, there would have been a profit of 25% . What is the cost price of item?

- (a) ₹350 (b) ₹320
(c) ₹325 (d) ₹360

SSC CHSL 02/07/2019 (Shift-I)

$$\text{Ans. (b) : } \therefore \text{S.P} = \frac{\text{M.P}(100 - D)}{100}$$

$$360 = \text{M.P} \times \left(\frac{100 - 10}{100} \right)$$

$$\text{M.P} = 400$$

$$\therefore \frac{\text{M.P}}{\text{C.P}} = \frac{100 + P\%}{100 - D\%}$$

$$\frac{400}{\text{C.P}} = \frac{125}{100} \quad (\text{Discount} = 0\%)$$

$$\text{C.P} = \frac{400 \times 100}{125} = ₹320$$

159. The marked price of an article is ₹400. After giving 20% discount on marked price, a shopkeeper gains ₹32. His gain percentage is:

- (a) $12\frac{1}{9}\%$ (b) 9%
(c) $11\frac{1}{9}\%$ (d) 8%

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c) : According to the question,

$$\text{Selling Price} = 400 \times \frac{80}{100} = ₹ 320$$

$$\text{Cost Price} = \text{Selling Price} - \text{Profit}$$

$$= 320 - 32$$

$$\text{Cost Price} = ₹288$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$

$$= \frac{32}{288} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

160. A shopkeeper marks his goods 25% above the cost price. He sells three-fourths of the goods at marked price and the remaining at a discount of 40% on the marked price. The profit/loss percentage of the shopkeeper is:

- (a) 8.75% loss
- (b) 12.5% loss
- (c) 10.5% profit
- (d) 12.5% profit

SSC CHSL 04/07/2019 (Shift-I)

Ans. (d) : Let, Cost price of goods = ₹ 100

Then, Marked Price = ₹ 125

According to the question,

$$\begin{aligned} \text{Selling Price of goods} &= \frac{3}{4} \times 125 + \frac{1}{4} \times 125 \times \frac{60}{100} \\ &= 93.75 + 18.75 \\ &= 112.5 \end{aligned}$$

Profit = Selling Price - Cost Price

$$\text{Profit} = 112.5 - 100 = 12.5$$

$$\text{Profit\%} = \frac{12.5}{100} \times 100$$

Hence, ∴ Profit % = 12.5

161. The shirt had a discount of 25%. A woman bought that shirt, she got an additional 20% discount for paying cash and being a loyal customer she got another discount of 10%. She paid ₹324. What was the price tag (in ₹) on the shirt?

- (a) ₹750
- (b) ₹650
- (c) ₹600
- (d) ₹725

SSC CHSL 05/07/2019 (Shift-II)

Ans. (c) : Let Price tag on shirt be ₹ P.

According to the question,

$$324 = P \times \left(\frac{100-25}{100} \right) \times \left(\frac{100-20}{100} \right) \times \left(\frac{100-10}{100} \right)$$

$$324 = P \times \frac{75}{100} \times \frac{80}{100} \times \frac{90}{100}$$

$$324 = P \times \frac{3}{4} \times \frac{4}{5} \times \frac{9}{10}$$

$$P = \frac{324 \times 50}{27}$$

$$P = 12 \times 50$$

$$P = ₹ 600$$

Hence, Price tag on shirt is ₹ 600

162. A dealer buys an item of marked price of ₹20000 at two successive discount of 20% and 5%. He spends ₹1800 on its repair and sells it for ₹20000. What is his profit/loss percentage (up to two decimal places)?

- (a) 23.46% Profit
- (b) 17.65% Loss
- (c) 17.65% Profit
- (d) 23.64% Loss

SSC CHSL 08/07/2019 (Shift-III)

Ans. (c) : Given,

$$\text{MP} = ₹20000$$

$$\therefore \text{CP} = 20000 \times \frac{80}{100} \times \frac{95}{100} = ₹15200$$

Expenditure repair = ₹1800

Hence total CP = 15200 + 1800 = ₹17000

SP = ₹20000

$$\text{Profit \%} = \left(\frac{20000-17000}{17000} \right) \times 100$$

$$= \frac{3000 \times 100}{17000} = 17.647\% \approx 17.65\%$$

163. A shopkeeper usually give a discount of 10% on the marked price of each item. During a sale season, he decides to give two more discounts—first discount is at the rate of 50% of the original discount and the second discount at the rate of 40% of the first. What would be the equivalent rate of a single discount (correct to two places of decimal) of all these discounts?

- (a) 14.85%
- (b) 13.27%
- (c) 16.21%
- (d) 11.25%

SSC CHSL 10/07/2019 (Shift-II)

Ans. (c) : Original discount = 10%

According to the question,

$$\text{First discount} = 10 \times \frac{50}{100} = 5\%$$

$$\text{Second discount} = 5 \times \frac{40}{100} = 2\%$$

Now the equivalent discount percentage of three successive discount of 10%, 5% and 2% = -14.5

$$-10 - 5 - 2 + \frac{10 \times 5}{100} + \frac{5 \times 2}{100} + \frac{10 \times 2}{100} - \frac{5 \times 10 \times 2}{10000}$$

$$-17 + 0.5 + 0.1 + 0.2 - 0.01 \Rightarrow -16.21\%$$

Equivalent single discount % = 16.21%.

164. The marked price of an article is 40% more than its cost price. If a discount of 5% is given, then what is the profit percentage?

- (a) 28%
- (b) 33%
- (c) 35%
- (d) 38%

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) Let, CP of the article = ₹ 100

MP = ₹ 140

$$\text{Discount} = \frac{140 \times 5}{100} = 7$$

SP after 5% discount = 140 - 7 = ₹ 133

$$\text{Profit\%} = \frac{133-100}{100} \times 100 = 33\%$$

165. The marked price of an article is ₹ 720. A shopkeeper gives a discount of 20% and still makes a profit of 20%. What is the cost price (in ₹) of the article?

- (a) ₹480
- (b) ₹560
- (c) ₹450
- (d) ₹600

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : Let, Cost Price of article = ₹ x

$$x = 720 \times \frac{(100 - 20)}{100} \times \frac{100}{(100 + 20)}$$

$$x = \frac{720 \times 80}{120} = 480$$

Hence, CP of article = ₹ 480

166. The marked price of an article is ₹ 1050. A shopkeeper gives a discount of 30% and still makes a profit of 40%. What is the cost price (in ₹) of the article.

- (a) 495 (b) 475
(c) 500 (d) 525

SSC MTS 10-10-2017 (Shift-II)

Ans. (d) : Let CP = ₹ x

According to the question,

$$1050 \times \frac{(100 - 30)}{100} = x \times \frac{(100 + 40)}{100}$$

$$105 \times 70 = x \times 14$$

$$\Rightarrow x = 5 \times 105$$

$$x = ₹ 525$$

167. A seller offers 11% discount on a mini-refrigerator with a marked price of ₹ 8200. If he still earns a profit of ₹ 600, what is the cost price of the refrigerator ?

- (a) ₹ 6698 (b) ₹ 7600
(c) ₹ 7350 (d) ₹ 4960

SSC MTS 7-10-2017 (Shift-I)

Ans. (a) : MP = 8200

ATQ,

$$SP = 8200 \times \frac{89}{100}$$

$$SP = 7298$$

$$CP = SP - \text{Profit}$$

$$CP = 7298 - 600$$

$$CP = ₹ 6698$$

168. A shopkeeper offers 19% discount on mobile phone with a marked price of ₹ 7400. If he still earns a profit of ₹ 500, what is the cost price of the phone ?

- (a) ₹ 6900 (b) ₹ 8340
(c) ₹ 5494 (d) ₹ 4950

SSC MTS 7-10-2017 (Shift-I)

Ans. (c) : $SP = 7400 \times \frac{81}{100}$

$$= 5994$$

$$CP = 5994 - 500$$

$$= ₹ 5494$$

169. The marked price of an object is 20% more than the cost price. The Shopkeeper bears a loss of 10% after giving a discount of x% on the marked price. What is the value of x?

- (a) 30
(b) 28
(c) 20
(d) 25

SSC MTS 20/08/2019 (Shift-I)

Ans. (d) : Profit/Loss % = $M - D - \frac{M \times D}{100}$

Where, M = Marked UP%

D = Discount%

$$-10 = 20 - x - \frac{20x}{100}$$

$$\frac{6x}{5} = 30$$

$$x = 25$$

170. The cost price and the selling price of a shirt are ₹960 and ₹1392 respectively. If by bargaining a customer can bring the selling price down by 10% of the cost price, then what is the profit percentage?

- (a) 55% (b) 35%
(c) 30% (d) 45%

SSC MTS 08/08/2019 (Shift-I)

Ans. (b) : Selling price after bargaining

$$= 1392 - 960 \times \frac{10}{100}$$

$$= 1296$$

$$\text{Profit} = 1296 - 960 = 336$$

$$\text{Profit \%} = \frac{336}{960} \times 100 = 35\%$$

171. The marked price of an article is $\frac{7}{5}$ of the cost price. If discount of 20% is given on the marked price. Then what is the profit percentage?

- (a) 22% (b) 12%
(c) 18% (d) 15%

SSC MTS 19/08/2019 (Shift-II)

Ans. (b) : Let Profit % = x

We know that, $\frac{MP}{CP} = \frac{(100 + P\%)}{(100 - D\%)}$

$$\frac{7}{5} = \left(\frac{100 + x}{100 - 20} \right)$$

$$\frac{7}{5} = \frac{100 + x}{80}$$

$$112 = 100 + x$$

$$\boxed{x = 12\%}$$

172. An item is marked 37.5% above the cost price. If a discount of 9.09% is allowed, then the profit percentage (correct to nearest integer) is:
- (a) 25% (b) 15%
(c) 10% (d) 20%

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) :

$$37.5\% = \frac{3}{8}$$

$$9.09\% = \frac{1}{11}$$

Let CP of the article = ₹88

According to the question,

$$MP = 88 \times \frac{11}{8} = ₹121$$

$$SP = 121 \times \frac{10}{11} = 110$$

$$\text{Profit} = 110 - 88 = 22$$

$$\text{Profit}\% = \frac{22}{88} \times 100 = 25\%$$

173. A shopkeeper earns 30% profit after giving 20% discount on a object. Marked price is what percent of cost price?

- (a) 122.5% (b) 137.5%
(c) 150% (d) 162.5%

SSC MTS 06/08/2019 (Shift-I)

Ans. (d) : Let CP of the article = ₹ 100

Now, SP of the article = ₹ 130

According to the question,

$$MP = 130 \times \frac{100}{80} = ₹ 162.5$$

$$\text{Required \%} = \frac{MP}{CP} \times 100 = \frac{162.5}{100} \times 100$$

$$= 162.5\%$$

174. If a shopkeeper marks the price of goods 40% more than their cost price and allows a discount of 30%, then what is his gain or loss percent?

- (a) 5% loss (b) 10% loss
(c) 2% loss (d) 7.5% loss

SSC MTS 10-10-2017 (Shift-II)

Ans. (c) : Let CP = 100

$$\therefore MP = 140$$

After discount of 30%

$$SP = 140 \times \left(\frac{100 - 30}{100} \right)$$

$$= 140 \times \frac{70}{100} = 98$$

$$\text{Loss} = CP - SP$$

$$\text{Loss} = 100 - 98 = 2$$

$$\text{Hence, Loss \%} = \frac{2}{100} \times 100 = 2\%$$

175. A vendor marked the price of an item 25% above the cost. If he offers a discount of 15% on the marked price, then what is his gain/loss percentage?

- (a) Gain 5% (b) No gain no loss
(c) Loss 5% (d) Gain 6.25%

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : Let, Marked Price = MP, Cost price = CP

$$CP = 100$$

$$MP = 125$$

$$\frac{CP \times (100 \pm P/L\%)}{100} = \frac{MP \times (100 - D\%)}{100}$$

$$100 \times (100 + P) = 125 \times (100 - 15) = 125 \times 85$$

$$4(100 + P) = 425$$

$$4P = 25$$

$$P = 6.25\%$$

176. A trader marks his goods 42% above the cost price and allows a discount of 24%. His gain percent is

- (a) 7.92 (b) 18
(c) 9 (d) 8.24

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (a) : Let Cost Price (CP) = ₹100

Marked Price (MP) = ₹142

$$\text{Selling price (SP)} = 142 \times \frac{76}{100} = ₹107.92$$

$$\text{Required profit \%} = \frac{(107.92 - 100)}{100} \times 100 = 7.92\%$$

177. A shopkeeper announced a 30% discount on the marked price of an item. A person bought the item from the shop for ₹ 21,000 after getting the discount, and sold the item to a customer in such a way that he earned a profit of 32% on the marked price. What is the profit (in ₹) the person earned by selling the item?

- (a) 10,000 (b) 9,600
(c) 21,600 (d) 18,600

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : Given,

$$CP = ₹ 21000$$

$$\therefore MP = 21000 \times \frac{100}{70} = ₹ 30000$$

\therefore He makes a profit of 32% at MP

$$\therefore SP = 30000 \times \frac{132}{100} = ₹ 39600$$

Profit earned by the person on selling the articles

$$= 39600 - 21000$$

$$= ₹ 18,600$$

11.

Simple Interest

(I) Problems based on Fundamental of Simple Interest

1. A sum of money becomes ₹3,364 at a rate of 16% compounded annually for 2 years.

- (a) ₹ 2,500 (b) ₹ 1,800
(c) ₹ 3,800 (d) ₹ 2,200

SSC CHSL 24/05/2022 (Shift- III)

Ans. (a) : Amount - ₹3,364

$$\text{Rate} - 16\% \text{ p.a.} \Rightarrow \frac{4}{25}$$

$$\text{Time} - 2 \text{ years} \\ \frac{25}{25} \quad \frac{29}{29}$$

$$\text{Principal} \rightarrow 625 \quad 841 \rightarrow \text{Amount}$$

$$841 \text{ units} = 3364$$

$$625 \text{ units} = \frac{3364}{841} \times 625 = ₹2500$$

2. The difference between the simple interest on a fixed amount for 7 years and on the same amount for 12 years is ₹ 2,500. If the rate of interest is 10% p.a., then the amount is:

- (a) ₹ 6,000 (b) ₹ 5,000
(c) ₹ 4,500 (d) ₹ 5,500

SSC CHSL 11/08/2021 (Shift-I)

Ans. (b) : According to the question,

$$\Delta \text{SI} = \frac{P \times R \times (t_2 - t_1)}{100}$$

Δ = Difference

$$\therefore \frac{P \times 10 \times (12 - 7)}{100} = 2500$$

$$\frac{P \times 50}{100} = 2500$$

$$P = 5000 \text{ Rs.}$$

3. A person invested a sum of ₹6500 at x% per annum at simple interest and a sum of ₹7500 at (x-2)% per annum at simple interest. If the total interest earned on both the investment for 3 years is ₹3,750, then the rate of interest on the first investment is

- (a) 14% (b) 10%
(c) 8% (d) 12%

SSC MTS 12/10/2021 (Shift-I)

$$\text{Ans. (b) : } \frac{6500 \times x \times 3}{100} + \frac{7500(x-2) \times 3}{100} = 3750 \\ 195x + (75x - 150) \times 3 = 3750$$

$$195x + 225x - 450 = 3750$$

$$420x = 4200$$

$$x = \frac{4200}{420} = 10\%$$

4. A sum of ₹25600 is invested on simple interest partly at 7% per annum and the remaining at 9% per annum. The total interest at the end of 3 years is ₹5832. How much money (in ₹) was invested at 9% per annum?

- (a) 18000 (b) 7600
(c) 9600 (d) 16000

SSC CGL-(Tier-I) 2308/2021 (Shift I)

Ans. (b) : Let ₹x was invested at 9% per annum.

$$\therefore \text{SI} = \frac{P \times R \times T}{100}$$

$$\frac{(25600 - x) \times 7 \times 3}{100} + \frac{x \times 9 \times 3}{100} = 5832$$

$$179200 - 7x + 9x = 194400$$

$$2x = 15200$$

$$x = 7600$$

5. In how many years, will ₹5450 amount to ₹8175, if invested at simple interest at the rate of 12.5% per annum?

- (a) 6 (b) 3
(c) 5 (d) 4

SSC CHSL 16/04/2021 (Shift-I)

Ans. (d) : SI = 8175 - 5450 = ₹2725

$$\text{from- SI} = \frac{P \times R \times T}{100}$$

$$2725 = \frac{5450 \times 12.5 \times T}{100}$$

$$T = \frac{50}{12.5} = 4 \text{ years}$$

6. What is the simple interest on a sum of ₹99000 at 12½% per annum for a period of 9 months?

- (a) ₹8281.25 (b) ₹9282.25
(c) ₹7281.25 (d) ₹9281.25

SSC CHSL 13/04/2021 (Shift-I)

$$\text{Ans. (d) : SI} = \frac{P \times R \times T}{100}$$

$$= \frac{99000 \times 25 \times 9}{100 \times 2 \times 12}$$

$$= ₹9281.25$$

7. In how much time will a sum of ₹5,000 invested at the rate of 15% simple interest per annum amount to ₹6,500?

- (a) 1 year (b) 2.5 year
(c) 2 year (d) 1.5 year

SSC CHSL 11/08/2021 (Shift-III)

Ans. (c) : SI = 6500 - 5000 = ₹1500

$$\text{From - SI} = \frac{P \times R \times T}{100}$$

$$1500 = \frac{5000 \times 15 \times T}{100}$$

$$T = \frac{1500}{50 \times 15} = 2 \text{ years}$$

8. If the simple interest for 9 years be equal to 45% of the principal, then the rate of interest per annum is equal to:

- (a) 6% (b) 8%
(c) 5% (d) 9%

SSC CHSL 15/04/2021 (Shift-II)

Ans : (c) Let principal be ₹x.

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$\frac{45}{100}x = \frac{x \times R \times 9}{100}$$

$$R = \frac{45}{9} = 5\%$$

9. At what rate of interest will a sum of ₹4,500 amount to ₹6,525 at simple interest for 5 years?

- (a) 9% (b) 8%
(c) 10% (d) 12%

SSC CGL (Tier-II)-2019 – 18/11/2020 (Shift-I)

Ans. (a) : According to the question,

$$\text{Rate of interest for 5 years} = \frac{6,525 - 4,500}{4500} \times 100$$

$$= \frac{2025}{4500} \times 100$$

$$= 45$$

$$\text{So, Rate of Interest of 1 year} = \frac{45}{5} = 9\%$$

10. A person invested one-fourth of the sum of ₹25,000 at a certain rate of simple interest and the rest at 4% p.a. higher rate. If the total interest received for 2 years is ₹4,125, what is the rate at which the second sum was invested?

- (a) 9.25% (b) 9.5%
(c) 7.5% (d) 5.25%

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : Let fixed interest rate = r%

$$\frac{6250 \times r \times 2}{100} + \frac{18750 \times (r+4) \times 2}{100} = 4125$$

$$\frac{10r}{10} + \frac{30(r+4)}{10} = 33$$

$$r + 3r + 12 = 33$$

$$4r = 21$$

$$r = 5.25$$

$$\therefore \text{Rate of Interest of second amount} = 5.25 + 4 = 9.25\%$$

11. A sum lent out at simple interest amounts to ₹6,076 in 1 year and ₹7,504 in 4 years. The sum and the rate of interest p.a. are respectively:

- (a) ₹5,400 and 10% (b) ₹5,600 and 8.5%
(c) ₹5,400 and 9% (d) ₹5,600 and 9%

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let Principal amount = x Rs.

$$\therefore \text{S.I. of 3 year} = 7504 - 6076 = 1428$$

$$\text{S.I. of 1 year} = \frac{1428}{3} = 476$$

$$\therefore \text{Principal} = 6076 - 476 = 5600 \text{ Rs.}$$

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$476 \times 100 = 5600 \times \text{Rate} \times 1$$

$$\frac{476 \times 100}{5600} = \text{Rate}$$

$$\text{Rate} = \frac{476}{56} = 8.5\%$$

Trick:

$$\boxed{P} \xrightarrow{1y} 6076 \text{ Rs.} \xrightarrow{+1428} \xrightarrow{3y} 7504 \text{ Rs.}$$

$$\text{Interest of 1 year} = \frac{1428}{3} = 476 \text{ Rs.}$$

$$\text{Principal} = 6076 - 476 = 5600 \text{ Rs.}$$

$$\text{Rate of interest} = \frac{476}{5600} \times 100 = 8.5\%$$

12. A sum of ₹10,500 amounts to ₹13,825 in $3\frac{4}{5}$ years at a certain rate percent annum simple interest. What will be the simple interest on the same sum for 5 years at double the earlier rate?

- (a) ₹8,670 (b) ₹8,750
(c) ₹8,470 (d) ₹8,560

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$$A = P \left(1 + \frac{RT}{100} \right)$$

$$13825 = 10500 \left(1 + \frac{R \times 19}{500} \right)$$

$$\frac{79}{60} = 1 + \frac{R \times 19}{500}$$

$$\frac{19}{60} = \frac{R \times 19}{500}$$

$$R = \frac{25}{3}\%$$

If rate of interest is double, then new interest rate

$$= \frac{25}{3} \times 2 = \frac{50}{3}$$

$$\text{Required S.I.} = \frac{10500 \times 50 \times 5}{300} = 8750 \text{ Rs.}$$

13. A sum of Rs. 36,000 is divided into two parts A and B such that the simple interest at the rate of 15% p.a. on A and B after two years and four years respectively is equal. The total interest (Rs. in) received from A is:

- (a) ₹3,600 (b) ₹1,800
(c) ₹5,400 (d) ₹7,200

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (d) : Let amount of A be x Rs.

$$\therefore \text{Amount of B} = (36000 - x) \text{ Rs.}$$

According to the question,

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

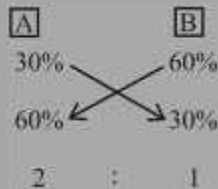
$$\frac{x \times 15 \times 2}{100} = \frac{(36000 - x) \times 15 \times 4}{100}$$

$$3x = 72000$$

$$x = 24000 \text{ Rs.}$$

$$\text{Hence, Total interest received by A} = \frac{24000 \times 15 \times 2}{100} = 7200 \text{ Rs.}$$

Trick:



$$\therefore \text{The total Principal received from A} = \frac{2}{3} \times 36000 = 24000 \text{ Rs.}$$

$$\text{So, total interest received from A} = 24000 \times \frac{30}{100} = 7200 \text{ Rs.}$$

14. A person invested ₹12,000 on simple interest for 7 years to obtain a total amount of ₹20,400 on a certain annual rate of interest. What was the rate of interest to obtain the above amount?

- (a) 8% (b) 7%
(c) 9% (d) 10%

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) : Given that

Time (T) = 7 year

Total amount = 20400Rs.

Principal amount = 12000Rs.

$$\begin{aligned} \text{Interest} &= \text{Total amount} - \text{Principal amount} \\ &= 20400 - 12000 \\ &= 8400 \text{ Rs.} \end{aligned}$$

$$\therefore \text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$8400 = \frac{12000 \times \text{Rate} \times 7}{100}$$

$$\text{Rate} = \frac{8400 \times 100}{84000}$$

$$\text{Rate} = 10\%$$

Trick:

7 years interest = 20400 - 12000 = 8400 Rs.

1 years interest = 1200Rs.

$$\text{Rate of interest} = \frac{1200}{12000} \times 100 = 10\%$$

15. If the annual rate of simple interest increases

from 11% to $17\frac{1}{2}\%$ then a person's yearly

income increases by 1,071.20. The simple interest (in ₹) on the same sum at 10% for 5 years is:

- (a) ₹8,240 (b) ₹9,120
(c) ₹7,250 (d) ₹16,480

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a): Annual rate of S.I. increase 11% to $17\frac{1}{2}\%$

$$\text{Rate increased by} = 6\frac{1}{2}\% = \frac{13}{2}\%$$

$$\frac{13}{2}\% = 1071.20$$

$$\frac{1}{2}\% = 82.4$$

$$1\% = 82.4 \times 2$$

$$1\% = 164.8$$

Simple interest on the same sum at 10% for 5 years.

$$50\% = 164.8 \times 50 = ₹8240$$

16. If the annual rate of simple interest increases

from 11% to $17\frac{1}{2}\%$, a person's yearly income

increases by ₹1,071.20. The principal amount invested (in ₹) is ?

- (a) ₹19,120 (b) ₹16,480
(c) ₹17,250 (d) ₹10,710

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : Before after
11% 17.5%

Rate Increases = 6.5%

According to the question,

$$6.5\% \rightarrow 1071.20$$

$$\therefore 100\% \rightarrow \frac{1071.20}{6.5} \times 100 = 16480$$

So, Principal amount invested (in Rs.) = ₹16480

17. Sunita invested ₹12,000 on simple interest at the rate of 10% p.a. to obtain a total amount of ₹20,400 after a certain period. For how many years did she invest to obtain the above amount?

- (a) 6 years (b) 8 years
(c) 9 years (d) 7 years

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d): Given that,

Principal amount = ₹12000

Final amount = ₹20400

Rate = 10%

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore (20400 - 12000) = \frac{12000 \times 10 \times \text{Time}}{100}$$

$$\text{Time} = \frac{8400 \times 100}{12000 \times 10}$$

$$\text{Time} = 7 \text{ years}$$

18. A certain sum (in ₹) is invested at y% per annum for 3½ years. Had it been invested at (y + 4)% per annum at simple interest, it would have fetched ₹4,452 more as interest. What is the sum?

- (a) ₹31,800 (b) ₹42,800
(c) ₹30,400 (d) ₹42,400

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (a) Let principal amount be Rs. P

According to the question,

$$\frac{P \times (y + 4) \times \frac{7}{2}}{100} - \frac{P \times y \times \frac{7}{2}}{100} = 4452$$

$$\frac{P \times 7}{100 \times 2} [y + 4 - y] = 4452$$

$$P = \frac{4452 \times 100 \times 2}{4 \times 7}$$

$$P = ₹31,800$$

19. Sudeep invested 1/8 of a certain sum at 5% p.a. for two years and 3/5 of the sum at 6% p.a. for two years and the remaining at 10% p.a. for two years. If the total interest received is ₹1,674, then the total sum invested is ?

- (a) ₹13,000 (b) ₹10,500
(c) ₹12,500 (d) ₹12,000

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d) Let total amount invested = ₹ 40x

$$\frac{5x \times 5 \times 2}{100} + \frac{24x \times 6 \times 2}{100} + \frac{11x \times 10 \times 2}{100} = 1674$$

$$25x + 144x + 110x = 83700$$

$$279x = 83700$$

$$x = 300$$

∴ Total amount = ₹12000

20. A person invested a sum of ₹10,500 at x% per annum at simple interest and a sum of ₹13,500 at (x + 2)% p.a. at simple interest. If the total interest earned on both the investments for 3 years is ₹7,650, then the rate of interest on the first investment is?

- (a) 9.5% (b) 9%
(c) 8.5% (d) 8%

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (a)

$$\text{Simple Interest} = \frac{P \times R \times T}{100}$$

$$\frac{10500 \times x \times 3}{100} + \frac{13500 \times (x + 2) \times 3}{100} = 7650$$

$$315x + 405(x + 2) = 7650$$

$$315x + 405x + 810 = 7650$$

$$720x = 6840$$

$$x = \frac{6840}{720} = \frac{57}{6} = 9.5\%$$

∴ The rate of interest on the first investment = 9.5%

21. A person invested a sum of ₹18,600 at x% p.a. and another sum that is twice the former at (x + 2)% p.a. both at simple interest. If the total interest earned on both investments for 3½ years is ₹23,110.50, then the rate of interest p.a. on the second investment is:

- (a) 13% (b) 11%
(c) 12.5% (d) 10.5%

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c) According to the question,

$$\frac{18600 \times x \times 7/2}{100} + \frac{(18600 \times 2)(x + 2) \times 7/2}{100} = 23110.50$$

$$93x + 186x + 372 = 3301.5$$

$$279x = 2929.5$$

$$x = 10.5\%$$

∴ The rate of interest on the second investment = x + 2 = 10.5 + 2 = 12.5%

22. A certain sum (in ₹) is invested at simple interest at x% p.a. for 5 years. Had it been invested at (x + 5)% p.a., the simple interest would have been ₹9,200 more than the earlier one. What is the sum?

- (a) ₹35,800 (b) ₹36,800
(c) ₹36,400 (d) ₹40,000

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b) Let amount = P

$$\frac{P \times (x + 5) \times 5}{100} - \frac{P \times x \times 5}{100} = 9200$$

$$\frac{5Px + 25P - 5Px}{100} = 9200$$

$$P = ₹36800$$

23. Two equal sums are borrowed at 10% and 8% simple interest p.a. respectively, at the same time. The first sum is received 2 years earlier than the second one and the amount received in each case was ₹36,900. Each sum was _____?

- (a) ₹20,200 (b) ₹18,100
(c) ₹21,500 (d) ₹20,500

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) Let principal amount be = ₹ P

∴ Taken time is (t - 2) and t years.

But difference time taken by them = 2 years.

∴ Both the sums are equal and each receives the same amount so interest will also be received equal

$$\frac{P \times 10 \times (t - 2)}{100} = \frac{P \times 8 \times t}{100}$$

$$10t - 20 = 8t$$

$$t = 10 \text{ years}$$

$$P + SI_1 = 36900$$

$$P \left(1 + \frac{10 \times 8}{100} \right) = 36900$$

$$P = \frac{36900 \times 100}{180}$$

$$P = ₹20500$$

So, Each sum was Rs. 20500

24. In how many years will a sum of ₹5000 yield a simple interest of ₹2,000 at an interest rate of 10% p.a.?

- (a) 6 years (b) 4 years
(c) 5 years (d) 3 years

SSC CHSL -15/10/2020 (Shift-III)

Ans. (b) : $S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$2000 = \frac{5000 \times 10 \times \text{Time}}{100}$$

$$\text{Time} = \frac{2000 \times 100}{5000 \times 10} = 4 \text{ years}$$

25. A man took a loan from a bank at the rate of 11% p.a. simple interest. After three years, he had to pay ₹9,570 interest only for the period. The principal amount borrowed by him was:

- (a) ₹26,545 (b) ₹29,000
(c) ₹27,685 (d) ₹25,000

SSC CHSL -19/10/2020 (Shift-III)

Ans. (b) : ∴ $S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$9570 = \frac{\text{Principal} \times 11 \times 3}{100}$$

$$\text{Principal amount} = \frac{9570 \times 100}{11 \times 3} = ₹ 29000$$

26. The sum of simple interest on a sum at 8% p.a. for 4 years and 8 years is ₹960. The sum is:

- (a) ₹1100 (b) ₹800
(c) ₹900 (d) ₹1000

SSC CHSL -19/10/2020 (Shift-II)

Ans. (d) : Let the amount is P.

$$S.I. = \frac{P \times R \times t}{100}$$

$$\therefore \frac{P \times 8 \times 4 + P \times 8 \times 8}{100} = 960$$

$$P(32+64) = 960 \times 100$$

$$P \times 96 = 960 \times 100$$

$$P = ₹1000$$

27. An amount of ₹12,000 was borrowed at simple interest, at an interest rate, After four months, ₹6000 more were added to it and the rate of interest on the total principal was doubled against the previous rate ₹2800 was paid as interest at the end of the year, calculate the rate of interest initially charged?

- (a) 10% (b) 12%
(c) 14% (d) 16%

SSC CHSL -13/10/2020 (Shift-I)

Ans. (a) : Let an amount of Rs. 12000 was borrowed at simple interest, at an interest rate on r%.

After four months the amount becomes (12000 + 6000) = 18000

According to the question,

The rate of interest on the total principal amount on 18000 was doubled = 2r%

$$\text{Interest for four months} = 12000 \times r \times \frac{1}{3} \times \frac{1}{100}$$

∴ 2800 was paid as interest at the end of the year.

$$\text{So, } 12000 \times r \times \frac{1}{3} \times \frac{1}{100} + 18000 \times 2r \times \frac{2}{3} \times \frac{1}{100} = 2800$$

$$280r = 2800$$

$$r = 10\%$$

28. A person deposits ₹8,000 in a bank which pays 8% p.a. simple interest. The amount after 8 years will be:

- (a) ₹12,545 (b) ₹10,784
(c) ₹12,600 (d) ₹13,120

SSC CHSL -12/10/2020 (Shift-III)

Ans. (d) : Principal amount = ₹8000

Rate = 8% per annum

Time = 8 years

$$S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{8000 \times 8 \times 8}{100}$$

$$= \frac{512000}{100} = 5120$$

Amount = Principal amount + Interest

$$= 8000 + 5120$$

$$= ₹13120$$

29. In how many years will the simple interest on a sum of money be equal to the principal at the rate of $12\frac{2}{4}\%$ p.a?

- (a) 7 years (b) 6 years
(c) 8 years (d) 5 years

SSC CHSL -12/10/2020 (Shift-II)

Ans. (c) : Let Principal amount is P and simple interest, at the rate of $12\frac{2}{4}\%$ per annum will be P in time t.

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$P = \frac{P \times 12\frac{2}{4} \times t}{100}$$

$$100 = \frac{50}{4} t$$

$$t = 8 \text{ years}$$

30. In how many years shall ₹ 3,500 invested at the rate of 10% simple interest per annum, amount to ₹ 4,500?

- (a) $2\frac{6}{7}$ years (b) $2\frac{5}{7}$ years
(c) $2\frac{3}{7}$ years (d) $2\frac{4}{7}$ years

SSC CHSL -12/10/2020 (Shift-I)

Ans. (a) : Given that

Rate of simple interest = 10% per annum

Principal amount = ₹3500

Final amount = ₹4500

$\therefore \text{Interest} = \text{Final amount} - \text{Principal amount}$

$$= 4500 - 3500$$

$$= ₹1000$$

Time = ?

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{Time} = \frac{\text{S.I.} \times 100}{\text{Principal amount} \times \text{Rate}}$$

$$= \frac{1000 \times 100}{3500 \times 10} = \frac{100}{35} = 2\frac{6}{7} \text{ years}$$

31. Find the simple interest on ₹74,000 at $18\frac{2}{3}\%$ per annum for a period of 8 months?

- (a) ₹8,956.74 (b) ₹9,208.88
(c) ₹8,458.96 (d) ₹9,486.32

SSC CHSL -14/10/2020 (Shift-III)

Ans. (b) : Simple interest = $\frac{74000 \times 56 \times 8}{100 \times 3 \times 12}$
= ₹9208.88

32. Suresh borrowed out a sum of money to Rakesh for 5 years at simple interest. At the end of 5 years, Rakesh paid $\frac{9}{8}$ of the sum of Suresh to clear out the amount. Find the rate of simple interest per annum.

- (a) 3% p.a. (b) 2.5% p.a.
(c) 2% p.a. (d) 3% p.a.

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) : Let the principal amount x given to Rakesh by Suresh.

Rakesh was returned money to Suresh by the end of

$$\text{the year} = \frac{9}{8}x$$

$$\therefore \text{Interest} = \frac{9}{8}x - x = \frac{x}{8}$$

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$\frac{x}{8} = \frac{x \times R \times 5}{100}$$

$$\text{or } R = \frac{x \times 100}{8 \times 5 \times x} = \frac{100}{40} = 2.5$$

So the rate of Simple interest is 2.5% yearly.

33. If the present amount is ₹87,750 with 8% rate of interest in four years, then what was the principal amount?

- (a) ₹78,456.34 (b) ₹69,345.6
(c) ₹66477.27 (d) ₹56,896.98

SSC CHSL -18/03/2020 (Shift-II)

Ans. (c) : Let principal amount = P

According to the question,

$$P + \frac{P \times 8 \times 4}{100} = 87750$$

$$P \left(1 + \frac{8}{25} \right) = 87750$$

$$P \times \frac{33}{25} = 87750$$

$$P = \frac{87750 \times 25}{33}$$

$$P = ₹66477.27$$

Trick:

Rate of interest of 4 years = $8 \times 4 = 32\%$

$$132\% = 87750$$

$$100\% = \frac{87750}{132} \times 100$$

$$= 66477.27 \text{ Rs.}$$

34. Lata deposited an amount of ₹35,000 in a bank with simple interest 11% per annum. How much interest will she earn after one year?

- (a) ₹3,850 (b) ₹3,370
(c) ₹3,500 (d) ₹3,220

SSC CHSL -17/03/2020 (Shift-II)

Ans. (a) : Principal amount = ₹ 35000, Rate of simple interest = 11% yearly

Time = 1 years

$$\therefore \text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{35000 \times 11 \times 1}{100} = ₹ 3850$$

35. The difference of simple interest on a sum of money for 8 years and 10 years is ₹200. If the rate of interest is 10% p.a, then what is the sum of money?

- (a) ₹1,200 (b) ₹1,400
(c) ₹1,600 (d) ₹1,000

SSC CHSL -17/03/2020 (Shift-I)

Ans. (d) : $SI_1 - SI_2 = 200$

$$\frac{10 \times 10 \times P}{100} - \frac{8 \times 10 \times P}{100} = 200$$

[Where P = Principal amount]

$$10P - 8P = 2000$$

$$2P = 2000$$

$$P = ₹ 1000$$

36. At simple interest Gaurav borrows ₹1500 from Sandeep at the rate of 14% per annum. What amount of money should Gaurav pay to Sandeep after 1 year to clear the debt?

- (a) ₹1715 (b) ₹1700
(c) ₹1710 (d) ₹1705

SSC CHSL -20/10/2020 (Shift-III)

Ans : (c) $\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$

$$= \frac{1500 \times 14 \times 1}{100} = 210$$

\therefore Paid amount = Simple interest + Principal amount
= 210 + 1500 = ₹1710

37. If the total simple interest on a sum of ₹1,400 for 4 years at rate of interest x% p.a. and on the same sum for two years at the same rate, is ₹672, then the value of x is:

- (a) 6% (b) 9%
(c) 8% (d) 10%

SSC CHSL -21/10/2020 (Shift-III)

Ans. (c) Let the rate at x% p.a.

$$\text{Sum of simple Interest} = \frac{x \times 1400 \times 4}{100} + \frac{x \times 1400 \times 2}{100}$$

$$672 = 56x + 28x$$

$$84x = 672$$

$$x = \frac{672}{84}$$

$$x = 8\%$$

38. A sum of money amounts to ₹7,500 in 5 years, and to ₹8,500 in 7 years at simple interest at the same rate of interest. The rate of interest per annum is:

- (a) 12% (b) 8%
(c) 10% (d) 9%

SSC CHSL -21/10/2020 (Shift-I)

Ans. (c) Let Principal amount = ₹P

Rate of interest per annum = R%

then, $\text{Final amount} = P \left(1 + \frac{RT}{100} \right)$

\therefore From above question, $P \left(1 + \frac{R \times 5}{100} \right) = 7500 \dots (i)$

and, $P \left(1 + \frac{R \times 7}{100} \right) = 8500 \dots (ii)$

Eqn. (i) \div (ii)

$$\frac{P \left(1 + \frac{5R}{100} \right)}{P \left(1 + \frac{7R}{100} \right)} = \frac{7500}{8500} = \frac{15}{17}$$

$$17 + \frac{85R}{100} = 15 + \frac{105R}{100}$$

$$\frac{105R - 85R}{100} = 17 - 15$$

$$\frac{20R}{100} = 2$$

$$\Rightarrow \boxed{R = 10\%}$$

Trick:

$$\boxed{P} \xrightarrow{5y} 7500 \text{Rs.} \xleftarrow{+1000 \text{Rs.}} 8500 \text{Rs.}$$

Interest of 1 years = 500 Rs.

Interest of 5 years = 2500 Rs.

\therefore Principal amount = 7500 - 2500
= 5000 Rs.

$$\text{Rate of interest} = \frac{500}{5000} \times 100 = 10\%$$

39. In how many years and months will a sum of ₹24 becomes ₹56 at 16% simple interest per annum?

- (a) 7 years 8 months (b) 6 years 11 months
(c) 6 years 5 months (d) 8 years 4 months

SSC CHSL -15/10/2020 (Shift-II)

Ans. (d) : Principal amount = ₹24

Amount = ₹56

Simple interest = 56 - 24
= ₹32

Rate of interest = 16% per annum

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$32 = \frac{24 \times 16 \times n}{100}$$

$$n = \frac{32 \times 100}{24 \times 16}$$

$$= \frac{100}{12}$$

$$n = 8 \frac{4}{12} = 8 \frac{1}{3} \text{ year}$$

Time = 8 years 4 months

40. A sum of 2000 is invested on simple interest for three years at the rate of 10% per annum, then the amount will be.

- (a) ₹2900 (b) ₹2600
(c) ₹2300 (d) ₹2500

SSC MTS 08/08/2019 (Shift-I)

Ans. (b) :

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{2000 \times 10 \times 3}{100}$$

$$= 600$$

Final amount = Principal amount + Simple interest
= 2000 + 600
= ₹ 2600

41. The simple interest on a certain sum for two years is ₹1000 at the rate of 10% per annum. What is the amount after these two years ?

- (a) ₹ 6500 (b) ₹ 6000
(c) ₹ 7000 (d) ₹ 5500

SSC MTS 07/08/2019 (Shift-II)

Ans. (b): S.I = Simple Interest = $\frac{P \times R \times T}{100}$

$$1000 = \frac{P \times 10 \times 2}{100}$$

$$P = ₹5000$$

The amount after two years = S.I + P
= 1000 + 5000
= ₹6000

42. A sum doubles in seven years at simple interest. In how many years will the sum become five times the original sum?

- (a) 35 (b) 21
(c) 28 (d) 30

SSC MTS 09/08/2019 (Shift-II)

Ans. (c) : Let principal amount be = P

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

condition 1st, $(2P - P) = \frac{P \times 7 \times R}{100}$

$$P = \frac{P \times 7 \times R}{100}$$

$$R = \frac{100}{7}$$

$$\text{condition 2}^{\text{nd}}, (5P - P) = \frac{P \times 100}{7} \times T$$

$$4P = \frac{P \times 100 \times T}{100 \times 7}$$

$$T = 28$$

Trick:

$$100\text{Rs.} \xrightarrow{+100\text{Rs.}} 200\text{Rs.}$$

$$100\text{Rs.} \xrightarrow{+400\text{Rs.}} 500\text{Rs.}$$

Get 100 Rs. interest = 7 years

Get 400 Rs. interest = 28 years

43. If the ratio of principal and the simple interest for 5 years is 10 : 7, then the rate of interest (per annum) is:

- (a) 15% (b) 20%
(c) 10% (d) 14%

SSC MTS 09/08/2019 (Shift-I)

Ans. (d) : ∴ P : S.I = 10 : 7

$$\therefore \text{S.I} = \frac{P \times R \times t}{100}$$

$$7 = \frac{10 \times R \times 5}{100}$$

$$R = 14\%$$

44. A certain sum amounts of Rs. 20720 in four years and Rs. 24080 in six years at a certain rate of simple interest. The sum (in Rs.) is:

- (a) ₹11000 (b) ₹12000
(c) ₹14000 (d) ₹15000

SSC MTS 13/08/2019 (Shift-II)

Ans. (c) : Interest of 2 year = 24080 – 20720
= 3360

Interest of 1 year = 1680

Interest of 4 year = 4 × 1680 = 6720

Principal amount = 20720 – 6720 = ₹14000

45. X took a loan of ₹5000 on simple interest, the rate of interest being the same as the number of years for which the loan was taken. If the interest paid was ₹1800, then what was the rate of interest?

- (a) 6.5% (b) 6%
(c) 5% (d) 5.5%

SSC MTS 14/08/2019 (Shift-II)

Ans. (b) :

According to the question

Rate (R) = Time (T)

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$1800 = \frac{5000 \times R \times R}{100}$$

$$R^2 = \frac{180}{5} = 36$$

$$R = 6\%$$

46. At the rate of 8% the amount invested earns a simple interest of ₹240 after 3 years. If the rate of interest had been 5% more, then how much more interest would it have earned?

- (a) ₹105 (b) ₹108
(c) ₹150 (d) ₹135

SSC MTS 14/08/2019 (Shift-III)

Ans. (c) : $SI = \frac{P \times R \times T}{100}$

$$240 = \frac{P \times 8 \times 3}{100} \Rightarrow P = 1000$$

Again for payment of new interest

$$SI = \frac{1000 \times 13 \times 3}{100}$$

$$SI = 390$$

Difference = 390 - 240 = ₹150

47. The simple interest on a principal for 6 months at an interest rate of 10% per annum is 100. What is the principal

- (a) ₹1000 (b) ₹2000
(c) ₹1500 (d) ₹2500

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Given that
Simple interest = 100
Time = 6 months
= 6/12 year
= 1/2 year
Rate = 10% per annum

$$\therefore SI = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$100 = \frac{\text{Principal} \times 10 \times 1}{100 \times 2}$$

Principal amount = ₹2000

48. The simple interest on a sum for a certain number of years, same as the rate percentage of the interest, is equal to the sum itself. The number of years is equal to:

- (a) 5 (b) 10
(c) 8 (d) 1

SSC MTS 02/08/2019 (Shift-I)

Ans. (b) : $\therefore SI = \frac{P \times R \times t}{100}$

According to the question,
SI = P
R = t

then,

$$P = \frac{P \times t \times t}{100}$$

$$t^2 = 100$$

$$t = 10 \text{ years}$$

49. The simple interest on an amount of ₹2800 at the end of 3 years is ₹420. What would be the simple interest on an amount of ₹3200 for the same rate and the same period?

- (a) ₹480 (b) ₹560
(c) ₹440 (d) ₹640

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) : $S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$420 \times 100 = 2800 \times \text{Rate} \times 3$$

$$\text{Rate} = \frac{420 \times 100}{2800 \times 3}$$

$$\text{Rate} = 5\%$$

$$SI = \frac{3200 \times 5 \times 3}{100} = ₹480$$

50. Ramesh borrowed ₹12000 at the rate of 13% simple interest yearly. How much amount will Ramesh pay in 5 years to repay and loan ?

- (a) ₹ 18800 (b) ₹ 20000
(c) ₹ 19800 (d) ₹ 18600

SSC MTS 09/08/2019 (Shift-III)

Ans. (c) :

$$S.I. = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{12000 \times 5 \times 13}{100} = 7800$$

Final amount = Principal + Simple Interest

$$= 12000 + 7800$$

$$= ₹ 19800$$

51. The simple interest on any amount at the rate of 7% per year for five years is Rs. 700. What is the principal?

- (a) ₹1800 (b) ₹1600
(c) ₹2000 (d) ₹2100

SSC MTS 16/08/2019 (Shift-III)

Ans. (c) : Let Principal = P.

$$\therefore SI = \frac{P \times R \times T}{100}$$

$$\therefore 700 = \frac{P \times 7 \times 5}{100}$$

$$P = 100 \times 20$$

$$P = ₹ 2000$$

52. What is the amount that will become at 5% simple interest to ₹1440 in 4 years?

- (a) ₹1180 (b) ₹1080
(c) ₹1200 (d) ₹1240

SSC MTS 21/08/2019 (Shift-II)

Ans. (c) : $A = P \left(1 + \frac{Rt}{100} \right)$

$$1440 = P \left(1 + \frac{4 \times 5}{100} \right)$$

$$1440 = P \left(1 + \frac{1}{5} \right)$$

$$1440 = P \times \frac{6}{5}$$

$$240 = \frac{P}{5}$$

$$P = ₹1200$$

53. An amount invested at simple interest gives Rs 2400 interest at rate of 12% in 5 years what is the principal.

- (a) 3000 (b) 4000
(c) 5000 (d) 6000

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) : Time = 5 years

Rate = 12%

Simple Interest = 2400 Rupees

Principal amount = ?

Let principal amount is P

$$2400 = \frac{P \times 12 \times 5}{100}$$

$$\frac{2400 \times 100}{60} = P$$

$$4000 = P$$

So, Principal amount = ₹4000

54. An amount invested at simple interest gives Rs 4200 interest at rate of 15% in 4 years. What is the principal (in Rs) ?

- (a) ₹7000 (b) ₹6000
(c) ₹8000 (d) ₹9000

SSC MTS 10-10-2017 (Shift-I)

Ans : (a) Time = 4 years

Rate = 15%

Simple Interest = ₹4200 Rs.

Let, Principal amount = P Rs.

$$4200 = \frac{P \times 4 \times 15}{100}$$

$$P = \frac{4200 \times 100}{60} = 7000 \text{ Rs.}$$

55. In how much time (in years) will Rs 9000 amount to Rs 13500 at simple interest at the rate of 5% per annum?

- (a) 15 (b) 10
(c) 12 (d) 13

SSC MTS 10-10-2017 (Shift-III)

Ans. (b): Final amount = 13500 Rs.

Principal amount = 9000 Rs.

S.I. = Final amount – Principal amount

S.I. = 13500 – 9000 = 4500 Rs.

Rate = 5% Per annum

Time = ?

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$4500 = \frac{9000 \times 5 \times \text{Time}}{100} \Rightarrow \text{Time} = \frac{4500 \times 100}{9000 \times 5}$$

$$\text{Time} = \boxed{10 \text{ years}}$$

56. A sum of ₹ 8250 gives simple interest of ₹ 2475 in 5 years. What will be the rate of interest per annum?

- (a) 7.5% (b) 8%
(c) 6% (d) 10%

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (c) : Given that

Principal amount = ₹ 8250

Simple interest = ₹ 2475

Time = 5 years

Rate = ?

$$\therefore \text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$2475 = \frac{8250 \times \text{Rate} \times 5}{100}$$

$$\text{Rate} = \frac{2475 \times 100}{8250 \times 5}$$

$$\text{Rate} = 6\%$$

57. A sum of ₹9800 gives simple interest of ₹4704 in 6 years. What will be the rate of interest per annum?

- (a) 9% (b) 8.5%
(c) 8% (d) 7.5%

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (c) : Interest of 1 year = $\frac{4704}{6} = ₹784$

$$\text{Rate of Interest} = \frac{784}{9800} \times 100 = 8\%$$

58. A sum of ₹ 4650 is lent at simple interest. If the rate of interest is 7.5% per annum, then what will be the simple interest for 4 years?

- (a) ₹ 1395 (b) ₹ 1295
(c) ₹ 1495 (d) ₹ 1300

SSC GD Constable 14/02/2019 (Shift-II)

$$\text{Ans. (a) : } \text{SI} = \frac{P \times R \times T}{100}$$

$$\text{SI} = \frac{4650 \times 4 \times 7.5}{100}$$

$$= ₹1395$$

59. A sum of Rs. 6,000 amounts to Rs. 7,800 in 4 years at simple interest. If the interest rate is increased by 2.5%, then the same sum in same time would amount to:

- (a) ₹8,500 (b) ₹9,200
(c) ₹8,400 (d) ₹8,600

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

$$\text{Ans. (c) : } \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$1800 = \frac{6000 \times R \times 4}{100} \Rightarrow R = 7.5\%$$

According to the question,

$$\text{S.I.} = \frac{6000 \times 10 \times 4}{100} = 2400$$

$$\text{Required amount} = (6000 + 2400) = ₹8400$$

(II) If an amount becomes n times in t years at the rate of Simple Interest

60. A certain sum doubles itself on simple interest in 10 years. At the same rate of interest in how many years it will become 3 times of itself?
- (a) 12 (b) 16
(c) 20 (d) 15

SSC MTS 20/10/2021 (Shift-I)

Ans. (c) $A = P + \frac{Prt}{100}$

$$2p = P \left(1 + \frac{r \times 10}{100} \right)$$

$$\Rightarrow 2 = 1 + \frac{r}{10}$$

$$\Rightarrow r = 10$$

According to the question,

$$3p = p \left(1 + \frac{rt}{100} \right)$$

$$\Rightarrow 3 - 1 = \frac{10 \times t}{100}$$

$$\Rightarrow 2 \times 10 = t$$

$$\Rightarrow 20 = t$$

Hence the money after 20 years, it will become 3 times of itself.

61. In how much time will the simple interest on a certain sum of money be $\frac{6}{5}$ times sum at 20% per annum?
- (a) 8 years (b) 7 years
(c) 6 years (d) 5 years

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : Let Principal amount is P.
According to the question,

$$\text{Interest} = \frac{6}{5}P$$

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$\frac{6}{5}P = \frac{P \times 20 \times \text{Time}}{100}$$

$$\text{Time} = 6 \text{ years}$$

62. If in 13 years a fixed sum doubles at simple interest, what will be the interest rate per year? (Correct to the decimal places)
- (a) 7.29% (b) 7.69%
(c) 7.92% (d) 8.69%

SSC CGL (Tier-I)-2019 – 07/03/2020

Ans. (b) : Let principal amount be x Rs.

$$\text{Final amount} = 2x$$

$$\text{S.I.} = 2x - x = x$$

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$x = \frac{x \times R \times 13}{100}$$

$$R = 7.69\%$$

Trick:-

$$\text{Let } P = 100\%$$

$$\text{SI for 13 years} = 100\%$$

$$\text{Rate} = 100/13\% = 7.69\%$$

63. At which rate of simple interest does an amount become double in 12 years?

- (a) 8% (b) $8\frac{1}{3}\%$
(c) $7\frac{4}{5}\%$ (d) $7\frac{1}{2}\%$

SSC CHSL –16/10/2020 (Shift-III)

Ans. (b) : Let Principal value be P

So final amount in 12 years

$$= \text{Principal amount} + \text{Simple interest}$$

$$2P = P + \text{Simple interest}$$

$$\therefore \text{Simple interest} = P$$

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$P = \frac{P \times R \times 12}{100}$$

$$R = \frac{100}{12} = \frac{25}{3}$$

$$\text{So Interest rate } R = 8\frac{1}{3}\%$$

64. In a certain time, a sum of money becomes five times itself if the rate of interest is 16% p.a. Then the certain time (in years) is:

- (a) 30 years (b) 38 years
(c) 32 years (d) 25 years

SSC CHSL –19/03/2020 (Shift-I)

Ans. (d) : ∵ A sum of money becomes n times itself the rate of the interest is R%.

$$\text{Time} = \left(\frac{n-1}{R\%} \times 100 \right) \text{ year}$$

According to the question,

$$\text{Time} = \frac{5-1}{16} \times 100$$

$$= \frac{4}{16} \times 100 = 25 \text{ years}$$

65. A sum at simple interest becomes two times in 8 years at a certain rate of interest p.a. The time in which the same sum will be 4 times at the same rate of interest at simple interest is:

- (a) 24 years (b) 20 years
(c) 30 years (d) 25 years

SSC CHSL –21/10/2020 (Shift-II)

Ans. (a) case 1st : $A = P \left(1 + \frac{RT}{100} \right)$

$$2P = P \left(1 + \frac{8R}{100} \right)$$

$$2 = \left(1 + \frac{2R}{25} \right)$$

$$R = 12.5\%$$

case IInd : $A = P \left(1 + \frac{RT}{100} \right)$

$$4P = P \left(1 + \frac{12.5 \times T}{100} \right)$$

$$4 = \left(1 + \frac{5T}{40} \right)$$

$$3 = \frac{T}{8}$$

$$T = 24 \text{ Years}$$

Trick:

$$100\text{Rs.} \xrightarrow{+100\text{Rs.}} 200$$

$$100\text{Rs.} \xrightarrow{+300} 400$$

66. An amount becomes 5 times in 8 years when kept in a scheme of simple interest. In how many years will it become 16 times?

- (a) 16 years (b) 30 years
(c) 24 years (d) 28 years

SSC MTS 9-10-2017 (Shift-II)

Ans. (b) : Let Principal value be = ₹ x, Time = 8 year, Rate = R%

$$\text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$4x = \frac{x \times R \times 8}{100} \quad \left[\begin{array}{l} \therefore \text{Total amount in 5 year} = 5x \\ \therefore \text{Interest} = 5x - x = 4x \end{array} \right]$$

$$\therefore R = 50\%$$

Took time (T) to be 16 times of Principal amount = ?

$$15x = \frac{x \times 50 \times T}{100} \quad \left[\begin{array}{l} \text{Having total money 16 times} \\ \text{Interest} = 16x - x = 15x \end{array} \right]$$

$$T = 30 \text{ years}$$

Trick:

$$100\text{Rs.} \xrightarrow{+400\text{Rs.}} 500\text{Rs.}$$

$$100\text{Rs.} \xrightarrow{+1500\text{Rs.}} 1600\text{Rs.}$$

Get 400 Rs. interest in 8 years

Get 100 Rs. interest in 2 years

Get 1500 Rs. interest in 30 years

67. At the rate of 10% simple interest per year how much amount will triple itself?

- (a) 25 years (b) 20 years
(c) 15 years (d) 18 years

SSC MTS 21/08/2019 (Shift-I)

Ans. (b): Time = $\left(\frac{n-1}{r} \right) \times 100$

$$= \left(\frac{3-1}{10} \right) \times 100 = \frac{2}{10} \times 100$$

$$T = 20 \text{ years}$$

68. A sum is invested at simple interest. If the rate of interest is 20% per annum, then in how much time will it become double of itself?

- (a) 10 years (b) 8 years
(c) 4 years (d) 5 years

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) : Time = $\left(\frac{n-1}{r} \right) \times 100$

$$= \left(\frac{2-1}{20} \right) \times 100$$

$$\text{Time} = 5 \text{ years}$$

69. In what time does money becomes double at simple interest rate of 12% per annum?

- (a) $6\frac{1}{3}$ years (b) $6\frac{2}{3}$ years
(c) $8\frac{1}{3}$ years (d) $8\frac{2}{3}$ years

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : Time = $\left(\frac{n-1}{r} \right) \times 100$

$$= \left(\frac{2-1}{12} \right) \times 100$$

$$T = 8\frac{1}{3} \text{ years}$$

(III) If an amount becomes P_1 in t_1 years and P_2 in t_2 years at the fixed rate of Simple Interest

70. A sum of money lent at simple interest amounts to ₹ 9,920 after 2 years and to ₹ 12,800 after 5 years. Find the rate of interest per annum.

- (a) 6.57% (b) 12%
(c) 18% (d) 9.68%

SSC CHSL 06/08/2021 (Shift-I)

Ans. (b) : Let the principal amount be P and rate of interest be R%

According to the question,

$$P + \frac{2PR}{100} = 9920 \text{ -----(i)}$$

$$P + \frac{5PR}{100} = 12800 \text{ -----(ii)}$$

$$\text{So, } PR/100 = 960$$

$$\text{Now } P + \frac{2PR}{100} = 9920$$

$$\Rightarrow P = 8000$$

then
 $PR/100 = 960$
 $8000 R = 96000$
 $\Rightarrow R = \frac{96000}{8000} = 12\%$
 \therefore The rate of interest is 12%

71. A sum become ₹ 500 in 5 years and ₹ 600 in 7 years at a certain rate percent p. a at of simple interest. What is the sum?
 (a) ₹ 300 (b) ₹ 400
 (c) ₹ 200 (d) ₹ 250

SSC MTS 19/08/2019 (Shift-I)

Ans. (d) : Amount in 5 years = ₹500
 Amount in 7 years = ₹600
 Simple interest for 2 years = 600 – 500
 = ₹ 100
 \therefore Simple interest of 5 years = $\frac{100 \times 5}{2} = 50 \times 5$
 = ₹ 250
 Principal = Amount - simple interest
 = 500 – 250
 = ₹ 250

72. A sum of ₹ 8,400 amounts to ₹ 11,046 at 8.75% p.a. simple interest in certain time. What is the simple interest on the sum of ₹ 9,600 at the same rate for the same time ?
 (a) ₹ 3,024 (b) ₹ 2,686
 (c) ₹ 3,012 (d) ₹ 2,990

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : $r_1 = 8.75\%$, $P_1 = 8400$ Rs.
 $SI_1 = 11046 - 8400 = 2646$ Rs.
 $SI = \frac{P \times r \times t}{100}$
 $2646 = \frac{8400 \times 8.75 \times t_1}{100}$
 $t_1 = 3.6$
 $SI_2 = ?$, $r_2 = 8.75\%$, $t_2 = 3.6$, $P_2 = ₹9600$
 $SI_2 = \frac{P_2 \times r_2 \times t_2}{100} = \frac{9600 \times 8.75 \times 3.6}{100}$
 = ₹3024

73. A certain sum of amounts to ₹9,766 in 3 years at simple interest R% per annum and ₹10,849 in $4\frac{1}{2}$ years at the same rate of simple interest. The value of R is:
 (a) 8.5 (b) 9.5
 (c) 8 (d) 9

SSC CHSL 11/082021 (Shift-II)

Ans. (b) : Let the principal amount be P and rate of interest be R%.
 According to the question,
 $P + \frac{3PR}{100} = 9766$ ----- (i)

$P + \frac{9PR}{200} = 10849$ ----- (ii)
 So, $PR/100 = 726$
 Now, $P + \frac{3PR}{100} = 9766$
 $\Rightarrow P = 7588$
 $PR/100 = 726$
 $7588R = 72600$
 $\Rightarrow R = \frac{72600}{7588} = 9.5\%$
 \therefore The rate of interest is 9.5%

74. A certain sum of money amounts to ₹8,928 in two years and to ₹10,224 in $3\frac{1}{2}$ years, both at simple interest. The rate of interest per annum is:
 (a) 9% (b) 15%
 (c) 12% (d) 10%

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c) :
 $\frac{3}{2} =$ Interest in $1\frac{1}{2}$ years = 10224 – 8928 = 1296
 Interest in 1 year = 864
 Interest in 2 year = 1728
 Principal amount = 8928 – 1728 = 7200
 Rate = $\frac{864}{7200} \times 100 = 12\%$

75. ₹ 4,300 becomes ₹ 4,644 in 2 years at simple interest. Find the principal amount that will become ₹ 10,104 in 5 years at the same rate of interest.
 (a) ₹5,710 (b) ₹7,200
 (c) ₹8,420 (d) ₹9,260

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (c) : Simple interest of 2 years = 4644 – 4300
 = 344 Rs.
 Interest of 1 years = 172 Rs.
 Rate = $\frac{172}{4300} \times 100 = 4\%$
 Again $A = P \left(1 + \frac{RT}{100} \right)$
 $10104 = P \left(1 + \frac{20}{100} \right)$
 $P = 10104 \times \frac{5}{6} = 8420$ Rs.

Trick:
 4300 Rs. $\xrightarrow{+344 \text{ Rs.}}$ 4644 Rs.
 Interest of 1 year = 172 Rs.
 Rate of interest = $\frac{172}{4300} \times 100$
 = 4%
 Rate of interest for 5 years = 20%
 $120\% = 10104$ Rs.
 $20\% = 1684$ Rs.
 $100\% = 8420$ Rs.

(IV) Miscellaneous

76. A loan is to be returned in two equal yearly installments. If the rate of interest is 10% p.a. compounded annually and each instalment is ₹5808, then 60% of the total interest (nearest to a ₹) charged in this scheme is:

- (a) 917 (b) 911
(c) 922 (d) 913

SSC CGL (Tier-II) 29/01/2022

Ans : (c) Rate of interest = 10% = $\frac{1}{10}$
 Each installment = ₹5808
 $110 \leftarrow 11 \times 10$: $11 \times 11 = 121 \leftarrow$ (Each installment)
 $\frac{100 : 121}{}$
 Principal $\leftarrow 210$: $242 \leftarrow$ Amount
 Interest = $242 - 210 = 32$ units
 1 unit $\rightarrow \frac{5808}{121}$
 32 units, $\rightarrow \frac{5808}{121} \times 32 = 1536$
 \therefore 60% of total interest = $\frac{1536 \times 60}{100} = 921.6 \approx 922$

77. A sum of amounts to ₹14,395.20 at 9.25% p.a. simple interest in 5.4 years. What will be the simple interest on the same sum at 8.6% p.a. in 4.5 years ?

- (a) ₹3,672 (b) ₹3,627
(c) ₹3,715.20 (d) ₹3,797.76

SSC CGL (Tier-II) 12-09-2019

Ans. (c) :
 \therefore Principal amount = $\frac{\text{Final amount}}{\left(1 + \frac{R \times T}{100}\right)}$
 \therefore Principal amount = $\frac{(14395.20) \times 100}{100 + 9.25 \times 5.4}$
 $= \frac{1439520}{100 + 49.95} = \frac{1439520}{149.95} = 9600$ Rs.
 \therefore S.I. = $\frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$
 $= \frac{9600 \times 8.6 \times 4.5}{100}$
 $= 3715.20$ Rs.

78. The simple interest on ₹ x for m years at a rate of r% is equal to the same on ₹ y for n years at

the rate of s% then $\frac{x}{y} = ?$

- (a) $\frac{nr}{ms}$ (b) $\frac{ns}{mr}$
(c) $\frac{ms}{nr}$ (d) $\frac{mr}{ns}$

SSC MTS 16/08/2019 (Shift-I)

Ans. (b) : $\therefore SI = \frac{P \times R \times t}{100}$
 then, $SI_1 = \frac{x \times r \times m}{100}$ and $SI_2 = \frac{y \times s \times n}{100}$
 According to the question, $SI_1 = SI_2$
 $\frac{x \times r \times m}{100} = \frac{y \times s \times n}{100}$
 $\frac{x}{y} = \frac{ns}{mr}$

79. A sum of ₹ x was borrowed and paid back in two equal yearly installment, each of ₹ 35,280. If the rate of interest was 5% compounded annually, then the value of x is :

- (a) 65,400 (b) 64,400
(c) 64,800 (d) 65,600

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (d) : Given that,
 Installment = 35,280 Rs.
 Rate = 5%
 Principal value = x

$$P = I \left[\left(\frac{100}{100+R} \right) + \left(\frac{100}{100+R} \right)^2 + \left(\frac{100}{100+R} \right)^3 + \dots \right]$$
 Where P = Principal value
 I = Installment
 R = Rate
 $x = 35,280 \left[\frac{100}{105} + \left(\frac{100}{105} \right)^2 \right]$
 $x = 35,280 \left[\frac{20}{21} + \frac{400}{441} \right]$
 $x = 35,280 \left[\frac{420 + 400}{441} \right]$
 $x = 35,280 \times \frac{820}{441} = ₹65,600$

80. What is the difference (in ₹) between the interests on ₹50,000 for one year at 8% per annum compounded half yearly and yearly?

- (a) 80 (b) 100
(c) 70 (d) 50

SSC CGL (Tier-II) 29/01/2022

Ans : (a) Effective Rate when compounded yearly = 8%
 Effective Rate when compounded half-yearly
 $= 4\% + 4\% + \frac{4 \times 4}{100}\%$
 $= 8.16\%$
 Required difference = $8.16\% - 8\%$
 $= 0.16\%$
 Difference (in ₹) = $50,000 \times 0.16\%$
 $= 80$

81. In a company, number of engineers doubles itself in every 2 years. In how much time will the number of engineers become 1024 times of its original number?

- (a) 12 years (b) 20 years
(c) 15 years (d) 24 years

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (b) : Let initially no of engineers be x

No. of engineers in 2 years = 2^1x

No. of engineers in 4 years = 2^2x

Thus No. of engineers $1024x = 2^{10}x$

So, Required number of years = 10×2 years

\Rightarrow Number of years = 20 years

\therefore The required duration is 20 years

82. Two equal sums were lent on simple interest at 6% and 10% per annum respectively. The first sum was recovered two years later than the second sum and the amount in each case was ₹1105. What was the sum (in ₹) lent in each scheme?

- (a) 850 (b) 936
(c) 891 (d) 900

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (a) : Let, Time = t years, Rate = R%

Principal = P

$(t + 2) \times 6\% = t \times 10\%$

$\Rightarrow t \times 6\% + 12\% = t \times 10\%$

$\Rightarrow 4\% \times t = 12\%$

t = 3 years

\therefore Amount = P + SI

$\Rightarrow 1105 = P + \frac{P \times R \times t}{100}$

$\Rightarrow 1105 = P + \frac{P \times 6 \times 5}{100}$

$\Rightarrow 1105 = P + \frac{P \times 3}{10}$

$\Rightarrow 1105 = \frac{13P}{10}$

$\Rightarrow P = \frac{11050}{13}$

\therefore P = Rs.850

83. The rate of simple interest for first two years is 8% p.a. for the next 4 years, it is 10% p.a. and for the period beyond 6 years, it is 12% p.a.. If a person gets ₹18358.60 as simple interest after 9 years, then how much money (in ₹) did he invest?

- (a) 20087 (b) 19674
(c) 19955 (d) 21075

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (c) : Let the Principal is P.

According to the question,

$$18358.60 = \frac{P}{100} [8 \times 2 + 4 \times 10 + 12 \times 3]$$

$$1835860 = P \times 92$$

$$P = \frac{1835860}{92}$$

$$P = ₹19955$$

84. A sum of x amounts to ₹9246 in 4 years and to ₹11,298.75 in $7\frac{1}{2}$ years, at y% p.a. simple

interest. The values of x and y are, respectively:

- (a) 6900 and 8.5 (b) 6800 and 8.5
(c) 6500 and 8 (d) 7200 and 7.5

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : Let, Principal is x.

According to the question,

Sum of a amount to 9246 Rs. in 4 years and to 11298.75 Rs. in 7.5 years.

$$3.5y = 11298.75 - 9246 = ₹2052.75$$

$$\text{Simple Interest of 1 year} = \frac{2052.75}{3.5} = 586.5$$

$$\text{Simple Interest of 4 year} = 4 \times 586.5 = 2346$$

$$\text{Principal} = 9246 - 2346 = 6900$$

$$R\% = \frac{586.5}{6900} \times 100 = 8.5\%$$

Hence, Principal and rate are ₹6900 and 8.5% respectively.

85. The rate of simple interest on a sum of money is 5% p.a. for the first 4 years, 8% p.a. for the next 3 years and 10% p.a. for the period beyond 7 years. If the simple interest accrued by the sum over a period of 10 years is ₹1,850, then the sum is:

- (a) ₹1,650 (b) ₹2,750
(c) ₹2,500 (d) ₹1500

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (c) : Let equal amount be x

$$SI = \frac{P \times 5 \times 4}{100} + \frac{P \times 8 \times 3}{100} + \frac{P \times 10 \times 3}{100}$$

$$1850 = \frac{1}{100} \times (20P + 24P + 30P)$$

$$P = \frac{1850 \times 100}{74} = ₹2500$$

86. When two equal amounts are deposited for 5 years and 3 years at the rate of 7% and 9% per annum respectively and the difference of their simple interest is ₹475. Then find the deposited amount.

- (a) ₹6,037.5 (b) ₹5,992.5
(c) ₹5,937.5 (d) ₹5,837.5

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (c) : Let the equal amount = ₹x

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100}$$

$$\frac{x \times 7 \times 5}{100} - \frac{x \times 9 \times 3}{100} = 475$$

$$\frac{8x}{100} = 475$$

$$x = \frac{47500}{8} = 5937.5 \text{ Rs.}$$

87. A sum of ₹ 5,000 is divided into two parts such that the simple interest on the first part for $4\frac{1}{5}$ years at $6\frac{2}{3}\%$ p.a. is double the simple interest on the second part for $2\frac{3}{4}$ years at 4% p.a. What is the difference between the two parts ?
- (a) ₹ 560 (b) ₹ 600
(c) ₹ 680 (d) ₹ 620

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

Let first part = x Rs.

Second part = ₹(5000-x)

$$\frac{x \times 20 \times 21}{100 \times 3 \times 5} = \frac{(5000-x) \times 4 \times 11}{4 \times 100} \times 2$$

$$14x = 55000 - 11x$$

$$25x = 55000$$

$$x = 2200$$

Difference between both parts = 5000 - 2x = 5000 - 4400 = ₹600

88. A sum of ₹27,000 is divided into two parts A and B such that the simple interest at the rate of 15% p.a. on A and B after two years and four years, respectively, is equal. The total interest (in ₹) received together from A and B is:
- (a) 5,400 (b) 9,600
(c) 18,000 (d) 10,800

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Let amount P_1 & P_2 are divided in two parts A & B

$$\therefore \text{SI} = \frac{P \times R \times T}{100}$$

$$\frac{P_1 \times 15 \times 2}{100} = \frac{P_2 \times 15 \times 4}{100}$$

$$\frac{P_1}{P_2} = \frac{2}{1}$$

$$\therefore P_1 = 27000 \times \frac{2}{3} = 18000$$

$$P_2 = 9000$$

\therefore Total interest received =

$$\frac{18000 \times 15 \times 2}{100} + \frac{9000 \times 15 \times 4}{100} = 10800 \text{ Rs.}$$

89. Two equal sums (in ₹) are lent at 8% and 4% simple interest p.a., respectively at the same time. The first sum is received 2 years earlier than the other and the amount received in each case is ₹14,500. Each sum is:
- (a) ₹12,800 (b) ₹13,200
(c) ₹12,000 (d) ₹12,500

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) Let two equal amount = x

Interest amount of both sum will be equal

Let in case of 8% and 4% of amount are borrowed at the time (t-2) and t years respectively.

\therefore Interest of both amount

$$\frac{x \times 8 \times (t-2)}{100} = \frac{x \times 4 \times t}{100}$$

$$t = 4$$

In case of 8% amount of time = t - 2

$$= 4 - 2$$

$$= 2 \text{ years}$$

$$A = P \left(1 + \frac{RT}{100} \right)$$

$$14500 = x \left(1 + \frac{8 \times 2}{100} \right)$$

$$x = 14500 \times \frac{25}{29} = ₹12500$$

90. A borrowed ₹3,000 from his friend B on 31 December, 2007 on the condition that he would return it after one year with a simple annual interest of 15%. But A is in a position to return the money only on 31 August, 2008. How much money does A have to return to B ?
- (a) ₹ 3,305 (b) ₹ 3,300
(c) ₹ 3,200 (d) ₹ 3,310

SSC CHSL 10/07/2019 (Shift-III)

Ans. (b) : Principal amount = 3000 Rs., Rate = 15%

Time = 8 months (31 December to 31 August)

$$\therefore \text{S.I.} = \frac{P \times R \times T}{100} = \frac{3000 \times 15 \times 8}{100 \times 12} = ₹ 300$$

$$\text{Amount returned to B by A} = 300 + 3000 = ₹ 3300$$

91. A borrowed ₹1,000 from his friend B on 31 December, 2015 on the condition that he would return it after one year with a simple interest of 12%. But A is in a position to return the money on 1 May, 2016. B how much amount does have to return him ?
- (a) ₹ 1,040 (b) ₹ 1,331.5
(c) ₹ 1,120 (d) ₹ 1,045

SSC CHSL 10/07/2019 (Shift-I)

Ans. (a) : Time = 4 months

$$\therefore \text{S.I.} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

$$= \frac{1000 \times 12}{100} \times \frac{4}{12} = \frac{1000 \times 4}{100}$$

$$= ₹ 40$$

Thus total money returned = 1000 + 40 = ₹ 1040

Note:—In December there are no remaining days and month of may is not over. Thus we can not count there in the number of months.

92. A person borrowed 1,200 at 8% p.a. and ₹1,800 at 10% p.a. as simple interest for the same period. He had to pay ₹1,380 in all as interest. Find the time period.

- (a) 6 years (b) 5 years
(c) 10 years (d) 4 years

SSC CHSL –19/10/2020 (Shift-I)

Ans. (b) : $(P \times r_1 \times t + P \times r_2 \times t) = 100 \times \text{S.I.}$

$$(1200 \times 8 \times t + 1800 \times 10 \times t) = 1380 \times 100$$

$$96t + 180t = 1380$$

$$276t = 1380$$

$$t = \frac{1380}{276}$$

$$t = 5 \text{ years}$$

93. A man takes a loan of some amount at some rate of simple interest. After three years, the loan amount is doubled and rate of interest is decreased by 2%. After 5 years, if the total interest paid on the whole is ₹13,600, which is equal to the same when the first amount was taken for $11\frac{1}{3}$ years, then the loan taken initially is:

- (a) ₹12,000 (b) ₹10,000
(c) ₹12,500 (d) ₹13,600

SSC CHSL –14/10/2020 (Shift-II)

Ans. (b) : Let amount be P and rate be r%

According to the question,

$$\frac{P \times r \times 3}{100} + \frac{2P \times (r-2) \times 5}{100} = 13600 \quad \dots\dots\dots (i)$$

$$\frac{P \times r \times 11\frac{1}{3}}{100} = 13600 \quad \dots\dots\dots (ii)$$

$$\frac{P \times r \times 34}{3 \times 100} = 13600$$

$$Pr = 120000$$

Putting the value of Pr in equation (i)

$$\frac{3Pr}{100} + \frac{10Pr - 20P}{100} = 13600$$

$$13Pr - 20P = 1360000$$

$$13 \times 120000 - 20P = 1360000$$

$$20P = 200000$$

$$P = ₹10000$$

∴ The initial loan amount is Rs10,000.

94. A person borrows ₹7,000 for 3 years at 5% p.a. simple interest. He immediately lends it to another person at $6\frac{1}{3}\%$ p.a. for 3 years. Find his gain in the transaction per year.

- (a) ₹90 (b) ₹93.33
(c) ₹92 (d) ₹95.33

SSC CHSL –18/03/2020 (Shift-III)

Ans. (b) : Required gain =

$$\frac{7000 \times 19 \times 3}{100 \times 3} - \frac{7000 \times 5 \times 3}{100}$$

$$= 1330 - 1050$$

$$= 280 \text{ Rs.}$$

$$\text{per year profit} = \frac{280}{3} = ₹93.33$$

95. A sum was invested on simple interest at a certain rate for 5 year. If the interest rate is increased by 2%, then the interest increases by Rs 190. What is the sum (in Rs.) invested.

- (a) 1300 (b) 1600
(c) 1900 (d) 2200

SSC MTS 10-10-2017 (Shift-II)

Ans. (c) : Let principal amount be Rs. P

Rate of interest = r% Per annum

Simple interest = A Rs.

Time = 5 year (given)

According to the question,

$$P \times \frac{r}{100} \times 5 = A \quad \dots\dots\dots (i)$$

$$\text{And } P \times \frac{(r+2)}{100} \times 5 = A + 190 \quad \dots\dots\dots (ii)$$

Subtracting eq (ii) from (i)

$$\frac{5P}{100} (r+2-r) = A + 190 - A$$

$$\frac{5P}{100} \times 2 = 190$$

$$P = 1900 \text{ Rs.}$$

96. A sum was invested for 7 years at a certain annual rate of simple interest. If the interest rate is increased by 8%, then the interest increases by Rs 2240. What is the sum (in Rs) invested?

- (a) 3500 (b) 4000
(c) 5000 (d) 6000

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) : Let principal = ₹ P

Rate = r% Per annum

Time = 7 year

According to the question ,

$$P \times \frac{(r+8)}{100} \times 7 - P \times \frac{r}{100} \times 7 = 2240$$

$$7Pr + 56P - 7pr = 2240 \times 100$$

$$56P = 2240 \times 100$$

$$P = 40 \times 100$$

Thus the amount invested (P) = ₹ 4000

97. If the interest on an amount of ₹28000 in three years is greater than an amount of ₹27000 in three years by ₹225 then what is the interest on

₹35500 in $2\frac{3}{5}$ years?

- (a) ₹6966.50 (b) ₹6922.50
(c) ₹6953.00 (d) ₹6723.50

SSC MTS 21/08/2019 (Shift-III)

Ans. (b) : $\therefore SI = \frac{P \times R \times t}{100}$

According to the question,

$$225 = \frac{28000 \times R \times 3}{100} - \frac{27000 \times R \times 3}{100}$$

$$225 = \frac{3R}{100} [28000 - 27000]$$

$$225 = \frac{3R}{100} [1000]$$

$$75 = 10R$$

$$R = 7.5\%$$

again, $SI = \frac{35500 \times 7.5 \times 13}{100 \times 5}$

$$SI = 71 \times 7.5 \times 13$$

$$SI = 6922.50Rs.$$

98. A sum of ₹ 800 invested on simple interest ₹1200 in 8 year . What will be simple interest for 6 years on the sum at the same rate of interest ?

- (a) ₹ 240 (b) ₹ 210
(c) ₹ 250 (d) ₹ 300

SSC MTS 08/08/2019 (Shift-II)

Ans. (d) : $\therefore SI = \frac{P \times R \times t}{100}$

($\because SI = 1200 - 800$
 $= 400$)

$$400 = \frac{800 \times R \times 8}{100}$$

$$R = \frac{50}{8}\%$$

again $SI = \frac{800 \times 50 \times 6}{8 \times 100}$

$$SI = ₹300$$

99. A sum of Rs. 10000 is invested in three schemes of simple interest. The annual interest rates are respectively, 4%, 6% and 10%. Rs. 4000 were invested in the first scheme. If the total interest earned after five years is Rs. 2800, then how much money was invested in the third scheme?

- (a) Rs. 1500 (b) Rs 5000
(c) Rs. 1000 (d) Rs. 3000

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) : Let investment in 3rd schemes be x Rs.
Then investment in 2nd schemes (10,000 - x - 4000)
 $= (6,000 - x)$ (\because Investment of 1st schemes = 4000Rs.)

According to the question,

$$2800 = \frac{4000 \times 4 \times 5}{100} + \frac{(6000 - x) \times 6 \times 5}{100} + \frac{x \times 10 \times 5}{100}$$

$$2800 = \frac{5}{100} [16000 + 36000 - 6x + 10x]$$

$$2800 = \frac{1}{20} [52000 + 4x]$$

$$56000 = 52000 + 4x$$

$$56000 - 52000 = 4x$$

$$4x = 4000$$

$$x = 1000 Rs.$$

100. A sum of Rs. 7500 amounts to Rs. 11000 in $5\frac{1}{3}$ year at a certain rate percent per annum simple interest. The sum will amount to Rs. x in $2\frac{2}{3}$ years at the same rate of simple interest.

The value of x is:

- (a) Rs. 9230 (b) Rs. 9240
(c) Rs. 9250 (d) Rs. 9180

SSC Sel. Post Phase VIII (M.L.) 15.10.19 (Shift-I)

Ans. (c) : Principal = ₹7500, Total Amount = ₹11000

Time = $5\frac{1}{3}$ years

Interest = Amount - Principal
 $= 11000 - 7500$
 $= ₹3500$

$$SI = \frac{P \times R \times T}{100}$$

$$3500 = 7500 \times \frac{R}{100} \times \frac{16}{3}$$

$$R = \frac{35}{4}\%$$

According to the question,

$$SI = \frac{P \times R \times T}{100}$$

$$SI = 7500 \times \frac{35}{4} \times \frac{8}{3} \times \frac{1}{100}$$

$$SI = ₹1750$$

Total Amount (x) = Interest + Principal
 $= 1750 + 7500$
 $= ₹9250$

12.

Compound Interest

(I) Problems based on Fundamental formula of Compound Interest

1. In what time will ₹3,90,625 amount to ₹4,56,976 at 8% per annum, interest being compounded half-yearly?

- (a) 2 years (b) $1\frac{1}{2}$ years
(c) $2\frac{1}{2}$ years (d) 1 year

SSC CHSL 08/06/2022 (Shift- II)

Ans. (a) : ∵ If the interest is compounded half-yearly. Then,

$$R = \frac{8\%}{2} = 4\%$$

Time = 2t half yearly

$$A = P \left(1 + \frac{R}{100}\right)^n$$

Now,

$$\frac{456976}{390625} = \left(1 + \frac{4}{100}\right)^{2t} \Rightarrow \left(\frac{26}{25}\right)^{2t} = \left(\frac{26}{25}\right)^4$$

$$2t = 4$$

$$t = 2 \text{ years}$$

2. What is the compound interest on ₹20,000 for 9 months at the rate of 4% per annum, when interest is compounded quarterly?

- (a) ₹610 (b) ₹606.02
(c) ₹609.05 (d) ₹605

SSC CHSL 30/05/2022 (Shift- III)

Ans. (b) : ∵ 12 months → 4%

∴ 3 months → 1%

Time → $\frac{9}{12} \times 4 = 3$ quarter

So, effective rates for 3 years =

$$\left[(x + y + z) + \left(\frac{xy + yz + zx}{100}\right) + \frac{xyz}{10000} \right] \%$$

Effective rate % for 3 years =

$$\left[(1+1+1) + \frac{(1+1+1)}{100} + \frac{1}{10000} \right] \%$$

$$= (3+0.03 + 0.0001)\% = 3.0301\%$$

Hence, Compound Interest = $20000 \times 3.0301\% = ₹606.02$

3. A sum of ₹18,000 becomes ₹21,780 after 2 years on compound interest compounded annually. What will be the compound interest (in ₹) on the same sum for the same period if the rate of interest increases by 5%?

- (a) 1,845 (b) 4,670
(c) 5,805 (d) 5,500

SSC CGL (Tier-I) 19/04/2022 (Shift-I)

Ans. (c) Given that P = ₹18,000

A = ₹21,780

T = 2 years

We know that,

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$\Rightarrow 21780 = 18000 \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow \frac{21780}{18000} = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow \left(\frac{11}{10}\right)^2 = \left(1 + \frac{R}{100}\right)^2$$

$$\Rightarrow 1 + \frac{R}{100} = \frac{11}{10}$$

$$\Rightarrow \frac{R}{100} = \frac{1}{10}$$

$$\Rightarrow R = 10\%$$

According to the question, rate of interest increase by 5%

then R = 10 + 5 = 15%

$$\therefore \text{Compound Interest} = P \left[\left(1 + \frac{R}{100}\right)^T - 1 \right]$$

$$= 18000 \left[\left(1 + \frac{15}{100}\right)^2 - 1 \right]$$

$$= 18000 \left[\left(\frac{23}{20}\right)^2 - 1 \right]$$

$$= 18000 \left[\frac{529 - 400}{400} \right]$$

$$= 18000 \times \frac{129}{400}$$

$$= ₹5,805$$

4. What is the amount (in ₹) of a sum ₹32,000 at 20% per annum for 9 months, compounded quarterly?

- (a) 37,044 (b) 35,087
(c) 32,000 (d) 30,876

SSC CGL (Tier-I) 18/04/2022 (Shift-I)

Ans. (a) ∵ P = Rs. 32000

Compound quarterly,

$$\text{So, } R = 20 \times \frac{1}{4} = 5\%$$

$$t = 9 \text{ months} = \frac{9}{12} \times 4 = 3$$

$$\therefore A = P \left(1 + \frac{R}{100} \right)^n \quad (\text{where } n = \text{time } (t))$$

$$A = 32000 \times \left(1 + \frac{5}{100} \right)^3 = 32000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= 4 \times 441 \times 21 = 37044$$

5. In what time will a sum of ₹1,25,000 amount to ₹1,48,877 at 12% per annum. If interest is being compounded half yearly?

- (a) 1½ years (b) 2½ years
(c) 1 years (d) 3 years

SSC CHSL 09/08/2021 (Shift-III)

Ans. (a) : Given,

$$P = ₹12500$$

$$A = ₹148877$$

$$\text{Rate} = 12/2 = 6\%$$

$$148877 = 12500 \left(1 + \frac{6}{100} \right)^{t \times 2}$$

$$\Rightarrow \frac{148877}{12500} = \left(1 + \frac{3}{50} \right)^{t \times 2}$$

$$\Rightarrow \left(\frac{53}{50} \right)^3 = \left(\frac{53}{50} \right)^{t \times 2}$$

$$\Rightarrow t = \frac{3}{2}$$

$$t = 1 \frac{1}{2} \text{ year}$$

6. If a sum increases by 21% after 2 years, then the rate of compound interest per annum, when compounded annually, must be :

- (a) 10.5% (b) 11.5%
(c) 10% (d) 11%

SSC MTS 02/11/2021 (Shift-I)

Ans. (c) : : Let principal = 100

According to the question,

$$100 \left(1 + \frac{r}{100} \right)^2 = 121$$

$$\left(1 + \frac{r}{100} \right)^2 = \frac{121}{100}$$

$$\left(1 + \frac{r}{100} \right)^2 = \left(\frac{11}{10} \right)^2$$

$$1 + \frac{r}{100} = \frac{11}{10}$$

$$\frac{r}{100} = \frac{11}{10} - 1$$

$$\frac{r}{100} = \frac{1}{10}$$

$$r = 10\%$$

7. What is the compound interest (in ₹) on a sum of 46,000 for $2\frac{2}{5}$ years at 15% per annum, interest being compounded annually (nearest to a ₹)?

- (a) 18458 (b) 19458
(c) 19485 (d) 18485

SSC CHSL 12/08/2021 (Shift-I)

$$\text{Ans. (d) : } A = P \left(1 + \frac{R}{100} \right)^n \left(1 + \frac{RT}{100} \right)$$

$$A = 46000 \left(1 + \frac{15}{100} \right)^2 \left(1 + \frac{15 \times \frac{2}{5}}{100} \right)$$

$$A = 46000 \left(\frac{23}{20} \right)^2 \times \left(\frac{53}{50} \right)$$

$$A = 46 \times 23 \times 23 \times \frac{53}{20} = 64485.1$$

$$\text{Now, C.I.} = A - P$$

$$= 64485.1 - 46000 = 18485.1 \approx 18485$$

8. What will be the compound interest (in ₹) on a sum of ₹7,200 for 18 months at rate of 20% per annum. If the interest is compounded half-yearly (nearest to an integer)

- (a) 2,338 (b) 3,238
(c) 2,833 (d) 2,383

SSC CHSL 05/08/2021 (Shift-II)

Ans. (d) : Half yearly interest (R) = 20/2 = 10%

$$\text{Time } (T) = \text{io} \frac{18}{12} \times 2 = 3$$

$$\text{Amount} = 7200(1+10/100)^3$$

$$\left\{ \because \text{Amount} = P \left[1 + \frac{R}{100} \right]^{T} \right\}$$

$$= 7200 \times 11/10 \times 11/10 \times 11/10$$

$$= 9583.2$$

$$\text{Interest} = 9583.2 - 7200 = 2383.2 \approx 2383$$

∴ The compound interest is Rs. 2383.

9. For a fixed period an amount of Rs. 60,000 invested at a fixed rate. The amount, whose interest is compounded annually, has increased to Rs. 63,654. If at the same rate, the amount would had been invested for half of the duration, how much would it have increased?

- (a) 61800 Rs. (b) 61675 Rs.
(c) 61827 Rs. (d) 61809 Rs.

SSC CHSL 04/07/2019 (Shift-II)

Ans. (a) : According to the question,

Let time be 2t

$$1 A = P \left(1 + \frac{R}{100} \right)^{2t}$$

$$63654 = 60000 \left(1 + \frac{R}{100}\right)^{2t}$$

$$\frac{63654}{60000} = \left(1 + \frac{R}{100}\right)^{2t}$$

$$\left(1 + \frac{R}{100}\right)^t = \sqrt{\frac{10609}{10000}}$$

$$\left(1 + \frac{R}{100}\right)^t = \frac{103}{100}$$

If it is invested for half the time at the same rate.

$$\text{Then amount} = P \left(1 + \frac{R}{100}\right)^t$$

$$= 60000 \times \frac{103}{100} = ₹ 61800$$

Trick: Taking the ratio

$$60000 : 63654$$

$$1000 : 10609$$

$$\sqrt{10000} : \sqrt{10609} \Rightarrow 100 : 103$$

$$\text{Rate (R)} = \frac{3}{100} \times 100 = 3\%$$

Time (t) = 2 years ((because the square root is taken)

$$\therefore \text{Required amount} = 60000 \times \frac{103}{100} = ₹ 61800$$

10. A sum amounts to ₹18,600 after 3 years and to ₹27,900 after 6 years, at a certain rate percent p.a., when the interest is compounded annually. The sum is :

- (a) 14,600 Rs. (b) 11,800 Rs.
(c) 14,400 Rs. (d) 12,400 Rs.

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (d) : We know that,

$$\text{Amount} = \text{Principal} \left(1 + \frac{\text{Rate}}{100}\right)^{\text{Time}}$$

or, $A = P \left(1 + \frac{R}{100}\right)^t$

$$P \left(1 + \frac{R}{100}\right)^3 = 18600 \quad \dots\dots\dots(i)$$

$$P \left(1 + \frac{R}{100}\right)^6 = 27900 \quad \dots\dots\dots(ii)$$

Equation (ii) ÷ equation (i)

$$\left(1 + \frac{R}{100}\right)^3 = \frac{27900}{18600}$$

$$\left(1 + \frac{R}{100}\right)^3 = \frac{279}{186} \quad \dots\dots\dots(iii)$$

Putting the value of equⁿ (iii) in equⁿ (i)

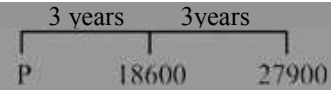
$$P \left(\frac{279}{186}\right) = 18600$$

$$P = \frac{18600 \times 186}{279}$$

$$P = \frac{3459600}{279}$$

$$P = 12400 \text{ Rs.}$$

Trick :



$$\text{Scaling factor} = \frac{27900}{18600} = \frac{3}{2}$$

$$\therefore P \times \frac{3}{2} = 18600$$

$$P = 12400 \text{ Rs.}$$

11. A sum amounts to ₹8,028 in 3 years and to ₹12,042 in 6 years at a certain rate percent per annum, when the interest is compounded yearly. The sum is:

- (a) ₹5,352 (b) ₹5,325
(c) ₹5,235 (d) ₹5,253

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (a) : We know that,

$$P \left(1 + \frac{R}{100}\right)^t = A$$

Given,

$$P \left(1 + \frac{R}{100}\right)^3 = 8028 \quad \dots\dots\dots(i)$$

$$P \left(1 + \frac{R}{100}\right)^6 = 12042 \quad \dots\dots\dots(ii)$$

Equation (ii) ÷ equation (i) ,

$$\left(1 + \frac{R}{100}\right)^3 = \frac{12042}{8028}$$

$$\left(1 + \frac{R}{100}\right)^3 = \frac{3}{2} \quad \dots\dots\dots(iii)$$

Putting the value of equⁿ (iii) in equⁿ (i)

$$P \left(\frac{3}{2}\right) = 8028$$

$$P = \frac{8028 \times 2}{3} \quad \boxed{P = ₹5352}$$

Trick: Let that fixed amount be P.

According to the question,



$$\text{Ratio } 12042 : 8028 = 3 : 2$$

$$\therefore 8028 : P = 3 : 2$$

$$\Rightarrow 3P = 8028 \times 2$$

$$P = 2676 \times 2 = 5352$$

$$P = ₹5352$$

12. At what rate percent per annum will a sum of ₹15,625 amount to ₹21,952 in three years, if the interest is compounded annually?

- (a) 8% (b) 10%
(c) 12% (d) 9%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : Let the rate of interest be R%

$$\text{Amount} = \text{Principal} \left(1 + \frac{\text{Rate}}{100}\right)^{\text{Time}}$$

$$\left(1 + \frac{R}{100}\right)^3 = \frac{21952}{15625}$$

$$\left(1 + \frac{R}{100}\right)^3 = \left(\frac{28}{25}\right)^3 = \left(1 + \frac{3}{25}\right)^3$$

$$\frac{R}{100} = \frac{3}{25}$$

$$\therefore R = 12\%$$

Trick: Taking the ratio

$$\begin{array}{c} \text{3 years} \\ \text{15625} \quad \text{21952} \\ \sqrt[3]{15625 : 21952} = 25 : 28 \\ \text{Rate (R)} = \frac{28 - 25}{25} \times 100 = 3 \times 4 = 12\% \end{array}$$

13. What is the compound interest on a sum of ₹10,000 at 14% p.a. for $2\frac{5}{7}$ years where the interest is compounded yearly? (nearest to ₹ 1)

- (a) ₹4,394 (b) ₹4,259
(c) ₹4,296 (d) ₹4,439

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (c) $A = P \left(1 + \frac{R}{100}\right)^2 \left(1 + \frac{\frac{5}{7}R}{100}\right)$

$$= 10000 \left(1 + \frac{14}{100}\right)^2 \left(1 + \frac{\frac{5}{7} \times 14}{100}\right)$$

$$= 10000 \times \frac{57}{50} \times \frac{57}{50} \times \frac{11}{10}$$

$$= 14296 \text{ Rs. (nearest)}$$

$$\text{C.I.} = A - P = 14296 - 10000 = 4296 \text{ ₹.}$$

Trick : Up to 2 years the rate percentage is 14%.

$$\text{Rate percentage in } \frac{5}{7} \text{ year} = 14 \times \frac{5}{7} = 10\%$$

∴ Net effective rate (R)

$$\begin{array}{c} R = \frac{14\%}{14} + \frac{14\%}{14} + \frac{10\%}{14} \\ R = \frac{a+b+c}{14+14+10} + \frac{ab+bc+ca}{14 \times 14 + 14 \times 10 + 14 \times 10} + \frac{abc}{14 \times 14 \times 10} \\ \text{Start adding from the back} \\ 38 \mid 476 \mid 1960 \\ \text{Put the decimal in place of hundred from the back side} \\ \text{and add it to the next number.} \\ 38 \mid 476 + 19 \mid .60 \\ 38 \mid 4.95 \mid .60 \\ \Rightarrow R = 42.9560\% \\ \therefore \text{C.I.} = 10000 \times \frac{42.9560}{100} = ₹4296 \end{array}$$

14. The compound interest on a certain sum at 10% p.a. for $2\frac{1}{3}$ years is ₹ 1,201.60, interest compounded yearly. The sum is:

- (a) ₹4,500 (b) ₹4,200
(c) ₹4,800 (d) ₹5,400

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : Let principal = x Rs.

$$A = x \left(1 + \frac{10}{100}\right)^2 \left(1 + \frac{10}{300}\right)$$

$$= x \times \frac{121}{100} \times \frac{31}{30} = \frac{3751x}{3000}$$

$$\text{C.I.} = A - P$$

$$\text{C.I.} = \frac{3751x}{3000} - x$$

$$1201.60 = \frac{751x}{3000}$$

$$x = \frac{1201.60 \times 3000}{751} = 4800 \text{ Rs.}$$

Trick: Up to 2 years the rate percentage = 10%

$$\frac{1}{3} \times 12 = \text{Rate \% of 4 months} = 10/3\%$$

Before	After
10	11
10	11
$\frac{\times 30}{3000}$	$\frac{\times 31}{3751}$

$$\text{Required principal value} = \frac{1201.60}{751} \times 3000 = ₹4800$$

15. A sum of ₹ 8,000 invested at 10% p.a. amounts to ₹9,261 in a certain time, interest compounded half-yearly. What will be the compound interest (in ₹) on the same sum for the same time at double the earlier rate of interest, when interest is compounded annually?

- (a) ₹2,520 (b) ₹2,480
(c) ₹2,500 (d) ₹2,560

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d)

$$\frac{A}{P} = \left(1 + \frac{R}{100}\right)^T$$

Interest is compounded on half yearly basis

Half yearly interest rate = $10/2=5\%$

$$\frac{9261}{8000} = \left(1 + \frac{5}{100}\right)^{2T}$$

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^{2T}$$

$$\therefore T = \frac{3}{2} = 1\frac{1}{2}$$

$$\text{Again } A = 8000 \left(1 + \frac{20}{100}\right)^1 \left(1 + \frac{20}{200}\right)$$

$$= 8000 \times \frac{6}{5} \times \frac{11}{10} = 960 \times 11 = 10560$$

$$\text{C.I.} = 10560 - 8000 = 2560 \text{ Rs.}$$

Trick : Compounding the interest on half yearly basis

$$8000 : 9261 \Rightarrow (20)^3 : (21)^3$$

Hence Time (t) = 3 half yearly

According to the question, double rate (R) = $10 \times 2 = 20\%$

20% of 1 year | 10% of 6 month

$$\text{Required rate\%} = 20 + 10 + \frac{20 \times 10}{100} = 32\%$$

$$\therefore \text{compound interest} = 8000 \times \frac{32}{100} = ₹2560$$

16. What is the compound interest on a sum of ₹ 12,000 for $2\frac{5}{8}$ years at 8% p.a., when the interest is compounded annually?

- (a) ₹2,697 (b) ₹2,654
(c) ₹2,642 (d) ₹2,712

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (a) :

$$A = 12000 \left(1 + \frac{8}{100}\right)^2 \left(1 + \frac{8 \times \frac{5}{8}}{100}\right)$$

$$= 12000 \times \frac{27}{25} \times \frac{27}{25} \times \frac{21}{20}$$

$$= 14696.64 \text{ Rs.}$$

$$\text{C.I.} = 14696.64 - 12000 = 2697 \text{ Rs.}$$

Trick: Up to 2 years the rate percentage (R) = 8%

Up to $\frac{5}{8}$ year of the rate (R) = 5%

Net effective rate =

$$8 + 8 + 5 \left| \frac{8 \times 5 + 8 \times 8 + 5 \times 8}{100} \right| \frac{8 \times 8 \times 5}{100^2}$$

$$= 22.4720$$

$$\therefore \text{Compound interest} = 12000 \times \frac{22.4720}{100} = ₹2697$$

17. A certain amount of money at compound interest grows to ₹66,550 in 3 years and ₹73,205 in 4 years. The rate percent per annum is:

- (a) 5% (b) 10%
(c) 9% (d) 11%

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (b): $\therefore A = P \left(1 + \frac{R}{100}\right)^T$

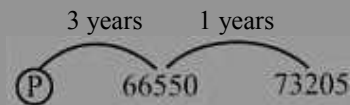
$$\frac{P \left(1 + \frac{R}{100}\right)^4}{P \left(1 + \frac{R}{100}\right)^3} = \frac{73205}{66550} = \frac{11}{10}$$

$$1 + \frac{R}{100} = 1 + \frac{1}{10}$$

$$\frac{R}{100} = \frac{1}{10}$$

$$R = 10\%$$

Trick : Let the fixed amount be P



Taking the ratio, $73205 : 66550 = 11 : 10$

$$\text{Required rate of interest (R)} = \frac{1}{10} \times 100 = 10\%$$

18. A and B together borrowed a sum of ₹51,750 at an interest rate of 7% p.a. compound interest in such a way that to settle the loan, A paid as much amount after three years as paid by B after 4 years from the days of borrowing. The sum (in ₹) borrowed by A was:

- (a) ₹24,860 (b) ₹25,000
(c) ₹26,750 (d) ₹25,650

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (c) : Let A and B borrow moneys P_1 and P_2 respectively

$$P_1 \left(1 + \frac{7}{100}\right)^3 = P_2 \left(1 + \frac{7}{100}\right)^4$$

$$\frac{P_1}{P_2} = 1 + \frac{7}{100}$$

$$\frac{P_1}{P_2} = \frac{107}{100}$$

$$207 \rightarrow 51750 \text{ Rs.}$$

$$1 \rightarrow 250$$

$$107 \rightarrow 250 \times 107 = 26750 \text{ Rs.}$$

Hence A borrowed Rs. 26750

19. A certain sum amounts to ₹280900 in 2 years at 6% per annum, interest compounded annually. The sum is:

- (a) ₹350000 (b) ₹250000
(c) ₹200000 (d) ₹550000

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (b)

$$A = P \left(1 + \frac{R}{100} \right)^T$$

$$280900 = P \left(1 + \frac{6}{100} \right)^2$$

$$P = \frac{280900 \times 50 \times 50}{53 \times 53}$$

$$P = 250000 \text{ ₹.}$$

20. In how many years will Rs. 2,000 yield Rs. 662 as compound interest at 10% per annum compounded annually?

- (a) 3 years (b) 2 years
(c) 4 years (d) 5 years

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : Amount = Principal + Compound interest
= 2000 + 662 = 2662

$$A = P \left[1 + \frac{R}{100} \right]^T$$

$$2662 = 2000 \left[1 + \frac{10}{100} \right]^T$$

$$\frac{2662}{2000} = \left[\frac{11}{10} \right]^T$$

$$\left[\frac{11}{10} \right]^3 = \left[\frac{11}{10} \right]^T$$

$$T = 3 \text{ years}$$

21. What is the compound interest earned on Rs. 80,000 at 40% per annum in 1 year compounded quarterly?

- (a) ₹28317 (b) ₹37128
(c) ₹18732 (d) ₹21387

SSC CGL (Tier-II) 20-02-2018

Ans. (b)

When interest rate is compounded quarterly $R = \frac{40}{4} =$

10%

$T = 4$ quarterly

$$CI = P \left[1 + \frac{R}{100} \right]^T - P$$

$$= 80000 \left[1 + \frac{10}{100} \right]^4 - 80000 = 80000 \left[\frac{11}{10} \right]^4 - 80000$$

$$= 80000 \times \frac{11 \times 11 \times 11 \times 11}{10 \times 10 \times 10 \times 10} - 80000$$

$$= 117128 - 80000 = 37128 \text{ Rupees}$$

22. If compound interest received on a certain amount in the 3 years is Rs. 12,100, what will be the compound interest (in Rs) for the 4th year on the same amount if rate of interest is 9%?

- (a) ₹17080 (b) ₹15669
(c) ₹13189 (d) ₹14376

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Compound interest received for 4th year

$$= 12100 \times \frac{109}{100}$$

$$= ₹ 13189$$

23. The amount received at 10% per annum compound interest after 3 yrs is Rs. 10,648. What was the principal (in Rs.)?

- (a) ₹8000 (b) ₹9000
(c) ₹8500 (d) ₹7500

SSC CGL (Tier-II) 19-02-2018

$$\text{Ans. (a) : } A = P \left(1 + \frac{10}{100} \right)^3$$

$$10648 = P \left(1 + \frac{10}{100} \right)^3$$

$$10648 = P \left(\frac{11}{10} \right)^3$$

$$P = \frac{10648 \times 1000}{1331}$$

$$P = ₹ 8000$$

24. In how many years will Rs 25,000 yield Rs 8275 as compound interest at 10% per annum compounded annually?

- (a) 2 years (b) 4 years
(c) 3 years (d) 5 years

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :

$$A = P + CI$$

$$A = ₹ (25000 + 8275)$$

$$A = ₹ 33,275$$

$$A = P \left(1 + \frac{R}{100} \right)^n$$

$$33275 = 25000 \left(1 + \frac{10}{100} \right)^n$$

$$\frac{33275}{25000} = \left(\frac{11}{10} \right)^n$$

$$\frac{1331}{1000} = \left(\frac{11}{10} \right)^n$$

$$\left(\frac{11}{10} \right)^3 = \left(\frac{11}{10} \right)^n$$

$$n = 3 \text{ years}$$

25. The amount received at 8% per annum compound interest after 2 years is Rs. 72,900. What was the principal (in Rs.) ?

- (a) ₹65000 (b) ₹67500
(c) ₹60000 (d) ₹62500

SSC CGL (Tier-II) 9-3-2018

$$\text{Ans. (d) : } A = P \left(1 + \frac{R}{100} \right)^T$$

$$72900 = P \left(1 + \frac{8}{100} \right)^2$$

$$72900 = P \times \frac{27}{25} \times \frac{27}{25}$$

$$P = 62500 \text{ Rs.}$$

26. If the amount on a certain principal in 3 years at 12% rate of interest compounded annually is Rs. 12,000, what will be the amount (in Rs.) after the 4th year?

- (a) ₹14330 (b) ₹15440
(c) ₹13440 (d) ₹14550

SSC CGL (Tier-II) 17-2-2018

Ans. (c) :

$$\therefore \text{Compound amount received after 4}^{\text{th}} \text{ year} \\ = 12000 \times \frac{112}{100} = ₹13440$$

27. The amount (in Rs.) received at 10% per annum compound interest after 3 years is Rs. 1,19,790. What was the principal?

- (a) ₹90000 (b) ₹1,00,000
(c) ₹80000 (d) ₹75000

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :

$$\text{Rate (r)} = 10\%$$

$$\text{Time (n)} = 3 \text{ years}$$

$$\text{Amount} = 119790$$

$$\therefore 119790 = P \left(1 + \frac{10}{100} \right)^3$$

$$P = 119790 \times \frac{10 \times 10 \times 10}{11 \times 11 \times 11} = ₹90000$$

28. In how many months will Rs. 8,000 yield Rs. 2,648 as compound interest at 20% per annum compounded semi-annually?

- (a) 18 months (b) 24 months
(c) 12 months (d) 30 months

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :

$$P = ₹8000$$

$$r = 20\% \text{ per annum} = 10\% \text{ half yearly}$$

$$CI = ₹2648$$

$$CI = P \left[\left(1 + \frac{r}{10} \right)^n - 1 \right]$$

$$2648 = 8000 \left[\left(1 + \frac{10}{100} \right)^n - 1 \right]$$

$$\frac{331}{1000} = \left(\frac{11}{10} \right)^n - 1$$

$$\left(\frac{11}{10} \right)^n = 1 + \frac{331}{1000} = \frac{1331}{1000}$$

$$\left(\frac{11}{10} \right)^n = \left(\frac{11}{10} \right)^3$$

$$n = 3 \text{ half-yearly or 18 months}$$

29. A certain sum amounts to ₹4,205.55 at 15% p.a. in $2\frac{2}{5}$ years, interest compounded yearly.

The sum is :

- (a) ₹2,700 (b) ₹3,200
(c) ₹3,500 (d) ₹3,000

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Amount (A) = $P \left(1 + \frac{r}{100} \right)^2 \left(1 + \frac{2r}{500} \right)$

$$4205.55 = P \left(1 + \frac{15}{100} \right)^2 \left(1 + \frac{30}{500} \right)$$

$$4205.55 = P \times \frac{529}{400} \times \frac{53}{50}$$

$$P = \frac{4205.55 \times 400 \times 50}{529 \times 53}$$

$$P = ₹3000$$

30. What is the compound interest on a sum of ₹7,200 for $2\frac{2}{5}$ years at 20% p.a., interest compounded yearly (nearest to an integer) ?

- (a) ₹3,997 (b) ₹4,290
(c) ₹4,205 (d) ₹3,960

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Amount = $7200 \times \left(1 + \frac{20}{100} \right)^2 \times \left(1 + \frac{20 \times 2}{5 \times 100} \right)$

$$= 7200 \times \frac{6}{5} \times \frac{6}{5} \times \frac{27}{25}$$

$$= 11197.44$$

$$\therefore \text{Compound interest} = (11197.44 - 7200)$$

$$= 3997.44$$

$$= 3997 \text{ (nearest)}$$

31. A sum of 18,000 is lent at 10% p.a. compound interest, compounded annually. What is the difference between the compound interest for 3rd year and 4th year ?

- (a) ₹215.40 (b) ₹217.80
(c) ₹220.60 (d) ₹221.80

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : P = ₹18000, r = 10%

$$CI \text{ of I}^{\text{st}} \text{ year} = 1800$$

$$CI \text{ of II}^{\text{nd}} \text{ year} = 1800 + 180$$

$$CI \text{ of III}^{\text{rd}} \text{ year} = 1800 + 360 + 18$$

$$CI \text{ of IV}^{\text{th}} \text{ year} = 1800 + 540 + 54 + 1.8$$

$$\text{Difference} = 595.8 - 378 = ₹217.80$$

32. At what percentage rate, compound interest compounded annually for a sum of ₹40,000, will amount to ₹44,100 in two years?

- (a) 5% (b) 4%
(c) 7.5% (d) 2%

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (a) Principal (P) = ₹40000

$$\text{Time (n)} = 2$$

$$\text{Amount (A)} = ₹44100$$

$$\text{Rate (r)} = ?$$

$$\text{Amount (A)} = P \left(1 + \frac{r}{100} \right)^n$$

$$44100 = 40000 \left(1 + \frac{r}{100} \right)^2$$

$$\frac{44100}{40000} = \left(1 + \frac{r}{100}\right)^2$$

$$1 + \frac{r}{100} = \frac{210}{200}$$

$$\frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$r = 5\%$$

33. What is the compound interest on a sum of ₹ 37,500 for $1\frac{1}{3}$ years at a rate of 12% p.a. if the interest is compounded 8-monthly?

- (a) ₹6,448 (b) ₹6,420
(c) ₹6,440 (d) ₹6,240

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) Rate=12% annually annum=8% (8-monthly)

Time = $1\frac{1}{3}$ year = 16 months = 2 (8-monthly)

$$CI = P \left(1 + \frac{R}{100}\right)^T - P$$

$$= 37500 \left(1 + \frac{8}{100}\right)^2 - 37500$$

$$= 37500 \times \frac{108}{100} \times \frac{108}{100} - 37500$$

$$= 43740 - 37500$$

Compound Interest = ₹6240

34. A sum of ₹x amounts to ₹12,777.60 in 2 years at 15% p.a., when the interest is compounded eight-monthly. The value of x is _____.

- (a) ₹10200 (b) ₹10400
(c) ₹9800 (d) ₹9600

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) Time (n) = 2 year = 24 months = 3 eight monthly

Rate (r) = 15% annually = $\frac{15}{12} = \frac{15 \times 8}{12} = 10\%$ eight-monthly

monthly

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$12777.60 = x \times \left(1 + \frac{10}{100}\right)^3$$

$$12777.60 = x \times \left(\frac{11}{10}\right)^3$$

$$x = 12777.60 \times \frac{1000}{1331}$$

$$x = ₹ 9600$$

35. The compound interest on a certain sum invested for 2 years at 10% per annum is ₹1,522.50, the interest being compounded yearly. The sum is:

- (a) ₹7,250 (b) ₹7,200
(c) ₹7,500 (d) ₹7,000

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (a)

Compound Interest = Principal

$$\left(1 + \frac{\text{Rate}}{100}\right)^{\text{Time}} - \text{Principal}$$

$$1522.50 = P \left[\left(1 + \frac{10}{100}\right)^2 - 1 \right]$$

$$1522.50 = \frac{21P}{100}$$

$$P = ₹ 7250$$

36. The compound interest (in ₹) on a sum of ₹ 12,000 at 10% per annum for 1.5 years, interest compounded half-yearly, is :

- (a) 1,821.50 (b) 1,750
(c) 1,891.50 (d) 1,900

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (c) : Principal = ₹ 12000

Interest is half yearly

Time = $2 \times 1.5 = 3$ half yearly

Rate = $10/2 = 5\%$ half yearly

$$\text{Amount} = 12000 \times \left(\frac{21}{20}\right)^3$$

$$= 12000 \times \frac{9261}{8000} = ₹ 13891.5$$

Compound Interest = 13891.50 – 12000

$$= ₹ 1891.50$$

37. Ram deposited an amount of ₹8,000 in a bank's savings account with interest 6.5% compounded monthly. What amount will he get at the end of 18 months?

- (a) ₹8790.54 (b) ₹8907.56
(c) ₹8788.98 (d) ₹8816.97

SSC CHSL –17/03/2020 (Shift-III)

Ans. (d) : Principal = ₹8000

Rate of compound (r) = 6.5% Per annum

Time n = 18 month = $1\frac{1}{2}$ year

$$\therefore A = P \left(1 + \frac{r}{100}\right)^n \text{ From, where A = Amount}$$

$$\text{Amount} = 8000 \left(1 + \frac{6.5}{100}\right) \left(1 + \frac{6.5}{200}\right)$$

$$= 8000 \left(\frac{100 + 6.5}{100}\right) \left(\frac{200 + 6.5}{200}\right)$$

$$= 8000 \times \frac{106.5}{100} \times \frac{206.5}{200}$$

$$= 8796.9 \text{ (Approx)}$$

38. In how many years will a sum of ₹320 amount to ₹405 if interest is compounded at 12.5% per annum?

- (a) $2\frac{1}{2}$ years (b) 2 years
(c) $1\frac{1}{2}$ years (d) 1 years

SSC CHSL –16/10/2020 (Shift-II)

Ans. (b) : Principal $P = ₹320$, Amount $A = ₹405$

$$\text{Rate of interest } r = 12.5\% = \frac{25}{2}\%$$

$$\therefore \text{ From } A = P \left(1 + \frac{r}{100}\right)^n$$

$$405 = 320 \left(1 + \frac{25}{100 \times 2}\right)^n$$

$$\frac{405}{320} = \left(1 + \frac{1}{4 \times 2}\right)^n$$

$$\text{or } \frac{81}{64} = \left(1 + \frac{1}{8}\right)^n$$

$$\text{or } \left(\frac{9}{8}\right)^2 = \left(\frac{9}{8}\right)^n$$

$$\Rightarrow n = 2 \text{ years}$$

39. The compound interest on ₹4,000 after 3 year is ₹630.50. Then the rate of interest compounded yearly is:

- (a) 6% (b) 7%
(c) 8% (d) 5%

SSC CHSL -15/10/2020 (Shift-I)

Ans. (d) : \therefore Compound Interest = Amount (A) - Principal (P)

$$630.50 = A - 4000$$

$$A = 4630.50 \text{ Rs.}$$

$$\therefore A = P \left(1 + \frac{R}{100}\right)^n \rightarrow \frac{4630.50}{4000} = \left(1 + \frac{R}{100}\right)^3$$

$$\frac{9261}{8000} = \left(1 + \frac{R}{100}\right)^3 \Rightarrow \left(\frac{21}{20}\right)^3 = \left(1 + \frac{R}{100}\right)^3$$

$$\frac{21}{20} = 1 + \frac{R}{100} \Rightarrow 210 = 200 + 2R$$

$$R = \frac{10}{2} = 5\%$$

40. The compound interest on ₹4,000 at the rate of 5% p.a. is ₹630.50, then the time period is:

- (a) 3 years (b) $3\frac{1}{2}$ years
(c) $1\frac{1}{2}$ years (d) 2 years

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) : Amount (A) = $4000 \left(1 + \frac{5}{100}\right)^t$

$$4630.5 = 4000 \left(\frac{21}{20}\right)^t$$

$$\frac{4630.5 \times 2}{4000 \times 2} = \left(\frac{21}{20}\right)^t$$

$$\frac{9261}{8000} = \left(\frac{21}{20}\right)^t$$

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^t$$

$$t = 3 \text{ years}$$

41. If the compound interest on a certain sum of money for 2 years at 5% p.a. is ₹328, then the sum is equal to:

- (a) ₹3,600 (b) ₹3,500
(c) ₹3,000 (d) ₹3,200

SSC CHSL -26/10/2020 (Shift-I)

Ans. (d) : Formula : C.I. = $\left[P \left(1 + \frac{R}{100}\right)^T - P \right]$

$$328 = P \left[\left(1 + \frac{5}{100}\right)^2 - 1 \right]$$

$$328 = P \left[\left(\frac{21}{20}\right)^2 - 1 \right]$$

$$328 = P \left[\left(\frac{21}{20}\right)^2 - 1 \right]$$

$$328 = P \times \frac{41}{400}$$

$$P = \frac{328}{41} \times 400$$

$$P = ₹ 3200$$

42. The compound interest and the amount obtained, on a certain sum of money are ₹820 and ₹8,820 respectively after 2 years. If the rate of interest compounded yearly, then the rate of interest is:

- (a) 8% (b) 7%
(c) 5% (d) 6%

SSC CHSL -13/10/2020 (Shift-III)

Ans. (c) : Compound Interest = 820 Rs.

Amount = 8820 Rs.

Principal = $8820 - 820 = 8000$ Rs.

$$\therefore \text{ Amount} = \text{Principal} \left(1 + \frac{\text{Rate}}{100}\right)^{\text{Time}}$$

$$8820 = 8000 \left(1 + \frac{\text{Rate}}{100}\right)^2$$

$$\frac{441}{400} = \left(1 + \frac{\text{Rate}}{100}\right)^2$$

$$\left(\frac{21}{20}\right)^2 = \left(1 + \frac{\text{Rate}}{100}\right)^2$$

$$\frac{21}{20} = 1 + \frac{\text{Rate}}{100}$$

$$\frac{21 - 20}{20} = \frac{\text{Rate}}{100}$$

$$\frac{1}{20} = \frac{\text{Rate}}{100}$$

$$\therefore \text{ Rate} = 5\%$$

43. ₹4,000 is given at 5% per annum for one year and interest is compounded half yearly. ₹2,000 is given at 40% per annum compounded quarterly for 1 year. The total interest received is nearest to:

- (a) ₹1,333.30 (b) ₹1,130.70
(c) ₹1,888.80 (d) ₹1,444.40

SSC CHSL -13/10/2020 (Shift-II)

Ans. (b) : ∴ ₹4000 per annum half yearly

$$\therefore R\% = \frac{5}{2}\% \text{ (half yearly)}$$

$$\frac{5}{2}\% = \frac{1}{40}$$

$$\therefore 10\% = \frac{1}{10}$$

$$\frac{\text{Amount}}{\text{Principal}} = \left(\frac{41}{40}\right)^2 = \frac{1681}{1600}$$

$$\frac{\text{Compound Interest}}{\text{Principal}} = \frac{81}{1600}$$

$$\text{Compound interest} = \frac{81}{1600} \times 4000 = ₹202.5$$

Amount = 2000 Rs.

$$\text{Rate (R)} = \frac{40}{4} \text{ quarterly, } R = 10\% \text{ quarterly}$$

$$\frac{\text{Amount}}{\text{Principal}} = \left(\frac{11}{10}\right)^4 = \frac{14641}{10000} \Rightarrow \frac{\text{Compound Interest}}{\text{Principal}} = \frac{4641}{10000}$$

$$\therefore \text{Compound Interest} = \frac{4641}{10000} \times 2000 = 928.2 \text{ Rs.}$$

Hence total interest received = 202.5 + 928.2 = 1130.70 Rs.

44. The difference between the compound interest on a sum of ₹8,000 for 1 year at the rate of 10% per annum, interest compounded yearly and half yearly is:

- (a) ₹10 (b) ₹40
(c) ₹20 (d) ₹30

SSC CHSL -19/03/2020 (Shift-III)

Ans. (c) : When interest is compounded annually

then rate of interest = 10% per annum

But, when interest is compounded half yearly,

$$\text{Then rate of interest} = \frac{10}{2}\% = 5\% \text{ half yearly}$$

Required rate of interest half yearly for 1 year

$$= 5 + 5 + \frac{5 \times 5}{100} = 10.25\%$$

$$\text{Required Difference} = 8000 \times \frac{(10.25 - 10)}{100} = 80 \times 0.25$$

$$= ₹20$$

45. There is a 60% increase in an amount in 5 years at simple interest. What will be the compound interest on ₹6250 for two years at the same rate of interest, when the interest is compounded yearly?

- (a) ₹1480 (b) ₹1560
(c) ₹1500 (d) ₹1590

SSC CHSL -20/10/2020 (Shift-II)

$$\text{Ans : (d)} \quad 60P = \frac{100P \times R \times 5}{100}, \quad R = 12\%$$

$$A = P \left(1 + \frac{R}{100}\right)^n$$

$$A = 6250 \left(1 + \frac{12}{100}\right)^2 = 6250 \times \left(\frac{28}{25}\right)^2$$

$$A = 7840$$

$$\therefore \text{Compound Interest} = 7840 - 6250 = ₹1590$$

46. At 6.25% annual compound interest amount of 14739 in 3 years will become?

- (a) ₹12184 (b) ₹12288
(c) ₹12473 (d) ₹12148

SSC MTS 21/08/2019 (Shift-III)

$$\text{Ans. (b): } A = P \left(1 + \frac{R}{100}\right)^t$$

$$14739 = P \left(1 + \frac{6.25}{100}\right)^3$$

$$\left\{6.25\% = 6\frac{1}{4}\% = \frac{25}{4}\%\right\}$$

$$14739 = P \left(1 + \frac{25}{4 \times 100}\right)^3$$

$$14739 = P \left(1 + \frac{1}{16}\right)^3$$

$$14739 = P \times \left(\frac{17}{16}\right)^3$$

$$3 = \frac{P}{4096}$$

$$P = 4096 \times 3$$

$$P = ₹12288$$

47. If compound interest is charged annually, then what amount will become ₹24494.40 in 2 years at the rate of 8% compound interest annually?

- (a) ₹21200 (b) ₹22400
(c) ₹21000 (d) ₹22000

SSC MTS 21/08/2019 (Shift-I)

Ans. (c) : Rate = 8%, Principal (P) = ?, Time = 2 years Amount = 24494.40

$$\text{Formula } A = P \left(1 + \frac{R}{100}\right)^t$$

$$24494.40 = P \left(1 + \frac{8}{100}\right)^2$$

$$24494.40 = P \times \frac{27}{25} \times \frac{27}{25}$$

$$P = \frac{24494.40 \times 25 \times 25}{27 \times 27}$$

$$P = ₹21000$$

48. A sum of 1000 is invested on compound interest (compounding annually) for 3 years. If the rate of interest is 10% per annum for the first two years and 50% per annum for the third year, then what will be the interest?

(a) ₹612 (b) ₹655
(c) ₹815 (d) ₹756

SSC MTS 08/08/2019 (Shift-I)

Ans. (c) : Principal = 1000

The interest for the first 2 years is 10% and the interest for the third year is 50% per annum

$$A = P \left[1 + \frac{r}{100} \right]^t$$

$$= 1000 \left[1 + \frac{10}{100} \right]^2 \times \left[1 + \frac{50}{100} \right]$$

$$= 1000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{3}{2}$$

$$= 1815$$

Interest = Amount - Principal

$$= 1815 - 1000 = ₹815$$

49. A sum of ₹900 is invested at compound interest (compounded annually) for 2 years. If the rate of interest is 10% per annum, then what will be the amount.

(a) ₹ 1071 (b) ₹ 1089
(c) ₹ 1289 (d) ₹ 1121

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) : T = 2 year, P = ₹ 900, R = 10 %

$$\text{Amount } A = P \left(1 + \frac{R}{100} \right)^T$$

$$= 900 \times \left(\frac{11}{10} \right)^2 = 9 \times 121$$

$$= ₹ 1089$$

50. ₹3600 becomes ₹4900 in 2 years when kept at compound interest (compounded annually). What is the rate of interest per annum?

(a) $18\frac{1}{3}\%$ (b) $17\frac{1}{3}\%$
(c) $15\frac{2}{3}\%$ (d) $16\frac{2}{3}\%$

SSC MTS 19/08/2019 (Shift-II)

Ans. (d)

$$\frac{4900}{3600} = \left(1 + \frac{R}{100} \right)^2$$

$$\left(\frac{7}{6} \right)^2 = \left(1 + \frac{R}{100} \right)^2$$

$$\frac{7}{6} = \left(1 + \frac{R}{100} \right)$$

$$\frac{7}{6} - 1 = \frac{R}{100}$$

$$\frac{1}{6} = 16\frac{2}{3}\%$$

51. If the compound interest rate is 20% per year, what is the interest an amount of Rs. 1,00,000 for two years compounded half yearly?

(a) ₹46,410 (b) ₹44,000
(c) ₹21,000 (d) ₹33,100

SSC MTS 14/08/2019 (Shift-I)

Ans. (a) : When interest is compound half yearly then

$$\text{rate (R)\%} = \frac{20}{2} = 10\%$$

Time = 4 half yearly

$$A = P \left[1 + \frac{R}{100} \right]^T$$

$$= 100000 \left[1 + \frac{10}{100} \right]^4$$

$$= 100000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = 146410$$

$$\text{Interest} = A - P = 146410 - 100000 = ₹46,410$$

52. An amount of ₹3000 at the rate of 20% rate of compound interest (changed annually) is invested after 2 years. What is the compound interest?

(a) ₹ 1360 (b) ₹ 1200
(c) ₹ 1320 (d) ₹ 1440

SSC MTS 06/08/2019 (Shift-I)

Ans. (c) : Compound Interest = $P \left[\left(1 + \frac{R}{100} \right)^n - 1 \right]$

$$= 3000 \left[\left(1 + \frac{20}{100} \right)^2 - 1 \right]$$

$$= 3000 \times \frac{11}{25} = 120 \times 11 = ₹1320$$

53. The compound interest on an amount of ₹5120 at the rate of 12.5% (compounded annually) for 3 years is:

(a) ₹2280 (b) ₹1960
(c) ₹2120 (d) ₹2170

SSC MTS 13/08/2019 (Shift-I)

Ans. (d) : $A = P \left[1 + \frac{r}{100} \right]^t$

$$= 5120 \left[1 + \frac{12.5}{100} \right]^3$$

$$= 5120 \left[1 + \frac{1}{8} \right]^3$$

$$= 5120 \left[\frac{9}{8} \right]^3$$

$$= \frac{5120 \times 9 \times 9 \times 9}{8 \times 8 \times 8} = 7290$$

$$\text{CI} = A - P$$

$$= 7290 - 5120$$

$$= ₹ 2170$$

54. ₹20000 is invested on compound interest (compounded half yearly) at the rate of 20% per annum, then what will be the interest after two years?

- (a) ₹ 8800 (b) ₹ 8824
(c) ₹ 9282 (d) ₹ 9428

SSC MTS 08/08/2019 (Shift-II)

Ans. (c) : $t = 2$ years \Rightarrow 4 half years

$R = 20\%$ per annum $\Rightarrow \frac{20}{2}\%$ half year rate
 $= 10\%$ half year rate

$$\therefore A = P \left(1 + \frac{R}{100} \right)^t$$

$$A = 20,000 \left(1 + \frac{10}{100} \right)^4$$

$$A = 20,000 \times \left(\frac{11}{10} \right)^4$$

$$A = 20,000 \times \frac{14641}{10000}$$

$$A = 29282$$

$$CI = A - P$$

$$= 29282 - 20000$$

$$\boxed{CI = 9282}$$

55. A sum of Rs. 1200 is invested at compound interest (compounded half yearly). If the rate of interest is 10% per annum, then what will be the amount after 18 months?

- (a) ₹ 1389.15 (b) ₹ 1185.45
(c) ₹ 1563.25 (d) ₹ 1295.35

SSC MTS 08/08/2019 (Shift-III)

Ans. (a) : $P = ₹1200$ $R = 10\%$, Time (T) = 18 months
 $= 3$ half yearly

When the rate is taken half yearly $= \frac{10}{2} = 5\%$

$$A = P \left(1 + \frac{R}{100} \right)^T$$

$$A = 1200 \left(1 + \frac{5}{100} \right)^3$$

$$A = 1200 \times \left(\frac{21}{20} \right)^3$$

$$A = 1200 \times \frac{9261}{8000}$$

$$A = ₹1389.15$$

56. What will be the compound interest on a sum of ₹ 1200 for 2 years at the rate of 20% per annum when the interest is compounded yearly?

- (a) ₹624 (b) ₹504
(c) ₹576 (d) ₹528

SSC MTS 02/08/2019 (Shift-I)

$$\text{Ans. (d)} \therefore A = P \left(1 + \frac{R}{100} \right)^t$$

$$A = 1200 \left(1 + \frac{20}{100} \right)^2 \quad \left. \begin{array}{l} \text{Where, } P = \text{Principal} \\ A = \text{Amount} \\ R = \text{Rate} \\ T = \text{Time} \end{array} \right\}$$

$$A = 1200 \left(1 + \frac{1}{5} \right)^2$$

$$A = 1200 \left(\frac{6}{5} \right)^2$$

$$A = 1200 \times \frac{36}{25}$$

$$A = 48 \times 36$$

$$A = 1728$$

$$\therefore \text{Compound Interest} = A - P \\ = (1728 - 1200) = 528 \text{ Rs.}$$

57. An amount of ₹ 2000 is invested at the compound interest (being changed annually). If the rate of interest is 10% per year then what will be the amount after 30 months?

- (a) ₹ 2538 (b) ₹ 2524
(c) ₹ 2541 (d) ₹ 2532

SSC MTS 05/08/2019 (Shift-III)

Ans. (c) :

$$30 \text{ months} \Rightarrow \frac{30}{12} = \frac{5}{2} = 2 \frac{1}{2} \text{ years}$$

$$\text{Amount} = 2000 \left(1 + \frac{10}{100} \right)^2 \times \left(1 + \frac{10}{200} \right)$$

$$= 2000 \times \frac{121}{100} \times \frac{21}{20} = 121 \times 21 = ₹2541$$

58. A sum invested at compound interest (compounded annually) amounts to ₹750 at the end of first year and ₹900 at the end of second year. What is the sum?

- (a) ₹700 (b) ₹625
(c) ₹600 (d) ₹650

SSC MTS 05/08/2019 (Shift-I)

$$\text{Ans. (b)} : \text{From } A = P \left(1 + \frac{R}{100} \right)^t$$

$$750 = P \left(1 + \frac{R}{100} \right)^1 \quad \dots\dots\dots (i)$$

$$\text{and } 900 = P \left(1 + \frac{R}{100} \right)^2 \quad \dots\dots\dots (ii)$$

From eqⁿ (ii) and eqⁿ (i)

$$\left(1 + \frac{R}{100} \right) = \frac{900}{750}$$

$$1 + \frac{R}{100} = \frac{6}{5}$$

$$\Rightarrow \frac{R}{100} = \frac{6}{5} - 1$$

$$\Rightarrow \frac{R}{100} = \frac{1}{5} \Rightarrow R = 20\%$$

$$\text{From eq}^n \text{ (i) } 750 = P \left(1 + \frac{20}{100} \right)$$

$$P \times \frac{6}{5} = 750$$

$$P = 125 \times 5$$

$$P = ₹625$$

59. What is the compound interest on ₹ 5000 in 2 years at the rate of 20% per annum ? (interest compounded half yearly).

- (a) ₹ 2340.50 (b) ₹ 2275.50
(c) ₹ 2290.50 (d) ₹ 2320.50

SSC MTS 19/08/2019 (Shift-I)

Ans. (d) : ∵ When the interest is half yearly then the rate is half and the time is doubled.

$$\therefore R = \frac{20}{2} = 10\%, \quad T = 2 \times 2 = 4 \text{ years}$$

$$A = P \left(1 + \frac{R}{100} \right)^T$$

$$\Rightarrow A = 5000 \left(\frac{11}{10} \right)^4$$

$$A = \frac{14641}{2} = 7320.5$$

$$\therefore \text{Compound interest (C.I)} = A - P \\ = 7320.5 - 5000 \\ = ₹ 2320.5$$

60. What is the effective annual rate of interest corresponding to a rate of 10% per annum compounded half-yearly?

- (a) 10.75% (b) 10.5%
(c) 10% (d) 10.25%

SSC MTS 14/08/2019 (Shift-II)

Ans. (d) : The given rate is 10% per annum When interest will be compounded half-yearly

$$\text{So, required rate} = 5 + 5 + \frac{5 \times 5}{100} \\ = 10 + 0.25 = 10.25\%$$

61. A man invested a sum of money at compound interest. It amounted to ₹12100 in two years and to ₹13310 in three years. The rate of interest per annum is:

- (a) 11% (b) 9.5%
(c) 12.5% (d) 10%

SSC MTS 13/08/2019 (Shift-III)

$$\text{Ans. (d) : } \therefore A = P \left(1 + \frac{R}{100} \right)^t$$

$$12100 = P \left(1 + \frac{R}{100} \right)^2 \dots\dots\dots(i)$$

$$13310 = P \left(1 + \frac{R}{100} \right)^3 \dots\dots\dots(ii)$$

Equation (ii) ÷ equation (i)

$$\frac{13310}{12100} = \frac{P \left(1 + \frac{R}{100} \right)^3}{P \left(1 + \frac{R}{100} \right)^2}$$

$$\frac{11}{10} = \left(1 + \frac{R}{100} \right)$$

$$\frac{11}{10} - 1 = \frac{R}{100}$$

$$\frac{R}{100} = \frac{1}{10}$$

$$R = 10\%$$

62. The compound interest for two years at 12% per annum is Rs. 477. What is the Principal amount (in Rs.) invested?

- (a) 1875 (b) 1500
(c) 2000 (d) 1650

SSC MTS 09/08/2019 (Shift-I)

$$\text{Ans. (a) : } \therefore A = P \left(1 + \frac{R}{100} \right)^t$$

$$CI = A - P$$

$$CI = P \left(1 + \frac{R}{100} \right)^t - P$$

$$CI = P \left[\left(1 + \frac{R}{100} \right)^t - 1 \right]$$

$$477 = P \left[\left(1 + \frac{12}{100} \right)^2 - 1 \right]$$

$$477 = P \left[\left(1 + \frac{3}{25} \right)^2 - 1 \right]$$

$$477 = P \left[\left(\frac{28}{25} \right)^2 - 1 \right]$$

$$477 = P \left[\frac{784}{625} - 1 \right]$$

$$477 = P \left[\frac{784 - 625}{625} \right]$$

$$477 = P \left[\frac{159}{625} \right]$$

$$3 = \frac{P}{625}$$

$$P = ₹1875$$

63. A sum borrowed under compound interest double itself in 10 years. When will it become fourfold of itself at the same rate of interest?

- (a) 24 years (b) 15 years
(c) 20 years (d) 40 years

SSC GD Constable 05/03/2019 (Shift-II)

(II) If an amount becomes n times in t years at the rate of Compound Interest

68. If a certain sum at compound interest becomes 3 times in 4 years, then in how many years will it become 9 times, at the same rate of interest?
 (a) 6 years (b) 9 years
 (c) 10 years (d) 8 years

SSC MTS 06/10/2021 (Shift-I)

Ans. (d) : Total amount = $P(1+r/100)^t$
 $3P = P(1+r/100)^4$
 $3 = (1+r/100)^4$ ——— (i)
 Now after t years the amount becomes 9 times.
 $\Rightarrow 9P = P(1+r/100)^t$
 $\Rightarrow 3^2 = (1+r/100)^t$ ——— (ii)
 From equation (i),
 $\Rightarrow (1+r/100)^8 = (1+r/100)^t$
 $t = 8$ years
 \therefore Required time is 8 years.

69. Any certain amount was invested at a certain compound interest rate. The compound after five years is 1.1881 times of the amount obtained in three years. What is percentage rate of interest?
 (a) 9.2% (b) 8%
 (c) 8.1% (d) 9%

SSC CHSL 04/07/2019 (Shift-III)

Ans. (d) : Let Principal = P
 Rate = R%
 According to the question,
 Amount in 5 years = 1.1881 × Amount in 3 years
 $P\left(1+\frac{R}{100}\right)^5 = P\left(1+\frac{R}{100}\right)^3 \times 1.1881$
 $\left(1+\frac{R}{100}\right)^2 = 1.1881$
 $(100+R)^2 = 1.1881 \times 100 \times 100$
 $(100+R)^2 = 11881$
 $100+R = 109$
 $R = 9\%$

Trick : According to the question,



$$\frac{y}{x} = \frac{11881}{10000} \text{ (For 2 years)}$$

So, for 1 year

$$y : x = \sqrt{11881} : \sqrt{10000}$$

$$= 109 : 100$$

$$\text{Required rate (I)} = \frac{9}{100} \times 100 = 9\%$$

70. A sum doubles in 4 years at a certain rate of compound interest. In how many years will that amount to 8 times itself at the same rate?
 (a) 9 (b) 12
 (c) 15 (d) 6

SSC MTS 13/08/2019 (Shift-II)

Ans. (b) :
 $1 \xrightarrow{4 \text{ year}} 2 \xrightarrow{4 \text{ year}} 4 \xrightarrow{4 \text{ year}} 8$
 Hence, in being 8 times, $4 \times 3 = 12$ year

71. If a sum of money triples in four years at compound interest, then in how many years will that amount become 27 times at the same interest rate?
 (a) 10 years (b) 16 years
 (c) 12 years (d) 15 years

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (c) :
 Amount (A) = $P\left(1+\frac{R}{100}\right)^T$
 According to the question,
 $3P = P\left(1+\frac{R}{100}\right)^4$
 $3 = \left(1+\frac{R}{100}\right)^4$
 Taking cube in both side,
 $(3)^3 = \left(1+\frac{R}{100}\right)^{3 \times 4}$
 $27 = \left(1+\frac{R}{100}\right)^{12}$
 Hence it is clear that amount will 27 times in 12 years
Trick :

 Required year = $(4 + 4 + 4) = 12$ year

(III) Problems based on difference in Simple Interest and Compound Interest

72. What is the difference (in ₹) between the simple interest and the compound interest on a sum of ₹8000 for $2\frac{2}{5}$ years at the rate of 10% p.a., when the interest is compounded yearly?
 (a) 147.20 (b) 152.80
 (c) 155 (d) 150

SSC CGL–(Tier-I) 18/08/2021 (Shift I)

Ans. (a) R = 10%
 When interest is compounded yearly
 $10\% \quad 10\% \quad 4\%$

For C.I. Total rate of interest

$$= 10 + 10 + 4 + \frac{100 + 40 + 40}{100} + \frac{400}{(100)^2}$$

$$= 24 + 1.8 + 0.04 = 25.84$$

For SI total rate of interest = $10 \times \frac{12}{5} = 24\%$

Required difference = 8000 [Rate of compound Interest ~ Rate of simple interest]

$$= 8000 [25.84 \sim 24]\%$$

$$= \frac{8000 \times 1.84}{100}$$

$$= 147.20$$

73. If the difference between the compound interest compounded annually and the simple interest on a certain sum of money for three years at 10% per annum is ₹279, then the sum (in ₹) is:

- (a) 10,000 (b) 8,000
(c) 7,500 (d) 9,000

SSC CHSL 04/08/2021 (Shift-III)

Ans. (d) : Given, R = 10%, T = 3 years

For 3 years Where D = Difference
P = Principal
R = Rate

$$D = \frac{PR^2(300 + R)}{100^3}$$

$$279 = \frac{P \times 100(300 + 10)}{1000000}$$

$$P = ₹9000$$

74. Amit borrowed a sum of ₹25,000 on simple interest. Bhola borrowed the same amount on compound interest (interest compounded yearly). At the end of 2 years, Bhola had to pay ₹160 more interest than Amit. The rate of interest charged per annum is:

- (a) $\frac{16}{25}\%$ (b) $\frac{8}{25}\%$
(c) 8% (d) $3\frac{1}{8}\%$

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (c) : Difference in CI and SI for 2 years
 $= P \left(\frac{R}{100} \right)^2$

$$160 = 25000 \left(\frac{R}{100} \right)^2$$

$$R^2 = \frac{160 \times 100 \times 100}{25000}, \quad R = 8\%$$

75. Compound interest for 2 year at ₹x at the rate of 6.5% p.a. and ₹33.80 in a simple interest is the difference. What is the value of x?

- (a) ₹ 8,000 (b) ₹ 7,500
(c) ₹ 7,800 (d) ₹ 8,500

SSC CHSL 11/07/2019 (Shift-III)

Ans. (a) : Let principal (P) = x

Difference in CI and SI for 2 years at the same rate

$$(D) = \frac{PR^2}{100^2}$$

$$33.80 = \frac{x(6.5)^2}{(100)^2}$$

$$x = \frac{33.80 \times 100^2}{(6.5)^2}$$

$$x = ₹ 8000$$

76. The difference between the compound interest and simple interest on ₹x at 9% per annum for 2 years is ₹20.25. What is the value of x?

- (a) 2,800 (b) 2,500
(c) 2,200 (d) 2,400

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) : $1 \text{ Principal} = D \times \frac{100}{R} \times \frac{100}{R}$

$$\therefore \text{Principal} = 20.25 \times \frac{100}{9} \times \frac{100}{9}$$

(Where D = Difference in C.I and S.I)

$$x = \frac{2025 \times 100}{81} = 25 \times 100$$

$$\therefore x = 2500 \text{ Rs.}$$

Note:-This formula is valid only when there is a difference of 2 years between compound interest and simple interest.

77. The difference between the compound interest and simple interest on Rs. x at 8% per annum for 2 years is Rs. 19.20. What is the value of x?

- (a) 2,500 (b) 3,200
(c) 2,800 (d) 3,000

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (d) : Given,

Principal = x, R = 8%

Interest difference = 19.20 Rs.

$$\therefore 1 \text{ Difference} = \text{Principal} \times \left(\frac{R}{100} \right)^2$$

$$\Rightarrow 19.20 = x \times \left(\frac{8}{100} \right)^2$$

$$\Rightarrow x = \frac{19.20 \times 100 \times 100}{8 \times 8}$$

$$\Rightarrow x = 3000 \text{ Rs.}$$

78. The difference between the compound interest and simple interest on ₹x at 12% per annum for 2 years is ₹ 18. What is the value of x?

- (a) ₹1,250 (b) ₹1,280
(c) ₹1,340 (d) ₹1,300

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (a) : Difference in C.I and S.I for 2 years

$$(D) = P \left(\frac{R}{100} \right)^2$$

$$18 = x \left(\frac{12}{100} \right)^2, \quad 18 = x \times \frac{9}{625}$$

$$x = ₹1250$$

79. The difference between the compound interest and simple interest on ₹ x at 7.5% per annum for 2 years is ₹45. What is the value of x?

- (a) ₹8,000 (b) ₹10,000
(c) ₹9,000 (d) ₹7,000

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (a) :

$$1 P = D \times \left(\frac{100}{R} \right)^2$$

Where P = Principal

D = Difference in S.I and C.I.

$$\therefore P = 45 \times \frac{100}{7.5} \times \frac{100}{7.5}$$

Where

$$\left. \begin{array}{l} P = x \text{ Rs.} \\ D = 45 \text{ Rs.} \\ R = 7.5\% \end{array} \right\} \text{ given that}$$

$$P = 0.8 \times 100 \times 100$$

$$\therefore x = 8000 \text{ Rs.}$$

Note:—This formula is valid only when there is a difference of 2 years between compound interest and simple interest.

80. The difference between the compound interest and simple interest on ₹ x at 8.5% per annum for 2 years is ₹ 28.90. The value of x is :

- (a) ₹3500 (b) ₹4500
(c) ₹3800 (d) ₹4000

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (d) :

$$D = P \times \left(\frac{R}{100} \right)^2$$

Where D = Difference in S.I. and C.I

P = Principal, R = Rate

$$\therefore 28.90 = P \times \left(\frac{8.5}{100} \right)^2$$

$$\frac{2890 \times 100}{8.5 \times 8.5} = x$$

$$x = ₹4000$$

81. The difference between the compound interest and simple interest on ₹x at 7% per annum for 2 years is ₹24.50. What is the value of x?

- (a) 5,400 (b) 6,000
(c) 5,000 (d) 4,800

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (c) : After 2 years, if difference in compound interest and simple interest is d, interest rate (R) and Principal is P then,

$$P = \frac{d \times 100^2}{R^2} \text{ From,}$$

$$x = \frac{24.50 \times 100^2}{7^2}$$

$$x = \frac{2450 \times 100^2}{100 \times 7^2}$$

$$x = \frac{2450 \times 100}{7 \times 7} = 5000 \text{ Rs.}$$

82. The difference between compound interest and simple interest on ₹ x at 15% per annum for 2 years is ₹ 9. What is the value of x?

- (a) ₹600 (b) ₹450
(c) ₹400 (d) ₹500

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c) : Difference in (compound interest – simple interest) for two years (D) = $\frac{Pr^2}{100^2}$

Where, P = Principal, r = Rate

According to the question,

$$9 = \frac{x \times 15^2}{100^2}$$

$$x = \frac{90000}{225}$$

$$x = 400 \text{ rupees}$$

83. The difference between the compound interest and simple interest on ₹x at 11% per annum for 2 years is ₹ 60.50. What is the value of x?

- (a) ₹4500 (b) ₹4000
(c) ₹4800 (d) ₹5000

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (d) : If the difference between the compound interest and simple interest on Rs. P for 2 years at R% p.a be Rs. D.

$$P = \frac{D \times 100^2}{R^2}$$

∴ From question,

$$R = 11\%, D = 60.50 \text{ Rupees, } P = x \text{ Rupees}$$

$$\therefore x = \frac{60.50 \times 100^2}{(11)^2}$$

$$x = ₹5000$$

84. If the difference between the compound interest and simple interest at 17% on a sum of money for 2 years (compounded annually) is ₹433.50, then the compound interest (in ₹) is:

- (a) ₹5,100 (b) ₹5,533.50
(c) ₹2,500 (d) ₹2,735.50

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) : Yearly compound rate (R) = 17%

Amount = ₹P

→ The difference between the compound interest and Simple interest received for two years at the rate of

R% on Rs P will be (D) = $\frac{PR^2}{100^2}$

∴ From question,

$$433.50 = \frac{P \times (17)^2}{100^2}$$

$$\therefore P = \frac{433.50 \times 100 \times 100}{17 \times 17}$$

P = ₹ 15000

Now compound interest = Principal

$$\left[\left(1 + \frac{\text{Rate}}{100} \right)^{\text{Time}} - 1 \right]$$

$$= 15000 \left[\left(1 + \frac{17}{100} \right)^2 - 1 \right]$$

$$= 15000 \left[\left(\frac{117}{100} \right)^2 - 1 \right]$$

$$= 15000 \left[\frac{13689}{10000} - 1 \right]$$

$$= 15000 \times \frac{3689}{10000}$$

$$= ₹5533.50$$

85. If the difference between the compound interest and simple interest at 17% on a sum of money for 2 years (compounded annually) is ₹433.50, then the sum (in ₹) is:

- (a) ₹15,000 (b) ₹25,000
(c) ₹20,000 (d) ₹12,000

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : $D = \frac{PR^2}{(100)^2}$

$$433.50 = \frac{P \times 17 \times 17}{100 \times 100}$$

$$P = \frac{4335 \times 1000}{289} = ₹15000$$

86. If the difference between the compound interest and simple interest on a certain sum of money for three years at 10% p.a. is ₹155, the sum is :

- (a) ₹6,000 (b) ₹5,000
(c) ₹6,600 (d) ₹5,500

SSC CHSL 11/07/2019 (Shift-II)

Ans. (b) : Given,

Rate (r) = 10%

Difference (D) = 155Rs.

Let principal be P

The difference between the compound interest and the simple interest for 3 years at the rate of r% per annum

$$D = \frac{Pr^2(300+r)}{(100)^3}$$

$$155 = \frac{P \times 100 \times 310}{1000000}$$

$$\frac{155 \times 1000}{31} = P$$

$$P = ₹5000$$

87. The difference between the compound interest and the simple interest on a sum of ₹8,000 for 2 years at the rate of 5% p.a., is:

- (a) ₹10 (b) ₹30
(c) ₹40 (d) ₹20

SSC CHSL -26/10/2020 (Shift-II)

Ans. (d) : Difference in C.I and S.I for 2 years (d) =

$$\frac{PR^2}{100^2}$$

Given : Principal (P) = ₹8000

$$\text{Rate} = 5\%, d = \frac{PR^2}{100^2}$$

$$d = \frac{8000 \times 5 \times 5}{100 \times 100}$$

$$d = ₹20$$

88. If the difference between the compound interest and simple interest on a certain sum of money for three years at 10% p.a. is ₹558, then the sum is:

- (a) ₹15000 (b) ₹18000
(c) ₹16000 (d) ₹18500

SSC CHSL -20/10/2020 (Shift-I)

Ans : (b) $D = P \times \left(\frac{R}{100} \right)^2 \times \left(\frac{300+R}{100} \right)$ -From formula

Where D = Difference, R = Rate, P = Principal

$$558 = P \times \left(\frac{10}{100} \right)^2 \times \left(\frac{310}{100} \right)$$

$$558 = P \times \frac{1}{100} \times \frac{31}{10}$$

$$\therefore P = \frac{558 \times 1000}{31} = 18000$$

$$\text{Principal (P)} = ₹18000$$

89. On a certain amount the difference in compound interest and simple interest at the rate of 20% rate of interest for 2 years is 200 find the Amount?

- (a) ₹3000 (b) ₹4500
(c) ₹4000 (d) ₹5000

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : Difference in C.I and S.I for two years

$$d = P \times \frac{R^2}{(100)^2}$$

$$200 = P \times \frac{(20)^2}{(100)^2}$$

$$200 = P \times \frac{400}{10000}$$

$$P = ₹5000$$

90. If the difference between simple and compound interest on a sum of money of 2 years at 5% p.a. is ₹125, the sum (in ₹) is:
 (a) 50000 (b) 5000
 (c) 10000 (d) 1000

SSC MTS 14/08/2019 (Shift-III)

Ans. (a) : Difference in C.I and S.I for 2 years

$$D = \frac{PR^2}{100^2}$$

$$125 = \frac{P \times 5 \times 5}{100 \times 100}$$

$$P = ₹50000$$

91. The difference on an amount at the rate 5% annual interest in 2 years on compound interest and simple interest charged is ₹25? find the principal.
 (a) ₹ 10000 (b) ₹ 15000
 (c) ₹ 12000 (d) ₹ 5000

SSC MTS 06/08/2019 (Shift-I)

Ans. (a) : Difference in C.I and S.I for two years

$$D = \frac{PR^2}{(100)^2}$$

$$\Rightarrow 25 = \frac{P \times 5 \times 5}{100 \times 100}$$

$$\Rightarrow P = ₹ 10000$$

92. The difference between compound interest and simple interest on ₹x at 8% per annum for 2 years is ₹48. What is the value of x?
 (a) ₹7500 (b) ₹7800
 (c) ₹7400 (d) ₹8000

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (a) : If the difference between the compound interest and the simple interest is Rs. P for 2 years at the rate of R% per annum is Rs. D = $P \left(\frac{R}{100} \right)^2$

$$48 = x \left(\frac{8}{100} \right)^2$$

$$x = \frac{48 \times 625}{4} = ₹7500$$

93. The difference between the compound interest and simple interest on ₹x at 12% per annum for 2 years is ₹43.20. What is the value of x?
 (a) 2,800 (b) 2,400
 (c) 3,000 (d) 2,500

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (c) :

If the difference between the compound interest and simple interest is Rs. P for 2 year at the rate of R% per annum is Rs. D.

$$P = D \times \left(\frac{100}{R} \right)^2$$

∴ From question,

$$T = 2 \text{ year, } R = 12\%, p = x, d = 43.20$$

$$\therefore x = \frac{43.20 \times 100^2}{(12)^2}$$

$$= \frac{4320 \times 100 \times 100}{100 \times 144} = \frac{432000}{144}$$

$$= ₹3000$$

(IV) Mixed problems on Simple and Compound Interest

94. The simple interest on a sum of ₹8,000 at a certain rate percent per annum for 3 years is ₹3,600. What will be the amount (in ₹) of the same sum after 2 years at the same rate, if the interest is compounded 8-monthly?
 (a) 11,239 (b) 10,450
 (c) 10,580 (d) 10,648

SSC CHSL 05/08/2021 (Shift-I)

Ans. (d) : $SI = \frac{PRT}{100}$

$$3600 = \frac{8000 \times R \times 3}{100}$$

$$R = 15\%$$

According to the question,
 12 months, = 15%

$$8 \text{ months} = \frac{15}{12} \times 8 = 10\%$$

$$\text{Time} = 3 \rightarrow \text{months in 2 years}$$

$$A = 8000 \left(1 + \frac{10}{100} \right)^3$$

$$= 8000 \times \frac{11 \times 11 \times 11}{1000} = ₹10648$$

95. A man invested a total of 12,050 in two parts, one at 10% p.a. simple interest for 2 years and the other at the same rate at compound interest, interest being compounded annually, for the same time. The amounts he received from both the parts are equal. The sum (in ₹) invested at the compound interest is:
 (a) 5850 (b) 6000
 (c) 5780 (d) 5800

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) Let the amount given on compound interest = x
 According to the question,

$$x \left(1 + \frac{10}{100} \right)^2 = (12050 - x) + \frac{(12050 - x) \times 10 \times 2}{100}$$

$$x \times \frac{11 \times 11}{10 \times 10} = (12050 - x) + \frac{241000 - 20x}{100}$$

$$\frac{121x}{100} + \frac{20x}{100} = 12050 - x + 2410$$

$$\frac{141x}{100} + x = 14460$$

$$241x = 1446000$$

$$x = ₹6000$$

96. A borrowed a sum of ₹160000 from B at 10% per annum simple interest. At the same time he lent the same sum to C at the same rate on compound interest, compounded semi-annually for 2 years. Find the amount (in ₹) earned by A in the whole transaction.

- (a) 4281 (b) 4280
(c) 2481 (d) 2840

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) : Amount, earned by A in the whole transaction = The difference between the compound interest & simple interest in the given year.

$$= 160000 \left[\left(1 + \frac{5}{100} \right)^4 - 1 \right] - \frac{160000 \times 10 \times 2}{100}$$

$$= 160000 \left[\frac{21^4 - 20^4}{20^4} \right] - 32000$$

$$= [194,481 - 160000] - 32000$$

$$= 34481 - 32000$$

$$= ₹2481$$

97. The simple interest on a sum of ₹12,000 at the end of 5 years is ₹6,000. What would have been the compound interest on the same sum at the same rate for 3 years when compounded annually?

- (a) ₹ 3,970 (b) ₹ 3,972
(c) ₹ 3,600 (d) ₹ 2,520

SSC CHSL 10/08/2021 (Shift-I)

Ans. (b) : $SI = \frac{PRT}{100}$

$$6000 = \frac{12000 \times R \times 5}{100}$$

$$R = 10\%$$

$$CI = P \left[\left(1 + \frac{R}{100} \right)^t - 1 \right]$$

$$= 12000 \left[\left(1 + \frac{10}{100} \right)^3 - 1 \right]$$

$$= 12000 \left[\frac{1331}{1000} - 1 \right]$$

$$= 12 \times 331 = ₹3972$$

98. Anamika paid ₹4965 as compound interest on a loan of ₹15000 after 3 years when compounded annually. Suman took a loan of ₹10000 at the same rate on simple interest. How much interest did Suman pay after 3 years?

- (a) ₹4000 (b) ₹3500
(c) ₹3000 (d) ₹4500

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c) $15000 \left(1 + \frac{R}{100} \right)^3 - 15000 = 4965$

$$15000 \left[\left(1 + \frac{R}{100} \right)^3 - 1 \right] = 4965$$

$$\left(1 + \frac{R}{100} \right)^3 = \frac{4965}{15000} + 1$$

$$\left(1 + \frac{R}{100} \right)^3 = \frac{1331}{1000}$$

$$\left(1 + \frac{R}{100} \right)^3 = \left(\frac{11}{10} \right)^3$$

$$\frac{R}{100} = \frac{11}{10} - 1$$

$$R = 10\%$$

According to the question,

$$SI = \frac{P \times R \times T}{100} = \frac{10000 \times 3 \times 10}{100} = ₹3000$$

99. A man invests ₹ 7,000 at 8% per annum simple interest for 2 years and ₹ 10,000 at compound interest at the same rate for the same period, compounded annually. What will be the total interest and the total amount (in ₹) respectively, on maturity?

- (a) 19,748 and 2,874 (b) 2,748 and 19,784
(c) 19,784 and 2,784 (d) 2,784 and 19,784

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : $SI = \frac{PRT}{100}$

$$SI = \frac{7000 \times 8 \times 2}{100}$$

$$SI = 1120$$

$$A = P \left(1 + \frac{R}{100} \right)^n$$

$$A = 10000 \times \left(1 + \frac{8}{100} \right)^2$$

$$A = 10000 \times \frac{54}{50} \times \frac{54}{50}$$

$$A = 11664$$

$$CI = A - P$$

$$CI = 11664 - 10000$$

$$CI = 1664$$

$$\text{Total interest} = SI + CI = 1120 + 1664 = ₹2784$$

$$\text{Total amount} = 7000 + 10000 + 2784 = ₹19784$$

100. Varun and Madhur invested Rs. 25,000 each in different schemes. Varun earned simple interest at 11% per annum, whereas Madhur earned compound interest at 10% per annum compounded annually. Who received more interest after 2 years and how much?

- (a) Madhur, ₹250 (b) Madhur, ₹302.50
(c) Varun, ₹250 (d) Varun, ₹500

SSC CHSL 04/08/2021 (Shift-II)

Ans. (c) : Simple Interest = $\frac{25000 \times 11 \times 2}{100} = ₹5500$
 Required percentage for the two years compound interest at 10% = $10 + 10 + \frac{10 \times 10}{100} = 21\%$
 Compound interest = $25000 \times \frac{21}{100} = ₹5250$
 The interest received by Varun = ₹5500
 The interest received by Madhur = ₹5250
 More interest received by Varun = ₹(5500 - 5250) = ₹250

- 101. The simple interest on a certain sum for 3 years at 12% p.a. is ₹6750. What is the compound interest (in ₹) on the same sum for 2 years at 20% p.a., if interest is compounded half-yearly? (rounded off to the nearest ₹)**
 (a) 7729 (b) 8702
 (c) 8000 (d) 6750

SSC CHSL 12/04/2021 (Shift-III)

Ans : (b) $SI = \frac{P \times R \times T}{100}$
 $6750 = \frac{P \times 12 \times 3}{100}$
 $P = \frac{6750 \times 100}{12 \times 3}$
 $P = ₹18750$
 When interest is compound half-yearly,
 $R = 20/2 = 10\%$
 $CI = P \left[\left(1 + \frac{R}{100} \right)^T - 1 \right]$
 $= 18750 \left[\left(1 + \frac{10}{100} \right)^4 - 1 \right]$
 $= 18750 \left[\left(\frac{11}{10} \right)^4 - 1 \right]$
 $= 18750 \left[\frac{14641 - 10000}{10000} \right]$
 $= \frac{18750 \times 4641}{10000}$
 $= ₹8702$

- 102. Same principal is invested in schemes of compound interest and simple interest. The interest obtained in compound interest and simple interest schemes after 2 years are Rs 3360 and Rs 2800 respectively. If the rate of interest is 40% then what is the principal (in Rs)?**
 (a) ₹3500 (b) ₹4500
 (c) ₹2500 (d) ₹5500

SSC MTS 9-10-2017 (Shift-III)

Ans : (a) If principal is Rs. x then
 Simple Interest = $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$2800 = \frac{x \times 40 \times 2}{100}$$

$$80x = 2800 \times 100$$

$$16x = 2800 \times 20$$

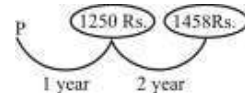
$$x = \frac{2800 \times 20}{16} = 3500$$

- 103. A sum lent out at compound interest amounts to ₹1,250 in one year and to ₹1,458 in 3 years at a certain rate percentage p.a. What is the simple interest on the same sum for $5\frac{2}{5}$ years at the same rate of interest?**

- (a) ₹600 (b) ₹480
 (c) ₹500 (d) ₹520

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-II)

Ans. (c):



Scaling factor of 2 year = $\frac{1458}{1250} = \left(\frac{27}{25} \right)^2$

Scaling factor of 1 year = $\frac{27}{25}$

$\therefore P \times \frac{27}{25} = 1250$

$P = \frac{1250 \times 25}{27}$

$R = \left(\frac{27}{25} - 1 \right) \times 100 = 8\%$

$S.I. = \frac{1250 \times 25 \times 8 \times 27}{27 \times 100 \times 5} = ₹500$

- 104. Any sum invested at the rate of 8% p.a. compound interest compounded half-yearly at the end of one year is Rs. 20280. It becomes $4\frac{3}{5}$ years at double the rate of interest on the same amount what would be simple interest for?**

- (a) ₹13800 (b) ₹14500
 (c) ₹13500 (d) ₹14200

SSC CHSL 04/07/2019 (Shift-I)

Ans. (a) :

Rate = 8% per annum, Rate (r) = 4% half yearly

Time = 1 year, Time (n) = 2 half yearly

Amount = 20280Rs.

Amount = Principal $\left(1 + \frac{\text{Rate}}{100} \right)^{\text{Time}}$

$20280 = \text{Principal} \left(1 + \frac{4}{100} \right)^2$

Principal = $\frac{20280 \times 25 \times 25}{26 \times 26}$

Principal = 18750 Rs.
 Now rate for simple interest = $8 \times 2 = 16\%$

$$\text{Time} = 4\frac{3}{5} \text{ year}$$

$$\text{Simple Interest} = \frac{18750 \times 16 \times 23}{100 \times 5}$$

$$\text{Simple Interest} = \frac{6900000}{500} = ₹13,800$$

Trick :

$$\text{Net effective rate (R)} = 4 + 4 + \frac{4 \times 4}{100} = 8.16\%$$

$$\text{Amount} = P \times \frac{108.16}{100} = 20280$$

$$\Rightarrow P = ₹ 18750$$

$$\therefore \text{S.I.} = 18750 \times 16 \times \frac{23}{500} = ₹13800$$

105. The compound interest on a certain amount for 21% and time 2 years is ₹9,282. At the same rate and for the same period of time, its simple interest (in ₹) is :

- (a) 8,750 (b) 8,400
 (c) 8,000 (d) 8,500

SSC CHSL 08/07/2019 (Shift-III)

Ans. (b) : Given,

$$\text{Time (T)} = 2 \text{ year, Rate (R)} = 21\%$$

$$\text{Compound Interest} = 9282 \text{ Rs.}$$

\therefore Compound Interest = Principal

$$\left[\left(1 + \frac{R}{100} \right)^T - 1 \right]$$

$$9282 = \text{Principal} \left[\left(1 + \frac{21}{100} \right)^2 - 1 \right]$$

$$9282 = \text{Principal} \left[\left(\frac{121}{100} \right)^2 - 1 \right]$$

$$9282 = \text{Principal} \left[\frac{14641 - 10000}{10000} \right]$$

$$\text{Principal} = \frac{9282 \times 10000}{4641}$$

$$\text{principal} = 20000 \text{ Rs.}$$

\therefore Simple Interest = $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$\text{Simple Interest} = \frac{20000 \times 21 \times 2}{100}$$

$$\text{Simple Interest} = ₹8400$$

Trick:

$$\text{Net effective Rate (R)} = 21 + 21 + \frac{21 \times 21}{100} = 46.41\%$$

$$\therefore 46.41\% \rightarrow 9282$$

$$\therefore 100\% \rightarrow \frac{9282}{46.41} \times 100 = ₹20000$$

$$\text{S.I.} = \frac{20000 \times 21 \times 2}{100} = ₹8400$$

106. A compound interest of 2 years at a rate of 11% on a sum of money is ₹6963. Its duration and at the same rate simple interest (in ₹) is :

- (a) ₹ 6600 (b) ₹ 6500 (c) ₹ 6000 (d) ₹ 6750

SSC CHSL 08/07/2019 (Shift-II)

Ans. (a) : Let the principal be P. Compound interest of 2 years = ₹ 6963 (Given)

$$P \left[\left(1 + \frac{r}{100} \right)^2 - 1 \right] = 6963$$

$$P \left[\left(1 + \frac{11}{100} \right)^2 - 1 \right] = 6963$$

$$P \left[\frac{12321}{10000} - 1 \right] = 6963$$

$$P = \frac{6963 \times 10000}{2321}$$

$$P = ₹ 30000$$

Simple interest for 2 years for the same period and at the same rate = $\frac{30000 \times 11 \times 2}{100} = ₹ 6600$

107. The simple interest on a certain amount at the rate of 20% interest per year is ₹ 250 for 2 years. What is the compound interest for the same period for the same amount (if the interest is charged annually)

- (a) ₹ 275 (b) ₹ 900
 (c) ₹ 550 (d) ₹ 750

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) Simple Interest = $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$250 = \frac{P \times 20 \times 2}{100} \Rightarrow P = ₹625$$

$$\text{Compound Interest} = 625 \left[\left(1 + \frac{20}{100} \right)^2 - 1 \right]$$

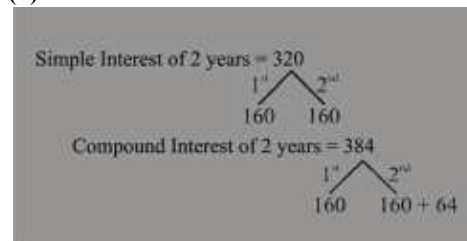
$$= 625 \times \frac{11}{25} = ₹275$$

108. The simple interest on a sum of money for 2 years at certain rate of interest is ₹320. The compound interest, compounded annually on the same sum for the same duration and at the same rate of interest is ₹384. The sum (in ₹) is :

- (a) 400 (b) 250
 (c) 200 (d) 309

SSC MTS 09/08/2019 (Shift-II)

Ans. (a)



$$\frac{64 \times 100}{160} = 40\%, 40\% = 160, \boxed{100\% = 400}$$

109. The difference in compound interest on a certain sum at 10% p.a. for one year, when the interest is compounded half yearly and yearly, is ₹88.80. What is the simple interest on the same sum for $1\frac{2}{3}$ years at the same rate?

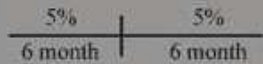
- (a) ₹ 5,920 (b) ₹ 5,916
(c) ₹ 5,986 (d) ₹ 5,980

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (a) :

When interest is compounded annually,
then $R = 10\%$

When interest is combined half yearly, then two cycles
will be formed in 1 year.



$$\text{Equivalent rate} = 5 + 5 + \frac{25}{100} = 10.25\%$$

Difference in rate = 0.25%

$$P \times \frac{0.25}{100} = 88.80$$

$$P \times 0.25 = 8880$$

$$P = 35520 \text{Rs.}$$

$$\text{S.I.} = \frac{35520 \times 10 \times 5}{100 \times 3} = ₹5920$$

110. The compound interest on a certain sum at $16\frac{2}{3}\%$ p.a. for 3 years is ₹6,350. What will be the simple interest on the same sum at the same rate for $5\frac{2}{3}$ years?

- (a) ₹11,400 (b) ₹7,620
(c) ₹9,600 (d) ₹10,200

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) :

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$= P \left(1 + \frac{50}{300}\right)^3 = P \left(\frac{7}{6}\right)^3$$

$$= \frac{343}{216} P$$

$$\text{C.I.} = A - P = \frac{343P}{216} - P$$

$$6350 = \frac{127P}{216}$$

$$P = 216 \times 50$$

$$\text{S.I.} = \frac{216 \times 50 \times 50 \times 17}{100 \times 3 \times 3} = 10200 \text{Rs.}$$

111. The simple interest on a sum of ₹50,000 at the end of two years is ₹4,000. What would be the compound interest on the same sum at the same rate for the same period?

- (a) ₹4040 (b) ₹4080
(c) ₹4008 (d) ₹8000

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

$$\text{Ans. (b) : S.I.} = \frac{P \times R \times T}{100}$$

$$4000 = \frac{50000 \times R \times 2}{100}$$

$$R = 4\%$$

$$\text{C.I.} = P \left[\left(1 + \frac{R}{100}\right)^T - 1 \right] = 50000 \left[\left(1 + \frac{4}{100}\right)^2 - 1 \right]$$

$$= 50000 \times \frac{51}{625} = ₹4080$$

112. The compound interest on a certain sum at the end of two years is ₹408. The simple interest on the same sum for the same time is ₹400. The rate of interest per annum is:

- (a) 8% (b) 4%
(c) 80% (d) 40%

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (b) :

$$\therefore \text{SI} = \frac{P \times R \times T}{100}$$

$$400 = \frac{P \times R \times 2}{100} \Rightarrow PR = 2000 \dots\dots(i)$$

$$\text{Difference in CI and SI for 2 years} = P \left(\frac{R}{100} \right)^2$$

$$8 = P \times R \times \frac{R}{(100)^2} \quad [\text{from equation (i)}]$$

$$R = \frac{8 \times 100 \times 100}{20000} = 4\%$$

113. The simple interest on a sum of money for 3 years at an interest rate of 6% p.a. is ₹6,750. What will be the compound interest rounded off on the same sum at the same rate for the same period, compounded annually is closest to:

- (a) ₹ 7,103 (b) ₹ 7,133
(c) ₹ 7,663 (d) ₹ 7,163

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (d) :

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$6750 = \frac{P \times 6 \times 3}{100}$$

$$P = 37500$$

$$\text{Compound interest (C.I.)} = 37500 \left\{ \left[1 + \frac{6}{100} \right]^3 - 1 \right\}$$

$$= 37500 \times \frac{23877}{125000} = ₹7163.1 \text{ or } ₹ 7163$$

114. In 2 years at simple interest the principal increases by 8%. What will be the compound interest earned (in Rs.) on Rs. 10 lakhs in 2 years at the same rate?

- (a) ₹86000 (b) ₹81600
(c) ₹90000 (d) ₹94000

SSC CGL (Tier-II) 21-02-2018

Ans. (b) ∴ Simple interest = $\frac{P \times R \times T}{100}$

$$\Rightarrow P \times \frac{8}{100} = \frac{P \times R \times 2}{100}$$

$$\Rightarrow R = 4\%$$

$$\therefore A = P \left(1 + \frac{R}{100}\right)^T$$

$$\therefore A = 1000000 \left(1 + \frac{4}{100}\right)^2$$

$$= 1000000 \times \frac{26}{25} \times \frac{26}{25}$$

$$= 1081600$$

∴ Compound interest = A - P

$$= 1081600 - 1000000$$

$$= \boxed{\text{₹}81600}$$

115. What is the rate of interest (in %) if simple interest earned on a certain sum for the 3 years is Rs. 6,000 and compound interest earned for 2 years is Rs. 4,160 ?

- (a) 9% (b) 8%
(c) 12% (d) 6%

SSC CGL (Tier-II) 20-02-2018

Ans. (b) ∴ Simple interest of 3 years = 6000

$$\therefore \text{Simple interest of 1 year} = \frac{6000}{3} = 2000$$

Compound interest is calculated on the simple interest of the second year only, $2000 + \frac{2000 \times R}{100} = 2160$

$$R = \frac{160}{20}$$

$$R = 8\%$$

116. What is the rate of interest if simple interest earned on a certain sum for the 3rd year is Rs 1750 and compound interest earned for 2 years is Rs 3622.5?

- (a) 8% (b) 9%
(c) 10% (d) 7%

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :

Let Principal be = P, Rate = R%

According to the question,

$$\text{Simple interest of 3 year} = \frac{PRT}{100} = \frac{PR \times 3}{100}$$

$$PR = 175000 \text{---(i)}$$

$$\text{Compound Interest of 2 years} = P \left[\left(1 + \frac{R}{100}\right)^2 - 1 \right]$$

$$3622.5 = P \left[\frac{(100+R)^2 - (100)^2}{(100)^2} \right] \text{---(ii)}$$

equⁿ (ii) ÷ (i)

$$\frac{3622.5}{175000} = P \frac{[(100+R)^2 - (100)^2]}{(100)^2}$$

$$\frac{3622.5}{175000} = \frac{PR}{100}$$

$$\frac{3622.5}{1750000} = \frac{(200+R) \times R}{10000 \times R}$$

$$200 + R = \frac{36225}{175}$$

$$200 + R = 207$$

$$R = 207 - 200$$

$$R = 7\%$$

117. Find the rate of interest (in %) if simple interest earned on a certain sum for the 3 years is Rs. 900 and compound interest earned in 2 years is Rs. 636 ?

- (a) 12% (b) 10%
(c) 9% (d) 8%

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : Simple Interest for 2 years

$$= \frac{900}{3} \times 2 = 600 \text{ Rs.}$$

$$\frac{PRT}{100} = 600$$

$$\frac{P \times R \times 2}{100} = 600$$

$$P = \frac{30000}{R} \text{.....(1)}$$

Difference in SI and CI for two years = 636 - 600

$$P \left(\frac{R}{100} \right)^2 = 36$$

$$\frac{30000}{R} \times \left(\frac{R}{100} \right)^2 = 36 \Rightarrow R = 12\%$$

118. In 4 years at simple interest the principal increases by 12%. Calculate the amount (in Rs.) received at the end of 2 years on Rs. 20,000 at the same rate if compounded annually ?

- (a) ₹ 21632 (b) ₹ 21218
(c) ₹ 22472 (d) ₹ 22400

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let the principal be Rs. P

$$A = P \left(1 + \frac{RT}{100}\right)$$

$$\frac{112P}{100} = P \left(1 + \frac{4R}{100}\right)$$

$$\frac{112}{100} - 1 = \frac{4R}{100}$$

$$\frac{12}{100} = \frac{4R}{100}, R = 3\%$$

$$\text{Amount (A)} = P \left(1 + \frac{R}{100}\right)^T$$

$$= 20000 \left(1 + \frac{3}{100}\right)^2$$

$$= 20000 \times \frac{103}{100} \times \frac{103}{100}$$

$$= \text{₹}21218$$

119. What is the rate of interest (in %) if simple interest earned on a certain sum for the 3rd year is Rs. 2,000 and compound interest earned in 2 years is Rs. 4,160?

- (a) 8% (b) 10%
(c) 12% (d) 6%

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :	
Simple Interest	Compound Interest
First year 2000	2000
Second year 2000	2160
Rate % = $\frac{160}{2000} \times 100 = 8\%$	

120. If in 2 years at simple interest the principal increases by 16%, what will be the compound interest earned (in Rs.) on Rs. 25,000 in 2 years at the same rate ?

- (a) ₹4000 (b) ₹2160
(c) ₹2000 (d) ₹4160

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Let the principal be Rs. P

$$\text{Simple Interest} = \frac{P \times R \times T}{100}$$

$$P \times \frac{16}{100} = \frac{P \times R \times 2}{100}$$

$$R = 8\%$$

$$\text{Compound Interest} = 25000 \left[\left(1 + \frac{8}{100} \right)^2 - 1 \right]$$

$$= 25000 \left[\left(\frac{27}{25} \right)^2 - 1 \right]$$

$$= 25000 \times \frac{104}{625} = ₹4160$$

121. If in 3 years at simple interest the principal increases by 15%. What will be the approximate compound interest earned (in Rs. lakhs) on Rs. 15 lakhs in 3 years at the same rate ?

- (a) 7.81 (b) 2.87
(c) 2.36 (d) 3.38

SSC CGL (Tier-II) 18-02-2018

Ans. (c) : Let the principal be x.

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$0.15x = \frac{x \times 3 \times R}{100}$$

$$R = 5\%$$

$$\text{Amount} = 15 \left[1 + \frac{5}{100} \right]^3 = 17.36$$

$$\text{Compound Interest} = 17.36 - 15 = 2.36 \text{ Lakhs}$$

122. A sum amounts to ₹7,562 in 4 years and to 8,469.44 in 5 years, at a certain rate percent per annum when the interest is compounded yearly. If ₹10,000 at the same rate of interest is borrowed for two years, then what will be the compound interest (in ₹)?

- (a) ₹2,764 (b) ₹2,544
(c) ₹1,736 (d) ₹1,965

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Given— Simple interest and compound interest of 1 year are equal

$$\text{Principal} = ₹7562$$

$$\text{Time} = 5 \text{ year} - 4 \text{ year} = 1 \text{ year}$$

$$\text{Interest} = 8469.44 - 7562$$

$$= ₹907.44$$

$$\therefore \text{Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$907.44 = \frac{7562 \times \text{Rate} \times 1}{100}$$

$$\text{Rate} = \frac{90744}{7562}$$

$$\text{Rate} = 12\%$$

Again From

$$A = P \left(1 + \frac{R}{100} \right)^t$$

$$A = 10000 \left(1 + \frac{12}{100} \right)^2$$

$$A = 10000 \times \frac{112}{100} \times \frac{112}{100}$$

$$A = ₹12544$$

$$\therefore \text{Compound Interest} = A - P$$

$$= 12544 - 10000$$

$$= ₹2544$$

123. The simple interest on a sum of money at 10% per annum for 2 years is ₹8,100. Compounded annually, what would be the compound interest (in ₹) on the same sum for the same period at the same rate of interest?

- (a) ₹8,715 (b) ₹8,100
(c) ₹9,000 (d) ₹8,505

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Let the principal be Rs. P

$$\text{S. I.} = \frac{P \times R \times T}{100}$$

$$8100 = \frac{P \times 10 \times 2}{100}$$

$$P = ₹40500$$

$$\text{Compound Interest} = P \left[\left(1 + \frac{r}{100} \right)^t - 1 \right]$$

$$= 40500 \left[\left(1 + \frac{10}{100} \right)^2 - 1 \right]$$

$$= 40500 \left[\frac{121}{100} - 1 \right]$$

$$= 405 \times 21 = ₹8505$$

124. The simple interest on a sum of money at 10% per annum for 2 years is Rs. 8,100. What would be the compound interest (in Rs.) on the same sum for the same period at 15% p.a. when the interest is compounded yearly?

- (a) ₹14,671 (b) ₹8,100
(c) ₹13,061 (d) ₹12,751

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Given,

Rate = 10%

Time = 2 years

Simple interest = 8100 Rs.

∴ Simple Interest = (Principal × Rate × Time)/100

$$8100 = (\text{Principal} \times 10 \times 2)/100$$

$$\text{Principal} = \frac{8100 \times 100}{10 \times 2}$$

$$= 40500 \text{ Rs.}$$

Again Rate = 15%

$$\therefore \text{Compound Interest} = 40500 \left[\left(1 + \frac{15}{100} \right)^2 - 1 \right]$$

$$= 40500 \left[\frac{529 - 400}{400} \right]$$

$$= 40500 \left[\frac{129}{400} \right]$$

$$= 13061.25 \text{ Rs.}$$

125. Same principal is invested in schemes of compound interest and simple interest. The interest obtained in compound interest and simple interest becomes after 2 years are Rs 3520 and 3200 respectively. If the rate of interest is 20%, then what is the principal (in Rs)?

- (a) ₹4000 (b) ₹8000
(c) ₹5000 (d) ₹10000

SSC MTS 11-10-2017 (Shift-I)

Ans : (b) Compound Interest + Simple Interest = 3520 + 3200

$$P \left[\left(1 + \frac{r}{100} \right)^2 - 1 \right] + \frac{P \times R \times T}{100} = 6720$$

$$P \left[\left(1 + \frac{20}{100} \right)^2 - 1 \right] + \frac{P \times 20 \times 2}{100} = 6720$$

$$P \left[\left(\frac{6}{5} \right)^2 - 1 \right] + \frac{2P}{5} = 6720$$

$$P \left[\frac{36}{25} - 1 \right] + \frac{2P}{5} = 6720$$

$$\frac{11P}{25} + \frac{2P}{5} = 6720$$

$$\frac{11P + 10P}{25} = 6720$$

$$21P = 6720 \times 25$$

$$\text{Principal (P)} = \frac{6720 \times 25}{21} = ₹8000$$

126. With a given annual interest rate a sum of Rs. 10000 gives a total compound interest of Rs. 1881 in 2 years. What will be the total simple interest in 3 years for the same principal amount with the same annual interest rate?

- (a) ₹2700 (b) ₹3000
(c) ₹2500 (d) ₹2300

SSC MTS 7-10-2017 (Shift-I)

Ans : (a) From question-

Interest = 1881, Principal = 10000

$$A = P \left(1 + \frac{r}{100} \right)^2$$

$$11881 = 10000 \left(1 + \frac{r}{100} \right)^2$$

$$\frac{11881}{10000} = \left(\frac{100+r}{100} \right)^2$$

$$109 = 100 + r$$

$$r = 9\%$$

According to the second condition,

$$\text{simple interest} = \frac{10000 \times 3 \times 9}{100} = 2700$$

Hence, simple interest = ₹2700

127. A principal rises to 50% in five years at simple interest. What is the compound interest payable for 3 years at Rs. 20,000 at simple interest rate?

- (a) ₹6620 (b) ₹3310
(c) ₹5760 (d) ₹2880

SSC MTS 16/08/2019 (Shift-III)

Ans. (a) : Let initial principal be = 100

$$\text{Amount} = 100 \times \frac{150}{100} = 150$$

Interest = 50

$$\therefore \text{SI} = \frac{P \times R \times T}{100}$$

$$50 = \frac{100 \times R \times 5}{100} \Rightarrow R = 10\%$$

$$\text{CI} = 20000 \left[\left(1 + \frac{10}{100} \right)^3 - 1 \right]$$

$$20000 \times \frac{331}{1000} = ₹6620$$

128. The principal increases by 21% with compound interest in two years. What is the simple interest on ₹1000 for 4 years.

- (a) ₹320 (b) ₹400
(c) ₹360 (d) ₹420

SSC MTS 14/08/2019 (Shift-I)

Ans. (b) : Let the principal (P) = 100

Amount (A) = Principal + Interest

$$= 100 + 21$$

$$= 121$$

After 2 years ratio of principal and amount P : A

$$\sqrt{100} : \sqrt{121}$$

$$10 : 11$$

$$\text{Rate\%} = \frac{1}{10} \times 100$$

$$= 10\%$$

$$SI = \frac{PRT}{100}$$

$$= \frac{1000 \times 10 \times 4}{100}$$

$$= ₹400$$

129. A sum of ₹9000 amounts to ₹13356 at a certain rate percent per annum in $4\frac{2}{5}$ years at simple interest. What will be the simple interest on the same sum at double the rate for $2\frac{1}{3}$ years?

- (a) ₹ 4640 (b) ₹ 4760
(c) ₹ 4260 (d) ₹ 4620

SSC MTS 22/08/2019 (Shift-II)

Ans. (d) : Principal (P) = ₹ 9,000
Amount (A) = ₹ 13,356
Rate = r %

$$\text{Time (t)} = 4\frac{2}{5} = \frac{22}{5} \text{ year}$$

Simple Interest = Amount – Principal

$$\frac{P \times r \times t}{100} = 13356 - 9000$$

$$4356 = \frac{9000 \times r \times \frac{22}{5}}{100}$$

$$r = 11\%$$

According to the question,

$$\text{Simple Interest} = \frac{PRT}{100}$$

$$= \frac{9000 \times 22 \times 7}{100 \times 3}$$

$$= 210 \times 22$$

$$= ₹ 4620$$

130. A sum of Rs. 6,600 amount to Rs. 8,756 in $4\frac{2}{3}$ years at x% p.a. simple interest. What will the same sum amount to if invested at (x + 3)% p.a. for $2\frac{1}{2}$ years, interest compounded yearly (nearest to Rs. 1)?

- (a) Rs. 8,175 (b) Rs. 8,458
(c) Rs. 8,385 (d) Rs. 8,066

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

$$\text{Ans (c) : } 8756 - 6600 = \frac{6600 \times \frac{14}{3} \times x}{100}$$

$$2156 = \frac{2200 \times 14 \times x}{100}$$

$$x = 7$$

$$\text{New rate} = x + 3 = 7 + 3 = 10\%$$

$$\text{New amount for two years} = 6600 \times (110/100)^2 = 7986$$

$$\text{Interest for next (1/2) year} = 7986 \times \left(\frac{10}{100}\right) \times \frac{1}{2} = 399.3$$

$$\text{Total amount} = 7986 + 399.3 = ₹8385.3 \approx ₹ 8385$$

131. If the simple interest on a certain sum for $2\frac{2}{3}$ years at 15% p.a. is Rs. 514.80 less than the simple interest on the same sum for $4\frac{1}{4}$ years

at 12% p.a. then the sum is :

- (a) Rs. 4,860 (b) Rs. 4,680
(c) Rs. 4,784 (d) Rs. 4,580

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : Let principal be Rs. P

According to the question

$$\frac{P \times 4\frac{1}{4} \times 12}{100} - \frac{P \times 2\frac{2}{3} \times 15}{100} = 514.80$$

$$P \times \frac{17}{4} \times 12 - P \times \frac{8}{3} \times 15 = 51480$$

$$51P - 40P = 51480$$

$$11P = 51480$$

$$P = ₹4680$$

132. The compound interest on certain sum for 1 year at 8% p.a. interest compounded half yearly is Rs. 652.80. What will be the simple interest on the same sum for $2\frac{1}{2}$ years at the same rate of interest?

- (a) Rs. 1,740 (b) Rs. 1,600
(c) Rs. 1,720 (d) Rs. 1,680

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b) : Let the principal be P.

Rate = $\frac{8}{2} = 4\%$, Time = 1 year, 2 Half yearly

$$\text{From, C.I.} = P \left[\left(1 + \frac{r}{100} \right)^n - 1 \right]$$

$$\text{C.I.} = P \times \left[\left(1 + \frac{4}{100} \right)^2 - 1 \right] \Rightarrow 652.80 = P \times \left(\frac{26 \times 26}{25 \times 25} - 1 \right)$$

$$652.8 = P \times \frac{51}{625}$$

$$P = ₹8000$$

$$\therefore \text{Simple Interest} = \frac{8000 \times 8 \times 5}{100 \times 2} = ₹1600$$

133. The compound interest on a sum of Rs. 18400 at 10% p.a. for a certain period of a time is Rs. 3864. What is the simple interest on the same sum at the same rate for double the time?

- (a) Rs. 9200 (b) Rs. 7340
(c) Rs. 7360 (d) Rs. 7280

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (c) : Principal (P) = ₹18400, R = 10%

Interest = ₹3864

Amount (A) = 18400 + 3864 = ₹22264

$$A = P \left(1 + \frac{R}{100} \right)^n$$

$$\frac{22264}{18400} = \left(1 + \frac{10}{100} \right)^n$$

$$\frac{121}{100} = \left(\frac{11}{10}\right)^n$$

$$\left(\frac{11}{10}\right)^2 = \left(\frac{11}{10}\right)^n$$

$$n = 2 \text{ year}$$

According to the question,

$$\begin{aligned} \text{SI} &= \frac{18400 \times 10 \times 4}{100} \\ &= ₹7360 \end{aligned}$$

134. Rahul invested two equal sums of money at compound interest under two schemes A and B. Under scheme A, the interest rate was 10% per annum and under scheme B, the interest rate was 12% p.a. Rahul got ₹ 1,050 as interest on the amount invested in scheme A after 2 years. How much interested will Rahul earned under scheme B after two years, if the interest is compounded annually in both schemes?

- (a) ₹1,722 (b) ₹1,372
(c) ₹1,270 (d) ₹1,272

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : Let equal amount = ₹1000

For scheme A,

Compound interest of Ist year = 100

Compound interest of IInd year = 100+10

Hence total interest = 210

$$210 \rightarrow ₹1050$$

$$1 \rightarrow ₹5$$

∴ Amount = ₹5000

For scheme B

Compound interest of Ist year = 600

Compound interest of IInd year = 600+72

Total Interest = 600+600+72=1272

135. The simple interest on a certain sum at the end of three years at 5% p.a. is ₹1,200. The compound interest on the same sum for the same period at the same rate is (interest compounded yearly) :

- (a) ₹1,260 (b) ₹1,800
(c) ₹820 (d) ₹1,261

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (d) :

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$1200 = \frac{P \times 5 \times 3}{100}$$

$$P = 8000 \text{ Rs.}$$

$$\text{C.I.} = P \left[\left(1 + \frac{R}{100} \right)^T - 1 \right]$$

$$= 8000 \left[\left(1 + \frac{5}{100} \right)^3 - 1 \right]$$

$$= 8000 \left[\frac{9261}{8000} - 1 \right] = ₹1261$$

(V)

Miscellaneous

136. What will be the compound interest (nearest to ₹1) on a sum of ₹25,000 for 2 years at 12% p.a., if the interest is compounded 8-monthly?

- (a) ₹6,439 (b) ₹6,394
(c) ₹6,493 (d) ₹6,349

SSC CGL (TIER-I)-2018 – 04.06.2019

Ans. (c) : Rate : 12% → 12 month

8% → 8 month

Time : 8% Rate 24 months for 3 times

$$\text{Rate} = \frac{8}{100} = \frac{2}{25} \rightarrow \text{Interest}$$

$$\rightarrow \text{Principal}$$

P A

25 27

25 27

25 27

15625 19683

↓× 1.6 ↓× 1.6

25000 31492.8

$$\text{CI} = \text{A} - \text{P} = 31492.8 - 25000 = 6492.8$$

$$\approx ₹ 6493$$

Basic method-

$$P = ₹ 25000$$

$$\text{Time}(n) = 2 \text{ year} = \frac{24 \text{ month}}{8} = 3$$

$$\text{Rate}(R) = \frac{12\%}{12} = 8\%$$

$$\text{C.I.} = P \left[\left(1 + \frac{r}{100} \right)^n - 1 \right]$$

$$= 25000 \left[\left(1 + \frac{8}{100} \right)^3 - 1 \right]$$

$$= 25000 \left[\left(\frac{27}{25} \right)^3 - 1 \right]$$

$$= 25000 \times \frac{4058}{15625} = 6492.8 \approx 6493 \text{ Rs.}$$

Trick: Rate of = 12% Per annum

∴ Rate of interest of 8 months = 8% (2 years)

8%	8%	8%
8 months	8 months	8 months

Net effective rate for 2 years

$$8 + 8 + 8 \mid 8 \times 8 + 8 \times 8 + 8 \times 8 \mid 8 \times 8 \times 8$$

$$24 \quad 192 \quad 512$$

$$24 \quad 192 + 5 \quad .12$$

$$24 + 1 = 25 \quad .97 \quad .12$$

∴ R = 25.9712%

$$\text{C.I.} = 25000 \times \frac{25.9712}{100} = ₹ 6493$$

137. The compound interest on a certain sum in $2\frac{1}{2}$ years at 10% p.a. interest compounded yearly is ₹ 1,623. The sum is:
- (a) ₹ 5,000 (b) ₹ 6,000
(c) ₹ 7,200 (d) ₹ 6,500

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b)

Let principal = P, Rate (R)=10% Time = $2\frac{1}{2}$ year

Compound interest = Amount – Principal

$$\Rightarrow \text{C.I.} = P \left(1 + \frac{R}{100}\right)^2 \left(1 + \frac{\frac{1}{2}R}{100}\right) - P$$

$$\Rightarrow 1623 = P \left[\left(1 + \frac{10}{100}\right)^2 \left(1 + \frac{10}{100} \times \frac{1}{2}\right) - 1 \right]$$

$$\Rightarrow 1623 = P \left[\frac{121}{100} \times \frac{105}{100} - 1 \right]$$

$$\Rightarrow 1623 = P \left[\frac{12705}{10000} - 1 \right] = P \left[\frac{12705 - 10000}{10000} \right]$$

$$\Rightarrow 1623 = \frac{2705}{10000} P$$

$$\therefore P = ₹ 6000$$

Trick : Interest rate up to 2 years = 10%
Rate of interest of $(1/2)$ year = 5%
Net effective rate (R) =
= 10 + 10 + 5 | 100 + 50 + 50 | 500
= 25 | 200 + 5 = 205 | .00
= 25 + 2 | .05 | .00
27.05%

$$\text{Amount} = \frac{1623}{27.25} \times 100 = ₹ 6000$$

138. A person borrowed a certain sum at 10% p.a. for three years, interest being compound annually. At the end of two years, he repaid a sum of ₹ 6,634 and at the end of the third year, he cleared off the debt by paying ₹ 13,200. What was the sum borrowed him?
- (a) 16,400 (b) 15,600
(c) 16,500 (d) 15,400

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (d) : Let the borrowed amount be P
 \therefore Rate (R)=10% Per annum
Time T = 2 year

Thus Amount (A) = $P \left(1 + \frac{R}{100}\right)^T$ From

$$A = P \times \left(1 + \frac{10}{100}\right)^2$$

$$A = \frac{121P}{100}$$

Remaining amount after paying Rs. 6634

$$= \left(\frac{121P}{100} - 6634 \right) \text{ Rs}$$

Hence new principal = $\left(\frac{121P}{100} - 6634 \right) \text{ Rs.}$

New amount = 13200 (given)

According to the question,

$$\Rightarrow \left(\frac{121P}{100} - 6634 \right) \times \left(1 + \frac{10}{100} \right)^1 = 13200$$

$$\Rightarrow \left(\frac{121P}{100} - 6634 \right) \times \frac{11}{10} = 13200$$

$$\Rightarrow \frac{121P}{100} = 18634$$

$$\Rightarrow P = \frac{1863400}{121}$$

$$P = ₹ 15400$$

139. If the amount received at the end of 2nd and 3rd year at compound interest on a certain Principal is Rs. 9,600 and Rs. 10,272 respectively, what is the rate of interest (in %)?
- (a) 7% (b) 8%
(c) 6% (d) 5%

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Amount of 2nd year = 9600

Amount of 3rd year = 10272

Difference = 672

Note: The amount for the second year is the principal amount for the third year.

$$\text{Rate (\%)} = \frac{672}{9600} \times 100 = 7\%$$

140. A invested an amount of x rupees in a bank for 2 years which gave 5% interest in 1 year and 6% interest in 2 year. The amount received after 2 years is Rs. 24,486. What is the value of x?
- (a) 23000 (b) 22500
(c) 22000 (d) 21500

SSC CGL (Tier-II) 18-02-2018

Ans. (c): Let the principal be x

Rate of 1st year = 5%

Rate of 2nd year = 6%

Hence, Amount after 2 years = 24486 = $x \times \frac{105}{100} \times \frac{106}{100}$

$$x = 24486 \times \frac{100}{105} \times \frac{100}{106} = ₹ 22000$$

141. What is the difference (in Rs.) in Compound interest earned in 1 year on a sum of Rs. 10,000 at 40% per annum compounded quarterly and annually?
- (a) ₹ 461 (b) ₹ 346
(c) ₹ 463 (d) ₹ 641

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : Principal = 10000
 Rate = 40%
 Time = 1 year
 Compound interest yearly = $\frac{10000 \times 40 \times 1}{100} = 4000$
 Compound interest quarterly = $10000 \left[1 + \frac{10}{100} \right]^4$
 = 4641
 Difference in yearly and quarterly C.I. = (4641 - 4000)
 = ₹641

142. Find the difference (in Rs.) in the interest earned on Rs. 10,00,000 at 10% in 1 year compounded annually and semi-annually.

- (a) ₹250 (b) ₹1000
 (c) ₹100 (d) ₹2500

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Interest on calculating from compound annually = $1000000 \times \frac{10}{100}$
 = 100000 Rs.
 On calculating from half yearly compound,
 R = 5%
 T = 2 half year
 Compound interest for 1st half year = $1000000 \times \frac{5}{100}$
 = 50000 Rs.
 Compound interest for 2nd half year = $50000 + 50000 \times \frac{5}{100}$
 = 52500 Rs.
 Total compound interest = 102500
 Difference = 102500 - 100000 = 2500 Rs.

143. If compound interest received on a certain amount in the 2nd year is Rs. 250. What will be the compound interest (in Rs.) for the 3rd year on the same amount at 12% rate of interest?

- (a) ₹250 (b) ₹300
 (c) ₹280 (d) ₹270

SSC CGL (Tier-II) 9-3-2018

Ans. (c):
 Compound interest for 3rd year = $250 + 250 \times \frac{12}{100}$
 = 250 + 30 = ₹280

144. What is the difference (in Rs.) between the compound interest on Rs. 12,500 for 1 year at 8% per annum compounded yearly and half-yearly ?

- (a) ₹16 (b) ₹25
 (c) ₹20 (d) ₹40

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : On annual calculation,
 Compound interest = $12500 \left[\left(1 + \frac{8}{100} \right)^1 - 1 \right]$
 = $12500 \times \frac{2}{25} = 1000$ Rs.
 On half yearly calculation
 R = 4%, T = 2 half yearly
 Compound interest = $12500 \left[\left(1 + \frac{4}{100} \right)^2 - 1 \right]$
 = $12500 \times \left[\frac{676}{625} - 1 \right]$
 = $12500 \times \frac{51}{625} = 1020$
 Difference = 1020 - 1000 = 20 Rs.

145. What will be the compound interest on a sum of ₹ 31,250 for 2 years at 12% p.a. if the interest is compounded 8-monthly?

- (a) ₹ 8,016 (b) ₹ 8,106
 (c) ₹ 8,156 (d) ₹ 8,116

SSC CGL (Tier-II) 11-9-2019

Ans. (d) : Principal (P) = ₹31250
 Rate (r) = 12% (Per annum) = 8% Per 8 months
 Time (n) = 2 year = $\frac{2 \times 12}{8} = 3$
 Compound interest (CI) = ?
 $CI = P \left[\left(1 + \frac{r}{100} \right)^n - 1 \right]$
 $CI = 31250 \left[\left(1 + \frac{8}{100} \right)^3 - 1 \right]$
 = $31250 \times \left[\left(\frac{27}{25} \right)^3 - 1 \right]$
 = $31250 \times \frac{(19683 - 15625)}{15625}$
 = ₹8116

146. A sum amounts to ₹7,562 in 4 years and to ₹8,469.44 in 5 years at a certain rate percent per annum, when the interest is compounded yearly. The rate of interest is :

- (a) 15% (b) 12%
 (c) 20% (d) 8%

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) : Given
 $A_1 = 7562, t_1 = 4$ year
 $A_2 = 8469.44, t_2 = 5$ year
 $A = P \left(1 + \frac{R}{100} \right)^t$ From

$$7562 = P \left(1 + \frac{R}{100} \right)^4 \text{ ————— (i)}$$

and

$$8469.44 = P \left(1 + \frac{R}{100} \right)^5 \text{ ————— (ii)}$$

From equⁿ (ii)/(i)

$$\frac{8469.44}{7562} = \frac{P \left(1 + \frac{R}{100} \right)^5}{P \left(1 + \frac{R}{100} \right)^4}$$

$$\frac{8469.44}{7562} = \left(1 + \frac{R}{100} \right)$$

$$\left(\frac{R}{100} \right) = \frac{907.44}{7562}$$

$$R = \frac{907.44 \times 100}{7562}$$

$$R = 12\%$$

147. A sum of money becomes ₹35,680 after 3 years and ₹ 53520 after, 6 years at a certain rate percentage p.a., interest compounded yearly. What is the compound interest on the same sum in the first case? (Your answer should be nearest to an integer)

- (a) ₹11,938 (b) ₹11,893
(c) ₹11,983 (d) ₹10,842

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b)

$$\frac{\text{Amount after 6 year}}{\text{Amount after 3years}} = \frac{53520}{35680}$$

$$\frac{P \left(1 + \frac{r}{100} \right)^6}{P \left(1 + \frac{r}{100} \right)^3} = \frac{3}{2}$$

$$\left(1 + \frac{r}{100} \right)^3 = \frac{3}{2}$$

Amount in 1st situation = 35680

$$P \left(1 + \frac{r}{100} \right)^3 = 35680$$

$$P \times \frac{3}{2} = 35680$$

$$P = \frac{35680 \times 2}{3} = ₹23787 \text{ (approx)}$$

$$\therefore \text{Compound interest} = 35680 - 23787 = ₹11893 \text{ (approx)}$$

148. The compound interest amounts on a certain sum at a certain rate percentage p.a. for the second year and third year are ₹3,300 and ₹3,630, respectively. What is the amount of the same sum at the same rate in 2½ years, interest compounded yearly?

- (a) ₹38,115 (b) ₹36,300
(c) ₹36,300 (d) ₹36,000

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (a) Let the initial principal = P

$$\text{Rate (R)} = \frac{(3630 - 3300)}{3300} \times 100 = 10\%$$

Compound interest at the end of the first year

$$= 3300 \times \frac{100}{110} = 3000$$

$$\therefore \text{Principal (P)} = (3000 \times 10) = 30000$$

Now required rate for compounding of 2 year
For first two years

$$10 + 10 + \frac{10 \times 10}{100} = 21\%$$

For 2½ years with next ½ year

$$21 + 5 + \frac{21 \times 5}{100} = 27.05\%$$

$$\therefore \text{Required Amounts} = 30000 \times \frac{127.05}{100} = ₹ 38115$$

149. A sum of ₹5,000 amounts to ₹7,200 in 8 years at a certain rate percent p.a, interest compounded yearly. What will be the compound interest on a sum of ₹6,550 in 4 years at the same rate of interest?

- (a) ₹1,285 (b) ₹1,310
(c) ₹1,290 (d) ₹1,415

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b)

$$\text{Amount} = \text{Principal} \left(1 + \frac{\text{Rate}}{100} \right)^{\text{Time}}$$

$$7200 = 5000 \left(1 + \frac{r}{100} \right)^8$$

$$\frac{72}{50} = \left(1 + \frac{r}{100} \right)^8$$

$$\frac{6}{5} = \left(1 + \frac{r}{100} \right)^4 \text{ ... (i)}$$

Compound interest for 4 years on an amount of Rs. 6550

$$= 6550 \left(1 + \frac{r}{100} \right)^4 - 6500$$

$$= 6550 \times \frac{6}{5} - 6550$$

$$= 7860 - 6550 = ₹ 1310$$

150. What sum of money at compound interest will amount to ₹4,630.08 in three years if the rate of interest is 4% for the first year, 5% for the second year and 6% for the third year?

- (a) ₹4,500 (b) ₹4,800
(c) ₹4,000 (d) ₹3,500

SSC CHSL – 26/10/2020 (Shift-III)

Ans. (c) : Let the principal = ₹x

$$\therefore x \times \frac{104}{100} \times \frac{105}{100} \times \frac{106}{100} = 4630.08$$

$$x \times 1157520 = 4630080000$$

$$x = \frac{4630080000}{1157520}$$

$$x = ₹4000$$

151. A person has borrowed a sum at the 8% annual rate of simple interest. In 8 years the interest obtained was 5490 which was less than the sum. What was the sum?

- (a) ₹ 15,500 (b) ₹ 15,250
(c) ₹ 14,280 (d) ₹ 15,600

SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : Let the amount lent = 100%

$$\text{Total interest received} = 8 \times 8\% = 64\%$$

From question,

Difference in amount borrowed

$$100\% - 64\% = 5490$$

$$36\% = 5490$$

$$1\% = \frac{5490}{36}$$

$$1\% = 152.5$$

$$100\% = 152.5 \times 100$$

$$100\% = ₹15250$$

152. A sum of 15,000/- is lent at 16% p.a. compound interest. What is the difference between the compound interest for the second year and the third year?

- (a) ₹548 (b) ₹544
(c) ₹445.44 (d) ₹454.88

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (c) : Scaling factor = $16\% = \frac{16}{100} = \frac{4}{25}$

$$\therefore \text{Interest of 1}^{\text{st}} \text{ year} = 15000 \times \frac{4}{25} = 2400 \text{ Rs.}$$

$$\begin{aligned} \text{Compound interest of 2}^{\text{nd}} \text{ year} &= 2400 + 2400 \times \frac{4}{25} \\ &= 2400 + 384 = 2784 \text{ Rs.} \end{aligned}$$

$$\begin{aligned} \text{Compound interest of 3}^{\text{rd}} \text{ year} &= 2784 + 2784 \times \frac{4}{25} \\ &= 2784 + 445.44 \text{ Rs.} \end{aligned}$$

Hence, The difference between the compound interest for the 2nd and 3rd year = ₹445.44

153. What is the compound interest on a sum of ₹ 8,100 for $1\frac{1}{4}$ years at 8% per annum if the interest is compounded 5 monthly? (Nearest to ₹1).

- (a) ₹842 (b) ₹837
(c) ₹873 (d) ₹824

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

Ans. (b) : Given,

$$P = 8100 \text{ Rs.}$$

$$\text{Time (T)} = 1\frac{1}{4} \text{ years}$$

$$\begin{aligned} &= \frac{5}{4} \text{ year} = \frac{5}{4} \times 12 \text{ months} \\ &= 15 \text{ months} \end{aligned}$$

$$\text{Time (T)} = \frac{15}{5} = 3$$

$$\text{Rate (R)} = \frac{8 \times 5}{12} = \frac{10}{3} \%$$

$$\text{Compound interest} = P \left(1 + \frac{R}{100} \right)^T - P$$

$$= 8100 \left(1 + \frac{10}{300} \right)^3 - 8100$$

$$= 8100 \times \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} - 8100$$

$$= 8937.1 - 8100 = 837.1$$

$$\approx 837 \text{ Rs.}$$

154. A sum of 12,000/- amounts to 20,736/- in 3 years at a certain rate percent per annual interest compounded annually. What will amount of the same sum to in 2 years at the same rate on compound interest?

- (a) ₹17,280 (b) ₹14,520
(c) ₹15,640 (d) ₹17,820

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (a) : Given,

$$\text{Principal (P)} = 12000 \text{ Rs.}$$

$$\text{Amount (A)} = 20736 \text{ Rs.}$$

$$\text{Time (T)} = 3 \text{ year}$$

$$\text{Rate (R)} = ?$$

$$\therefore \text{Amount} = \text{Principal} \left(1 + \frac{\text{Rate}}{100} \right)^{\text{Time}}$$

$$20736 = 12000 \left(1 + \frac{R}{100} \right)^3$$

$$\frac{20736}{12000} = \left(1 + \frac{R}{100} \right)^3$$

$$\frac{1728}{1000} = \left(1 + \frac{R}{100} \right)^3$$

$$\left(\frac{12}{10} \right)^3 = \left(1 + \frac{R}{100} \right)^3$$

$$1 + \frac{R}{100} = \frac{12}{10} \Rightarrow \frac{R}{100} = \frac{12}{10} - 1$$

$$R = 20\%$$

Again $P = 12000$ Rs.

Rate (R) = 20%

Time (T) = 2 year

$$\therefore \text{From, } A = P \left(1 + \frac{R}{100}\right)^{\text{Time}}$$

$$A = 12000 \left(1 + \frac{20}{100}\right)^2$$

$$A = 12000 \times \left(\frac{6}{5}\right)^2$$

$$A = 12000 \times \frac{36}{25}$$

$$A = 480 \times 36$$

$$A = ₹17280$$

Trick:



Taking the ratio, $12000 : 20736 = 125 : 216$

Ratio of 1 year = $\sqrt[3]{125} : \sqrt[3]{216} = 5 : 6$

$$\text{Rate} = \frac{6-5}{5} \times 100 = 20\%$$

Effective rate of 2 year =

$$20 + 20 + \frac{20 \times 20}{100} = 44\%$$

$$\text{Required Amount} = 12000 \times \frac{144}{100} = ₹17280$$

155. If a sum amounts to ₹ 2,190 in four years and ₹ 2,409 in five years at compound interest, when the interest is compounded yearly, then the annual rate of interest is:

- (a) 8% (b) 10%
(c) 9% (d) 11%

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (b) : Given,

Amount (A_1) = 2190 Rs., Time (T_1) = 4 year

Amount (A_2) = 2409 Rs., Time (T_2) = 5 year

Let Rate = R, Principal = P

According to the question,

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$2190 = P \left(1 + \frac{R}{100}\right)^4 \dots\dots\dots(i)$$

$$\text{and } 2409 = P \left(1 + \frac{R}{100}\right)^5 \dots\dots\dots(ii)$$

From eq. (ii)/(i),

$$\left(1 + \frac{R}{100}\right) = \frac{2409}{2190}$$

$$\left(1 + \frac{R}{100}\right) = \frac{11}{10}$$

$$\frac{R}{100} = \frac{11}{10} - 1$$

$$\frac{R}{100} = \frac{1}{10}$$

$$R = 10\%$$

156. If the compound Interest for the 3rd and 4th year on a certain principal is Rs. 125 and Rs. 135 respectively, what is the rate of interest?

- (a) 9% (b) 10%
(c) 8% (d) 12%

SSC CGL (Tier-II) 21-02-2018

Ans. (c) :

C.I of 3rd year = 125 Rs.

C.I. of 4th year = 135Rs.

C.I. of 3rd year will be principal for 4th year

$$\therefore 135 = 125 + \frac{125 \times R \times 1}{100}$$

$$10 = \frac{5}{4} \times R$$

$$R = 8\%$$

157. What is the difference (in Rs.) in compound interest earned in 1 year on a sum of Rs. 25000 at 20% per annum compounded semi-annually and annually?

- (a) ₹125 (b) ₹250
(c) ₹500 (d) ₹375

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : S.I and C.I for 1 year are equal

Compound interest per annum for 1 year

$$\frac{25000 \times 20 \times 1}{100} = 5000$$

Half yearly interest compounded,

$n = 2$ half yearly

$r = 10\%$ half yearly

$$\text{C.I.} = P \left[\left(1 + \frac{r}{100}\right)^n - 1 \right]$$

$$= 25000 \left[\left(1 + \frac{10}{100}\right)^2 - 1 \right]$$

$$= 25000 \left[\frac{121}{100} - 1 \right] = 25000 \times \frac{21}{100} = 5250 \text{ Rs.}$$

\therefore Difference = $5250 - 5000 = 250$ Rs.

13.

Partnership

(I) Problems based on finding the share of one person in a partnership of two or three persons

1. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invest 25% of the remaining and C, the rest. If the total profit at the end of the year is ₹219000, then A's share (in ₹) is:
- (a) 65000 (b) 71000
(c) 73000 (d) 79000

SSC CGL (Tier-I) 13/04/2022 (Shift-I)

Ans. (c) Let total investments in business is 300 units

$$\begin{aligned} \text{A's amount invests in business} &= 300 \times \frac{100}{300} \\ &= 100 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{B invests } 25\% \text{ of the remaining amounts} \\ &= 200 \times \frac{25}{100} \\ &= 50 \text{ units} \\ \text{C's invested amount in business} &= 150 \text{ units} \\ \text{Profit ratio of A, B and C} &= 100 : 50 : 150 \\ &= 2 : 1 : 3 \end{aligned}$$

$$\begin{aligned} \text{A's share} &= \frac{2 \times 219000}{6} \\ &= 2 \times 36500 \\ &= ₹73000 \end{aligned}$$

2. A, B and C invested ₹40,000, ₹48,000, and ₹80000 respectively, for a business at the start of a year. After six months, for the remaining time of the year, A added ₹ 4,000, B added ₹ 4,000 while C withdrew ₹ 4,000 every month. If the total profit is ₹ 6,72,000, then what is C's share (in ₹)?
- (a) 1,96,750 (b) 1,80,480
(c) 2,11,200 (d) 2,80,320

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans. (d) According to the question,

$$\begin{aligned} \text{A's investment} &= 40,000 \times 6 + 44,000 + 48,000 + 52,000 \\ &+ 56,000 + 60,000 + 64,000 \\ &= ₹5,64,000 \\ \text{B's investment} &= 48,000 \times 6 + 52,000 + 56,000 + \\ &60,000 + 64,000 + 68,000 + 72,000 \\ &= ₹6,60,000 \\ \text{C's investment} &= 80,000 \times 6 + 76,000 + 72,000 + \\ &68,000 + 64,000 + 60,000 + 56,000 \\ &= ₹8,76,000 \\ \therefore \text{Profit ratio between A, B and C} \end{aligned}$$

$$\begin{aligned} &= 5,64,000 : 6,60,000 : 8,76,000 \\ &= 141 : 165 : 219 \\ \text{Total} &= 525 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{So, C's share} &= \frac{6,72,000 \times 219}{525} \\ &= ₹2,80,320 \end{aligned}$$

Hence, option (d) is correct.

3. The profit earned by a company is to be divided among three friends who invested their money in the company, in the proportion of 6 : 9 : 11. If the share of the person who invested the most is ₹ 2,310, then what is the sum of the money (in ₹) received by the other two friends?
- (a) 1,890 (b) 3,150
(c) 5,460 (d) 1,260

SSC MTS 22/10/2021 (Shift-I)

Ans. (b) : Let

I	II	III
6x	9x	11x

\therefore Ratio of III investment = Ratio of profit
 $\therefore 11x = 2310$
 $\therefore x = 210$

Money received by Ist friend = $6x = 6 \times 210 = 1260$

Money received by IInd friend = $9x = 9 \times 210 = 1890$

Intended sum = $1260 + 1890 = 3150$

4. A, B and C together invests ₹53,000 in a business. A invests ₹5,000 more than B and B invests ₹6,000 more than C. Out of a total profit of ₹31,800, find the share of A.
- (a) ₹13,800 (b) ₹12,800
(c) ₹12,500 (d) ₹13,500

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) :

Let C's investment = x Rs.

B's investment = $(x + 6000)$ ₹

And, A's investment = $(x + 6000) + 5000 = (x + 11,000)$ Rs.

Hence, $x + x + 6000 + x + 11000 = 53000$

$3x = 53000 - 17000$

$x = 12,000$

Investment ratio

A	:	B	:	C
23000	:	18000	:	12000
23	:	18	:	12

Hence, share of A = $\frac{23 \times 31800}{53} = 600 \times 23 = ₹13,800$

5. A sum of ₹1,50,000 is distributed among three persons- A, B and C, so that they receive 20%, 30% and 50% respectively. A receives the same amount from another sum of money which is distributed among them so that they receive 50%, 30% and 20%, respectively. Find the total amount received from both sums of money, by B.

- (a) ₹60,000 (b) ₹63,000
(c) ₹58,000 (d) ₹55,000

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the total amount of the second type be ₹x.

According to the question

$$\text{A's share} \Rightarrow 150000 \times 20\% = x \times 50\%$$

$$x = ₹60000$$

Amount received by B in both the sum

$$= 150000 \times \frac{30}{100} + 60000 \times \frac{30}{100}$$

$$= 45000 + 18000 = ₹63000$$

6. Ramesh started a business investing a sum of ₹40,000. Six months later, Kevin joined by investing ₹20,000. If they make a profit of ₹10,000 at the end of the year, how much is the share of Kevin?

- (a) ₹3,000 (b) ₹4,000
(c) ₹2,500 (d) ₹2,000

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : Ratio of Ramesh and Kevin in the profit
= (40000 × 12) : (20000 × 6) = 4 : 1

$$\text{Share of Kevin in the profit} = \frac{1}{5} \times 10000 = ₹2000$$

7. A starts a cement trading business by investing Rs 5 lakhs. After 2 months, B joins the business by investing ₹10 lakhs and then after 4 months C too joins them by investing ₹20 lakhs. 1 year after since A started the business they make ₹3,50,000 in profit. What is B's share of the profit (₹ in)?

- (a) 75000 (b) 1,25,000
(c) 1,50,000 (d) 1,00,000

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Ratio of shares → A : B : C = (5 × 12) : (10 × 10) : (6 × 20)
= 3 : 5 : 6

$$\therefore \text{Profit of B} = \left(\frac{5}{3+5+6} \right) \times 350000$$

$$= \frac{5}{14} \times 350000 = ₹125000$$

8. A, B and C invest in a business in the ratio 3 : 6 : 5. A and C are working partners. Only B is a sleeping partner hence his share will be 3/4th of what it would have been if he were a working partner. If they make ₹50,000 profit, half of which is reinvested in the business and the other half is distributed between the partners, then how much does C get (in Rs.) ?

- (a) 20000 (b) 6000
(c) 10000 (d) 9000

SSC CGL (Tier-II) 21-02-2018

Ans. (c) : Investment ratio of A, B & C = 3 : 6 : 5

$$\text{Actual investment of A, B and C} = 3 : 6 \times \frac{3}{4} : 5$$

$$= 3 : 4.5 : 5 \text{ (Because B is a sleeping partner)}$$

$$\text{Total Profit} = 50,000$$

∴ Half of the profit is reinvested

$$\text{Hence remaining profit} = 25000$$

$$\therefore \text{Share of C} = 25000 \times \frac{5}{(3+4.5+5)}$$

$$= 25000 \times \frac{5}{12.5}$$

$$= ₹10000$$

9. A, B and C invest to start a restaurant. The total investment was ₹3 lakhs. B invested ₹50,000 more than A and C invested ₹25,000 less than B. If the profit at the end of the year was ₹14,400 then what is C's share of the profit (in ₹)?

- (a) 3600 (b) 4800
(c) 6000 (d) 7200

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Let A's investment = x

$$\text{then B's investment} = (x+50000)$$

$$\text{C's investment} = (x+25000)$$

According to the question,

$$3x + 75000 = 300000$$

$$x = 75000$$

$$\therefore \text{Investment ratio's of A, B \& C} = 75000 : 125000 : 100000 = 3 : 5 : 4$$

$$\text{C's shares} = 14400 \times \frac{4}{12} = 4800$$

10. A starts a taxi service by investing ₹25 lakhs. After 3 months, B joins the business by investing ₹40 lakhs then 4 months after B joined, C too joins them by investing ₹50 lakhs. One year after A started the business they make ₹2,73,000 in profit. What is C's share of the profit (in ₹) ?

- (a) 100000 (b) 1,25,000
(c) 75000 (d) 1,50,000

SSC CGL (Tier-II) 18-02-2018

Ans. (c) :

According to the question,

Investment ratio of A : B : C

A	:	B	:	C
25 × 12	:	40 × 9	:	50 × 5
300	:	360	:	250
30	:	36	:	25

$$\text{C's share} = \frac{25}{(30+36+25)} \times 273000$$

$$= ₹75000$$

11. A, B and C invest in a business in the ratio 4:5:7. C is a sleeping partner, so his share of profits will be half of what it would have been if he were a working partner. If they make ₹36,000 profit of which 25% is reinvested in the business, how much does B get (in ₹)?

- (a) 7560 (b) 10800
(c) 8640 (d) 9200

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : Profit ratio of A, B and C \rightarrow
 A : B : C
 $4 \times 12 : 5 \times 12 : \frac{7}{2} \times 12$ (Sleeping partner)
 $8 : 10 : 7$
 Profit = $36000 \times \frac{75}{100} = 27000$
 B's share = $\frac{27000}{25} \times 10 = 10800 \text{ ₹}$

12. A started a trading firm by investing ₹10 lakhs. After 4 months, B joined the business by investing ₹15 lakhs then 2 months after B joined C too joined them by investing ₹20 lakhs. 1 year after A started the business they made ₹6,00,000 in profit. What is C's share of the profit (in ₹)?
 (a) 2,00,000 (b) 1,00,000
 (c) 1,50,000 (d) 3,00,000

SSC CGL (Tier-II) 9-3-2018

Ans. (a) : According to the question,
 Ratio of profit of A, B and C
 $= 10 \times 12 : 15 \times 8 : 20 \times 6$
 A : B : C = $120 : 120 : 120 = 1 : 1 : 1$
 C's share = $\frac{600000 \times 1}{3} = ₹2,00,000$

13. A and B started a business by investing equal amounts. Four months later, C joins them by investing ₹3.5 lakhs. By withdrawing his investment in the business B leaves the business after 4 months since C joined. At the end of the year the business makes ₹62,400 profit out of which A collects ₹24,000 as his share of profit. How much should be paid to C (in ₹) as his share of profit?
 (a) 16000 (b) 32000
 (c) 22400 (d) 27800

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let A and B invest ₹x lakh in equal amounts.
 According to the question,
 Ratio of shares of A, B and C
 $= (x \times 12) : (x \times 8) : (3.5 \times 8) \Rightarrow 3x : 2x : 7$
 $\frac{3x}{5x+7} = \frac{24000}{62400}$
 $\frac{3x}{5x+7} = \frac{5}{13}$
 $39x = 25x + 35$
 $14x = 35$
 $x = 2.5$
 Hence, ratio of shares of A, B and C = $7.5 : 5 : 7$
 Profit of C = $\frac{7}{19.5} \times 62400 = ₹22400$

14. A and B invest in a business in the ratio 3 : 7. The business makes a profit of ₹60,000 in 1 year. They decide to distribute the profit remaining after reinvesting 40% of the profit. How much will A get (in ₹)?

- (a) 25200 (b) 15600
 (c) 10800 (d) 20400

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Ratio of shares of A and B = 3 : 7
 Since, after reinvesting 40% part of the profit
 $60000 \times \frac{40}{100} = ₹24000$
 Remaining profit = $60000 - 24000 = 36000$
 Hence, the profit earned by A = $\frac{36000 \times 3}{10}$
 $\Rightarrow ₹10800$

15. A, B and C started a business. Thrice the investment of A is equal to twice the investment of B and also equal to four times the investment of C. If C's share out of the total profit is ₹4,863, then the share of A in the profit is:

- (a) ₹9,726 (b) ₹6,484
 (c) ₹8,105 (d) ₹7,272

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : Let A, B and C invest ₹x, y and z respectively
 According to the question :-
 $3x = 2y = 4z = k$ (Let)
 $x : y : z = \frac{k}{3} : \frac{k}{2} : \frac{k}{4} = 4 : 6 : 3$
 $\therefore 3 \text{ unit} = 4863 \dots[\text{given}]$
 1 unit = 1621
 Hence, the share of A = $4 \times 1621 = ₹6484$

16. A, B and C invested their capitals in the ratio of 2 : 3 : 5. The ratio of months for which A, B and C invested is 4 : 2 : 3. If C gets a share of profit which is ₹1,47,000 more than that of A, then B's share of profit is :
 (a) ₹1,05,000 (b) ₹1,89,000
 (c) ₹1,68,000 (d) ₹1,26,000

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : Ratio of shares of A, B and C = $(2 \times 4) : (3 \times 2) : (5 \times 3) = 8 : 6 : 15$
 According to the question:-
 $15x - 8x = 147000$
 $7x = 147000$
 $x = 21000$
 \therefore Profit of B = $6x = 6 \times 21000 = ₹126000$

17. A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invests 25% of the remaining and C invests the rest. If the total profit at the end of a year is ₹1,62,000, then A's share in profit is :
 (a) ₹81,000 (b) ₹54,000
 (c) ₹90,000 (d) ₹60,000

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : $33\frac{1}{3}\% = \frac{1}{3}$, $25\% = \frac{1}{4}$

L.C.M of 3, 4 = 12

∴ Let total capital = 12 unit

Investment of A = $\frac{1}{3} \times 12 = 4$ unit

Investment of B = $(12 - 4) \times \frac{1}{4} = 2$ unit

Investment of C = $12 - (4 + 2) = 6$ unit

Ratio of investment of A, B and C = 4 : 2 : 6
= 2 : 1 : 3

∴ Profit ratio = $(2 \times 12) : (1 \times 12) : (3 \times 12)$
= 2 : 1 : 3

∴ Profit of A = $\frac{2}{6} \times 162000 = ₹54000$

18. A and B invest in a business in the ratio 4 : 5. After 10 months B leaves the business after withdrawing his investment. In the first year the business made a profit of ₹49,000. What is B's share (in ₹) of this profit?

- (a) 25000 (b) 20000
(c) 18000 (d) 22000

SSC CGL (Tier-II) 17-2-2018

Ans. (a) : Profit ratio of A and B = $4 \times 12 : 5 \times 10$
= 24 : 25

Let profit of A and B are 24x and 25x respectively

According to the question,

$$24x + 25x = 49000$$

$$x = 1000$$

$$\therefore 25x = 25000$$

Hence, share of B in profit = ₹25000

19. A, B, C subscribe a sum of ₹75,500 for a business. A subscribes ₹3,500 more than B, and B subscribes ₹4,500 more than C. Out of a total profit of ₹45,300 how much (in ₹) does A receive?

- (a) 15,000 (b) 12,600
(c) 17,400 (d) 14,700

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Let the amount invested by C be ₹x

The amount invested by B = x + 4500

The amount invested by A = (x + 4500 + 3500) Rs.

According to the question,

$$x + (x + 4500) + (x + 8000) = 75500$$

$$\Rightarrow 3x + 12500 = 75500$$

$$\Rightarrow 3x = ₹63000$$

$$\Rightarrow x = ₹21000$$

The amount invested by B = 21000 + 4500 = ₹25500

The amount invested by A = 21000 + 8000 = ₹29000

The ratio of the amount invested by A, B & C

$$= 29000 : 25500 : 21000$$

$$= 58 : 51 : 42$$

$$\therefore \text{Total profit} = ₹45300$$

Hence, out of the total income, the amount received by A.

$$= \frac{58}{(58 + 51 + 42)} \times 45300$$

$$= \frac{58}{151} \times 45300$$

$$= ₹17400$$

20. Teena, Reena and Sheena start a business with investment of ₹24000, ₹28000 and ₹20000 respectively. Teena invests for 8 months, Reena invest for 10 months and Sheena invests for one year. If the total profit at the end of year is ₹25810, then what is the share of Teena?

- (a) ₹6960 (b) ₹10150
(c) ₹7940 (d) ₹8700

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (a):	Teena	Reena	Sheena
	24000 × 8	: 28000 × 10	: 20000 × 12
	24	: 35	: 30

Share of Teena = $25810 \times \frac{24}{89} = ₹6960$

(II) Problems based on Profit accumulated in Partitions in a partnership

21. A, B and C started a business with their capitals in the ratio 4:2:9. At the end of every quarter, A halves his capital whereas B doubles his capital and C leaves his capital unchanged. If at the end of a year, A's profit was ₹24,000, then what is the total profit (in ₹)?

- (a) ₹2,30,400 (b) ₹2,35,200
(c) ₹2,16,000 (d) ₹2,25,600

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (b) Profit ratio of A, B and C
= $(4 \times 3 + 2 \times 3 + 1 \times 3 + \frac{1}{2} \times 3) : (2 \times 3 + 4 \times 3 + 8 \times 3 + 16 \times 3) : (9 \times 12)$

$$= \left(21 + \frac{3}{2}\right) : (90) : (108)$$

$$= \frac{45}{2} : 90 : 108 = 5 : 20 : 24$$

According to the question:-

Let total profit = x

$$\therefore \text{Profit of A} = \frac{5}{(5 + 20 + 24)} \times x$$

$$24000 = \frac{5}{49} \times x$$

$$x = ₹2,35,200$$

22. A, B and C enter into a partnership with capitals in the ratio $\frac{2}{3} : \frac{3}{5} : \frac{5}{6}$. After 8 months,

A increases his share of capital by 25%. If at the end of the year, the total profit earned is 5,820 then the share of C in the profit is:

- (a) ₹2,250 (b) ₹2,350
(c) ₹2,450 (d) ₹2,050

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (a)

$$\text{Ratio of capital of A, B and C} = \frac{2}{3} : \frac{3}{5} : \frac{5}{6} \\ = 20:18:25$$

According to the question,

$$\text{Profit ratio of A, B and C} \\ = (20 \times 8 + 25 \times 4) : (18 \times 12) : (25 \times 12) \\ = 260 : 216 : 300 \\ = 65 : 54 : 75$$

$$\text{Share of C in profit} = \frac{75}{65 + 54 + 75} \times 5820 = ₹2,250$$

23. P, Q and R invest sum in the ratio of 7 : 4 : 9 respectively. If they earned total profit of ₹ 6680 at the end of year, then what is the total share of P and Q together?

- (a) ₹ 4868 (b) ₹ 4254
(c) ₹ 4124 (d) ₹ 3674

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Given,

Ratio of investment of P, Q and R = 7 : 4 : 9

Total profit = ₹ 6680

Total capital invested by P and Q together.

$$= \left(\frac{7+4}{7+4+9} \right) \times 6680 \\ = \frac{11}{20} \times 6680 \\ = ₹ 3674$$

24. K, L and M invest sum in the ratio of 15 : 20 : 27 respectively. If they earned total profit of ₹ 10230 at the end of year, then what is the difference between share of K and L?

- (a) ₹ 1155 (b) ₹ 1275
(c) ₹ 1980 (d) ₹ 825

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Ratio of investment of K, L and M = 15 : 20 : 27

Total profit = ₹ 10230

Difference of investment of K and L.

$$= \left(\frac{20-15}{15+20+27} \right) \times 10230 \\ = \frac{5}{62} \times 10230 \\ = 5 \times 165 \\ = ₹ 825$$

25. A sum (in ₹) is distributed between A, B and C in the ratio 9 : 6 : 11. If A gives ₹500 from his share to C, the ratio of shares of A, B and C becomes 4:3:6. What is the sum of shares (in ₹) of B and C, in the beginning?

- (a) ₹7,800 (b) ₹7,500
(c) ₹8,500 (d) ₹9,100

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) Let A, B and C have the amount 9x, 6x and 11x respectively.

$$\therefore \frac{9x-500}{11x+500} = \frac{4}{6} \\ 27x - 1500 = 22x + 1000 \\ 5x = 2500 \\ x = 500$$

The sum of the initial part of B and C = (11x + 6x) ⇒ 17x = ₹ 8500

26. A, B and C enter into a partnership by investing their capitals in the ratio of 2/5:3/4:5/8. After 4 months, A increased his capital by 50%, but B decreased his capital by 20%. What is the share of B in the total profit of ₹2,82,100 at the end of a year?

- (a) ₹1,00,750 (b) ₹97,500
(c) ₹1,01,400 (d) ₹83,200

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c)

$$\text{Ratio of their investment} = \frac{2}{5} : \frac{3}{4} : \frac{5}{8} = 16 : 30 : 25$$

Let A, B and C invested ₹16x, 30x and 25x respectively.

According to the question,

Ratio of profit

$$= (16x \times 4 + 24x \times 8) : (30x \times 4 + 24x \times 8) : 25x \times 12 \\ = 256x : 312x : 300x = 64 : 78 : 75$$

$$\text{B's share} = \frac{78}{217} \times 282100 = ₹1,01,400$$

27. A started a business with a capital of ₹1,12,000. After 2 months, B joined the business with a capital of ₹80,000 and after another 2 months, C joined the business with a capital of ₹72,000. After 10 months from the start of the business, B withdrew ₹8,000 and C also withdrew ₹8,000. If B received ₹9,800 as his share in the profit at the end of a year, then the total profit was:

- (a) ₹33,600 (b) ₹32,400
(c) ₹35,800 (d) ₹30,800

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) Ratio of investments of A, B and C

$$= (112000 \times 12) : (80000 \times 8 + 72000 \times 2) : (72000 \times 6 + 64000 \times 2)$$

$$= (112 \times 12) : (80 \times 8 + 72 \times 2) : (72 \times 6 + 64 \times 2)$$

$$= 1344 : 784 : 560 = 12 : 7 : 5$$

∴ At the end of the year, B got a profit of ₹9800

$$\therefore \text{Total profit} = 9800 \times \frac{12+7+5}{7}$$

$$\text{Total profit} = ₹33600$$

28. A, B and C started a business. A invested 33⅓% of the total capital. B invest 33⅓% of the remaining capital and C, the remaining. If the total profit, at the end of a year, was ₹20,250, then the profit of C exceeds the profit of B by:

- (a) ₹6,750 (b) ₹2,700
(c) ₹4,500 (d) ₹5,200

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c) $33\frac{1}{3}\% = \frac{1}{3}$

Let total capital = 9 unit
Then ratio of capital of A, B and C = 3 : 2 : 4
∴ Profit ratio will remain same as capital ratio because time period is same
Profit ratio = 3 : 2 : 4

$$\text{Required value} = \frac{(4-2)}{(3+2+4)} \times 20250$$

$$= 2 \times 2250 = ₹4500$$

29. A, B and C started a business with their capitals in the ratio 1:4:4. At the end of every 3 months. A doubles his capital, b halves his capital and C leaves his capital unchanged. At the end of the year, if B's share in the profit was ₹4,50,000, then the total profit (in ₹ lakhs) was _____.

- (a) 24.2 (b) 32.4
(c) 34.8 (d) 23.1

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) Ratio of capitals,

$$A : B : C = 1 : 4 : 4$$

According to the question, profit ratio,
 $= (1 \times 3 + 2 \times 3 + 4 \times 3 + 8 \times 3) : (4 \times 3 + 2 \times 3 + 1 \times 3 + \frac{1}{2} \times 3) : (4 \times 12)$
 $= 45 : 45/2 : 48$
 $= 90 : 45 : 96$
 $= 30 : 15 : 32$

Let profit of A, B and C are 30x, 15x and 32x respectively

As per question,

$$\therefore 15x = 450000$$

$$x = ₹30000$$

$$\therefore \text{Total profit} = 30x + 15x + 32x = 77x$$

$$= 77 \times 30000 = 2310000 = 23.1 \text{ lakhs}$$

30. Two businessmen A and B invest in a business in the ratio 5 : 8. They decided to reinvest 30% of the profit they earned back into the business. The remaining profit they distributed amongst themselves. If A's share of the profit was ₹87,500 then how much profit (in ₹) did the business make ?

- (a) 227000 (b) 250000
(c) 375000 (d) 325000

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Let there be a profit of ₹x in the business

Profit ratio = 5 : 8

According to the question,

$$x \times \frac{70}{100} \times \frac{5}{(5+8)} = 87500$$

$$x \times \frac{7}{2} \times \frac{1}{13} = 87500$$

$$x = 12500 \times 26$$

$$= 325000$$

31. A and B started a partnership business investing some amount in the ratio of 5 : 6. C joined then after 6 months with an amount equal to $\frac{2}{3}$ rd of B. What was their profit (in Rs.) at the end of the year if C got Rs 21,600 as his share.

- (a) 46800 (b) 56160
(c) 70200 (d) 140400

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :

$$A : B : C$$

$$5 \times 12 : 6 \times 12 : 6 \times \frac{2}{3} \times 6$$

$$5 : 6 : 2$$

According to the question,

$$\therefore \text{Share of C} = 2 \text{ unit} = 21600 \text{ given}$$

$$1 \text{ unit} = 10800$$

$$\therefore \text{Profit of (A+B+C)} = (5+6+2)$$

$$= 13 \times 10800 = 140400$$

32. A and B invest in a business in the ratio 2 : 5. If 50% of the total profit goes to charity and A's share is ₹3.6 lakhs, the total profit is Rs..... lakhs.

- (a) 12.6 (b) 25.2
(c) 37.8 (d) 16.8

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

$$A \quad B$$

Investment ratio 2 : 5

Profit ratio 2x : 5x

Profit after donating to charity = (2x + 5x)

$$\times \left(\frac{100-50}{100} \right) = \frac{7x}{2}$$

$$\therefore \text{Share of A} = 3.6 \text{ Lakhs}$$

$$\therefore \frac{7x}{2} \times \frac{2}{2+5} = 3.6 \text{ Lakhs}$$

$$x = 3.6 \text{ Lakhs}$$

$$\text{Hence, total profit} = 7x$$

$$= 7 \times 3.6$$

$$= 25.2 \text{ lakhs}$$

33. A and B started a partnership business investing in the ratio of 2 : 5. C joined then after 3 months with an amount equal to $\frac{4}{5}$ th of B. What was their profit (in Rs.) at the end of the year if A got ₹16,800 as his share?

- (a) 56000 (b) 100800
(c) 84000 (d) 117600

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Let A and B invest ₹2x and 5x respectively
And C invest ₹4x

Ratio of investment of A, B and C = (2x×12) : (5x×12)

: (4x × 9)

= 2 : 5 : 3

∴ 2 unit = 16800----- (Given)

∴ 10 unit = ₹84000

Hence, total profit = ₹84000

34. A and B started a partnership business investing in the ratio of 3 : 8. C joined them after 4 months with an amount equal to $\frac{3}{4}$ th of B. What was their profit (in ₹) at the end of the year if C got ₹24,000 as his share?

- (a) 120000 (b) 150000
(c) 90000 (d) 180000

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Profit ratio of A, B and C = $3 \times 12 : 8 \times 12 : 8 \times \frac{3}{4} \times 8$
 $= 3 : 8 : 4$
 Let profit of A, B and C are $3x$, $8x$ and $4x$
 According to the question,
 $4x = 24000$
 $x = ₹6000$
 Total profit = $3x + 8x + 4x$
 $= 15x = 15 \times 6000 = ₹90000$

35. A, B and C started a business with their capitals in the ratio 2 : 3 : 5. A increased his capital by 50% after 4 months, B increased his capital by $33\frac{1}{3}\%$ after 6 months and C withdrew 50% of his capital after 8 months, from the start of the business. If the total profit at the end of a year was ₹86,800, then the difference between the shares of A and C in the profit was :

- (a) ₹7,000 (b) ₹9,800
 (c) ₹8,400 (d) ₹12,600

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Let A, B and C invest ₹200, 300 and 500 respectively
 Ratio of investments of A, B and C
 $= (200 \times 12 + 100 \times 8) : (300 \times 12 + 100 \times 6) : (500 \times 8 + 250 \times 4)$
 $= 3200 : 4200 : 5000$
 $= 16 : 21 : 25$
 Total profit \Rightarrow
 $\therefore 62 \text{ unit} = ₹86800$
 $1 \text{ unit} = ₹1400$
 $9 \text{ unit} = ₹12600 (\because C-A = 9 \text{ unit})$
 Hence difference of shares of A and C = ₹12600

36. 'A' started a business with a capital of ₹ 54,000 and admitted 'B' and 'C' after 4 months and 6 months, respectively. At the end of the year, the profit was divided in the ratio 1 : 4 : 5. What is the difference between the capitals invested by 'B' and 'C' ?

- (a) ₹ 1,62,000 (b) ₹ 3,24,000
 (c) ₹ 2,16,000 (d) ₹ 1,08,000

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : Let the capital invested by B be ₹x
 And the capital invested by C be ₹y
 According to the question,
 $54000 \times 12 : x \times 8 : y \times 6 = 1 : 4 : 5$
 $\Rightarrow 8x = 54000 \times 12 \times 4$
 $x = 54000 \times 6 = 324000$
 $\Rightarrow 6y = 54000 \times 12 \times 5$
 $y = 540000$
 $\therefore y - x = 540000 - 324000$
 $= ₹216000$
 Hence, the difference between the capital invested by B and C is ₹216000

37. A, B and C started a business by investing ₹13,750, ₹16,250 and ₹18,750 respectively. If B's share in the profit earned by them is ₹5,200, what is the total profit (in ₹) earned by them together ?

- (a) 15,600 (b) 18,200
 (c) 16,600 (d) 17,500

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : Let the total profit be x
 \therefore Time is equal so, the ratio of profit will be same of the ratio of capital.

A : B : C
 $13750 : 16250 : 18750$
 $11 : 13 : 15$

Proportional sum of A, B and C = 39

So $B = \frac{x}{39} \times 13$

$5,200 = \frac{x}{39} \times 13$

$x = 15,600$

Hence, Total profit earned by them = ₹15600.

38. B starts some business by investing ₹90000. After 4 months, D joins business by investing ₹80000. At the end of the year, in what ratio will they share the profit?

- (a) 10:7 (b) 9:4
 (c) 27:16 (d) 7:3

SSC MTS 9-10-2017 (Shift-I)

Ans : (c)

\therefore Profit ratio will be the share ratio = $90000 \times 12 : 80000 \times (12-4) = 12 \times 90000 : 80000 \times 8$
 $= 27 : 16$

\therefore The required ratio = 27 : 16

(III) Problems based on Principal Amount

39. A invests ₹6,00,000 more than B in business. B invests his capital for $7\frac{1}{2}$ months, while A invests his capital for $2\frac{1}{2}$ more months than B. Out of the total profit of ₹12,40,000, if the share of B is ₹2,48,000 less than share of A, then capital of B is:

- (a) ₹42,00,000 (b) ₹40,00,000
 (c) ₹45,00,000 (d) ₹48,00,000

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (d) Total profit = 12,40,000

Let profit of A be X

Profit of B = x - 248000

$x + x - 248000 = 12,40,000$

$2x = 1488000$

$x = 744000$

Profit of A = 7,44,000

Profit of B = 7,44,000 - 2,48,000

$= 496000$

As we know,

Capital \times Time = Profit

Profit Share A to B = 7,44,000 : 49,6000

$3 : 2$

Time ratio A to B = $10 : \frac{15}{2}$

$4 : 3$

$$\frac{4A}{3B} = \frac{3}{2}$$

$$8A = 9B$$

$$\frac{A}{B} = \frac{9}{8}$$

So, Capital ratio A to B = 9 : 8
 9-8 = 1 unit = 600000
 8 unit = 48,00000

40. A, B and C are partners in a business. A, whose capital has been used for 5 months, claims 1/7 of the profit. B whose capital has been used for 7 months, claims 1/5 of the profit. C has invested ₹4,600 for 9 months. How much capital did A contribute?

- (a) ₹ 1,800 (b) ₹ 1,650
 (c) ₹ 1,600 (d) ₹ 1,850

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a): Let the total profit be 35 units
 Profit of A = $\frac{1}{7} \times 35 = 5$ units
 Profit of B = $\frac{1}{5} \times 35 = 7$ units
 Profit of C = 35 - 5 - 7 \Rightarrow 23 units
 Let the capital of A and B are x and y respectively.
 We know that :-
 Capital \times Time = Profit
 $5x : 7y : 4600 \times 9 = 5 : 7 : 23$
 According to the question.
 $\frac{5x}{4600 \times 9} = \frac{5}{23}$
 $x = \frac{4600 \times 9}{23}$
 $x = ₹1800$
 Hence, A contributed ₹1800.

41. Three partners shared the profit in a business in the ratio 8:7:5. They invested their capitals for 7 months, 8 months and 14 months respectively. What was the ratio of their capitals?

- (a) 49 : 64 : 20 (b) 64 : 49 : 20
 (c) 20 : 64 : 49 (d) 20 : 49 : 64

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : Profit = Capital \times Time
 Profit ratio = 8 : 7 : 5
 Time ratio = 7 : 8 : 14
 Hence, the ratio of capital = $\frac{8}{7} : \frac{7}{8} : \frac{5}{14}$
 = 64 : 49 : 20

(IV) Miscellaneous

42. A and B entered into a partnership with investments in the ratio 3 : 5. After a few months, A withdrew and collected back his money. At the end of the year, they received profit in the ratio 2 : 5. After how many months did A withdraw?

- (a) 7
 (b) 9
 (c) 8
 (d) 6

SSC CGL (Tier-I) 21/04/2022 (Shift-II)

Ans : (c) Let A invests his investment in x month.
 According to the question,
 Profit = Capital \times Time
 $\frac{2}{5} = \frac{(12-x) \times 3}{5 \times 12} \Rightarrow 120 = 15 \times (12-x)$
 $\Rightarrow 120 = 180 - 15x$
 $\Rightarrow 15x = 60$
 $\Rightarrow x = 4$
 Hence, A withdraw his money in = (12-4) = 8 months.

43. The ratio of the profits of P and Q is 5 : 8. What is their investment ratio, if their investment time period ratio is 3 : 5

- (a) 13 : 25 (b) 12 : 25
 (c) 24 : 25 (d) 25 : 24

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (d) Let their investment ratio is a : b.
 Then,
 Profit = Investment \times Time-period
 $\therefore 5 : 8 = a \times 3 : b \times 5$
 $\frac{a}{b} = \frac{25}{24}$
 Hence, their investment ratio = a : b = 25 : 24

44. The ratio of investment by A to that by B in a business is 14 : 15 and the ratio of their respective profits at the end of a year is 2 : 5. If A invested the money for 3 months, then for how much time (in months) B invested his money?

- (a) 7 (b) 9
 (c) 6 (d) 5

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : Let B invest for x month
 $\frac{A's \text{ Profit}}{B's \text{ Profit}} = \frac{A's \text{ Investment} \times \text{Time}}{B's \text{ Investment} \times \text{Time}}$
 According to the question,
 $\frac{2}{5} = \frac{14 \times 3}{15 \times x}$
 $x = 7$ months

14.

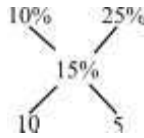
Alligation

1. A dealer had 120 kg of wheat. A part of it was sold by him at 10% gain and the rest at 25% gain. Overall, he had a gain of 15%. How much of the wheat was sold at 10% gain?
 (a) 80 kg (b) 60 kg
 (c) 40 kg (d) 50 kg

SSC CHSL 03/06/2022 (Shift- II)

Ans. (a) :

2 : 1
 3 unit = 120 kg
 1 unit = 40 kg
 2 unit = 80 kg



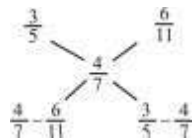
Hence, 80 kg of wheat was sold at 10% gain.

2. Two containers have mixtures of milk and water, in the ratio of 3 : 2 and 6 : 5 respectively. In what ratio should the contents be mixed so that the ratio of milk to water in the final mixture is 4 : 3?
 (a) 6 : 13 (b) 9 : 14
 (c) 10 : 11 (d) 5 : 8

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) : According to the question,

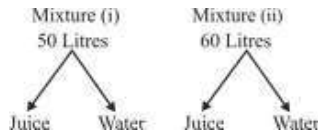
$$\begin{aligned} \text{Required} &= \frac{44-42}{7 \times 11} : \frac{21-20}{5 \times 7} \\ &= \frac{2}{11} : \frac{1}{5} \\ &= 10 : 11 \end{aligned}$$



3. A large container has a 50 litre mixture of juice and water in the ratio 3:2. In this mixture a 60 litre juice and water mixture is added, that has a juice to water ratio of 2:1. After this, 11 litres of the solution is replaced with pure juice. What is the ratio of water to juice in the final mixture?
 (a) 37:18 (b) 29:81
 (c) 4:7 (d) 18:37

SSC MTS 11/10/2021 (Shift-I)

Ans. (d) :



Total Juice = 30 + 40 = 70 Litres
 total water = 20 + 20 = 40 Litres
 Total mixture = 50 + 60 = 110 Litres
 According to the question,

$$\begin{aligned} \text{Water : Juice} &= (110-11) \frac{4}{11} : (110-11) \times \frac{7}{11} + 11 \\ &= 99 \times 4 : 99 \times 7 + 121 \\ &= 36 : 74 \\ &= 18 : 37 \end{aligned}$$

4. A container has 30 litres of milk, from which 3 litres of milk is taken out and replaced with water. The process is done three times. What is the final ratio of the water and the milk in the container?
 (a) 729 : 271 (b) 19 : 81
 (c) 81 : 19 (d) 271 : 729

SSC MTS 02/11/2021 (Shift-I)

Ans. (d) : Remaining = Initial quantity

$$\begin{aligned} &\left(1 - \frac{\text{Quantity taken out}}{\text{Initial quantity}}\right)^{\text{Repeated number}} \\ &= 30 \left(1 - \frac{3}{30}\right)^3 \\ &= 30 \times \frac{9 \times 9 \times 9}{10 \times 10 \times 10} \\ &= \frac{729 \times 3}{100} = \frac{2187}{100} \end{aligned}$$

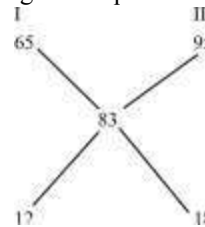
Now, quantity of water = 30.00 - 21.87
 = 8.13

Required ratio = 813 : 2187
 = 271 : 729

5. Two kinds of rice, the first costing ₹65 per kg and the second ₹95 per kg, are mixed together. Find the ratio in which the 2 types are mixed so that the mixture costs ₹83 per kg.
 (a) 19 : 13 (b) 13 : 19
 (c) 2 : 3 (d) 3 : 2

SSC MTS 02/11/2021 (Shift-I)

Ans. (c) : According to the question,



Required ratio = 12 : 18
 = 2 : 3

6. A mixture contains acid and water in the ratio of 6 : 1. On adding 12 litres of water to the mixture, the ratio of acid to water becomes 3 : 2. The quantity of water (in litres) in the original mixture was :
 (a) 6 (b) 4
 (c) 3.5 (d) 5

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (b) : Acid : Water = 6 : 1 = 6x : x
 According to the question,

$$\frac{6x}{x+12} = \frac{3}{2}$$

$$12x = 3x + 36$$

$$9x = 36$$

$$\boxed{x = 4}$$

The quantity of water in the original mixture $x = 4$ litre

7. The volume of the water in two tanks, A and B, is in the ratio of 6 : 5. The volume of water in tank A is increased by 30%. By what percentage should the volume of water in tank B be increased so that both the tanks have the same volume of water?

- (a) 15% (b) 18%
(c) 30% (d) 56%

SSC CHSL 2019 -16/10/2020

Ans. (d) : Let, the volume of water in Tank A = $6x$

And volume of water in tank B = $5x$

Again let the tank B increase by $m\%$ then

According to the question,

$$\frac{6x \times 130}{100} = \frac{5x \times (100 + m)}{100}$$

$$156 = 100 + m$$

$$m = 56\%$$

8. Alloy A contains copper and zinc in the ratio of 4 : 3 and alloy B contains copper and zinc in the ratio of 5 : 2. A and B are taken in the ratio of 5 : 6 and melted to form a new alloy. The percentage of zinc in the new alloy is closest to :

- (a) 54 (b) 34.2
(c) 35 (d) 36.8

SSC CGL (Tier-II) 12-09-2019

Ans. (c) :

Copper : Zinc

A → 4 : 3

B → 5 : 2

On mixing A and B in the ratio of 5 : 6, respectively

The new alloy → $(4 \times 5 + 5 \times 6) : (3 \times 5 + 2 \times 6)$
= 50 : 27

$$\text{Zinc Percentage} = \frac{27}{77} \times 100$$

$$= 35.06\%$$

9. A vessel contains a solution of two liquids A and B in the ratio 5:3. When 10 litres of the solution is taken out and replaced by the same quantity of B, the ratio of A and B in the vessel becomes 10:11. The quantity (in litres) of the solution, in the vessel was _____.

- (a) 42 (b) 52
(c) 44 (d) 48

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) Let, Quantity of solution A = $5x$

And Quantity of solution B = $3x$

As per question Total mixture = $5x + 3x = 8x$

$$\frac{(8x-10) \times \frac{5}{8}}{(8x-10) \times \frac{3}{8} + 10} = \frac{10}{11}$$

$$\frac{40x-50}{24x-30+80} = \frac{10}{11}$$

$$440x-550 = 240x+500$$

$$440x-240x = 500+550$$

$$200x = 1050$$

$$x = \frac{1050}{200} = \frac{21}{4}$$

Hence, Initially volume of mixture in the vessel

$$= 8x = 8 \times \frac{21}{4} = 42 \text{ liters}$$

10. A beaker contains acid and water in the ratio 1 : x. When 300 ml of the mixture and 50 ml of water are mixed, the ratio of acid and water becomes 2 : 5. What is the value of x ?

- (a) 2 (b) 1
(c) 3 (d) 4

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Acid : water

1 : x

When 50 ml of water is added to the mixture then the ratio becomes 2 : 5.

According to the question,

$$\frac{\frac{1}{(x+1)} \times 300}{\left(\frac{x}{x+1} \times 300\right) + 50} = \frac{2}{5}$$

$$= \frac{\frac{300}{x+1}}{300x+50x+50} = \frac{2}{5}$$

$$300 \times 5 = 2 [300x + 50x + 50]$$

$$1500 = 700x + 100$$

$$x = 2$$

11. How many litres of water should be added to a 7.5 litre mixture of acid and water in the ratio of 1 : 2 such that the resultant mixture has 20% acid in it ?

- (a) 10 (b) 2.5
(c) 7.5 (d) 5

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Quantity of acid in mixture

$$= 7.5 \times \frac{1}{3} = 2.5 \text{ litre}$$

Let x litres of water to be added

$$\left(\frac{2.5}{7.5+x}\right) \times 100 = 20$$

$$12.5 = 7.5 + x$$

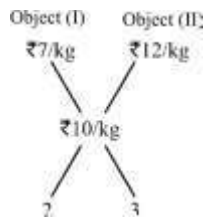
$$x = 5 \text{ litres}$$

12. The price of a variety of a commodity is ₹7/kg. and that of another is 12/kg. Find the ratio in which two varieties should be mixed so that the price of the mixture is ₹10/kg.

- (a) 3 : 4 (b) 2 : 5
(c) 2 : 3 (d) 4 : 5

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (c) :



Intended Ratio = 2:3

13. A container contains 20 L mixture in which there is 10% sulphuric acid. Find the quantity of sulphuric acid to be added in it to make the solution to contain 25% sulphuric acid.

- (a) 3 L (b) 5 L
(c) 2 L (d) 4 L

SSC CGL (Tier-II)-2019-18/11/2020

Ans. (d) : According to the question, Let x Sulphuric acid mixed in the mixture

$$\frac{2+x}{20+x} = \frac{1}{4}$$

$$8+4x=20+x$$

$$3x=12$$

$$x=4$$

Hence 4L of sulphuric acid should be added to the mixture.

14. Two bottles of the same capacity are 35% and $33\frac{1}{3}\%$ full of orange juice, respectively. They are filled up completely with apple juice and then the contents of both bottles are emptied into another vessel. The percentage of apple juice in the mixture is:

- (a) $64\frac{1}{3}\%$ (b) $65\frac{5}{6}\%$
(c) $60\frac{2}{3}\%$ (d) $34\frac{1}{6}\%$

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (b): Let, each bottles capacity = 300 litre
Quantity of apple juice in the mixture

$$= 300 \times \frac{65}{100} + 300 \times 66\frac{2}{3}\%$$

$$= 195 + 200 = 395 \text{ litre}$$

Total quantity = 600 litre

$$\text{Apple juice percentage} = \frac{395}{600} \times 100 = 65\frac{5}{6}\%$$

15. 25 litres of a mixture contains 30% of spirit and rest water. If 5 litres of water be mixed in it, the percentage of spirit in the new mixture is:

- (a) $12\frac{1}{2}\%$ (b) $33\frac{1}{3}\%$
(c) 25% (d) 45%

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (c) : Quantity of spirit = $25 \times \frac{30}{100} = \frac{15}{2}$ litres

∴ In 25 litres of mixture + on mixing 5 litres of water = 30 litre

$$\text{Required}\% = \frac{\frac{15}{2}}{30} \times 100 = 25\%$$

16. A jar contains a mixture of a fruit juice and water in the ratio 5:x. When 1 litre of water is added to 4 litres of the mixture the ratio of fruit juice to water becomes 1:1. What is the value of x ?

- (a) 3 (b) 1
(c) 2 (d) 4

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Fruit juice in a mixture of 4 liters

$$= 4 \times \frac{5}{(5+x)}$$

Quantity of water in a mixture of 4 liters

$$= 4 \times \frac{x}{(5+x)}$$

According to the question,

$$\frac{4 \times \left(\frac{5}{5+x} \right)}{4 \times \left(\frac{x}{5+x} \right) + 1} = \frac{1}{1}$$

$$\Rightarrow \frac{20}{(5+x)} - \frac{4x}{(5+x)} = 1$$

$$\Rightarrow \left(\frac{20-4x}{5+x} \right) = 1$$

$$\Rightarrow 20 - 4x = 5+x$$

$$\Rightarrow 5x = 15$$

$$\Rightarrow \boxed{x=3}$$

17. An alloy contains copper and tin in the ratio 3 : 2. If 250 gm of copper is added to this alloy then the copper in it becomes double the quantity of tin in it. What is the amount (in gm) of tin in the alloy ?

- (a) 250 (b) 750
(c) 1000 (d) 500

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Amount of copper in an alloy = 3x

Amount of tin in an alloy = 2x

According to the question,

$$\left(\frac{3x+250}{2x} \right) = \frac{2}{1}$$

$$\Rightarrow 3x + 250 = 4x$$

$$\Rightarrow x = 250$$

Hence Amount of tin in an alloy = 2x

$$= 2 \times 250$$

$$= \boxed{500\text{gm.}}$$

18. A drum contains 80 litres of ethanol. 20 litres of this liquid is removed and replaced with water. 20 litres of this mixture is again removed and replaced with water. How much water (in litres) is present in this drum now ?

- (a) 45 (b) 40
(c) 35 (d) 44

SSC CGL (Tier-II) 20-02-2018

Ans. (c): In last, the amount of ethanol in the mixture

$$\begin{aligned}
 &= \text{Initial amount} \left(\frac{\text{Initial amount} - \text{removing amount}}{\text{Initial amount}} \right)^2 \\
 &= 80 \left(\frac{80 - 20}{80} \right)^2 \\
 &= \frac{80 \times 9}{16} \\
 &= 45 \text{ litres} \\
 \therefore \text{Amount of water} &= 80 - 45 \\
 &= 35 \text{ litres}
 \end{aligned}$$

19. An alloy is made by mixing metal A costing Rs. 2000/kg and metal B costing Rs. 400/kg in the ratio A : B = 3 : 1. What is the cost (in Rs.) of 8 kilograms of this alloy ?

- (a) 1600 (b) 9800
(c) 6400 (d) 12800

SSC CGL (Tier-II) 20-02-2018

Ans. (d) :

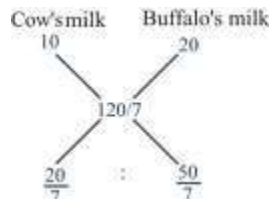
$$\begin{aligned}
 \text{Amount of metal A in the mixture} &= 8 \times \frac{3}{4} = 6 \text{ kg} \\
 \text{And amount of metal B} &= 8 - 6 = 2 \text{ kg} \\
 \text{Cost of 8kg of an alloy} &= 2000 \times 6 + 400 \times 2 \\
 &= 12000 + 800 \\
 &= 12800
 \end{aligned}$$

20. If a dairy mixes cow's milk which contains 10% fat with buffalo's milk which contains 20% fat, then the resulting mixture has fat (120/7)% of fat. What ratio was the cow's milk mixed with buffalo's milk?

- (a) 2 : 5 (b) 1 : 5
(c) 2 : 3 (d) 2 : 1

SSC CGL (Tier-II) 19-02-2018

Ans. (a):



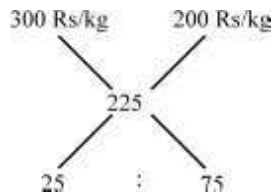
Intended ratio of cow's milk and buffalo's milk = 2 : 5

21. In what ratio should tea costing Rs 300 / kg be mixed with tea costing Rs 200/kg so that the cost of the mixture is Rs 225/kg?

- (a) 3 : 1 (b) 1 : 3
(c) 1 : 4 (d) 4 : 1

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :



Intended Ratio = 1 : 3

22. A mixture is composed of 11 parts of pure milk and 2 parts of water. If 35 litres of water were added to the mixture then the new mixture will contain twice as much pure milk as water, then how many litres of pure milk does the original mixture contain ?

- (a) 110 (b) 55
(c) 220 (d) 70

SSC CGL (Tier-II) 18-02-2018

Ans. (a):

Ratio of milk and water in the given mixture = 11x:2x
After adding 35 liters of water to the mixture, the ratio of the mixture is 2:1.

According to the question,,

$$\begin{aligned}
 \frac{11x}{2x + 35} &= \frac{2}{1} \\
 11x &= 4x + 70 \\
 x &= 10
 \end{aligned}$$

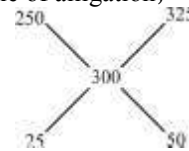
Quantity of milk in the mixture = 11x = 11 × 10 = 110 liter

23. In what ratio should cement costing Rs. 250 per bag be mixed with cement costing Rs. 325 per bag so that the cost of the mixture is Rs. 300 per bag (A bag of cement is 50 kg).

- (a) 1:2 (b) 2:1
(c) 3:2 (d) 2:3

SSC CGL (Tier-II) 9-3-2018

Ans. (a): From rule of alligation,



Required ratio = 25:50 = 1:2

24. If x beakers of 100 ml containing 1:4 acid-water solution are mixed with y beakers of 200 ml containing 3:17 acid-water solution then the ratio of acid to water in the resulting mixture becomes 19:91. Find x : y.

- (a) 5 : 3 (b) 3 : 5
(c) 7 : 13 (d) 13 : 7

SSC CGL (Tier-II) 9-3-2018

Ans.(a): Amount of acid in 100 ml solution

$$= 100 \times \frac{1}{5} = 20 \text{ml}$$

Amount of water = 100 - 20 = 80 ml

$$\text{Amount of acid in 200 ml solution} = 200 \times \frac{3}{20} = 30 \text{ml}$$

And amount of water = 200 - 30 = 170 ml

∴ According to the question,

$$\frac{20x + 30y}{80x + 170y} = \frac{19}{91}$$

$$\frac{2x + 3y}{8x + 17y} = \frac{19}{91}$$

$$182x + 273y = 152x + 323y$$

$$30x = 50y$$

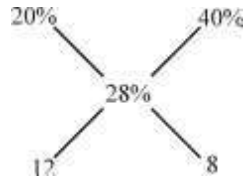
$$\frac{x}{y} = \frac{5}{3}$$

$$x : y = 5 : 3$$

25. In what ratio should 20% ethanol solution be mixed with 40% ethanol solution to obtain a 28% ethanol solution ?
 (a) 2 : 3 (b) 8 : 5
 (c) 3 : 2 (d) 5 : 8

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

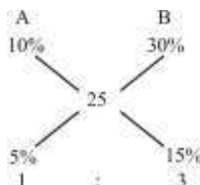


Hence, intended ratio = 3 : 2

26. Solution A contains 10% acid and solution B contains 30% acid. In what ratio should solution A be mixed with Solution B to obtain a mixture with 25% acid?
 (a) 1 : 2 (b) 3 : 1
 (c) 1 : 3 (d) 2 : 1

SSC CGL (Tier-II) 17-2-2018

Ans. (c):

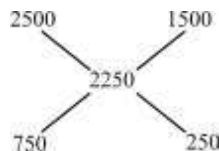


Hence Intended Ratio = 1 : 3

27. In what ratio should coffee powder costing Rs 2500/kg be mixed with coffee powder costing Rs. 1500/kg so that the cost of the mixture is Rs. 2250/kg?
 (a) 1 : 4 (b) 4 : 1
 (c) 3 : 1 (d) 1 : 3

SSC CGL (Tier-II) 17-2-2018 (Shift-I)

Ans. (c) :



Hence Intended Ratio = 3 : 1

28. 40 litres of 60% concentration of acid solution is added to 35 litres of 80% concentration of acid solution. What is the concentration of acid in the new solution ?
 (a) 69% (b) $66\frac{2}{3}\%$
 (c) $69\frac{1}{3}\%$ (d) 66%

SSC CGL (Tier-II) 12-09-2019

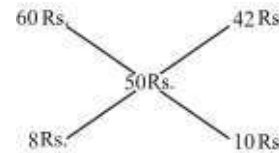
Ans. (c) : Total solution = 40 + 35 = 75 litre
 Amount of total acid = $40 \times \frac{60}{100} + 35 \times \frac{80}{100} = 52$ litre
 \therefore Concentration of acid in the new solution
 $= \frac{52}{75} \times 100$
 $= \frac{208}{3} = 69\frac{1}{3}\%$

29. In what ratio, sugar costing ₹ 60 per kg be mixed with sugar costing ₹ 42 per kg such that by selling the mixture at ₹ 56 per kg there is a gain of 12%?
 (a) 5 : 7 (b) 4 : 5
 (c) 5 : 6 (d) 8 : 9

SSC CGL (Tier-II) 2019

Ans. (b) :

Cost price of mixing sugar = $56 \times \frac{100}{112} = ₹50$



Intended Ratio = 8 : 10
 = 4 : 5

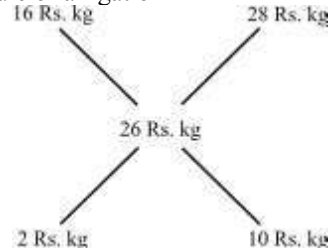
30. How many kg of salt costing ₹28 per kg must be mixed with 39.6 kg of salt costing ₹16 per kg, so that selling the mixture at ₹29.90, there is a gain of 15%?
 (a) 138 (b) 198
 (c) 200 (d) 130

SSC CGL (Tier-II) 13-09-2019

Ans. (b): Cost price of the mixture per

kg = $29.90 \times \frac{100}{115} = 26$ Rs.

From the Rule of alligation



Ratio = 2 : 10 = 1 : 5

28 Rs/kg amount of salt = $39.6 \times 5 = 198$ kg.

31. A milkman uses three containers for selling milk, their capacities being 40L, 30 L and 20L respectively. He fills respectively 87.5%, 80% and 90% of the container with a mix of milk and water in theratios, 3 : 2, 5 : 1 and 7 : 2 respectively. What is the ratio of the total quantity of milk to that of water carried by him?
 (a) 35 : 9 (b) 7 : 2
 (c) 5 : 2 (d) 31 : 12

SSC CHSL 10/07/2019 (Shift-III)

Ans. (c) : Let three container be A, B and C
 Milk and water in container A = $40 \times 87.5\% = 35$
 Milk in container A = $\frac{3}{5} \times 35 = 21$
 Water in container A = $\frac{2}{5} \times 35 = 14$
 Milk and water in container B = $30 \times 80\% = 24$
 \therefore Milk in container B = $24 \times \frac{5}{6} = 20$

$$\text{Water in container B} = 24 \times \frac{1}{6} = 4$$

$$\text{Milk and water in container C} = 20 \times 90\% = 18$$

$$\text{Milk in container C} = 18 \times \frac{7}{9} = 14$$

$$\text{Water in container C} = 18 \times \frac{2}{9} = 4$$

$$\text{Now total quantity of milk and water} = (21+20+14) : (14+4+4) = 55 : 22 = 5 : 2$$

32. In a 56 liters mixture of milk and water, the ratio of milk to water is 5 : 2. In order to make the ratio of milk to water 7 : 2, some quantity of milk is to be added to the mixture. The quantity of the milk present in the new mixture will be:

- (a) 16 liters (b) 48 liters
(c) 40 liters (d) 56 liters

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d) :

$$\begin{array}{l} 56 \begin{cases} \text{Quantity of milk} = 56 \times \frac{5}{7} = 40 \text{ litre} \\ \text{Quantity of water} (56 - 40) = 16 \text{ litre} \end{cases} \end{array}$$

Let the quantity of milk to be mixed = x liter

According to the question,

$$\frac{40+x}{16} = \frac{7}{2}$$

$$40 + x = 56$$

$$x = (56 - 40) = 16 \text{ liter}$$

The quantity of the milk present in the new mixture = (40 + 16) = 56 liter

33. A man has ₹10,000. He lent a part of it at 15% simple interest and the remaining at 10% simple interest. The total interest he received after 5 years amounted to ₹6,500. The difference between the parts of the amounts he lent is:

- (a) ₹1,750 (b) ₹1,500
(c) ₹2,500 (d) ₹2,000

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d) : Interest of 5 years = ₹6500

$$\therefore \text{Interest of 1 year} = \frac{6500}{5} = ₹1300$$

$$\text{Interest \%} = \frac{1300}{10000} \times 100 = 13$$

$$\begin{array}{ccc} 15 & & 10 \\ & \searrow & \nearrow \\ & 13 & \\ & \nearrow & \searrow \\ 3 & & 2 \end{array}$$

difference between parts of amount =

$$10000 \times \frac{(3-2)}{(3+2)} = ₹2000$$

34. In solution of 729 litre of acid and water the ratio of acid and water is 7:2. To obtain such a solution how many litres of water will be added such that the ratio of acid and water will be 5:3?

- (a) 180.4 (b) 178.2
(c) 182.4 (d) 187.2

SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : Total solution of acid and water = 729 liter

$$\text{Acid} = 729 \times \frac{7}{9} = 567, \quad \text{water} = 729 \times \frac{2}{9} = 162$$

After adding water the ratio of acid and water is = 5 : 3

∴ The amount of acid is constant

$$\text{Acid} = 5 \rightarrow 567$$

$$\text{water} = 3 \rightarrow \frac{567}{5} \times 3 = 340.2 \text{ litres}$$

The quantity of water is 162 litre to 340.2 litres.

Amount of water that has been mixed = 340.2 - 162 = 178.2 litres.

35. The ratio (by volume) of milk and water in a mixture is 2 : 1. If we add 12 litres of water in the mixture that the ratio of milk and water become 4 : 3. What is the quantity of water in the new mixture.

- (a) 84 litres (b) 24 litres
(c) 48 litres (d) 36 litres

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : M:W = 2 : 1 = 2x : x

$$\frac{M+W}{M} = \frac{3x+12}{2x} = \frac{7}{4}$$

$$3x + 12 = \frac{7x}{2}$$

$$6x + 24 = 7x$$

$$x = 24$$

∴ Quantity of water in the new mixture

$$= W+12 = x + 12 = 24 + 12 = 36$$

36. The ratio of spirit and water in solutions in vessels A and B are 3 : 4 and 5 : 9, respectively. The contents of A and B are mixed in the ratio 2 : 3. What is the ratio of water and spirit in the resulting solution?

- (a) 43 : 27 (b) 39 : 16
(c) 8 : 3 (d) 1 : 3

SSC MTS 22/08/2019 (Shift-II)

Ans. (a) : Spirit Water

Vessel A 3 : 4

Vessel B 5 : 9

According to the question,

$$\frac{\text{Spirit}}{\text{Water}} = \frac{2 \times \frac{3}{7} + 3 \times \frac{5}{9}}{2 \times \frac{4}{7} + 3 \times \frac{9}{9}}$$

$$\frac{\text{Spirit}}{\text{Water}} = \frac{\frac{6}{7} + \frac{15}{3}}{\frac{8}{7} + \frac{27}{9}}$$

$$\frac{\text{Spirit}}{\text{Water}} = \frac{\frac{6}{7} + \frac{15}{3}}{\frac{8}{7} + \frac{27}{9}}$$

$$\frac{\text{Spirit}}{\text{Water}} = \frac{\frac{6}{7} + \frac{15}{3}}{\frac{8}{7} + \frac{27}{9}}$$

$$\frac{\text{Spirit}}{\text{Water}} = \frac{12+15}{14} = \frac{27}{14}$$

$$\frac{\text{Spirit}}{\text{Water}} = \frac{27}{14} \times \frac{14}{43}$$

$$\text{Spirit} : \text{Water} = 27 : 43$$

$$\text{Water} : \text{Spirit} = 43 : 27$$

37. In a mixture the ratio of milk and water is 4 : 3. If 4 litres of water is mixed then ratio becomes 1 : 1. What is the amount of milk in the original mixture?

- (a) 16 litre (b) 20 litre
(c) 18 litre (d) 12 litre

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) :

Let quantity of milk in mixture is 4x litre and quantity of water in mixture is 3x litre
According to the question,

$$\frac{4x}{3x+4} = \frac{1}{1}$$

$$4x = 3x + 4$$

$$x = 4$$

Quantity of milk in the original mixture is = 4x = 16 litre.

38. The ratio of milk and water in a mixture is 4 : 3. If we add 2 litres of water, the ratio of milk and water becomes 8 : 7. What is the quantity of the final mixture

- (a) 18 litres (b) 30 litres
(c) 24 litres (d) 28 litres

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Milk : Water = 4 : 3

Let, Milk = 4x, Water = 3x

According to the question,

$$\frac{4x}{3x+2} = \frac{8}{7}$$

$$\Rightarrow 28x = 24x + 16$$

$$\Rightarrow 4x = 16$$

$$\Rightarrow x = 4$$

Hence total quantity of final mixture = 4x + (3x + 2)
= 7x + 2
= 7 × 4 + 2
= 30 litre

39. A mixture contains milk and water in the ratio (by volume) 5:3 and another mixture, of the same volume as that of the former, contains water and milk in the ratio (by volume) 1:3. In what ratio, two mixtures be mixed in order to obtain a new mixture consisting of milk and water in the ratio (by volume) 7 : 3?

- (a) 2 : 3 (b) 3 : 4
(c) 5 : 6 (d) 3 : 2

SSC MTS 13/08/2019 (Shift-II)

Ans. (a) :

$$\left[\begin{array}{cc} \text{Quantity of milk} & \text{Quantity of milk} \\ \text{in first mixture} & \text{in second mixture} \\ \left[\begin{array}{cc} \frac{5}{8} & \frac{3}{4} \end{array} \right] & \times 40 \\ & \frac{7}{10} \end{array} \right]$$

or



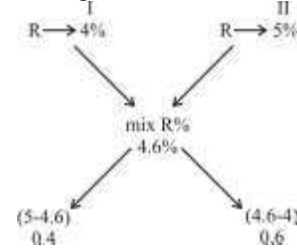
Hence, both the mixture have to be mixed in the ratio of 2 : 3.

40. A sum of ₹50,000 is lent partly at 4% and remaining at 5% per annum. If the yearly simple interest on the average is 4.6%, the two parts are:

- (a) ₹22500 (b) ₹15000
(c) ₹20000 (d) ₹25000

SSC MTS 13/08/2019 (Shift-III)

Ans. (c) : From Alligation



$$I : II = 0.4 : 0.6$$

$$I : II = 2 : 3$$

$$\text{then } I = 50,000 \times \frac{2}{(2+3)} = 20000\text{Rs.}$$

$$\text{And } II = 50,000 \times \frac{3}{5} = 30,000\text{Rs.}$$

41. A vessel contains a 32 litre solution of acid and water in which the ratio of acid and water is 5 : 3. If 12 litres of the solution are taken out and $7\frac{1}{2}$ litres of water are added to it, then what is the ratio of acid and water in the resulting solution?

- (a) 5 : 6 (b) 4 : 7
(c) 4 : 9 (d) 8 : 11

SSC CGL (Tier-II) 13-09-2019

Ans. (a) : After taken out 12 litres of solution the remaining quantity = 32 - 12 = 20 liters

Amount of acid in the remaining solution

$$= 20 \times \frac{5}{8} = \frac{25}{2} \text{ litre}$$

$$\text{Amount of water} = 20 - \frac{25}{2} = \frac{15}{2} \text{ litre}$$

$$\text{Required ratio} = \frac{25}{2} : \left(\frac{15}{2} + \frac{15}{2} \right)$$

$$= \frac{25}{2} : 15 = 5 : 6$$

15.

Time and Work

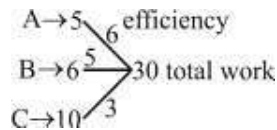
(I) Problems based on Time and Work

1. A, B and C can do a work in 5 days, 6 days and 10 days, respectively. Working together, in how many days will they finish the same work?

- (a) $2\frac{1}{7}$ (b) $4\frac{1}{7}$
 (c) $3\frac{1}{7}$ (d) $1\frac{1}{7}$

SSC CHSL 08/06/2022 (Shift- II)

Ans. (a) :



Efficiency of A, B and C = 6 : 5 : 3
 Total work = 30

$$\text{If they work together, time taken by them} = \frac{30}{6+5+3}$$

$$= \frac{30}{14} = 2\frac{1}{7}$$

2. If 35 men can finish a work in 6 days, then in how many days can 7 men do half of the same work?

- (a) 30 (b) 15
 (c) 60 (d) 17

SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (b) Let 35 men do x work

From,

$$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{35 \times 6}{x} = \frac{7 \times D_2}{x/2} \Rightarrow D_2 = 15 \text{ days}$$

3. 20 men can finish a work in 30 days. They started working, but 4 men left the work after 10 days, In how many days would the work be completed?

- (a) 30 (b) 25
 (c) 35 (d) 28

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

Ans. (b) According to the question,

$$20 \times 30 = 20 \times 10 + (20 - 4) \times D$$

$$20 \times 20 = 16 \times D \Rightarrow D = 25 \text{ days}$$

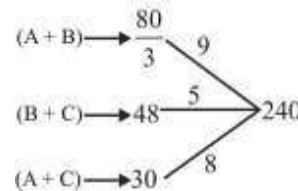
4. A and B can do a work in $26\frac{2}{3}$ days, B and C

together can complete the same work in 48 days, while A and C together can complete the same work in 30 days. How long (in days) will A alone take to complete 60% of the work?

- (a) 20 (b) 32
 (c) 24 (d) 36

SSC CGL (Tier-II) 29/01/2022

Ans : (c)



$$2(A + B + C) = 22$$

$$A + B + C = 11$$

$$\text{Efficiency of A} = 11 - 5 = 6$$

$$60\% \text{ of total work} = \frac{240 \times 60}{100}$$

$$= 144$$

Time taken by A to complete the 60% of the work

$$= \frac{144}{6} = 24$$

Hence, A will alone complete 60% of the work in 24 days.

5. 8 women and 8 girls can finish a piece of work in 6 days, whereas 4 women and 10 girls can finish it in 8 days. In how many days will one girl finish it working alone?

- (a) 120 (b) 144
 (c) 72 (d) 84

SSC MTS 08/10/2021 (Shift-I)

Ans. (b) : Let,

W = Women

G = Girls

Let, one girl done work in x days

According to the question,

$$(8W + 8G) \times 6 = (4W + 10G) \times 8 = 1G \times x \text{ ----- (i)}$$

$$48W + 48G = 32W + 80G$$

$$16W = 32G$$

$$\therefore 1W = 2G$$

$$(4 \times 2G + 10G) \times 8 = 1G \times x \quad \text{From equation (i)}$$

$$(8G + 10G) \times 8 = 1G \times x$$

$$18G \times 8 = 1G \times x$$

$$\therefore x = 144 \text{ days}$$

6. A can complete a work in 15 days and B can complete the same work in 20 days. If they are working together then in how many days will they complete 35% of the same work?

- (a) 5 (b) 3
(c) 6 (d) 7

SSC MTS 26/10/2021 (Shift-I)

Ans. (b) : A can complete a work = 15 days

B can complete a work = 20 days

(A + B) working together to complete the work

$$= \frac{15 \times 20}{35}$$

$$= \frac{300}{35}$$

$$= \frac{60}{7} \text{ days}$$

$$\therefore 35\% \text{ of total work} = \frac{60}{7} \times \frac{35}{100}$$

$$= \frac{60}{7} \times \frac{7}{20}$$

$$= 3 \text{ days}$$

7. 40 persons take 6 days to complete a certain task, working 10 hours a day. How many hours a day will be sufficient for 30 persons to complete the same task in 10 days?

- (a) 9 (b) 8
(c) 10 (d) 6

SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) : By formula-

$$M_1 D_1 H_1 = M_2 D_2 H_2$$

then, $40 \times 6 \times 10 = 30 \times 10 \times H_2$

$$H_2 = \frac{4 \times 6}{3} = 8 \text{ hours}$$

8. 24 persons can do a piece of work in 20 days. In how many days can 30 persons do the same work?

- (a) 14 (b) 16
(c) 12 (d) 18

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : $M_1 D_1 = M_2 D_2$

$$24 \times 20 = 30 \times D_2$$

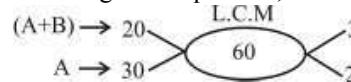
$$D_2 = 16 \text{ days}$$

9. If A and B can do a piece of work in 20 days, and A alone can do the same work in 30 days, then in how many days can B alone complete the same work?

- (a) 60 (b) 40
(c) 75 (d) 50

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) According to the question,



$$= 3 : 2$$

Time taken by B to complete the whole work

$$= \frac{60}{1} = 60 \text{ day}$$

10. Eighteen persons working 8 hours a day can complete 3 units of work in 10 days. How many days are required by 25 persons to complete 5 units of work working 6 hours a day ?

- (a) 12 (b) 16
(c) 10 (d) 20

SSC CGL-(Tier-I) 13/08/2021 (Shift II)

Ans. (b) :

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

$$\frac{18 \times 10 \times 8}{3} = \frac{25 \times D_2 \times 6}{5}$$

$$D_2 = \frac{8 \times 6 \times 10}{30}$$

$$D_2 = 16 \text{ days}$$

11. 10 men or 15 woman can complete a work in 30 days. In how many days can 15 men and 27 women complete the work?

- (a) $6\frac{1}{11}$ (b) $5\frac{1}{11}$
(c) $11\frac{1}{11}$ (d) $9\frac{1}{11}$

SSC CHSL 10/08/2021 (Shift-I)

Ans. (d) : 10 Men = 15 Women

$$\frac{\text{Men}}{\text{Women}} = \frac{3}{2}$$

Ratio of efficiencies of 1 man and 1 woman = 3:2

$$\therefore M_1 D_1 = M_2 D_2$$

$$10 \times 3 \times 30 = (15 \times 3 + 27 \times 2) \times D_2$$

$$\frac{900}{99} = D_2$$

$$D_2 = 9\frac{1}{11} \text{ days}$$

12. Geeta can assemble a toy in 10 minute, whereas Sudha can assemble the same toy in 15 minutes. If they work together, how much time will they take to assemble 60 toys?

- (a) 6 hours (b) 5 hours
(c) 7 hours (d) 7 hours 30 minutes

SSC CHSL 06/08/2021 (Shift-I)

Ans. (a) : $\frac{\text{Geeta} \times 10 \text{ m}}{1} = \frac{\text{Sudha} \times 15 \text{ m}}{1}$
 Geeta : Sudha = 3 : 2 (efficiency)
 $\therefore \frac{(\text{Geeta} + \text{Sudha}) \times t}{60} = \frac{\text{Geeta} \times 10 \text{ min}}{1}$
 $\frac{5 \times t}{60} = \frac{3 \times 10}{1}$
 $t = 360 \text{ min}$
 $t = 6 \text{ hours}$

13. Suman and Lata working together can complete a task in 8 days. If Lata can complete the same task in 12 days, then how many days will Suman take to complete the same task?
 (a) 18 (b) 15
 (c) 10 (d) 24

SSC CHSL 06/08/2021 (Shift-III)

Ans. (d) : According to the question,

 Time taken by Suman to complete the same task
 $= \frac{24}{1} = 24 \text{ days}$

14. A can complete one-sixth of a work in 5 days and B can complete one-fourth of the same work in 15 days. In how many days, will both working together complete the work?
 (a) 20 days (b) 10 days
 (c) 25 days (d) 12 days

SSC CHSL 09/08/2021 (Shift-III)

Ans. (a) : A can complete one-sixth of a work in 5 day
 \Rightarrow A can complete total work in $5 \times 6 \text{ days} = 30 \text{ days}$
 B can complete total work in $15 \times 4 \text{ days} = 60 \text{ days}$
 \therefore A and B together can complete total work in
 $= \frac{30 \times 60 \times 1}{30 + 60} \text{ days}$
 $= 20 \text{ days}$

15. Varun and Syan can do a work in 3 days, Syan and Anil can do it in 4 days, and Anil and Varun can do it in 6 days. How many days will Anil alone take to do the work?
 (a) 22 (b) 24
 (c) 18 (d) 20

SSC CHSL 12/04/2021 (Shift-II)

Ans : (b)

$$2(V + S + A) = 4 + 3 + 2 = 9$$

$$V + S + A = \frac{9}{2}$$

$$A = \frac{9}{2} - 4 = \frac{1}{2}$$

$$\text{Hence required time} = \frac{12 \times 2}{1} = 24 \text{ days}$$

16. Antony and Vikash together can complete a piece of work in 20 days and Vikash alone can complete it in 25 days. In how many days can Antony alone complete the same work?
 (a) 80 days (b) 90 days
 (c) 110 days (d) 100 days

SSC CHSL -20/10/2020 (Shift-III)

Ans : (d)

 Efficiency of Antony = $5 - 4 = 1$

$$\text{Time taken by Antony to complete the work} = \frac{100}{1} = 100 \text{ days}$$

17. If 18 men can cut a field in 35 days, then in how many days can 21 men cut the same field?
 (a) 32 (b) 27
 (c) 28 (d) 30

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-II)

Ans. (d) : $\because M_1 D_1 = M_2 D_2$
 $18 \times 35 = 21 \times D_2$
 $D_2 = 30 \text{ days}$

18. A and B together can do a piece of work in 12 days. A alone can do it in 18 days, in how many days B alone can do the work?
 (a) 24 days (b) 36 days
 (c) 30 days (d) 32 days

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (b) : 1 day's work of (A + B) = $\frac{1}{12}$
 $1 \text{ day's work of A} = \frac{1}{18}$
 $1 \text{ day's work of B} = \frac{1}{12} - \frac{1}{18} = \frac{9-6}{108} = \frac{1}{36}$
 Hence the time taken by B to finish the work = 36 days

19. If 30 people work for 8 hours every day, they can complete a work in 10 days. So how many hours would 40 people have to work everyday to complete it in 6 days ?
 (a) 6 (b) 12
 (c) 8 (d) 10

SSC CHSL (Tier-I) 02/07/2019 (Shift-I)

Ans. (d) : $\because M_1 D_1 H_1 = M_2 D_2 H_2$

$$30 \times 10 \times 8 = 40 \times 6 \times h_2$$

$$\Rightarrow h_2 = \frac{30 \times 10 \times 8}{40 \times 6}$$

$$h_2 = 10 \text{ hours}$$

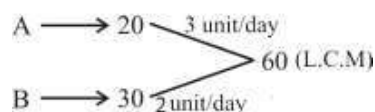
20. A can do a work in 20 days and B can do 20% of the work in 6 days. If they work together, then in how many days can they complete the 50% of that work ?

- (a) 6 (b) 8
(c) 9 (d) 12

SSC CHSL 11/07/2019 (Shift-I)

Ans. (a) : B completes $20\% = \frac{1}{5}$ Part of work = in 6 days

B will complete the whole work = in 30 days



$$50\% \text{ of the work} = 60 \times \frac{1}{2} = 30 \text{ units}$$

$$\text{Time taken by both to complete 50\% of the work} = \frac{30}{(3+2)} = 6 \text{ days.}$$

21. How many men will be required to plough 50 acres of land in 10 days if 15 men required 6 days to plough 10 acres of land?

- (a) 45 (b) 55
(c) 50 (d) 40

SSC CHSL -15/10/2020 (Shift-III)

Ans. (a) : Let x men will be required.

$$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{15 \times 6}{10} = \frac{x \times 10}{50}$$

$$x = 45$$

22. 6 men maintain a road in 14 hours. how many mens are required to maintain a road in 4 hours?

- (a) 21 (b) 7
(c) 28 (d) 14

SSC MTS 20/08/2019 (Shift-III)

Ans. (a) : $M_1 H_1 = M_2 H_2$

$$6 \times 14 = M_2 \times 4$$

$$M_2 = \frac{84}{4}$$

$$M_2 = 21$$

23. If Dev can make 40 chairs in 20 days, working 10 hours per day then in how many days can be make 10 chairs working 8 hour per day?

- (a) 8 (b) 6
(c) $6\frac{1}{4}$ (d) $7\frac{1}{2}$

SSC MTS 07/08/2019 (Shift-II)

Ans. (c) : $\frac{D_1 H_1}{W_1} = \frac{D_2 H_2}{W_2}$

D_1 = Number of days

W_1 = work done

H_1 = Time taken to do the work (in hours)

$$\therefore \frac{20 \times 10}{40} = \frac{8 \times D}{10}$$

$$D = \frac{50}{8} = 6\frac{1}{4} \text{ days}$$

24. Anil can make 20 bags in 4 days and Manoj can make 10 bags in 5 days. How many bags make both Anil and Manoj together.

- (a) 11 bags (b) 7 bags
(c) 9 bags (d) 5 bags

SSC MTS 08/08/2019 (Shift-II)

Ans. (b) : Bags made by Anil in 1 day = $\frac{20}{4} = 5$

$$\text{Bags made by Manoj in 1 day} = \frac{10}{5} = 2$$

$$\text{Bags made by both in 1 day} = 5 + 2 = 7$$

25. 36 men and 48 women can do a certain work in one day whereas 6 men and 12 women can do it in 5 days. The number of women required to do the same work in 8 days is :

- (a) 10 (b) 15
(c) 18 (d) 12

SSC MTS 22/08/2019 (Shift-II)

Ans. (b) : We know that

$$M_1 D_1 = M_2 D_2$$

$$(36M + 48W) \times 1 = (6M + 12W) \times 5$$

$$\left[\begin{array}{l} \text{Where } M = \text{Men} \\ W = \text{Women} \end{array} \right]$$

$$36M + 48W = 30M + 60W$$

$$6M = 12W$$

$$\frac{M}{W} = \frac{2}{1}$$

Let x women will required to do the same work

$$(36M + 48W) \times 1 = x \times 8$$

$$36 \times 2 + 48 \times 1 = x \times 8$$

$$8x = 120$$

$$x = 15$$

26. Sixteen men can finish a work in 8 days. Eight men and nine women working together can finish the same work in 10 days. In how many days will twenty women finish the same work?

- (a) 12 (b) 13
(c) 9 (d) 11

SSC CGL (Tier-I)-2019 – 05/03/2020

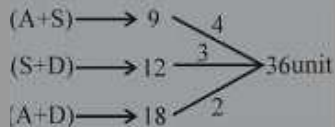
Ans. (a) : Total work = $16M \times 8 = (8M + 9W) \times 10$
 $64M = 40M + 45W$
 $24M = 45W$
 $\frac{M}{W} = \frac{15}{8}$
 Ratio of efficiencies of men and women = 15 : 8
 Let 20 women will complete the work in x days.
 Total work = $16 \times 15 \times 8 = 20 \times 8 \times x$
 $x = \frac{16 \times 3}{4} = 12$ days

27. Amit and Sunil together can complete a work in 9 days, Sunil and Dinesh together can complete the same work in 12 days, and Amit and Dinesh together can complete the same work in 18 days. In how many days will they complete the work if Amit, Sunil and Dinesh work together?

- (a) 14 days (b) 16 days
(c) 8 days (d) 12 days

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (c) :



If Amit, Sunil and Dinesh work together then their total efficiencies = $\frac{9}{2}$
 Required time = $\frac{36 \times 2}{9} = 8$ days

28. A can do a piece of work in 6 days. B can do it in 9 days. With the assistance of C they completed the work in 3 days. In how many days can C alone do the work?

- (a) 18 (b) 12
(c) 16 (d) 8

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (a) :



Efficiency of C = $6 - 5 = 1$

∴ C can complete the work alone in $\frac{18}{1} = 18$ days.

29. A can paint a house in 55 days and B can do it in 66 days. Alongwith C, they did the job in 12 days only. Then, C alone can do the job in how many days?

- (a) 24 (b) 44
(c) 33 (d) 20

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Let C will do the work in 'T' days.

1 day's work of (A+B+C) = $\frac{1}{12}$

$$\left(\frac{1}{55} + \frac{1}{66} + \frac{1}{T}\right) = \frac{1}{12}$$

$$\frac{1}{30} + \frac{1}{T} = \frac{1}{12}$$

$$\frac{1}{T} = \frac{1}{12} - \frac{1}{30}$$

$$\frac{1}{T} = \frac{18}{12 \times 30}$$

$$T = 20 \text{ days}$$

30. A, B and C can together do a job in 9 days. C alone can do the job in 36 days. In how many days can A and B do 50% of the job working together?

- (a) 6 (b) 12
(c) 9 (d) 15

SSC CGL (Tier-II) 21-02-2018

Ans. (a) : Let A and B together can do the work in T days.

1 day's work of (A+B+C) = $\frac{1}{9}$

According to the question,

$$\frac{1}{T} + \frac{1}{36} = \frac{1}{9}$$

$$\Rightarrow \frac{1}{T} = \frac{1}{9} - \frac{1}{36}$$

$$\Rightarrow T = 12 \text{ days}$$

Time taken to complete 50% of the work by (A + B)

$$= 12 \times \frac{50}{100}$$

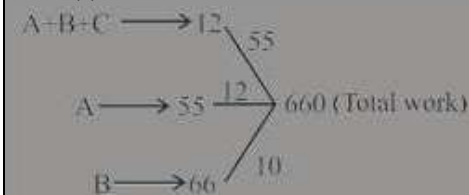
$$= 6 \text{ days}$$

31. Working together A, B and C can complete a task in 12 days. A and B can do the task in 55 days and 66 days respectively if they worked alone. In how many days can C do the task if he worked alone?

- (a) 22 (b) 44
(c) 20 (d) 40

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :



Working capacity of C = $55 - (12+10) = 33$

Hence C will complete the work = $\frac{660}{33} = 20$ days

32. B would have taken 10 hours more than what A would have taken to complete a task if each of them worked alone. Working together they can complete the task in 12 hours. How many hours would B take to do 50% of the task ?

- (a) 30 (b) 15
(c) 20 (d) 10

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Let A do the work in x hours
And B do the work in $(x + 10)$ hours
According to the question,
1 hour's work of A and B $\Rightarrow \frac{1}{x} + \frac{1}{x+10} = \frac{1}{12}$
 $\Rightarrow 12(10+2x) = x(x+10)$
 $x^2 - 14x - 120 = 0$
 $(x-20)(x+6) = 0$
 $x = 20, x = -6$
Time taken by B to do 50% of that work $\Rightarrow (20+10) \times 50\%$
 $= 15$ hours

33. If A, B and C together do a job in 4 days, A and C together do the job in 4.5 days and B and C together do the job in 12 days then in how many days can C alone do the job?

- (a) 36 (b) 6
(c) 18 (d) 12

SSC CGL (Tier-II) 19-02-2018

Ans. (c) :

1 day's work of A = $[(A+B+C) - (B+C)]$
 $= 45 - 15$
 $= 30$
1 day's work of C = $40 - 30 = 10$
 \therefore The time taken to complete the work by C alone
 $= \frac{180}{10}$
 $= 18$ days

34. If A alone can do a job in 40 days then, in how many days can B alone do the job if together they can do the job in 8 days

- (a) 15 (b) 10
(c) 20 (d) 25

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

1 day's work of B = $5 - 1$
 $= 4$ unit
Time taken by B to do the work = $\frac{40}{4}$
 $= 10$ days

35. A can complete 50% of a job in 9 days and B can complete 25% of the job in 9 days if they worked alone. If they worked together how much of the job (in %) can they complete in 9 days?

- (a) 80 (b) 90
(c) 75 (d) 100

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

Work done in 9 days = $9 \times 3 = 27$ units
Required percentage of work % = $\frac{27}{36} \times 100 = 75\%$

36. Working together A and B can do a job in 40 days, B and C in 36 days and all three together in 24 days. In how many days can B alone do the job?

- (a) 60 (b) 90
(c) 72 (d) 120

SSC CGL (Tier-II) 17-2-2018

Ans. (b) :

1 day's work of B = $(9+10) - 15 = 4$ units
Time taken by B to complete the work
 $= \frac{360}{4} = 90$ days

37. A, B and C can do a job working alone in 50, 75 and 20 days respectively. They all work together for 4 days, then C quits. How many days will A and B take to finish the rest of the job?

- (a) 20 (b) 30
(c) 18 (d) 24

SSC CGL (Tier-II) 17-2-2018

Ans. (a) :

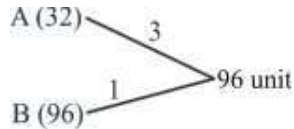
Work done by (A + B + C) in 4 days = $4 \times (6+4+15)$
 $= 100$ units
Remaining work = $300 - 100 = 200$ units
Time taken by (A+B) to complete the remaining work
 $= \frac{200}{6+4} = 20$ days

38. A can do 50% of the job in 16 days, B can do 1/4th of the job in 24 days. In how many days can they do 3/4th of the job working together?
- (a) 24 (b) 9
(c) 21 (d) 18

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

Time taken by A to do 50% of the work = 16 days
 \therefore Time taken by A to complete the work = 32 days
 Time taken by B to do 1/4 part = 24 days
 \therefore Time taken by B to complete the work = $24 \times 4 = 96$ days



\therefore Time taken by (A+B) to do $\frac{3}{4}$ part of the work.

$$= \frac{96 \times \frac{3}{4}}{4} = 18 \text{ days}$$

39. A and B can together complete a task in 18 hours. After 6 hours A leaves. B takes 36 hours to finish rest of the task. How many hours would A have taken to do the task if he worked alone?
- (a) 54 (b) 45
(c) 21 (d) 27

SSC CGL (Tier-II) 17-2-2018

Ans. (d) :

6 hour's work of (A+B) = $\frac{6}{18}$ Part or $\frac{1}{3}$ Part

Remaining work = $1 - \frac{1}{3} = \frac{2}{3}$

The remaining $\frac{2}{3}$ part of the work is done by B in 36 hours then B will complete the whole work in $36 \times \frac{3}{2} = 54$ hours.

Let A will do the work in x hours.

$$\frac{1}{54} + \frac{1}{x} = \frac{1}{18}$$

$$\frac{1}{x} = \frac{1}{18} - \frac{1}{54}$$

$$\frac{1}{x} = \frac{1}{27}$$

$$x = 27$$

Hence A will complete the work in 27 hours.

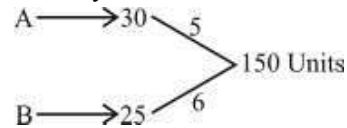
40. A can do 40% of a work in 12 days, whereas B can do 60% of the same work in 15 days. Both work together for 10 days. C completes the remaining work alone in 4 days. A, B and C together will complete 28% of the same work in:

- (a) 2 days (b) $2\frac{1}{2}$ days
(c) 3 days (d) $1\frac{1}{2}$ days

SSC CGL (Tier-II) 12-09-2019

Ans. (a) :

A (40%) \rightarrow 12 days
 100% \rightarrow 30 days
 B (60%) \rightarrow 15 days
 100% \rightarrow 25 days



1 day's work of A + B = $5 + 6 = 11$ units
 10 days' work of A + B = $10 \times 11 = 110$ units
 Remaining work = $150 - 110 = 40$ units
 Time taken by C to do the remaining work = 4 days

Work done by C in 1 day = $\frac{40}{4} = 10$ units

Time taken by (A+B+C) to finish 28% of the work

$$= \frac{150}{(5+6+10)} \times \frac{28}{100} = \frac{150}{21} \times \frac{28}{100} = 2 \text{ days}$$

41. If 10 men can complete a piece of work in 12 days by working 7 hours a day, then in how many days can 14 men do the same work by working 6 hours a day?
- (a) 16 (b) 15
(c) 10 (d) 12

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (c) $M_1D_1H_1 = M_2D_2H_2$
 $10 \times 12 \times 7 = 14 \times d_2 \times 6$
 $d_2 = 10$ days

42. Working 7 hour a day, 18 persons can complete a certain work in 32 days. In how many days would 14 persons complete the same work 8 hours a day?
- (a) 42 (b) 30
(c) 36 (d) 35

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (c)

$\therefore M_1D_1H_1 = M_2D_2H_2$
 $18 \times 32 \times 7 = 14 \times D_2 \times 8$
 $D_2 = \frac{18 \times 32 \times 7}{14 \times 8}$
 $D_2 = 36$ days

43. A certain number of persons can complete a work in 34 days working 9 h a day. If the number of persons is decreased by 40% then how many hours a day should the remaining persons work to complete the work in 51 days?

- (a) 9 (b) 10
(c) 8 (d) 12

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Let total number of persons = x

According to the question,

$$M_1 D_1 H_1 = M_2 D_2 H_2$$

$$x \times 34 \times 9 = x \times \frac{(100-40)}{100} \times 51 \times H_2$$

$$H_2 = \frac{34 \times 9 \times 100}{60 \times 51}$$

$$H_2 = 10 \text{ hours}$$

44. 4 men and 5 women can complete a work in 15 days, whereas 9 men and 6 women can do it in 10 days. To complete the same work in 7 days, how many women should assist 4 men ?

- (a) 12 (b) 14
(c) 13 (d) 11

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Total work = $(4M+5W) \times 15 = (9M + 6W) \times 10$

$$12M + 15W = 18M + 12W$$

$$6M = 3W$$

$$\frac{M}{W} = \frac{1}{2}$$

Ratio of the capacity of 1 man and 1 woman = 1 : 2

$$\text{Total work} = (4 \times 1 + 5 \times 2) \times 15 \\ = (14 \times 15) \text{ unit}$$

Let x women are required.

$$\text{Again } (4 \times 1 + 2x) \times 7 = 14 \times 15$$

$$4 + 2x = 30$$

$$x = 13$$

45. A, B and C together can build a wall in 12 days. C is four times as productive as B and A alone can build the wall in 48 days. In how many days A and B working together can build the wall ?

- (a) 20 (b) 30
(c) 80 (d) 40

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let B and C build the wall in 4x and x days respectively.

$$\therefore \frac{1}{48} + \frac{1}{4x} + \frac{1}{x} = \frac{1}{12}$$

$$\frac{5}{4x} = \frac{1}{12} - \frac{1}{48}$$

$$\frac{5}{4x} = \frac{3}{48}$$

$$x = 20$$

$$\text{1 day's work of A and B} = \frac{1}{48} + \frac{1}{80}$$

$$= \frac{8}{240} = \frac{1}{30}$$

So, both will build the wall in 30 days.

46. Working together A and B can do a job in 36 days, B and C in 10 days and all three together in 9 days. In how many days can B alone do the job ?

- (a) 90 (b) 30
(c) 24 (d) 60

SSC CGL (Tier-II) 9-3-2018

Ans. (d) :

$$\text{1 day's work of B} = \left(\frac{1}{36} + \frac{1}{10} \right) - \frac{1}{9}$$

$$= \frac{10 + 36 - 40}{360} = \frac{1}{60}$$

Hence, B will complete the work in 60 days.

47. A can do 1/5 of a job in 10 days, B can do 1/3 rd of the job in 25 days. In how many days can they do half of the job working together?

- (a) 30 (b) 45
(c) 15 (d) 20

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

A and B can complete the work in 50 days and 75 days respectively.

$$\text{1 day's work of both A and B} = \frac{1}{50} + \frac{1}{75}$$

$$= \frac{3+2}{150} = \frac{1}{30}$$

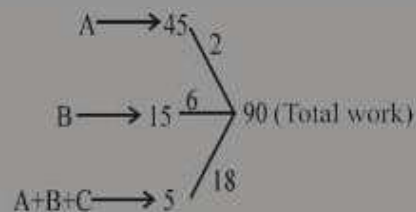
Hence, the time taken to complete half of the part = 15 days

48. A can paint a house in 45 days and B can do it in 15 days. Alongwith C, they did the job in 5 days only. Then, C alone can do the job in how many days?

- (a) 12 (b) 9
(c) 15 (d) 8

SSC CGL (Tier-II) 18-02-2018

Ans. (b) :



$$\text{1 day's work of C} \\ = (A+B+C) - (A+B) \\ = 18 - 8 \\ = 10$$

$$\text{Time taken by C to do the work} = \frac{90}{10} \\ = 9 \text{ days}$$

49. P and Q together can do a work in 12 days. P alone can do the same work in 36 days. In how many days can Q alone complete two-third part of the same work?

- (a) 18 (b) 21
(c) 15 (d) 12

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (d) : 1 day's work of (P+Q) = $\frac{1}{12}$

1 day's work of P = $\frac{1}{36}$

1 day's work of Q = $\frac{1}{12} - \frac{1}{36}$

$= \frac{2}{36} = \frac{1}{18}$ Part

∴ Q takes 1 day to complete $\frac{1}{18}$ part of the work

∴ Time taken by Q to complete $\frac{2}{3}$ part of the work

$= 18 \times \frac{2}{3} = 12$ days

50. P and Q together can do a work in 12 days. P alone can do the same work in 18 days. In how many days can Q alone complete two-third part of the same work?

- (a) 21 (b) 30
(c) 36 (d) 24

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) :

$$\begin{array}{l} P \rightarrow 18 \text{ days} \quad \swarrow 2 \\ \quad \quad \quad \quad \quad \searrow 3 \\ (P+Q) \rightarrow 12 \text{ days} \end{array} \quad \rightarrow 36 \text{ units}$$

∴ Capacity of Q = 3 - 2 = 1 unit/day

The time taken by Q to do $\frac{2}{3}$ part of the work =

$\frac{36 \times \frac{2}{3}}{1} = 24$ days

51. A and B can do a piece of work in 25 days. B alone can do $66\frac{2}{3}\%$ of the same work in 30 days. In how many days can A alone do $\frac{4}{15}$ part of the same work?

- (a) 15 (b) 18
(c) 12 (d) 20

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : ∴ $66\frac{2}{3}\% = \frac{2}{3}$

Time taken by B to complete the work alone

$$30 \times \frac{3}{2} = 45 \text{ days}$$

∴ A will do the work alone in

$$\frac{25 \times 45}{45 - 25} = \frac{25 \times 45}{20} = \frac{225}{4} \text{ days}$$

Hence, the time taken by A to do the $\frac{4}{15}$ part of the

$$\text{work} = \frac{225}{4} \times \frac{4}{15} = 15 \text{ days}$$

52. A and B can do a piece of work in 36 days. B and C can do the same work in 60 days. A and C can do the same work in 45 days. In how many days can B alone complete the same work?

- (a) 45 (b) 120
(c) 90 (d) 60

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) :

$$\begin{array}{l} (A+B) \rightarrow 36 \text{ days} \quad \swarrow 5 \\ (B+C) \rightarrow 60 \text{ days} \quad \rightarrow 3 \quad \searrow \\ (A+C) \rightarrow 45 \text{ days} \quad \swarrow 4 \end{array} \quad \rightarrow 180$$

Capacity of (A+B+C) = $180/2 = 90$

Capacity of B = 90 - 90 = 0

B alone complete the work in = $\frac{180}{2} = 90$ days

53. A and B can do a piece of work in 36 days. B and C can do the same work in 60 days. A and C can do the same work in 45 days. In how many days can A alone complete the same work?

- (a) 90 (b) 60
(c) 120 (d) 45

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) :

$$\begin{array}{l} (A+B)=36 \quad \swarrow 5 \\ (B+C)=60 \quad \rightarrow 3 \quad \searrow \\ (C+A)=45 \quad \swarrow 4 \end{array} \quad \rightarrow 180 \text{ (Total work)}$$

$2(A+B+C) = (5+3+4) = 12$

$A+B+C = 6$

$A+3 = 6 \Rightarrow A = 3$

∴ A alone will complete the work in = $\frac{180}{3}$

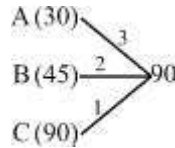
$= 60$ days.

54. A, B and C can do a piece of work in 30 days, 45 days and 90 days, respectively. A starts the work and he is assisted by B and C together on every third day. In how many days will the work be completed?

- (a) 21 (b) $22\frac{1}{2}$
(c) 23 (d) 24

SSC CPO-SI - 09/12/2019 (Shift-II)

Ans. (c)



According to the question,

$$\begin{aligned} \text{Work done in first three days} \\ &= 3 \times 3 + (2 + 1) \times 1 \\ &= 12 \end{aligned}$$

Work done in first (3×7) days $= 12 \times 7 = 84$
 Remaining work $= 90 - 84 = 6$
 Hence time taken by A to do the remaining work

$$= \frac{6}{3} = 2 \text{ days}$$

Hence the time taken to complete the work $= 21 + 2$
 $= 23$ days

55. A and B together can do certain work in x days. Working alone, A and B can do the same work in $(x + 8)$ and $(x + 18)$ days, respectively. A and B together will complete $5/6$ of the same work in:

- (a) 8 days (b) 12 days
 (c) 9 days (d) 10 days

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) A and B together complete a work in x days, whereas A and B separately complete the work in $(x + a)$ and $(x + b)$ days respectively.

$$\begin{aligned} x &= \sqrt{ab} \\ x &= \sqrt{8 \times 18} = 12 \end{aligned}$$

A and B together will complete the work in 12 days
 \therefore The time taken to complete $5/6$ part of the same

$$\text{work} = 12 \times \frac{5}{6} = 10 \text{ days}$$

56. A is twice as efficient as B and C is thrice as efficient as B. Working together, they can finish a certain work in 5 days. A and C worked together for 5 days. B alone would complete the remaining work in _____.

- (a) 5 days (b) 8 days
 (c) 6 days (d) 4 days

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a)

Ratio of work Capacity of A, B and C $= 2 : 1 : 3$

\therefore Work done by $(A + B + C)$ in 5 days $= 6 \times 5 = 30$ units

Work done by $(A + C)$ in 5 days $= 5 \times 5 = 25$ units

Remaining work $= 30 - 25 = 5$ units

Time taken by B to complete the remaining work $= 5/1 = 5$ days

57. A, B and C can do a work in 4 days, 20 days and 60 days respectively. In how many days they can complete one-third of the same work by working together ?

- (a) $1\frac{1}{19}$ (b) $\frac{3}{19}$
 (c) $1\frac{3}{19}$ (d) $2\frac{1}{19}$

SSC CHSL 05/07/2019 (Shift-III)

Ans. (a) : 1 day's work of A $= \frac{1}{4}$

1 day's work of B $= \frac{1}{20}$

1 day's work of C $= \frac{1}{60}$

$$\begin{aligned} \text{1 day's work of } (A + B + C) &= \frac{1}{4} + \frac{1}{20} + \frac{1}{60} \\ &= \frac{15 + 3 + 1}{60} = \frac{19}{60} \end{aligned}$$

$(A + B + C)$ will complete the work $= \frac{60}{19}$ days

\therefore Time taken to complete $\frac{1}{3}$ Part of work

$$= \frac{60}{19} \times \frac{1}{3} = \frac{20}{19} = 1\frac{1}{19} \text{ days}$$

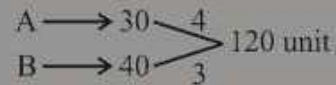
58. A can complete one-third of a work in 10 days and B can do $3/5^{\text{th}}$ of the same work in 24 days. They worked together for 10 days. The remaining work was completed by C alone in 15 days. In how many days can C alone do $2/3^{\text{rd}}$ of the same work?

- (a) 27 (b) 24
 (c) 32 (d) 30

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) A completes the work in 30 days.

B completes the same work in 40 days.



10 days work of A and B $= 7 \times 10 = 70$ unit

Remaining work $= 120 - 70 = 50$ unit

C completes the remaining work in 15 days.

$$\text{Efficiency of C} = \frac{50}{15} = \frac{10}{3}$$

Time taken by C to do $2/3$ of the same work

$$\begin{aligned} &= \frac{120 \times \frac{2}{3}}{\frac{10}{3}} = 24 \text{ days} \end{aligned}$$

59. A, B and C can complete a work in 10, 20 and 60 days respectively working together, in how many days will they complete the same work ?

- (a) 8 (b) 6
 (c) 10 (d) 5

SSC CHSL 04/07/2019 (Shift-II)

Ans. (b) : 1 day's work of A = $\frac{1}{10}$

1 day's work of B = $\frac{1}{20}$

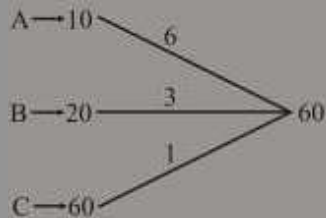
1 day's work of C = $\frac{1}{60}$

$$1 \text{ day's work of A, B and C} = \frac{1}{10} + \frac{1}{20} + \frac{1}{60}$$

$$= \frac{6+3+1}{60} = \frac{10}{60} = \frac{1}{6}$$

Hence the time taken to complete the work = 6 days

Trick:



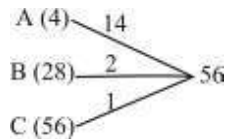
Total time taken by (A + B + C) to complete the work = $\frac{60}{10}$
= 6 day.

60. A, B and C can complete a work in 4, 28 and 56 days respectively. Working together in how many days will they complete the same work ?

- (a) $3\frac{1}{17}$ (b) $3\frac{5}{17}$
(c) $5\frac{1}{17}$ (d) $5\frac{5}{17}$

SSC CHSL 04/07/2019 (Shift-III)

Ans. (b) :



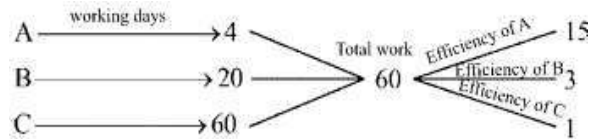
1 day's work of A, B and C = $14 + 2 + 1 = 17$
Time taken by A, B and C to complete the work
= $\frac{56}{17} = 3\frac{5}{17}$ days

61. A, B and C can complete a work in 4, 20 and 60 days respectively. Working together in how many days will they complete the same work ?

- (a) $5\frac{3}{19}$ (b) $3\frac{3}{19}$
(c) $5\frac{1}{19}$ (d) $3\frac{1}{19}$

SSC CHSL 05/07/2019 (Shift-II)

Ans. (b) :



∴ Work = Efficiency × Time

Hence required time = $\frac{60}{19}$

Time = $3\frac{3}{19}$ days

62. A and B working together can do 45% of the work in 9 days. A alone can do the work in 30 days. How many days will B alone take to do the same work?

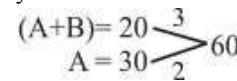
- (a) 60 days (b) 70 days
(c) 48 days (d) 50 days

SSC CHSL -26/10/2020 (Shift-III)

Ans. (a) : 45% work of (A + B) = 9 days

∴ 45% → 9 days

∴ 100% → 20 days



B alone will do the work = $\frac{60}{(3-2)} = 60$ days

63. Ravi and Mohan together can complete a task in 3 days. Ravi alone can complete the same task in 7 days. How many days will Mohan alone take to complete the same task?

- (a) $5\frac{1}{4}$ days (b) $4\frac{1}{5}$ days
(c) 10 days (d) 4 days

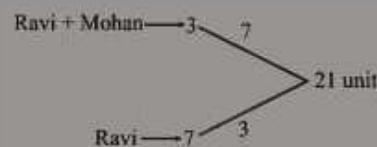
SSC CHSL -26/10/2020 (Shift-II)

Ans. (a) : 1 day's work of Mohan = $\frac{1}{3} - \frac{1}{7}$

$$= \frac{7-3}{21} = \frac{4}{21}$$

Time taken by Mohan to complete the task = $5\frac{1}{4}$ days

Trick:



Ravi + Mohan = 7
Mohan = $7 - 3 = 4$ unit

Time taken by Mohan to complete the work = $\frac{21}{4}$
= $5\frac{1}{4}$ day.

64. Raju can finish a piece of work in 20 days. He worked at it for 5 days and then Jakob alone finished the remaining work in 15 days. In how many days can both finish it together?
- (a) 20 days (b) 12 days
(c) 10 days (d) 16 days

SSC CHSL -16/10/2020 (Shift-I)

Ans. (c) : 1 day's work of Raju = $\frac{1}{20}$ Part

5 days' work of Raju = $\frac{5}{20} = \frac{1}{4}$ Part

Remaining work = $1 - \frac{1}{4} = \frac{3}{4}$ Part

∴ Jakob completes $\frac{3}{4}$ part of the work in 15 days

∴ Time taken by Jakob to complete the work
= $15 \times \frac{4}{3} = 20$ days

∴ Time taken by both of them to complete the work

$$= \frac{20 \times 20}{40} \left[\text{from formula } \frac{xy}{x+y} \right]$$

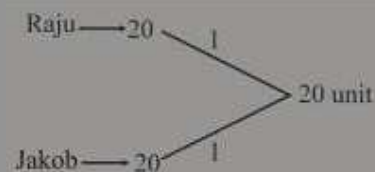
$$= 10 \text{ days}$$

Trick:

∴ Raju = $\frac{5}{20} = \frac{1}{4}$ Part

Remains Part = $\frac{3}{4}$

Jakob taken time to complete work
= $\frac{15 \times 4}{3} = 20$ day



Total time taken [Raju + Jakob] to complete the work
= $\frac{20}{2}$
= 10 day.

65. A alone can complete a task in 3 days and B alone can complete the same task in 6 days. In how many days can A and B complete it together?
- (a) 3 (b) 2
(c) 1 (d) 6

SSC CHSL -16/10/2020 (Shift-III)

Ans. (b) : Time taken by A to complete the work = 3 days

Time taken by B to complete the work = 6 days

∴ Time taken by both of them working together

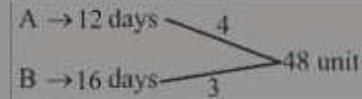
$$= \frac{3 \times 6}{3+6} = \frac{18}{9} = 2 \text{ days}$$

66. A and B separately can build a wall in 12 and 16 days respectively. If they work for 1 day alternatively, starting with A, in how many days will the wall be built?

- (a) $12\frac{2}{3}$ day (b) $13\frac{2}{3}$ day
(c) $6\frac{3}{4}$ day (d) $7\frac{2}{3}$ day

SSC CHSL -16/10/2020 (Shift-II)

Ans. (b):



Work done in 2 days = 4 + 3 = 7 unit

Work done in (2 × 6 = 12) days = 7 × 6 = 42 unit

Work done in 13 days = 42 + 4 = 46 unit

Remaining work = 48 - 46 = 2 unit

Remaining work done by B in = $\frac{2}{3}$ days

Total time = $13 + \frac{2}{3} = 13\frac{2}{3}$ days

67. If 27 people, working 8 hours a day, can complete a task in 12 days, then in how many days will 18 people finish the task, working 9 hours a day?

- (a) 15 days (b) 20 days
(c) 16 days (d) 18 days

SSC CHSL -14/10/2020 (Shift-II)

Ans. (c) : $M_1 D_1 H_1 = M_2 D_2 H_2$

$$27 \times 12 \times 8 = 18 \times D_2 \times 9$$

$$D_2 = \frac{27 \times 12 \times 8}{18 \times 9} = 16 \text{ days}$$

68. 5 men and 8 women can complete a task in 34 days, whereas 4 men and 18 women can complete the same task in 28 days. In how many days can the same task be completed by 3 men and 5 women?

- (a) 64 (b) 72
(c) 56 (d) 36

SSC CHSL -13/10/2020 (Shift-I)

Ans. (c) :

Work done = $M_1 D_1 = M_2 D_2$

$$(5M + 8W)34 = (4M + 18W)28$$

$$(5M + 8W)17 = (4M + 18W)14$$

$$85M + 136W = 56M + 252W$$

$$29M = 116W$$

$$1M = 4W$$

$$\frac{M}{W} = \frac{4}{1}$$

$$\begin{aligned} \text{Work done} &= (5 \times 4 + 8 \times 1) \times 34 \\ &= (28 \times 34) \\ \text{Required time} &= \frac{28 \times 34}{(3 \times 4 + 5 \times 1)} = 56 \text{ days} \end{aligned}$$

69. Shyam can complete a task in 12 days by working 10 hours a day. How many hours a day should he work to complete the task in 8 days?

- (a) 15 (b) 14
(c) 16 (d) 12

SSC CHSL –12/10/2020 (Shift-III)

Ans. (a): Let Shyam should work x hours daily to complete the work in 8 days.

We know that,

$$M_1 D_1 H_1 = M_2 D_2 H_2$$

$$\therefore 1 \times 12 \times 10 = 1 \times 8 \times x$$

$$\Rightarrow x = 15 \text{ hours}$$

70. 30 men working 8 hours per day can dig a pond in 16 days. By working how many hours per day can 32 men dig two same ponds, in 20 days?

- (a) 6 hours per day (b) 5 hours per day
(c) 7 hours per day (d) 8 hours per day

SSC CHSL –12/10/2020 (Shift-II)

Ans. (a) : Let 32 men work x hours a day for 20 days to complete the work

$$\therefore 30 \times 16 \times 8 = 32 \times 20 \times x$$

$$\Rightarrow x = 6 \text{ hour/day}$$

71. 15 men can complete a task in 10 days. In how many days can 20 men complete the same task?

- (a) 6.5 days (b) 8.5 days
(c) 5.5 days (d) 7.5 days

SSC CHSL –12/10/2020 (Shift-I)

Ans. (d) : Let 20 men will complete the same work in x days.

$$\therefore 15 \times 10 = 20 \times x$$

$$x = \frac{15 \times 10}{20} = 7.5 \text{ days}$$

72. Ramu works 4 times as fast as Somu. If Somu can complete a work in 20 days independently, then the number of days in which Ramu and Somu together can complete the work is:

- (a) 3 days (b) 5 days
(c) 4 days (d) 6 days

SSC CHSL –14/10/2020 (Shift-III)

Ans. (c) :

Ratio of work capacity of Ramu and Somu = 4:1

Total work = time \times efficiency = $20 \times 1 = 20$ units

$$\text{Hence required time} = \frac{20}{5} = 4 \text{ days.}$$

73. Ravi, Mohan and Govind can complete a task in 12 days, 10 days and 15 days, respectively. In how many days can Ravi, Mohan and Govind together complete the same task?

- (a) 2 (b) 4
(c) 6 (d) 8

SSC CHSL –19/03/2020 (Shift-I)

Ans. (b) \therefore 1 day's work of Ravi = $\frac{1}{12}$ Part

1 day's work of Mohan = $\frac{1}{10}$ Part

1 day's work of Govind = $\frac{1}{15}$ Part

$$\begin{aligned} \text{1 day's work of all the three people} &= \frac{1}{12} + \frac{1}{10} + \frac{1}{15} \\ &= \frac{5+6+4}{60} \\ &= \frac{15}{60} = \frac{1}{4} \text{ part} \end{aligned}$$

\therefore Time taken by all the three people to complete the work in 4 days.

74. X and Y together can finish a piece of work in 15 days, while Y alone can finish it in 40 days. X alone can finish the work in:

- (a) 25 day (b) 23 day
(c) 6 day (d) 24 day

SSC CHSL –17/03/2020 (Shift-I)

Ans. (d) : \therefore 1 day's work of (X + Y) = $\frac{1}{15}$ Part

1 day's work of Y = $\frac{1}{40}$ Part

$$\text{1 day's work of X} = \frac{1}{15} - \frac{1}{40} = \frac{8-3}{120} = \frac{5}{120} = \frac{1}{24}$$

\therefore Time taken by X to finish the work alone = 24 days.

75. Ravi can complete a task in 6 days and Mohan can complete the same task in 9 days. In how many days can Ravi and Mohan together complete the same task?

- (a) $3\frac{2}{5}$ days (b) 9 days
(c) 15 days (d) $3\frac{3}{5}$ days

SSC CHSL –19/03/2020 (Shift-III)

Ans. (d) : \therefore 1 day's task of Ravi = $\frac{1}{6}$ Part

1 day's task by Mohan = $\frac{1}{9}$ Part

$$\text{1 day's task of both} = \frac{1}{6} + \frac{1}{9} \Rightarrow \frac{3+2}{18} = \frac{5}{18}$$

Hence, the time taken by both of them to complete the task = $\frac{18}{5} = 3\frac{3}{5}$ days

Tricky Method:

$$\frac{xy}{x+y}$$

$$= \frac{6 \times 9}{6+9} = \frac{54}{15} = 3\frac{3}{5} \text{ Day.}$$

76. A and B working together can do 30% of the work in 6 days. B alone can do the same work in 25 days. How long will A alone take to complete the same work?

- (a) 100 days (b) 75 days
(c) 80 days (d) 60 days

SSC CHSL -20/10/2020 (Shift-II)

Ans. (a)

(A+B) can do 100% work in = $\frac{6}{30} \times 100 = 20$ days

$$\begin{array}{l} A+B \rightarrow 20 \\ B \rightarrow 25 \end{array} \xrightarrow{5} 100 \text{ (Total work)}$$

∴ 1 day's work of A = 5 - 4 = 1 unit

$$A \text{ will complete the work in } = \frac{100}{1} = 100 \text{ days}$$

77. A and B can do a work in 12 days, B and C can do it in 15 days C and A can do it in 20 days. If A, B and C work together, then they will complete the same work in:

- (a) 14 days (b) 10 days
(c) 5 days (d) 12 days

SSC CHSL -21/10/2020 (Shift-III)

Ans. (b) 1 day's work of (A + B) = 1/12 Part

1 day's work of (B + C) = 1/15 Part

1 day's work of (C + A) = 1/20 Part

$$2(A+B+C) = \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$$

$$2(A+B+C) = \frac{5+4+3}{60}$$

$$2(A+B+C) = \frac{12}{60} = \frac{1}{5}$$

$$A+B+C = \frac{1}{10}$$

Hence, A, B and C will do the work in 10 days.

78. A can do a piece of work in 15 days and B can do it in 10 days. If work together for 4 days, then the fraction of the work left is:

- (a) 1/3 (b) 2/3
(c) 1/4 (d) 3/4

SSC CHSL -21/10/2020 (Shift-I)

Ans. (a) Work done by A and B for 4 days

$$= 4 \left(\frac{1}{15} + \frac{1}{10} \right) = 4 \times \frac{5}{30} = \frac{2}{3}$$

Then remaining work = $1 - \frac{2}{3} = \frac{1}{3}$

79. A, B and C complete the work in 12, 15 and 20 days respectively. How much time they take to complete the work together?

- (a) 5 days (b) 4 days
(c) 7.5 days (d) 6 days

SSC MTS 21/08/2019 (Shift-II)

Ans. (a) :

Work done by (A+B+C) in 1 day = $\frac{1}{12} + \frac{1}{15} + \frac{1}{20}$

$$= \frac{5+4+3}{60} \Rightarrow \frac{12}{60} \text{ Part}$$

$$= \frac{1}{5} \text{ Part}$$

∴ Time taken by (A+B+C) = 5 days

80. A and B complete the work in 20 and 30 days respectively. A worked full time whereas B worked for half time. What is the number of days taken to complete the whole work?

- (a) 9 days (b) 15 days
(c) 12 days (d) 10 days

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : 1 day's work of A = $\frac{1}{20}$ Part

1 day's work of B = $\frac{1}{30}$ Part

Half day's work of B = $\frac{1/2}{30} = \frac{1}{60}$ Part

Time taken to complete the work

$$= \frac{1}{20} + \frac{1}{60} = \frac{3+1}{60} = \frac{4}{60} = \frac{1}{15}$$

$$= 15 \text{ days}$$

81. E, F and G together can complete a work in 12 days. If E and F together can complete the same work in 30 days, then in how many days can G alone complete the same work?

- (a) 18 days (b) 20 days
(c) 12 days (d) 24 days

SSC MTS 08/08/2019 (Shift-I)

Ans. (b) :

$$\begin{array}{l} E+F+G \rightarrow 12 \\ E+F \rightarrow 30 \end{array} \xrightarrow{5} 60 \text{ (Total work)}$$

1 day's work of G = (E + F + G) - (E + F)

$$= (5 - 2)$$

$$= 3$$

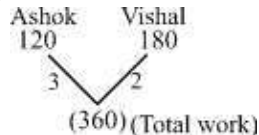
Time taken by G to do the work = $\frac{60}{3} = 20$ days

82. Vishal alone can complete $\frac{1}{3}$ part of a work in 60 days and Ashok alone can complete $\frac{1}{4}$ part of the same work in 30 days. In how many days Vishal and Ashok together can complete the same work?

- (a) 64 (b) 20
(c) 72 (d) 56

SSC MTS 08/08/2019 (Shift-I)

Ans. (c) : Time taken by Vishal to complete the whole work = $60 \times 3 = 180$ days
Time taken by Ashok to complete the whole work = $4 \times 30 = 120$ days



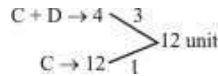
\therefore Time taken by Vishal and Ashok to complete the whole work = $\frac{360}{5} = 72$ days.

83. C and D together can make a chair in 4 days and C alone can make this chair in 12 days. In how many days D alone can make this chair?

- (a) 10 days (b) 6 days
(c) 4 days (d) 8 days

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) :



\therefore 1 day's work of D = $3 - 1 = 2$ units

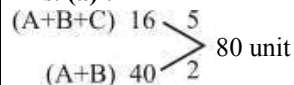
Hence, time taken by D to make the chair alone = $\frac{12}{2} = 6$ days

84. A, B and C work together for 16 days whereas A and B complete the same work in 40 days, What is the time taken by C to complete the work alone?

- (a) 26.67 (b) 25
(c) 23.33 (d) 30

SSC MTS 16/08/2019 (Shift-III)

Ans. (a) :



\therefore 1 day's work of (A + B + C) = 5 units

1 day's work of (A + B) = 2 units

\therefore 1 day's work of C = (5 - 2) = 3 units

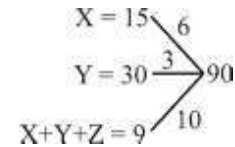
Hence, C will do the whole work = $\frac{80}{3} = 26.67$ days

85. X can do a work alone in 15 days. Y can do the same work alone in 30 days. X, Y and Z work together and complete the same work in 9 days. In how many days Z can complete the same work alone?

- (a) 120 (b) 90
(c) 45 (d) 60

SSC MTS 06/08/2019 (Shift-I)

Ans. (b) :



1 day's work of Z = $10 - (6 + 3) = 1$ unit

Z alone will do the whole work in = $\frac{90}{1} = 90$ days

86. Vijay alone can complete a work in 50 days. How much part of the work will be completed in ten days?

- (a) $\frac{1}{5}$ (b) $\frac{1}{3}$
(c) $\frac{1}{10}$ (d) $\frac{1}{4}$

SSC MTS 08/08/2019 (Shift-III)

Ans. (a) : Work done by Vijay in 10 days = $\frac{10}{50}$ Part
 $= \frac{1}{5}$ Part

87. N and K together can complete a work in 240 days, K and G together can complete the same work in 72 days and N and G together can complete the same work in 80 days. In how many days K alone can complete the same work?

- (a) 280 days (b) 240 days
(c) 360 days (d) 180 days

SSC MTS 08/08/2019 (Shift-III)

Ans. (c) :

$$1 \text{ day's work of } N + K = \frac{1}{240} \text{ Part} \dots\dots\dots(i)$$

$$1 \text{ day's work of } K + G = \frac{1}{72} \text{ Part} \dots\dots\dots(ii)$$

$$1 \text{ day's work of } N + G = \frac{1}{80} \text{ Part} \dots\dots\dots(iii)$$

On adding equation (i) + (ii) + (iii),

$$2(N + K + G) = \frac{1}{240} + \frac{1}{72} + \frac{1}{80} = \frac{3 + 10 + 9}{720}$$

$$2(N + K + G) = \frac{22}{720}$$

$$(N + K + G) = \frac{11}{720} \text{ Part} \dots\dots\dots(iv)$$

From equation (iv) – (iii),

$$(N + K + G) - (N + G) = \frac{11}{720} - \frac{1}{80}$$

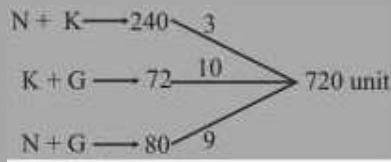
$$K = \frac{11-9}{720}$$

$$K = \frac{2}{720}$$

$$K = \frac{1}{360} \text{ Part}$$

Hence, time taken by K to complete the work = 360 days

Trick



$$2(N + K + G) = 22$$

$$N + K + G = 11$$

$$K + 9 = 11$$

$$K = 2$$

Hence, Total time taken by K to complete the work = $\frac{720}{2} = 360$ days.

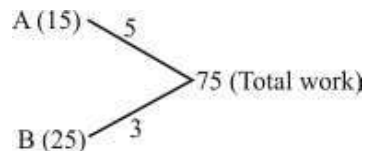
88. A can complete one-third of a work in 5 days and B can do $\frac{2}{5}$ th of the same work in 10 days. They work together for 6 days. The remaining work is completed by C in 18 days. C alone will do the same work in:

- (a) 50 days (b) 30 days
(c) 25 days (d) 45 days

SSC MTS 22/08/2019 (Shift-II)

Ans. (a) : Time taken by A to complete the work = 15 days

Time taken by B to complete the work = $10 \times \frac{5}{2} = 25$ days



Work done by (A + B) in 6 days = $8 \times 6 = 48$

Remaining work = $75 - 48 = 27$

Work done by C in 1 day = $\frac{27}{18} = \frac{3}{2}$

Time taken by C to complete the work = $75 \times \frac{2}{3} = 50$ days

89. 10 men can complete the work in 30 days after working for 8 hours. In how many days 12 men can complete the same work after working for 4 hours a day?

- (a) 30days (b) 50days
(c) 40days (d) 60days

SSC MTS 05/08/2019 (Shift-III)

Ans. (b) :

$$M_1 D_1 H_1 = M_2 D_2 H_2$$

$$10 \times 30 \times 8 = 12 \times D_2 \times 4$$

$$D_2 = \frac{10 \times 30 \times 8}{12 \times 4} = 50 \text{ days}$$

90. Working together, A and B can complete a work in 12 days. They work together for 9 days after which B leaves. If A finishes the remaining work in 5 days, then the number of days that B alone would take to complete the work is:

- (a) 12 (b) 24
(c) 30 (d) 15

SSC MTS 09/08/2019 (Shift-II)

Ans. (c) : 9 days' work of A and B together = $\frac{9}{12} = \frac{3}{4}$

Remaining work = $1 - \frac{3}{4} = \frac{1}{4}$

A finish the remaining work in 5 days.

Time taken by A to complete the work = $5 \times 4 = 20$ days

$$B = \frac{xy}{x-y} = \frac{20 \times 12}{20-12} \quad (\text{By formula})$$

$$= \frac{20 \times 12}{8} = 30 \text{ days}$$

91. A can do 50% of the job in 16 days, B can do one-fourth of the same job in 24 day. Working together, in how many days they can do seven-fourth of the job?

- (a) 24 (b) 28
(c) 27 (d) 42

SSC MTS 09/08/2019 (Shift-I)

Ans. (d) : \because A does 50% of the work in 16 days

\therefore A will do 100% of the work in 32 days

B does the complete work in $24 \times 4 = 96$ days

Work done by both in 1 day = $\frac{1}{32} + \frac{1}{96}$

$$= \frac{3+1}{96}$$

$$= \frac{4}{96} \text{ Part}$$

$$= \frac{1}{24} \text{ Part}$$

Hence, Time taken by both of them to complete the work = 24 days

$$\text{Then time taken to do } \frac{7}{4} \text{ part of the work} = 24 \times \frac{7}{4} = 42 \text{ days}$$

92. A and B together can complete same work in 36 days, B and C together can complete the same work in 60 days, A and C together can complete the same work in 45 days. In how many days, B alone can complete the same work?

- (a) 180 days (b) 60 days
(c) 100 days (d) 90 days

SSC MTS 13/08/2019 (Shift-III)

Ans. (d) :

$$1 \text{ day's work of } A + B = \frac{1}{36} \text{ Part} \text{ ----- (i)}$$

$$1 \text{ day's work of } B + C = \frac{1}{60} \text{ Part} \text{ ----- (ii)}$$

$$1 \text{ day's work of } A + C = \frac{1}{45} \text{ Part} \text{ ----- (iii)}$$

On adding equation (i) + (ii) + (iii)

$$2[A + B + C] = \frac{1}{36} + \frac{1}{60} + \frac{1}{45} = \frac{12}{180}$$

$$A + B + C = \frac{1}{30} \text{ ----- (iv)}$$

On subtracting equation (iv) -----(iii)

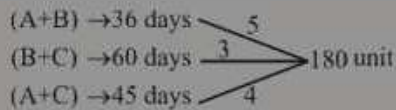
$$(A + B + C) - (A + C) = \frac{1}{30} - \frac{1}{45}$$

$$B = \left[\frac{1}{30} - \frac{1}{45} \right] \text{ Part}$$

$$B = \frac{1}{90} \text{ Part}$$

Thus, B alone can complete the same work in 90 days.

Trick:



$$\text{Efficiency of } (A+B+C) = \frac{5+3+4}{2} = 6$$

$$\text{Efficiency of } B = 6 - 4 = 2$$

$$\text{Time taken by } B \text{ to complete the work} = \frac{180}{2} = 90 \text{ days}$$

93. A and B can do a piece of work alone in 15 and 30 days respectively. In how many days can they together complete the work?

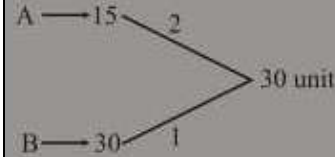
- (a) 10 (b) 8
(c) 9 (d) 12

SSC MTS 16/08/2019 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : } (A+B) &= \frac{1}{15} + \frac{1}{30} \\ &= \frac{2+1}{30} = \frac{3}{30} \text{ Part} \\ &= \frac{1}{10} \text{ Part} \end{aligned}$$

So, they together will complete the whole work in 10 days.

Trick:



$$\begin{aligned} \text{Total time taken by } (A + B) \text{ to complete the work} &= \frac{30}{3} \\ &= 10 \text{ day} \end{aligned}$$

94. X takes 10 days less than Y to complete a task. Both X and Y together can complete the work in 12 days. In how many days will Y alone complete the work?

- (a) 22.5 Days (b) 25 Days
(c) 28 Days (d) 30 Days

SSC MTS 09/08/2019 (Shift-III)

Ans. (d) : Let Y will complete the work in x days.

$$\frac{1}{x-10} + \frac{1}{x} = \frac{1}{12}$$

$$\frac{x+x-10}{x(x-10)} = \frac{1}{12}$$

$$x^2 - 10x = 24x - 120$$

$$x^2 - 34x + 120 = 0$$

$$x^2 - 30x - 4x + 120 = 0$$

$$(x-30)(x-4) = 0$$

$$\text{If, } x - 30 = 0$$

$$x = 30$$

$$\text{If } x - 4 = 0$$

$$x = 4$$

∴ Y can alone finish the work in 30 days.

95. Aditya can complete a work in 24 days alone. Raman can complete the same work in 45 days alone. In how many days can they together complete the work?

- (a) $\frac{720}{13}$ (b) $\frac{1080}{43}$
(c) $\frac{360}{23}$ (d) $\frac{960}{33}$

SSC MTS 19/08/2019 (Shift-II)

Ans. (c) :

$$\text{Work done by Aditya in 1 day} = \frac{1}{24}$$

$$\text{Work done by Raman in 1 day} = \frac{1}{45}$$

$$\begin{aligned} \text{Work done by Raman and Aditya in 1 day} &= \frac{1}{24} + \frac{1}{45} \\ &= \frac{15+8}{360} = \frac{23}{360} \end{aligned}$$

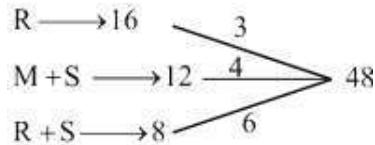
$$\text{Time taken by both} = \left(\frac{360}{23}\right) \text{ days}$$

96. Radha can do a piece of work in 16 days, Meera and Shashi together can do it in 12 days, while Radha and Shashi together can do it in 8 days. How many days will Meera take to do the work alone.

- (a) 40 days (b) 28 days
(c) 32 days (d) 48 days

SSC MTS 7-10-2017 (Shift-I)

Ans. (d):



$$\text{Efficiency of Shashi} = 6 - 3 = 3$$

$$\text{Efficiency of Meera} = 4 - 3 = 1$$

$$\begin{aligned} \text{Time taken by Meera to complete the work} \\ &= \frac{48}{1} = 48 \text{ days} \end{aligned}$$

97. A and B together can do a piece of work in 10 days and A alone can do it in 30 days. B alone can do the work in how many days?

- (a) 15 (b) 12
(c) 18 (d) 24

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) :

$$\text{Work of A + B in 1 day} = \frac{1}{10}$$

$$\text{Work done by A alone in 1 day} = \frac{1}{30}$$

$$\text{Work done by B alone in 1 day} = \frac{1}{10} - \frac{1}{30} = \frac{3-1}{30} = \frac{1}{15}$$

Hence, B alone will do the work in 15 days.

98. A can do a piece of work in 20 days. He worked for 5 days and B finished the remaining work in 42 days. B alone can do the whole work in how many days?

- (a) 56 (b) 52
(c) 11 (d) 6

SSC MTS 10-10-2017 (Shift-I)

$$\text{Ans : (a) Work done by A in 5 days} = \frac{5}{20} = \frac{1}{4}$$

$$\text{Remaining work} = 1 - \frac{1}{4} = \frac{3}{4}$$

$$\therefore \frac{3}{4} \text{ time taken by B to complete } \frac{3}{4} \text{ Part of work} = 42 \text{ days}$$

$$\therefore \text{Time taken by B to complete the whole work} = \frac{42}{3} \times 4 = 14 \times 4 = 56 \text{ days}$$

99. A and B together can do a piece of work in 20 days and A alone can do it in 30 days. B alone can do the work in how many days?

- (a) 45 (b) 60
(c) 75 (d) 90

SSC MTS 10-10-2017 (Shift-II)

$$\text{Ans. (b) : 1 day's work of (A + B)} = \frac{1}{20} \text{ Part}$$

$$\text{1 day's work of A} = \frac{1}{30} \text{ Part}$$

$$\text{1 day's work of B} = \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60} \text{ Part}$$

Hence B alone can do the work in 60 days.

100. A and B together can do a piece of work in 10 days and A alone can do it in 15 days. B alone can do the work in how many days?

- (a) 30 (b) 45
(c) 12 (d) 24

SSC MTS 9-10-2017 (Shift-III)

Ans : (a) Let B alone can do the work in x days. According to the question.

$$\frac{1}{15} + \frac{1}{x} = \frac{1}{10}$$

$$\frac{1}{x} = \frac{1}{10} - \frac{1}{15}$$

$$\frac{1}{x} = \frac{3-2}{30}$$

$$\boxed{x = 30 \text{ days}}$$

Hence B alone will do the work in 30 days.

101. If 30 men can do a job in 30 days, find what part of the job can be completed by 1 man in 1 day.

- (a) $\frac{1}{30}$ (b) $\frac{1}{900}$
(c) $\frac{1}{90}$ (d) $\frac{1}{60}$

SSC GD Constable 05/03/2019 (Shift-II)

$$\text{Ans. (b) : } \frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{30 \times 30}{1} = \frac{1 \times 1}{W_2}$$

$$W_2 = \frac{1}{900}$$

102. 40 mechanics can repair a bike in 56 days. In how many days 32 mechanics will do the same work?

- (a) 60 days (b) 56 days
(c) 80 days (d) 70 days

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) : Given-

$$M_1 = 40, \quad D_1 = 56$$

$$M_2 = 32, \quad D_2 = ?$$

$$\therefore M_1 \times D_1 = M_2 \times D_2$$

$$\Rightarrow 40 \times 56 = 32 \times D_2$$

$$D_2 = \frac{40 \times 56}{32}$$

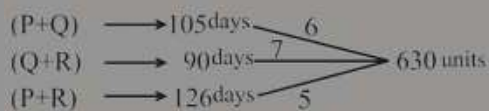
$$D_2 = 70 \text{ days}$$

103. P and Q together can complete a work in 105 days, Q and R together can complete the same work in 90 days, P and R together can complete the same work in 126 days. In how many days P, Q and R together can complete the same work?

- (a) 70 days (b) 74 days
(c) 76 days (d) 72 days

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a):



$$\text{Efficiency of } 2(P + Q + R) = 6 + 7 + 5 = 18$$

$$\text{Efficiency of } (P + Q + R) = 9$$

$$\therefore \text{Required time} = \frac{630}{9} = 70 \text{ days}$$

104. P and Q together can complete a work in 20 days. If P alone can complete the same work in 36 days, then in how many days Q alone can complete the same work?

- (a) 48 days (b) 42 days
(c) 45 days (d) 51 days

SSC GD Constable 14/02/2019 (Shift-II)

$$\text{Ans. (c) : } \frac{1}{P} + \frac{1}{Q} = \frac{1}{20}$$

$$\frac{1}{Q} = \frac{1}{20} - \frac{1}{36}$$

$$\frac{1}{Q} = \frac{9-5}{180}$$

$$\frac{1}{Q} = \frac{4}{180}$$

$$Q = 45$$

Hence, Q alone will do the same work in 45 days.

(II) Problems based on Remaining Work

105. A can complete a work in 20 days, while B can complete the same work in 25 days. Both worked together for 10 days and then C alone completed the remaining work in 10 days. In how many days will A, B and C together complete the same work?

(a) 10 days

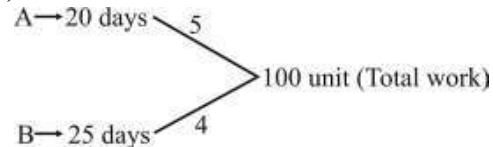
(b) 5 days

(c) 8 days

(d) 12 days

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) :



Work done by (A+B) in 10 days = $(5+4) \times 10 = 90$ unit

Remaining Work = 100 unit - 90 unit = 10 unit

Remaining work done by C in 10 days = 10 unit

$$\text{Efficiency of C} = \frac{10}{10} = 1 \text{ unit}$$

According to the question:-

(A+B+C) together completed the work

$$\Rightarrow \frac{\text{Total work}}{\text{Their efficiency}} = \frac{100}{5+4+1}$$

$$= \frac{100}{10} = 10 \text{ days}$$

106. A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 4 days B had to leave. Then A working with a new worker C completed the remaining work in 3 days. If C works alone, in how many days he can do 40% of the same work?

(a) 9

(b) $8\frac{1}{2}$

(c) 8

(d) 10

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

$$\text{Ans. (a) : A's 1 day work} = \frac{1}{15}$$

$$\text{B's 1 day work} = \frac{1}{10}$$

$$\therefore (A+B)'s 1 \text{ day work} = \frac{1}{15} + \frac{1}{10}$$

$$= \frac{5}{30}$$

$$= \frac{1}{6}$$

$$\therefore (A+B)'s 4 \text{ days work} = 4 \times \frac{1}{6}$$

$$= \frac{2}{3}$$

$$\text{Remaining work} = 1 - \frac{2}{3}$$

$$= \frac{1}{3}$$

Remaining work completed in 3 days by A and C = $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

Let, C's 1 day work = $\frac{1}{x}$

$$\therefore \frac{1}{15} + \frac{1}{x} = \frac{1}{9}$$

$$\Rightarrow \frac{1}{x} = \frac{1}{9} - \frac{1}{15}$$

$$\Rightarrow \frac{1}{x} = \frac{2}{45}$$

C alone can complete the work = $\frac{45}{2}$ days

\therefore Time taken by C to complete 40% of work
 $= \frac{40}{100} \times \frac{45}{2}$

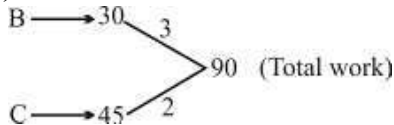
= 9 days

107. A, B and C together can complete a work in x, 30 and 45 days, respectively. B and C worked together for 6 days. The remaining work was completed by A alone in 12 days. The value of x is:

- (a) 18 (b) 20
 (c) 24 (d) 15

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : A = ?



6 days work of (B+C) = (3+2) × 6 = 30 unit

Remaining work = (90-30) = 60 unit

\therefore A completed remaining work in 12 days.

\therefore A's efficiency = $\frac{60}{12} = 5$

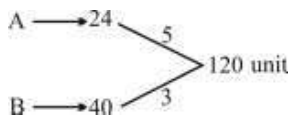
\therefore Time taken by A to complete the work = $\frac{90}{5} = 18$ days

108. A and B can complete a certain task in 24 days and 40 days, respectively. They worked together for 8 days. C completed the remaining task in 14 days. Working together, A and C will complete 75% of the same work in:

- (a) 10 days (b) 12 days
 (c) 9 days (d) 15 days

SSC CHSL 12/04/2021 (Shift-I)

Ans : (a)



Work done by A and B in 8 days = 8 (5+3) = 64 unit

Remaining work = 120 - 64 = 56 unit

According to the question,

56 unit is done by C = 14 days

Then, 120 unit = $\frac{14}{56} \times 120 = 30$ days

A and C together will do 75% of the work-

$$= 120 \times \frac{75}{100} \times \frac{1}{9} = 10 \text{ days}$$

109. P can complete five-eighths of a work in 15 days and Q can complete three-fourths of the same work in 30 days. They worked together for 8 days and then P left. How much time will Q working alone, take to complete the remaining work?

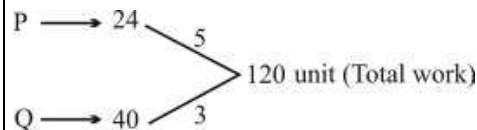
- (a) 15 days 16 hours (b) 15 days 8 hours
 (c) 20 days 4 hours (d) 18 days 16 hours

SSC CHSL 16/04/2021 (Shift-I)

Ans. (d) :

P can complete a whole work in = $15 \times \frac{8}{5} = 24$ days

Q can complete a whole work in = $30 \times \frac{4}{3} = 40$ days



Work done by A and B together in 8 days = (5+3) × 8 = 64 unit

Remaining work = 56 unit

Required time = $\frac{56}{3} = 18 \frac{2}{3}$ days

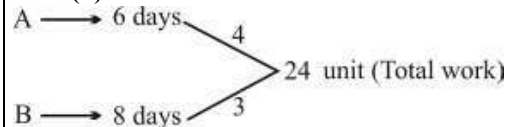
= 18 days 16 hours

110. A and B can complete a certain work in 6 days and 8 days, respectively. They worked together for 3 days. C alone completed the remaining work in 2 days. B and C together can complete 3/4 of the same work in:

- (a) 2 days (b) 3 days
 (c) 6 days (d) 4 days

SSC CHSL 13/04/2021 (Shift-I)

Ans. (d) :



Work done by A and B in 3 days = (4+3) × 3 = 21 unit

Remaining work = 3 unit

Efficiency of C = $\frac{3}{2}$

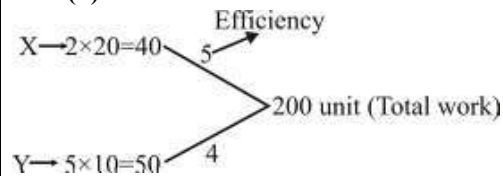
$$\text{Required time} = \frac{24 \times \frac{3}{4}}{\left(3 + \frac{3}{2}\right)} = \frac{18 \times 2}{9} = 4 \text{ days}$$

111. X can complete half of the work in 20 days and Y can do one-fifth of the same work in 10 days. X started the work and left after 8 days. Then Y took over to complete the remaining work. The total number of days taken by them to complete the work is:

- (a) 60 days (b) 40 days
(c) 50 days (d) 48 days

SSC CHSL 11/08/2021 (Shift-I)

Ans. (d) :



∴ X, stopped the work after 8 days

Work done by X in 8 days = 8 × 5 = 40

Remaining work is completed by Y

Remaining work = 200 – 40 = 160

Time taken by Y = $\frac{(200 - 40)}{4} = \frac{160}{4} = 40$ days

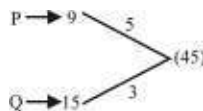
So, Total time taken by X and Y to complete the work = 8 days + 40 days = 48 days

112. P and Q can completed a work in 9 days and 15 days, respectively. If they work together for three days, then in how many days will the remaining work be completed by Q alone?

- (a) 12 (b) 9
(c) 8 (d) 7

SSC CHSL 19/04/2021 (Shift-III)

Ans. (d) :



P and Q worked together for 3 days = $[3 \times (5 + 3)] = 24$ units

Remaining work = (45 – 24) = 21 units

∴ The remaining work completed by Q alone = $\frac{21}{3} = 7$ days

113. A can do 60% of a work in 18 days, while B can do 40% of the same work in 10 days. But work together for 10 days only. C completed the remaining work in 4 days. In how many days will C complete the same work?

- (a) 12 (b) 25
(c) 15 (d) 18

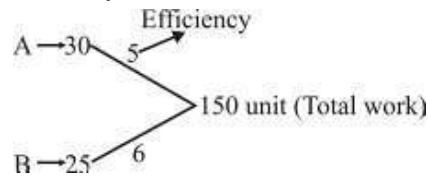
SSC CHSL 05/08/2021 (Shift-II)

Ans. (c) : A can do 60% in 18 days

So, total in 30 days

B can do 40% in 10 days

So, total in 25 days



So effective efficiency = 11

In 10 days they will complete 110 units of the work
Remaining 40 units to be done in 4 days by C.

So, C will do in = $\frac{150}{40/4} = 15$ days

114. The ratio of the efficiencies of A, B and C is 7 : 5 : 4. Working together, they can finish a work in 35 days. A and B work together for 28 days. The remaining work will be completed (in days) by C alone:

- (a) 60 (b) 63
(c) 49 (d) 56

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (d) : Total work done by (A + B + C)

= (7+5+4) × 35 = 560

Total work done by (A + B) in 28 days

= 28 × 12 = 336

Time taken by C to complete the remaining work

= $\frac{560 - 336}{4} = \frac{224}{4} = 56$ days

115. 18 men can complete a work in 9 days. 6 more men join them after five days. How many days will they take to complete the remaining work?

- (a) $2\frac{1}{2}$ (b) $3\frac{1}{2}$
(c) 3 (d) 2

SSC CHSL (Tier-I) 03/07/2019 (Shift-III)

Ans. (c) : Total work = 18 × 9 = 162 units

According to the question,

Let the remaining work be completed in x days.

162 = 18 × 5 + 24 × x

24x = 162 – 90

x = $\frac{72}{24} = 3$ days

116. To do a certain work, the ratio of the efficiencies of A, B and C is 7 : 5 : 6. Working together, they can complete the same work in 35 days. B and C work together for 21 days. The remaining work will be completed by A alone in :

- (a) 57 days (b) 60 days
(c) 54 days (d) 50 days

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-III)

Ans. (a) : Total work = $(7 + 5 + 6) \times 35 = 630$ units
 21 days' work of B and C = $(5 + 6) \times 21 = 231$ units
 Remaining work = $630 - 231 = 399$ units
 Time taken by A to complete the remaining work = $\frac{399}{7} = 57$ days

117. The efficiencies of A, B and C are in the ratio 5 : 3 : 8. Working together they can complete a work in 30 days. A and B worked together for 20 days. The remaining work will be completed by C alone in:

- (a) 30 days (b) 40 days
 (c) 36 days (d) 32 days

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (b) : Total work = $(5 + 3 + 8) \times 30 = 480$ units
 20 days' work of A and B = $(5 + 3) \times 20 = 160$ units
 Remaining work = $480 - 160 = 320$ units
 Time taken by C to complete the remaining work = $\frac{320}{8} = 40$ days.

118. The ratio of the efficiencies of A, B and C is 3 : 5 : 1. Working together they can complete a piece of work in 5 days. A and B work together for 3 days. The remaining work will be completed by C alone in?

- (a) 21 Days (b) 18 Days
 (c) 24 Days (d) 15 Days

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-III)

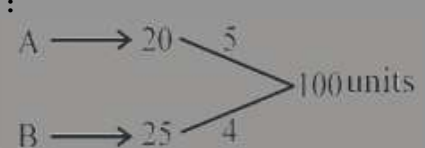
Ans. (a) : Total work = $(3 + 5 + 1) \times 5 = 45$ units
 3 days' work of A and B = $(3 + 5) \times 3 = 24$ units
 Remaining work = $45 - 24 = 21$ units
 Time taken by C to complete the remaining work = $\frac{21}{1} = 21$ days

119. A can finish a work in 20 days and B can finish the same work in 25 days. They began together, but B left the work after 5 days. How many more days will A take to finish the remaining work?

- (a) 11 (b) 21
 (c) 16 (d) 8

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (a) :



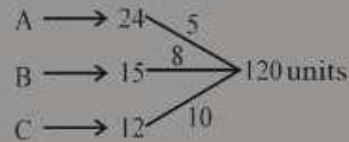
Remaining work = $100 - 9 \times 5 = 55$ units
 Time taken by A to complete the remaining work = $\frac{55}{5} = 11$ days

120. A, B and C can individually complete a piece of work in 24 days, 15 days and 12 days, respectively. B and C started the work and worked for 3 days and left. The number of days required by A alone to complete the remaining work, is:

- (a) 11 (b) $13\frac{1}{5}$
 (c) 18 (d) $15\frac{1}{2}$

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) :



Remaining work = $120 - 18 \times 3 = 66$ units
 Time taken by A to complete the remaining work = $\frac{66}{5} = 13\frac{1}{5}$ days

121. A and B, working together, can complete a work in d days. Working alone, A takes (8+d) days and B takes (18+d) days to complete the same work, A works for 4 days. The remaining work will be completed by B alone, in:

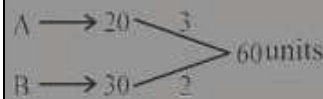
- (a) 20 days (b) 24 days
 (c) 16 days (d) 18 days

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (b) : If A does the work in $(x + a)$ days, and B does in $(x + b)$ days while both can do the work in x days.

then $x = \sqrt{ab}$

$\therefore d = \sqrt{8 \times 18} = 12$ days



Remaining work = $60 - 12 = 48$ units

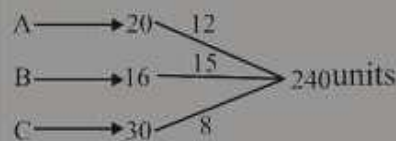
Required time = $\frac{48}{2} = 24$ units

122. A, B and C can individually complete a task in 20 days, 16 days and 30 days, respectively. If A and B started working on the task, and they worked for 4 days and left, then the number of days required by C to finish the remaining work is:

- (a) 13 days (b) $16\frac{1}{2}$ days
 (c) $12\frac{1}{2}$ days (d) 10 days

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (b) :



Remaining work = $240 - 27 \times 4 = 132$ units

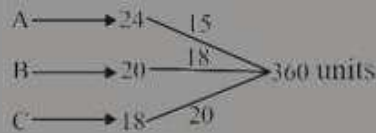
Required time = $\frac{132}{8} = 16\frac{1}{2}$ days

123. A, B and C can individually complete a task in 24 days, 20 days and 18 days, respectively. B and C start the task, and they work for 6 days and leave. The number of days required by A alone to finish the remaining task, is:

- (a) 10 days (b) $15\frac{2}{3}$ days
 (c) $8\frac{4}{5}$ days (d) $12\frac{1}{2}$ days

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (c) :



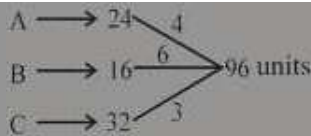
Remaining work = $360 - 38 \times 6 = 132$ units
 Time taken by A to complete the remaining work = $\frac{132}{15} = 8\frac{4}{5}$

124. A, B and C can individually complete a task in 24 days, 16 days, and 32 days respectively. If A and C start the work and worked for 6 days and left, then the number of days required by B to complete the remaining task, is:

- (a) 9 (b) $7\frac{1}{2}$
 (c) $17\frac{1}{2}$ (d) $12\frac{1}{2}$

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (a) :



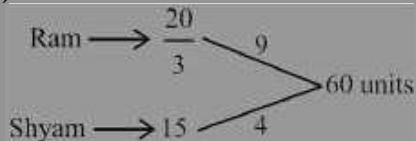
Remaining work = $96 - 7 \times 6 = 54$ units
 \therefore Required time = $\frac{54}{6} = 9$ days

125. Ram and Shyam can complete a task in $6\frac{2}{3}$ days and 15 days, respectively. They work together for 4 days, and then Ram leaves. In how many days after Ram leaves, will Shyam complete the remaining task alone?

- (a) $1\frac{1}{2}$ days (b) 2 days
 (c) 3 days (d) 4 days

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (b) :



Remaining work = $60 - 13 \times 4 = 8$ units
 Required time = $\frac{8}{4} = 2$ days

126. A can do a work in 21 days and B in 42 days. If they work on it together for 7 days, then what fraction of work is left ?

- (a) $\frac{1}{3}$ (b) $\frac{1}{4}$
 (c) $\frac{2}{3}$ (d) $\frac{1}{2}$

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : 7 days' work of (A+B) = $7 \times \left(\frac{1}{21} + \frac{1}{42}\right)$

$$= \frac{1}{2}$$

Remaining part of the work = $1 - \frac{1}{2}$

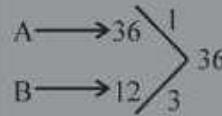
$$= \frac{1}{2}$$

127. A can do a work in 36 days and B in 12 days. If they work on it together for 3 days, then what fraction of work is left?

- (a) $\frac{2}{3}$ (b) $\frac{1}{3}$
 (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

SSC CGL (Tier-II) 18-02-2018

Ans. (a) :



(A+B) together worked for 3 days = $4 \times 3 = 12$

Remaining part of the work = $\frac{36 - 12}{36}$

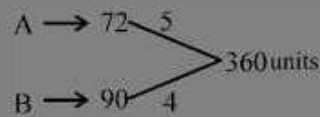
$$= \frac{2}{3} \text{ Part}$$

128. A can do a work in 72 days and B in 90 days. If they work on it together for 10 days, then what fraction of work is left ?

- (a) $\frac{3}{4}$ (b) $\frac{1}{4}$
 (c) $\frac{4}{5}$ (d) $\frac{5}{6}$

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :



Remaining work = $360 - 9 \times 10 = 270$ units

Required fraction = $\frac{270}{360} = \frac{3}{4}$

129. A can do one-third of a work in 15 days, B can do 75% of the same work in 18 days and C can do the same work in 36 days. B and C work together for 8 days. In how many days will A alone complete the remaining work ?

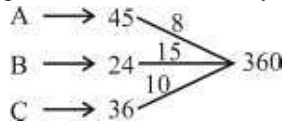
- (a) 24 days (b) 20 days
 (c) 16 days (d) 18 days

SSC CGL (Tier-II) 13-09-2019

Ans. (b) : A completes the work in 45 days

B completes the work = $18 \times \frac{4}{3} = 24$ days

C completes the work in 36 days



8 days' work of B and C = $25 \times 8 = 200$ units

Time taken by A to complete the remaining work
 $= \frac{160}{8} = 20$ days

130. A is as efficient as B and C together. Working together A and B can complete a work in 36 days and C alone can complete it in 60 days. A and C work together for 10 days. B alone will complete the remaining work in :

- (a) 88 days (b) 110 days
 (c) 84 days (d) 90 days

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$$\frac{1}{A} = \frac{1}{B} + \frac{1}{C} \dots\dots(1)$$

$$\frac{1}{A} + \frac{1}{B} = \frac{1}{36} \dots\dots(2)$$

From equation (1),

$$\frac{1}{A} - \frac{1}{B} = \frac{1}{60} \dots\dots(3)$$

From equation (2) + (3),

$$\frac{2}{A} = \frac{8}{180}$$

A = 45

From equation (2),

$$\frac{1}{B} = \frac{1}{36} - \frac{1}{45} = \frac{1}{180}$$

B = 180

10 days' work of A and C = $\frac{10}{45} + \frac{10}{60}$

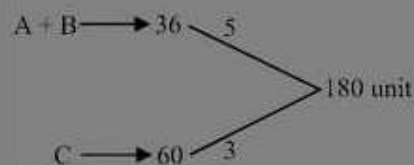
$$= \frac{2}{9} + \frac{1}{6} = \frac{7}{18}$$

Remaining work = $1 - \frac{7}{18} = \frac{11}{18}$

B will complete $\frac{11}{18}$ Part of work = $180 \times \frac{11}{18} = 110$ days

Trick:

Given A = B + C



$$A = B + 3$$

$$B = A - 3$$

$$A + B = 5$$

$$A + A - 3 = 5$$

$$A = 4 \text{ unit}$$

$$B = 1 \text{ unit}$$

Total work of (A + C) in 10 days = $7 \times 10 = 70$ unit

Time taken by B to complete the remaining work

$$= \frac{[180 - 70]}{1} = 110 \text{ Days}$$

131. A can complete a certain work in 35 days and B can complete the same work in 15 days. They worked together for 7 days, then B left the work. In how many days will A alone complete 60% of the remaining work?

- (a) 10 (b) 7
 (c) 15 (d) 8

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : 7 days' work of (A+B) = $7 \times \left(\frac{1}{35} + \frac{1}{15} \right)$

$$= \frac{70}{105} = \frac{2}{3}$$

$$\therefore \text{Remaining work} = 1 - \frac{2}{3} = \frac{1}{3}$$

60% part of the remaining work = $\frac{1}{3} \times \frac{60}{100}$

$$= \frac{1}{5} \text{ Part}$$

\therefore Time taken by A to complete $\frac{1}{5}$ part of the work.

$$= 35 \times \frac{1}{5}$$

$$= 7 \text{ days}$$

132. A can complete some work in 35 days and B can complete the same work in 15 days. They worked together for 8 days, then B left the work. In how many days will A alone complete 60% of the remaining work?

- (a) 8 (b) 10
 (c) 5 (d) 15

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) :



8 days work of both = $(3+7) \times 8 = 80$ units

Hence, Time taken by A to complete 60% part of the

$$\text{remaining work} = \frac{25 \times \frac{60}{100}}{3} = 5 \text{ days}$$

133. A can do $\frac{2}{5}$ of a work in 6 days and B can do $\frac{2}{3}$ of the same work in 12 days. A and B worked together for 6 days. C alone completed the remaining work in 8 days. A and C, working together, will complete the same work in:

- (a) 8 days (b) 9 days
(c) 12 days (d) 10 days

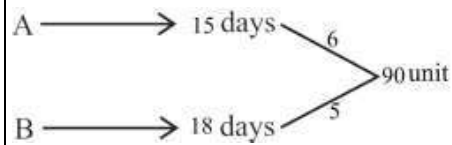
SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d) Time taken by A to complete the whole work

$$= 6 \times \frac{5}{2} = 15 \text{ days}$$

Time taken by B to complete the whole work

$$= 12 \times \frac{3}{2} = 18 \text{ days}$$



$$6 \text{ day's work of (A+B)} = (6+5) \times 6 = 66 \text{ unit}$$

$$\text{Efficiency of C} = \frac{90 - 66}{8} = 3$$

$$\text{Required time} = \frac{90}{(6+3)} = 10 \text{ days}$$

134. A can do $\frac{2}{5}$ of work in 12 days while B can do $66\frac{2}{3}\%$ of the same work in 16 days. They work together for 10 days. B alone will complete the remaining work in:

- (a) 9 days (b) 4 days
(c) 6 days (d) 8 days

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c)

A completes $\frac{2}{5}$ part of work = 12 days

$$\text{A completes whole part} = 12 \times \frac{5}{2} = 30 \text{ days}$$

B completes $66\frac{2}{3}\% = \frac{2}{3}$ Part of work = in 16 days

B will complete the whole part of work
 $= 16 \times \frac{3}{2} = \text{in } 24 \text{ days}$

Let B will complete the remaining work in x days.

$$\frac{10}{30} + \frac{10+x}{24} = 1$$

$$\frac{1}{3} + \frac{10+x}{24} = 1$$

$$\frac{10+x}{24} = \frac{2}{3}$$

$$10+x = 16$$

$$x = 6 \text{ days}$$

135. Vaibhav can do a piece of work in 60 days. He works there for 15 days and then Sandeep alone finishes the remaining work in 30 days. In how many days will Vaibhav and Sandeep working together finish the work?

- (a) 22 days (b) 18 days
(c) 20 days (d) 24 days

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d)

$$\text{Work done by Vaibhav in 15 days} = 15 \times \frac{1}{60} = \frac{1}{4} \text{ Part}$$

$$\text{Remaining work} = 1 - \frac{1}{4} = \frac{3}{4} \text{ Part}$$

Hence, Work done by Sandeep in 30 days = $\frac{3}{4}$ Part

$$\text{Work done by Sandeep in 1 day} = \frac{3}{4} \times \frac{1}{30} = \frac{1}{40} \text{ Part}$$

Work done by Vaibhav and Sandeep together in 1 day

$$= \frac{1}{60} + \frac{1}{40} = \frac{5}{120} = \frac{1}{24}$$

Hence, time taken to complete the work together = 24 days

136. A can finish one-third of a work in 5 days, B can finish $\frac{2}{5}$ th of the same work in 10 days and C can finish 75% of the same work in 15 days. They work together for 6 days. The remaining work will be finished by B alone in:

- (a) $1\frac{1}{2}$ days (b) 2 days
(c) 3 days (d) 5 days

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a)

Time taken by A to finish the work

$$= \frac{3}{1} \times 5 = 15 \text{ days}$$

Time taken by B to finish the work

$$= \frac{5}{2} \times 10 = 25 \text{ days}$$

Time taken by C to finish the work = $\frac{15}{75} \times 100$

$$= 20 \text{ days}$$

Work done by A, B and C in 6 days

$$= 6 \left[\frac{1}{15} + \frac{1}{25} + \frac{1}{20} \right]$$

$$= 6 \times \frac{47}{300}$$

$$= \frac{47}{50} \text{ Part}$$

$$\text{Remaining work} = 1 - \frac{47}{50} = \frac{3}{50} \text{ Part}$$

∴ Time taken by B to do $\frac{3}{50}$ Part of work

$$= 25 \times \frac{3}{50} = \frac{3}{2}$$

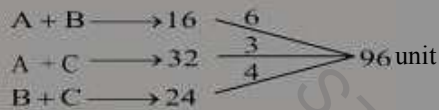
$$= 1\frac{1}{2} \text{ days}$$

137. A and B together can do a piece of work in 16 days, C and A together can complete it in 32 days, B and C together can complete it in 24 days. They worked together for 12 days. In how many days will C alone complete the remaining work ?

- (a) 45 (b) 36
(c) 32 (d) 40

SSC CHSL 02/07/2019 (Shift-III)

Ans. (b) :



$$2(A+B+C) = 13$$

$$1 \text{ day's work of } (A+B+C) = \frac{13}{2}$$

$$1 \text{ day's work of } C = (A+B+C) - (A+B)$$

$$= \frac{13}{2} - 6 = \frac{1}{2}$$

$$\text{Work done by } (A+B+C) \text{ in 12 days} = \frac{13}{2} \times 12 = 78$$

$$\text{Remaining work} = 96 - 78 = 18$$

$$\text{Time taken by C to do the remaining work} = \frac{18}{\frac{1}{2}} \text{ days}$$

$$= 36 \text{ days}$$

138. A and B can complete a work in 25 days. B alone can complete the $33\frac{1}{3}\%$ of that work in 15 days. In how many days, A can complete the $\frac{4}{15}$ of the same work ?

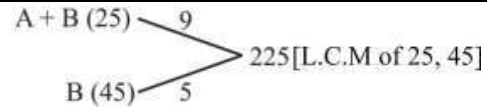
- (a) 15 (b) 10
(c) 18 (d) 12

SSC CHSL 01/07/2019 (Shift-III)

Ans. (a) : Time taken by (A+B) to do 100% work = 25 days

Time taken by B to do $33\frac{1}{3}\%$ or $\frac{100}{3}\%$ work = 15 days

∴ Time taken by B to do 100% work = $15 \times 3 = 45$ days



∴ Work done by A in 1 day = $9 - 5 = 4$

Time taken by A to complete $\frac{4}{15}$ part of the whole

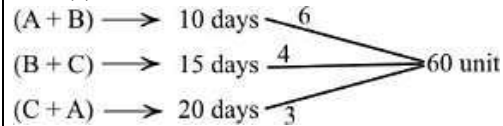
$$\text{work} = 225 \times \frac{4}{15} \times \frac{1}{4} = 15 \text{ days.}$$

139. A and B can do a work in 10 days, B and C can do the same work in 15 days while C and A can complete the same work in 20 days. They work together for 8 days. In how many days C can complete the remaining work ?

- (a) $5\frac{1}{3}$ days (b) 12 days
(c) 16 days (d) $3\frac{1}{5}$ days

SSC CHSL 03/07/2019 (Shift-II)

Ans. (c) :



$$\text{Efficiency of } (A+B+C) = \frac{6+4+3}{2} = \frac{13}{2}$$

$$8 \text{ day's work of } (A+B+C) = \frac{13}{2} \times 8 = 52 \text{ unit}$$

$$\text{Efficiency of } C = \frac{13}{2} - 6 = \frac{1}{2}$$

$$\text{Time taken by C to complete the remaining work}$$

$$= \frac{8}{\frac{1}{2}} = 16 \text{ days}$$

140. Smith and Ajit can complete a task in 12 days and 18 days, respectively. If they work together on the task for 4 days, then the fraction of the task that will be left is:

- (a) $\frac{1}{9}$ (b) $\frac{5}{9}$
(c) $\frac{4}{9}$ (d) $\frac{2}{9}$

SSC CHSL -17/03/2020 (Shift-III)

Ans. (c) : Work done by Smith in 1 day = $\frac{1}{12}$ Part

Work done by Ajit in 1 day = $\frac{1}{18}$ Part

$$\text{Work done by both in 1 day} = \frac{1}{12} + \frac{1}{18}$$

$$= \frac{15+10}{180}$$

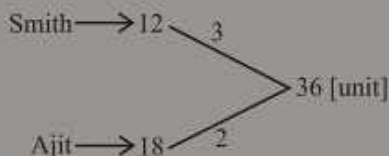
$$= \frac{25}{180}$$

$$\therefore \text{Work done by both in 4 days} = \frac{25 \times 4}{180}$$

$$= \frac{100}{180} = \frac{5}{9} \text{ Part}$$

$$\therefore \text{Remaining work} = 1 - \frac{5}{9} = \frac{4}{9}$$

Trick:



$$\text{Work done by both (Smith + Ajit) in 4 days} = 5 \times 4$$

$$= 20 \text{ days}$$

$$\text{Part of work done by (Smith + Ajit)} = \frac{20}{36} = \frac{5}{9}$$

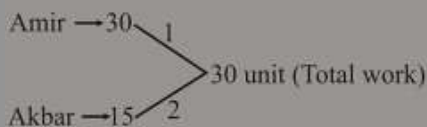
$$\text{Remaining Parts} = 1 - \frac{5}{9} = \frac{4}{9} \text{ Part.}$$

141. Amir and Akbar can finish a task in 30 days and 15 days, respectively. Akbar worked on the task for 8 days and left the job. In how many days can Amir alone finish the remaining work?

- (a) 14 days (b) 17 days
(c) 16 days (d) 15 days

SSC CHSL –19/10/2020 (Shift-III)

Ans. (a) :



$$\therefore 8 \text{ days' work of Akbar} = 8 \times 2 = 16 \text{ units}$$

$$\text{Remaining work} = 30 - 16 = 14 \text{ units}$$

Hence, time taken by Amir to complete the remaining

$$\text{work} = \frac{14}{1} = 14 \text{ days}$$

142. A can do a work in 12 days and B can do the same work in 16 days. If they work on it together for 4 days, then the fraction of the work that is left is:

- (a) $\frac{9}{16}$ (b) $\frac{3}{5}$
(c) $\frac{5}{12}$ (d) $\frac{7}{8}$

SSC CHSL –15/10/2020 (Shift-II)

$$\text{Ans. (c) Work done by A in 1 day} = \frac{1}{12} \text{ Part}$$

$$\text{Work done by B in 1 day} = \frac{1}{16} \text{ Part}$$

$$\therefore \text{Work done by both in 1 day} = \frac{1}{12} + \frac{1}{16}$$

$$= \frac{4+3}{48}$$

$$= \frac{7}{48} \text{ Part}$$

$$\therefore \text{Work done by both in 4 days} =$$

$$\frac{7}{48} \times 4 = \frac{28}{48} = \frac{7}{12} \text{ Part}$$

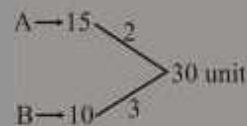
$$\therefore \text{Remaining work} = 1 - \frac{7}{12} = \frac{5}{12}$$

143. A and B can do a work in 15 days and 10 days respectively. They begin the work together but B leaves after two days. Now A completes the remaining work. The total number of days needed for the completion of the work is:

- (a) 15 days (b) 18 days
(c) 12 days (d) 10 days

SSC CHSL –26/10/2020 (Shift-I)

Ans. (c) :



$$\text{Work done in 2 days by both} = (2 + 3) \times 2 = 10 \text{ unit}$$

$$\text{Remaining work} = 30 - 10 = 20 \text{ unit}$$

$$\text{Time taken by A to complete the remaining work} =$$

$$\frac{20}{2} = 10 \text{ days}$$

$$\text{Total Time} = 10 + 2 = 12 \text{ days.}$$

144. A can finish a piece of work in a certain number of days. B takes 45% more number of days to finish the same work independently. They worked together for 58 days and then the remaining work was done by B alone in 29 days. In how many days could A have completed the work, had he worked alone?

- (a) 98 days (b) 120 days
(c) 118 days (d) 110 days

SSC CHSL –13/10/2020 (Shift-II)

Ans. (c) : Let A can do a piece of work in x days, then

$$\text{B will do that work in } x \times \frac{145}{100} \text{ days.}$$

According to the question,

$$\frac{1 \times 58}{x} + \frac{100 \times 58}{145x} + \frac{100 \times 29}{145x} = 1$$

$$\frac{58}{x} + \frac{100(58+29)}{145x} = 1$$

$$\frac{58}{x} + \frac{60}{x} = 1$$

$$x = 118 \text{ days}$$

145. P can do a work in 10 days and Q can do the same work in 15 days. If they work on it together for 3 days, then the fraction of the work that is left is:

- (a) $\frac{4}{3}$
 (b) $\frac{2}{3}$
 (c) $\frac{1}{2}$
 (d) $\frac{1}{3}$

SSC CHSL -18/03/2020 (Shift-III)

Ans. (c) : Work done by P and Q in 3 days

$$= 3\left(\frac{1}{10} + \frac{1}{15}\right) = \frac{1}{2} \text{ Part}$$

$$\text{Hence, Remaining work} = 1 - \frac{1}{2} = \frac{1}{2} \text{ Part}$$

146. A can do a piece of work in 12 days. He worked for 3 days and B finished the remaining work in 48 days. B alone can do the whole work in how many days?

- (a) 64
 (b) 56
 (c) 52
 (d) 72

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : 1 day's work of A = $\frac{1}{12}$ Part

$$\therefore 3 \text{ days' work of A} = \frac{3}{12} = \frac{1}{4} \text{ Part}$$

$$\therefore \text{Remaining work} = 1 - \frac{1}{4} = \frac{3}{4} \text{ Part}$$

$$\text{Time taken by B to do } \frac{3}{4} \text{ part of the work} = 48 \text{ days}$$

$$\therefore \text{Time taken to complete the whole work by B} = 48 \times \frac{4}{3} = 64$$

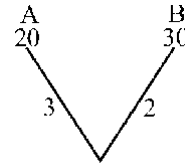
Hence, B can complete the whole work in 64 days.

147. A can do a piece of work in 20 days and B can do the same piece of work in 30 days. They start working together and work for 5 days and then both leave the work. C alone finishes the remaining work in 14 days. In how many days will C alone finish the whole work?

- (a) 24
 (b) 18
 (c) 36
 (d) 42

SSC MTS 9-10-2017 (Shift-I)

Ans : (a)



(LCM=60)

Work done by (A + B) in 5 days = $5 \times 5 = 25$
 Remaining work = $60 - 25 = 35$

$$\text{Efficiency of C} = \frac{35}{14} = \frac{5}{2}$$

$$\text{Time taken by C to complete the whole work} = \frac{60}{5} \times 2 = 24 \text{ days}$$

148. A can do a piece of work in 24 days. He worked for 6 days and B finished the remaining work in 12 days. B alone can do the whole work in how many days?

- (a) 12
 (b) 16
 (c) 18
 (d) 24

SSC MTS 11-10-2017 (Shift-II)

Ans. (b) : Work done by A in 1 day = $\frac{1}{24}$ Part

$$\text{Work done by A in 6 days} = 6 \times \frac{1}{24} = \frac{1}{4} \text{ Part}$$

$$\text{Remaining work} = 1 - \frac{1}{4} = \frac{3}{4} \text{ Part}$$

B completes $\frac{3}{4}$ part of the work in 12 days

$$\text{Then, B will complete the work} = \frac{12}{\frac{3}{4}} = \frac{12 \times 4}{3} = 16 \text{ days}$$

149. A can do a piece of work in 30 days. He worked for 6 days and B finished the remaining work in 48 days. B alone can do the whole work in how many days?

- (a) 60
 (b) 55
 (c) 75
 (d) 70

SSC MTS 11-10-2017 (Shift-I)

Ans : (a) 1 day's work of A = $\frac{1}{30}$

$$6 \text{ days' work of A} = \frac{6}{30} = \frac{1}{5}$$

$$\text{Remaining work} = 1 - \frac{1}{5} = \frac{4}{5}$$

B alone will complete the whole work in =

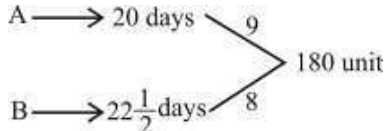
$$\frac{48}{\frac{4}{5}} = 48 \times \frac{5}{4} = 60 \text{ days.}$$

150. A can complete the work in 20 days and B can complete the same work in $22\frac{1}{2}$ days. Both of them work together for 6 days and the remaining work is completed by C in 26 days. How much is the time taken by all of them to complete the work together?

- (a) 8 days (b) 9 days
(c) 12 days (d) 10 days

SSC MTS 21/08/2019 (Shift-III)

Ans. (b) :



Work done by (A + B) in 6 days = $17 \times 6 = 102$ unit
Remaining work = $180 - 102 = 78$ unit

Efficiency of C = $\frac{78}{26} = 3$

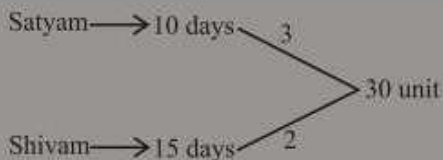
Time taken by (A + B + C) to complete the work
 $= \frac{180}{(9 + 8 + 3)} = 9$ days

151. Satyam and Shivam completes a work in 10 days and 15 days respectively. Both work together. After 4 days Satyam stops doing the work. The remaining work is to be completed by Shivam. What is the time taken to complete the whole work?

- (a) 9 (b) 12
(c) 10 (d) 6

SSC MTS 21/08/2019 (Shift-I)

Ans. (a) :



Work done by both in 4 days = $(3 + 2) \times 4 = 20$ unit

The remaining work = $\frac{10}{2} = 5$ days

Total time = $5 + 4 = 9$ days

152. A completes the work alone in 96 days. B is three times more skilled than A. A worked for 24 days alone then B joins him. How much time they will take to complete the remaining work together?

- (a) 18 (b) 16
(c) 21 (d) 14

SSC MTS 16/08/2019 (Shift-III)

Ans. (a) : Ratio of work Capacity of A and B = 1 : 3

Total work = $96 \times 1 = 96$ unit

Work done by A in 24 days = $1 \times 24 = 24$ units

Time taken by (A + B) to complete the remaining

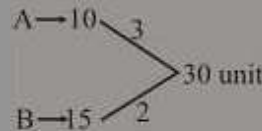
$$\text{work} = \frac{96 - 24}{4} = \frac{72}{4} = 18 \text{ days}$$

153. A can do a work alone in 10 days. B can do the same work alone in 15 days. They start together but B leaves the job 2 days after start and A completes the remaining work alone. What is the total number of days in which the work is completed?

- (a) $\frac{17}{3}$ (b) $\frac{31}{3}$
(c) $\frac{26}{3}$ (d) $\frac{13}{3}$

SSC MTS 19/08/2019 (Shift-II)

Ans. (c) :



Work done by both in 2 days = $5 \times 2 = 10$ unit

Remaining work = $30 - 10 = 20$ unit

Time taken by A to complete the remaining work

$$= \frac{20}{3}$$

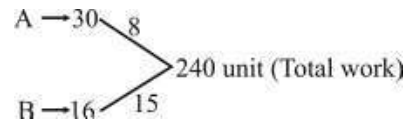
Total time = $2 + \frac{20}{3} = \frac{26}{3}$ days

154. A can complete the work alone in 30 days. He has completed half work and left it. If B alone complete the work in 16 days then how much time B takes to complete the remaining work?

- (a) 9 (b) 12
(c) 6 (d) 8

SSC MTS 14/08/2019 (Shift-I)

Ans. (d) :



Time taken by B to complete the remaining work =

$$\frac{120}{15} = 8 \text{ days}$$

155. A can do the work alone in 30 days. B can do the same work alone in 60 days. If they work for 5 days together then what portion of work remains?

- (a) $\frac{2}{3}$ (b) $\frac{1}{2}$
(c) $\frac{3}{4}$ (d) $\frac{5}{6}$

SSC MTS 06/08/2019 (Shift-I)

Ans. (c)

$$\begin{array}{l} A = 30 \xrightarrow{2} \\ B = 60 \xrightarrow{1} \end{array} \left. \vphantom{\begin{array}{l} A \\ B \end{array}} \right\} 60 \text{ (Total work)}$$

$$5 \text{ days' work} = (2+1) \times 5 = 15 \text{ units}$$

$$\text{Remaining work} = (60-15) = 45 \text{ units}$$

$$\text{Remaining portion} = \frac{45}{60} = \frac{3}{4}$$

156. A contractor takes a contract to complete a road in 60 days and employed 70 labours. After 25 days, he found that one fourth work is completed. How many more labours he requires to complete the remaining work in time.

- (a) 90 (b) 82
(c) 80 (d) 85

SSC MTS 09/08/2019 (Shift-II)

Ans. (c) : Let x labour will be required to complete the remaining work.

$$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{70 \times 25}{\frac{1}{4}} = \frac{(70+x)35}{\frac{3}{4}}$$

$$150 = 70 + x$$

$$\boxed{x = 80}$$

157. An experienced carpenter can complete a woodwork in 8 days. A young carpenter can complete the same work in 12 days. Both work together for 3 days, and then the latter leaves. How many days will be taken by the former to complete the remaining work?

- (a) 3 (b) 4
(c) 2 (d) 6

SSC MTS 16/08/2019 (Shift-I)

Ans. (a) : Work done by both in 3 days = $\frac{3}{8} + \frac{3}{12}$

$$= \frac{9+6}{24} = \frac{15}{24} = \frac{5}{8} \text{ Part}$$

$$\text{Remaining work} = 1 - \frac{5}{8} = \frac{3}{8} \text{ Part}$$

$$\therefore \text{Time taken to do } \frac{3}{8} \text{ Part of work by an experienced}$$

$$\text{carpenter} = 8 \times \frac{3}{8}$$

$$= 3 \text{ days}$$

158. A, B and C can complete a work in 9 days, 12 days, and 18 days respectively. They started the work together, but after 3 days A left the work. In how many days did the remaining work complete ?

- (a) $\frac{11}{4}$ (b) $\frac{5}{2}$
(c) $\frac{9}{5}$ (d) 2

SSC CHSL 11/07/2019 (Shift-III)

Ans. (c) : Let the total work = L.C.M of (9, 12, 18)

$$= 36 \text{ units}$$

$$\text{work done by A in 1 day} = \frac{36}{9} = 4 \text{ units}$$

$$\text{work done by B in 1 day} = \frac{36}{12} = 3 \text{ units}$$

$$\text{work done by C in 1 day} = \frac{36}{18} = 2 \text{ units}$$

$$\text{work done by A, B and C in 1 day} = 4 + 3 + 2 = 9 \text{ units}$$

$$\text{work done by A, B and C in 3 days} = 3 \times 9$$

$$= 27 \text{ units}$$

$$\text{Remaining work} = 36 - 27 = 9 \text{ units}$$

The time taken by B and C to do the remaining work

$$\text{after A leaves the work} = \frac{9}{5} \text{ days}$$

159. A contractor takes a contract to complete a road in 60 days and employed 105 labours. After 25 days, he found that one third work is completed. How many more labours he requires to complete the remaining work in time?

- (a) 45 (b) 150
(c) 75 (d) 105

SSC MTS 13/08/2019 (Shift-III)

Ans. (a) : Let x more labourers are required

$$\therefore \frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{105 \times 25}{\frac{1}{3}} = \frac{(105+x)(60-25)}{\frac{2}{3}}$$

$$150 = 105 + x$$

$$\Rightarrow x = 45$$

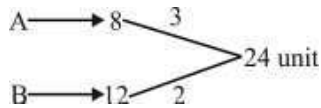
(III) When a person leaves the work incomplete during the process

160. A and B working alone can complete a work in 8 days and 12 days, respectively. They started working together, but A left 2 days before completion of the work. In how many days was the work completed?

- (a) 6 (b) 5
(c) 8 (d) 10

SSC CGL (Tier-I) 21/04/2022 (Shift-I)

Ans : (a)



Work done by B in last 2 days = 4 unit
 Remaining work = 24 - 4
 = 20 units

∴ A and B work together

$$\begin{aligned} \text{Then, total time taken by (A + B)} &= \frac{20}{3+2} \\ &= \frac{20}{5} \\ &= 4 \text{ days} \end{aligned}$$

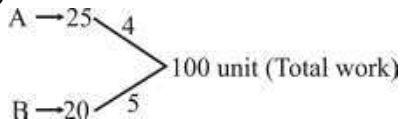
Hence, total days = 4 + 2 = 6 days.

161. A can complete work in 25 days and B can complete the same work in 20 days. They started the work together but B left after 4 days and A continued to work. In how many days will the entire work be completed?

- (a) 25 (b) 20
 (c) 28 (d) 22

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b)



Work done in 4 days by (A + B) = (5 + 4) × 4 = 36 units
 Remaining work = 100 - 36 = 64 units
 Then, time taken by A to complete the remaining work
 $= \frac{64}{4} = 16$ days

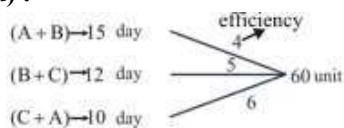
Hence, entire work be completed = 16 + 4
 = 20 days

162. A and B can do a piece of work in 15 days, while B and C can do the same work in 12 days, and C and A in 10 days. They all work together for 5 days, and then B and C leave. How many days more will A take to finish the work?

- (a) 12 (b) 4
 (c) 15 (d) 9

SSC MTS 22/10/2021 (Shift-I)

Ans. (d) :



$$2(A + B + C) = (4 + 5 + 6)$$

$$(A + B + C) = \frac{15}{2} = 7.5$$

$$\therefore \text{Efficiency of A} = 7.5 - 5 = 2.5$$

According to the question,

5 days work of (A + B + C) + x days work of A = Total work

$$7.5 \times 5 + 2.5 \times x = 60$$

$$2.5x = 60 - 37.5$$

$$2.5x = 22.5$$

$$\therefore x = 9$$

163. A can do a piece of work in 12 days. He worked for 6 days and left, and then B finished it in 10 days. If both work together, then in how many days will they finish the same work?

- (a) 9.5 (b) 9
 (c) 7.5 (d) 7

SSC CHSL 06/08/2021 (Shift-II)

Ans. (c) : 1 day work of A = $\frac{1}{12}$

$$6 \text{ days work of A} = \frac{1}{2}$$

$$\text{Remaining work} = \frac{1}{2}$$

The remaining $\frac{1}{2}$ is done by B in 10 days

Time taken by B to complete the whole work = 20 days.

$$\therefore \text{Time taken by (A+B) to finish the same work} = \frac{60}{8} = 7.5 \text{ days}$$

164. A can finish a task in 45 days and B can finish the same task in 30 days. They work together for 3 days and then A leaves. In how many days will B finish the remaining task?

- (a) 20 (b) 5
 (c) 18 (d) 25

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : Let B can complete remains work in x days

According to the question,

$$\frac{3}{45} + \frac{3+x}{30} = 1$$

$$\frac{3+x}{30} = \frac{42}{45}$$

$$\frac{3+x}{6} = \frac{42}{9} \Rightarrow \frac{3+x}{2} = \frac{42}{3}$$

$$9 + 3x = 84$$

$$3x = 75$$

$$x = 25$$

∴ Time taken by B to complete the remaining work = 25 days

165. A, B and C can do a work separately in 18, 36 and 54 days, respectively. They started the work together, but B and C left 5 days and 10 days, respectively, before the completion of the work. In how many days was the work finished?

- (a) 14 days
 (b) 13 days
 (c) 15 days
 (d) 12 days

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the work be completed in x days.

$$\frac{x}{18} + \frac{x-5}{36} + \frac{x-10}{54} = 1$$

$$\frac{6x + 3x - 15 + 2x - 20}{108} = 1$$

$$11x = 108 + 35$$

$$11x = 143$$

$$x = 13 \text{ days}$$

166. A, B and C together can finish a task in 7.5 days. C is thrice as productive as A and B alone can do the task in 15 days. In how many days can A and C do the job if B goes on leave ?

- (a) 30
 (b) 10
 (c) 10
 (d) 15

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : 7.5 day's work of (A + B + C) = 15 day's work of B

7.5 day's work of (A + C) = 7.5 day's work of B

Let Efficiency of A = x

$$3x + x = B$$

$$B = 4x$$

Thus, the ratio of Efficiency of A, B and C = 1 : 4 : 3

$$\text{Total work} = 8 \times 7.5 = 60$$

A and C will do this work in = $\frac{60}{4} = 15$ days

167. 25 persons can complete a work in 60 days. They started the work. 10 persons left the work after x days. If the whole work was completed in 80 days, then what is the value of x ?

- (a) 18
 (b) 15
 (c) 23
 (d) 30

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : We know that,

$$\text{Formula } M_1D_1 = M_2D_2 + M_3D_3$$

$$25 \times 60 = 25 \times x + 15 \times (80-x)$$

$$5 \times 60 = 5x + 3(80-x)$$

$$300 = 5x + 240 - 3x$$

$$2x = 60$$

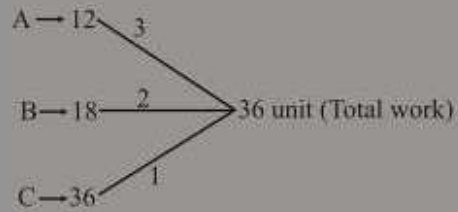
$$x = 30 \text{ days.}$$

168. If A, B and C can do a job working alone in 12, 18 and 36 days respectively. They all work together for 2 days, then B quits. How many days will A and C take to finish rest of the job?

- (a) 9
 (b) 6
 (c) 3
 (d) 4

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :



2 days' work of (A + B + C) = $6 \times 2 = 12$ unit

Remaining work = $36 - 12 = 24$ unit

Time taken by (A + C) to do the remaining work =

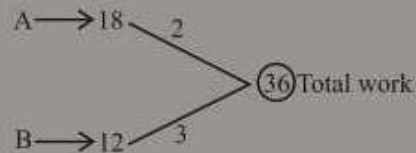
$$\frac{24}{(3+1)} = 6 \text{ days}$$

169. A can complete a task in 18 days while B can complete the same task in 12 days. If both work together for 6 days, and then A leaves. In how many days will B complete the task?

- (a) 3 days
 (b) 4 days
 (c) 6 days
 (d) 2 days

SSC CHSL –19/10/2020 (Shift-I)

Ans. (d) :



1 day's work of (A + B) = $2 + 3 = 5$ units

6 day's work of (A + B) = $6 \times 5 = 30$ units

Remaining work = $36 - 30 = 6$ units

Time taken by B to complete the remaining work

$$= \frac{6}{3} = 2 \text{ days}$$

170. P and Q can finish a work in 10 days and 5 days, respectively. Q worked for 2 days and left the job. In how many days can P alone finish the remaining work?

- (a) 6 days
 (b) 4 days
 (c) 8 days
 (d) 10 days

SSC CHSL –17/03/2020 (Shift-II)

Ans. (a) : Work done by Q in 2 days = $\frac{2}{5}$ Part

∴ Remaining work = $1 - \frac{2}{5} = \frac{3}{5}$ Part

∴ Time taken by P to complete $\frac{3}{5}$ Part of the work

$$= 10 \times \frac{3}{5} = 6 \text{ days}$$

171. Two teachers A and B can complete an academic work in 10 days and 15 days respectively. They started the work together, but A left after 5 days and another teacher C joined, who alone can complete the work in 60 days. In how many days the work got completed?

- (a) 7 (b) 5
(c) 6 (d) 2

SSC MTS 02/08/2019 (Shift-I)

Ans. (a) : According to the question,
Let the whole work be completed in x days

$$\frac{5}{10} + \frac{x}{15} + \frac{(x-5)}{60} = 1$$

$$\frac{30 + 4x + x - 5}{60} = 1$$

$$5x + 25 = 60$$

$$5x = 60 - 25$$

$$5x = 35$$

$$x = 7 \text{ days}$$

172. A work can be completed by 35 workers in 30 days. If 5 workers leave after every 10 days then in how many days will the work be completed?

- (a) 35.5 days (b) 37.5 days
(c) 40 days (d) 50 days

SSC MTS 13/08/2019 (Shift-II)

Ans. (b) : Total work = $35 \times 30 = 1050$ units
First 10 days,
 $35 \times 10 = 350$ units
Next 10 days,
 $30 \times 10 = 300$ units
Next 10 days,
 $25 \times 10 = 250$ units
Remaining units = $1050 - 900 = 150$
Time taken to complete the remaining work = $\frac{150}{20} = 7.5$
Total time = $10 + 10 + 10 + 7.5 = \boxed{37.5}$ days

173. A can do 40% of a work in 6 days and B can do 30% of the same work in 3 days. Both started work together, but after 2 days, B left the work and A continued the work. In how many days did the whole work complete ?

- (a) 9 (b) 10
(c) 15 (d) 12

SSC CHSL 04/07/2019 (Shift-I)

Ans. (d) :
Time taken by A to do 40% of the work = 6 days
 \therefore Time taken by A to do 100% of the work
 $= \frac{6}{40} \times 100 = 15$ days
Time taken by B to do the 30% of the work = 3 days
 \therefore Time taken by B to do the 100% of the work
 $= \frac{3}{30} \times 100 = 10$ days
Two days' work of A + B = $\frac{2}{15} + \frac{2}{10}$

$$= \frac{10}{30} = \frac{1}{3} \text{ Part}$$

$$\text{Remaining work} = 1 - \frac{1}{3} = \frac{2}{3} \text{ Part}$$

Time taken by A to complete the remaining work = $\frac{2}{3} \times 15 = 10$ days

Hence the total time = $2 + 10 = 12$ days

174. A alone can complete a work in 14 days and B alone can complete the same work in 21 days. A and B start the work together but A leaves the work after 4 days of the starting of work. In how many days B will complete the remaining work?

- (a) 9 days (b) 16 days
(c) 12 days (d) 11 days

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : Let B works for x days.

$$\frac{4}{14} + \frac{x}{21} = 1$$

$$2x = 30$$

$$x = 15$$

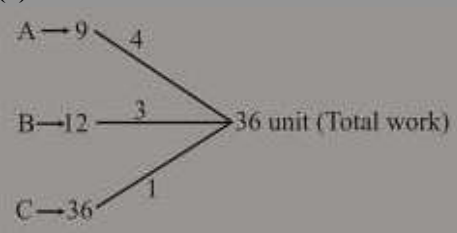
\therefore B will complete the remaining work in $(15-4) = 11$ days

175. A, B and C can do job in 9, 12 and 36 days respectively if they worked alone. A leaves after they have worked together for 3 days. In how many days can B and C do the rest of the job ?

- (a) 3 (b) 4
(c) 5 (d) 6

SSC CGL (Tier-II) 18-02-2018

Ans. (a) :



3 days' work of (A + B + C) = $8 \times 3 = 24$
Time taken by (B + C) to complete the remaining work
 $= \left(\frac{36 - 24}{4} \right) = \frac{12}{4} = 3$

176. A, B and C together can finish a task in 12 days. A is twice as productive as B and C alone can do the task in 36 days. In how many days can A and B do the task if C goes on leave ?

- (a) 10 (b) 20
(c) 15 (d) 18

SSC CGL (Tier-II) 21-02-2018

Ans. (d) : A : B

Capacity $\rightarrow 2 : 1$

Time $\rightarrow 1 : 2$

According to the question,

$$\frac{1}{x} + \frac{1}{2x} + \frac{1}{36} = \frac{1}{12}$$

$$\Rightarrow \frac{3}{2x} = \frac{1}{12} - \frac{1}{36}$$

$$\Rightarrow \frac{3}{2x} = \frac{1}{18}$$

$$\Rightarrow x = 27$$

$$\therefore \text{1 day's work of (A+B)} = \frac{3}{2x}$$

$$= \frac{3}{2 \times 27} = \frac{1}{18}$$

So the time taken by A and B to complete the work together = 18 days.

(IV) When Additional Persons are hired to complete the work after commencement of work

177. 12 men can complete a painting work in 8 days. However, 16 women can complete the same painting work in 12 days. 8 men started painting the house. After 6 days of painting, 2 men were replaced by 4 women. Now how many days will they take to complete the remaining painting?

- (a) 4 (b) 6
(c) 8 (d) 5

SSC MTS 11/10/2021 (Shift-I)

Ans. (b) : 12 men can complete a work in 8 days = 12 \times 8 = 96

16 women can complete the same work in 12 days = 16 \times 12 = 192

The ratio of men and women = 96 : 192
= 1 : 2

Total work = 12 \times 1 \times 8 = 96 units

Now,

8 men started painting for 6 days = 8 \times 1 \times 6 = 48 units

Remaining work = 96 - 48 = 48 units

2 men were replaced by 4 women = 4 \times 2 = 8 women

Time taken to complete the remaining work

$$= \frac{48}{8} = 6 \text{ days}$$

178. Four men and 6 women can complete a certain piece of work in 5 days whereas three men and 4 women can complete it in 7 days. How many men should assist 25 women to complete

$2\frac{1}{2}$ times the same work in 5 days?

- (a) 10 (b) 8
(c) 4 (d) 5

SSC CGL (Tier-I)-2019 - 04/03/2020 (Shift-III)

Ans. (d) :

$$\text{Total work} = (4M + 6W) \times 5 = (3M + 4W) \times 7$$

$$20M + 30W = 21M + 28W$$

$$M = 2W$$

$$\frac{M}{W} = \frac{2}{1}$$

Ratio of work Efficiency of man and woman = 2 : 1

Let x men should assist.

$$\frac{(4 \times 2 + 6 \times 1) \times 5}{1} = \frac{(2x + 25 \times 1) \times 5}{2}$$

$$70 = 4x + 50$$

$$x = 5$$

179. A contract is to be completed in 75 days and 187 men are to work 15 hours per day. After 65

days, $\frac{3}{5}$ of the work is completed. How many additional men may be employed, so that the work may be completed in time, each man now working 17 hours per day?

- (a) 528 (b) 495
(c) 514 (d) 532

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-II)

Ans. (a) : Let x more men should be employed.

$$\therefore \frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

$$\frac{187 \times 65 \times 15}{5} = \frac{(187 + x) \times 10 \times 17}{5}$$

$$11 \times 65 = 187 + x$$

$$x = 715 - 187 = 528$$

180. A certain number of persons can complete a task in 28 days. If there were 150 persons more, it would have taken 7 days less for the task to be completed. How many persons are there in the beginning?

- (a) 420 (b) 480
(c) 350 (d) 450

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (d) : Let the number of person in begning = n

$$\therefore n \times 28 = (n + 150) \times (28 - 7)$$

$$n \times 28 = (n + 150) \times 21$$

$$n \times 4 = (n + 150) \times 3$$

$$4n - 3n = 450$$

$$n = 450$$

181. Eight persons can finish a work in 20 days. After 5 days they were requested to complete the work in the next 8 days. How many more persons should join the group to fulfil the requirement?

- (a) 23 (b) 12
(c) 15 (d) 7

SSC CGL (Tier-I)-2019 - 09/03/2020 (Shift-III)

Ans. (d) : Let x more persons should join the group
 $\therefore M_1 D_1 = M_2 D_2$
 Remaining work = $8 \times 15 = (8+x) \times 8$
 $15 = 8 + x$
 $x = 7$

- 182. If 45 persons complete a work in 18 days, working 8 hours a day, then how many persons are required to complete two-thirds of the same work in 20 days, working 9 hours a day?**
 (a) 40 (b) 24
 (c) 36 (d) 30

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) Let the number of persons required = x

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

$$\frac{45 \times 18 \times 8}{1} = \frac{x \times 20 \times 9}{\frac{2}{3}}$$
 $x = 24$

- 183. A certain number of men can do a piece of work in 54 days. If there were 30 more men, it would take 18 days less to complete the work. The number of men, initially is:**
 (a) 50 (b) 54
 (c) 72 (d) 60

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

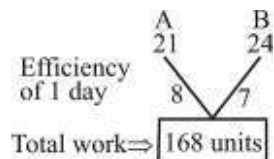
Ans. (d) : Let x person can do the works
 As per question,
 $x \times 54 = (x + 30) \times (54 - 18)$
 $x \times 54 = (x + 30) \times 36$
 $3x = 2x + 60$
 $x = 60$

(V) Problems based on Efficiency

- 184. A and B working separately can do a piece of work in 21 and 24 days, respectively. If they work for a day alternately with A beginning the work, it would be completed in _____.**
 (a) $24\frac{1}{8}$ days (b) $21\frac{3}{8}$ days
 (c) $22\frac{3}{8}$ days (d) $22\frac{1}{8}$ days

SSC CHSL 26/05/2022 (Shift- III)

Ans. (c) :



According to the question:-

2 days work of $(A + B) = 8 + 7 \Rightarrow 15$ units
 $\downarrow \times 11$ $\downarrow \times 11$
 22 days work of $A + B = 15 \times 11 \Rightarrow 165$ units
 Remaining work is done by A = $\frac{168 - 165}{8} = \frac{3}{8}$ days
 Hence, total work would be completed in $22\frac{3}{8}$ days

- 185. Person A can do one-fifth of the work in 3 days, while B's efficiency is half of that of A. In how many days A and B working together can do half of the work?**
 (a) 4 (b) 7
 (c) 6 (d) 5

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (d) Let A and B working together can do half of the work in x days.

B : A = 1 : 2 (efficiency)

$$\frac{A \times 3}{1/5} = \frac{(A + B) \times x}{1/2}$$

$$15 \times A = 2 \times (A + B) \times x$$

$$15 \times 2 = 2 \times 3 \times x$$

$$x = 5 \text{ days}$$

- 186. 'A' is 3 times as good a workman as 'B' and therefore A is able to complete a job in 36 days less than 'B'. In how many days will they finish 40% of the work, working together?**

- (a) $3\frac{1}{2}$ (b) $4\frac{2}{5}$
 (c) $5\frac{2}{5}$ (d) $5\frac{1}{2}$

SSC MTS 14/10/2021 (Shift-I)

Ans. (c) : According to the question,

(Efficiency A = 3 : 1

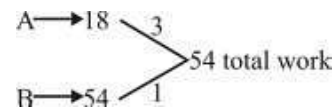
(Time) A : B = 1 : 3

Difference of their times = 36

2 unit = 36

1 unit = 18

\therefore



40% work done by both A and B together

$$= \frac{54}{4} \times \frac{40}{100} = 5\frac{2}{5}$$

- 187. Two friends, one of whom is thrice as efficient as the other, working together, can complete a work in 6 days. In how many days will the less efficient among the two be able to complete twice the quantum of work?**

- (a) 24 (b) 36
(c) 48 (d) 12

SSC MTS 05/10/2021 (Shift-I)

Ans. (c) : Let two friends are A and B.

According to the question,
A \longrightarrow 3 (Efficiency)

B \longrightarrow 1 (Efficiency)

Total work = $6 \times (1 + 3) = 24$ unit

Twice of total work = $2 \times 24 = 48$ unit

The less efficient friend B will complete the total work

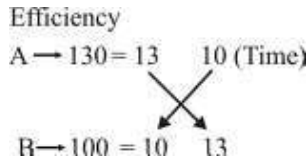
$$= \frac{48}{1} = 48 \text{ days}$$

188. A is 30% more efficient than B. If B finishes a work in 13 days, then in how many days will A finish the same work?

- (a) 11 (b) 9
(c) 10 (d) 12

SSC MTS 11/10/2021 (Shift-I)

Ans. (c) : Efficiency is inversely proportional to the time when the work done is constant.



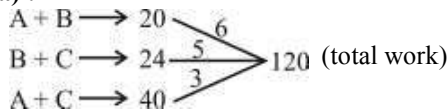
Hence, A can finish the same work in 10 days

189. A and B together can complete a certain work in 20 days whereas B and C together can complete it in 24 days. If A is twice as good a workman as C, then in what time will B alone do 40% of the same work ?

- (a) 12 days (b) 15 days
(c) 18 days (d) 10 days

SSC CGL-(Tier-I) 18/08/2021 (Shift I)

Ans. (a) :



$$\text{Efficiency of (A+B+C)} = \frac{6+5+3}{2} = 7$$

Efficiency of C = $7 - 6 = 1$

Efficiency of A = 2

Efficiency of B = $7 - (2+1) = 4$

Time taken by B to complete 40% of work

$$= \frac{120 \times 40}{4 \times 100} = 12 \text{ days}$$

190. A is twice as good as workman B. They together finish a piece of work in 22 days. In how many days will A alone finish the same work?

- (a) 30 days (b) 44 days
(c) 11 days (d) 33 days

SSC CHSL -21/10/2020 (Shift-II)

Ans. (d) A : B

Efficiency 2 : 1

Total work = $(2 + 1) \times 22 = 66$ units

Time taken by A to finish the whole work

$$= \frac{66}{2} = 33 \text{ days}$$

191. Ten men or twelve women can finish the same work in 10 days. If 5 men and 2 women undertake the work together, how many days will they take to complete the work?

- (a) 15 (b) 40
(c) 20 (d) 60

SSC CGL (Tier-I)-2019 - 07/03/2020 (Shift-I)

Ans. (a) : $10M = 12W$

$$\frac{M}{W} = \frac{6}{5}$$

Ratio of efficiencies of a man and a woman = 6 : 5

Total work = $10 \times 6 \times 10 = 600$ units

$$\text{Required time} = \frac{600}{(5 \times 6 + 2 \times 5)} = 15 \text{ days}$$

192. A and B together can complete a piece of work in 15 days, B and C together can do it in 24 days. If A is twice as good a workman as C, in how many days can B alone complete the work?

- (a) 60 days (b) 52 days
(c) 45 days (d) 40 days

SSC CHSL -20/10/2020 (Shift-I)

Ans : (a) Let the total work = 120

Efficiency of A + B = 8

Efficiency of B + C = 5

A - C = $8 - 5 = 3$

A : C = 2 : 1 (given)

(A - C) = 1 unit \rightarrow 3

\therefore Efficiency of A = 6

Efficiency of B = $8 - 6 = 2$

Time taken by B to do the total work

$$= \frac{120}{2} = 60 \text{ days}$$

193. A and B can do a work together in 18 days. A is three times as efficient as B. In how many days can B alone complete the work?

- (a) 54 days (b) 64 days
(c) 72 days (d) 60 days

SSC CGL (Tier-II)-2019 - 18/11/2020

Ans. (c) :

The ratio of the efficiencies of A and B = 3:1

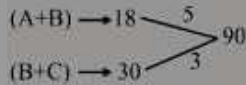
Time taken by B to complete the work = $\frac{4 \times 18}{1} = 72$ days

194. A and B can do a piece of work in 18 days. B and C together can do it in 30 days. If A is twice as good a workman as C, find in how many days B alone can do the work?

- (a) 90 days (b) 100 days
(c) 75 days (d) 80 days

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) :



The ratio of the efficiencies of A and C = 2 : 1

$$(A + B) - (B+C) = 5-3$$

$$A - C = 2 \text{ units}$$

$$\therefore 1 \rightarrow 2 \text{ units}$$

$$\therefore \text{Efficiency of A} = 4 \text{ unit/day}$$

$$\text{Efficiency of B} = 5-4 = 1 \text{ unit/day}$$

$$\text{Required time} = \frac{90}{1} = 90 \text{ days}$$

195. The ratio of the efficiencies of A, B and C is 2 : 5 : 3. Working together, they can complete a work in 27 days. B and C together can complete $\frac{4}{9}$ th part of that work in:

- (a) 27 days (b) 15 days
(c) 24 days (d) $17\frac{1}{7}$ days

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (b) : Total work done = $(2+5+3) \times 27 = 270$ unit
Time taken by (B+C) to complete the $\frac{4}{9}$ part of the

$$\text{Work} = \frac{270 \times \frac{4}{9}}{(5+3)} = \frac{30 \times 4}{8} = 15 \text{ days}$$

196. The ratio of the efficiencies of A, B and C is 4 : 5 : 3. Working together, they can complete that work in 25 days A and C together will complete 35% of total work in.

- (a) 18 days (b) 15 days
(c) 12 days (d) 10 days

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b) : Ratio of capacity of A, B and C = 4 : 5 : 3

$$\text{Total work} = 12 \times 25 = 300$$

Time taken by (A + C) to complete the 35% of the

$$\text{work} = \frac{300}{7} \times \frac{35}{100} = 15 \text{ days}$$

197. The ratio of the efficiencies of A, B and C is 7 : 5 : 8. Working together, they can complete a piece of work in 42 days. B and C worked together for 21 days and the remaining work was completed by A alone. The whole work was completed in:

- (a) 102 days (b) 93 days
(c) 99 days (d) 96 days

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (a) : We know that,

$$\text{Work} = \text{Time} \times \text{Efficiency}$$

$$\text{Efficiency (E)} \propto \frac{1}{\text{Time (T)}}$$

$$\text{i.e. } E_1 T_1 = E_2 T_2$$

According to the question

$$\text{Total work} = 20 \times 42$$

$$\text{Work done by B and C in 21 days} = 13 \times 21$$

Hence, the time taken by A to complete the remaining work.

$$= \frac{20 \times 42 - 13 \times 21}{7} \text{ days}$$

$$= \frac{21(20 \times 2 - 13)}{7} \text{ days}$$

$$= \frac{21(40 - 13)}{7}$$

$$= 81 \text{ days}$$

$$\text{Time taken to complete the work} = 81 + 21 = 102 \text{ days}$$

198. A is 40% more efficient than B and C is 20% less efficient than B. Working together, they can finish a work in 5 days. In how many days will A alone complete 70% of that work?

- (a) 8 (b) 9
(c) 7 (d) 10

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (a) : Ratio of efficiencies of A, B and C

$$A : B : C = 140 : 100 : 80$$

$$\Rightarrow A : B : C = 7 : 5 : 4$$

$$\text{Total work} = (7 + 5 + 4) \times 5 = 80 \text{ units}$$

$$70\% \text{ of total work} = 80 \times \frac{70}{100} = 56 \text{ units}$$

$$\text{Time taken by A to complete 70\% of the work} = \frac{56}{7} = 8 \text{ days}$$

199. The ratio of the efficiencies of A, B and C to do a certain work is 7 : 3 : 5. Working together they can complete the work in 21 days. A and C worked together for 15 days. The remaining work will be completed by B alone in:

- (a) 63 days (b) 60 days
(c) 54 days (d) 45 days

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (d) : A : B : C = 7 : 3 : 5 (efficiency)

Time taken by B to complete the remaining work

$$= \frac{15 \times 21 - 12 \times 15}{3} = \frac{315 - 180}{3}$$

$$= \frac{135}{3} = 45 \text{ days}$$

200. A is 50% more efficient than B and C is 40% less efficient than B. Working together, they can complete a task in 10 days. In how many days will A alone complete 150% of that task?
- (a) 33 (b) 35
(c) 31 (d) 28

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (c) : A B C
Efficiency 150 100 60
A : B : C = 150 : 100 : 60 = 15 : 10 : 6
Total work = (15 + 10 + 6) × 10 = 310 units
150% of total work = $310 \times \frac{150}{100} = 465$ units
Time taken by A = $\frac{465}{15} = 31$ days

201. A is 40% more efficient than B and C is 20% less efficient than B. Working together, they can complete a task in 20 hours. In how many hours will A alone complete 35% of that task?
- (a) 14 (b) 13
(c) 16 (d) 15

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (c) : According to the question,
Ratio of efficiencies of A, B and C
= 140 : 100 : 80 = 7 : 5 : 4
Total work = [7 + 5 + 4] × 20 = 16 × 20
∴ Time taken by A to do 35% of the work.
$$= \frac{16 \times 20 \times 35}{7 \times 100}$$

= 16 hours

202. A is 40% more efficient than B and C is 20% less efficient than B. Working together, they can finish a task in 15 days. In how many days, will B alone complete 75% of the task?
- (a) 44 (b) 36
(c) 32 (d) 48

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (b) :
Let Efficiency of B = 100
Efficiency of C = 80
Efficiency of A = 140
∴ A : B : C = 7 : 5 : 4
Total work = (7 + 5 + 4) × 15 = (16 × 15) unit
∴ Time taken by B to complete 75% of the task
$$= \frac{16 \times 15 \times 75}{5 \times 100} = 36$$
 days

203. The efficiencies of A, B and C are in the ratio of 2 : 3 : 5. Working together, they can complete a task in 6 days. In how many days will A alone complete 20% of that task?
- (a) 5 (b) 8
(c) 4 (d) 6

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (d) : Ratio of efficiencies of A, B and C = 2 : 3 : 5

Total work = (2 + 3 + 5) × 6 = 60 units

20% of work = $60 \times \frac{20}{100} = 12$ units

Time taken by A to complete 20% part of work = $\frac{12}{2} = 6$ days

204. A is 50% more efficient than B and C is 40% less efficient than B. Working together, they can complete a task in 20 days. In how many days will C alone complete 30% of that task?

(a) 35 (b) 29
(c) 33 (d) 31

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (d) :

According to the question,

Ratio of working efficiency of A, B and C = 15 : 10 : 6

Ratio of working efficiency of A, B and C to complete

the work = $\frac{1}{15} : \frac{1}{10} : \frac{1}{6} = 2 : 3 : 5$

Let A, B and C alone complete the work in 2x days, 3x days and 5x days respectively.

$$\therefore \frac{1}{2x} + \frac{1}{3x} + \frac{1}{5x} = \frac{1}{20}$$

$$\Rightarrow \frac{15+10+6}{30x} = \frac{1}{20}$$

$$\Rightarrow \frac{31}{30x} = \frac{1}{20}$$

$$x = \frac{62}{3}$$

C will finish the whole work in $5x = \frac{5 \times 62}{3} = \frac{310}{3}$ days

Hence, the time taken by C to complete the 30% the

work = $\frac{310}{3} \times \frac{30}{100} = 31$ days.

205. The efficiencies of A, B and C are in the ratio of 5 : 3 : 2. Working together, they can complete a task in 21 hours. In how many hours will B alone complete 40% of that task?

(a) 24 (b) 35
(c) 28 (d) 21

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c) : Ratio of efficiencies of A, B and C = 5 : 3 : 2

Total work = (5 + 3 + 2) × 21 = 210 unit

Time taken by B to complete 40% of that task

$$= \frac{210 \times 40}{3 \times 100} = 28$$
 hours

206. The efficiencies of A, B, and C are in the ratio 2 : 5 : 3 Working together, they can complete a task in 12 days. In how many days can A alone complete 30% of that task?

- (a) 15 (b) 18
(c) 16 (d) 20

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (b) : Ratio of efficiencies of A, B and C = 2 : 5 : 3
Total work = (2 + 5 + 3) × 12 = 120 unit
Time taken by A alone to complete 30% of that task
$$= \frac{120 \times 30}{2 \times 100} = 18 \text{ days}$$

207. 3 men, 4 women and 6 boys together complete a work in 5 days. A woman works twice as much as a man does in a day, and a boy does half the work than a man. How many women alone can complete that work in 7 days?

- (a) 5 (b) 8
(c) 14 (d) 7

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (a) : Given–

$$1W = 2M \Rightarrow 1M = \frac{1}{2}W$$

$$1B = \frac{1}{2}M = \frac{1}{4}W$$

$$\text{Hence, } 3M + 4W + 6B = \frac{3}{2}W + 4W + \frac{3}{2}W = 7W$$

Let x women complete the work in 7 days

$$W_1D_1 = W_2D_2$$

$$7 \times 5 = x \times 7$$

$$x = 5$$

208. A can complete a certain piece of work in 40 days. B is 25% more efficient than A and C is 28% more efficient than B. They work together for 5 days. The remaining work will be completed by B alone, in:

- (a) $16\frac{1}{5}$ days (b) $20\frac{3}{4}$ days
(c) $16\frac{3}{5}$ days (d) $20\frac{1}{2}$ days

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : Ratio of efficiencies of A, B and C = 100 : 125 : 160 = 20 : 25 : 32
Total work of A = 20 × 40 = 800 units
Remaining work = 800 – (20 + 25 + 32) × 5 = 800 – 385 = 415 units
Required time = $\frac{415}{25} = 16\frac{3}{5}$ days

209. A can complete a certain work in 30 days. B is 25% more efficient than A and C is 20% more efficient than B. They all worked together for 3 days. B alone will complete the remaining work in:

- (a) 20 days (b) 15 days
(c) 18 days (d) 12 days

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (b) :

Ratio of efficiencies of A, B and C
= 100 : 125 : 150 = 4 : 5 : 6

Total work done by A = 4 × 30 = 120 units

Remaining work = 120 – 3 × 15 = 75 units

Required time = $\frac{75}{5} = 15$ days.

210. To complete a certain task, X is 40% more efficient than Y, and Z is 40% less efficient than Y. Working together, they can complete the task in 21 days. Y and Z together worked for 35 days. The remaining work will be completed by X alone in:

- (a) 5 days (b) 8 days
(c) 4 days (d) 6 days

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (a) : Ratio of efficiencies of X, Y, and Z.

$$= 140 : 100 : 60 = 7 : 5 : 3$$

Total work = (7 + 5 + 3) × 21 = 315 units

Remaining work = 315 – 8 × 35 = 35 units

Required time = $\frac{35}{7} = 5$ days

211. A is thrice as productive as C. Together they can complete a job in 22.5 days. If B joins them after they have worked for 15 days then in how many days can they finish the rest of the job if B alone can do the job in 15 days.

- (a) 6 (b) 3
(c) 9 (d) 2

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

A C

Efficiency → 3 : 1

Work done by (A + C) in 1 day = 4 units

Work done by (A+C) in 22.5 days

$$= 4 \times 22.5 = 90 \text{ unit (Total work)}$$

Work done by (A + C) in 15 days = 15 × 4 = 60 unit

∴ Work done by B in 1 day = $\frac{90}{15} = 6$ unit

Work done by (A + B + C) in 1 day = (3 + 1 + 6) = 10 unit

Hence, the time taken by (A + B + C) to do the

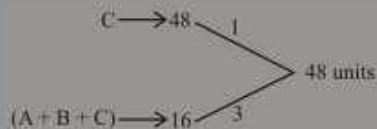
remaining work = $\frac{(90 - 60)}{10} = 3$ days

212. A is thrice as good a workman as B. C alone takes 48 days to paint a house. All three A, B and C working together take 16 days to paint the house. It will take how many days for B alone to paint the house ?

- (a) 32 (b) 64
(c) 96 (d) 72

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :



Efficiency of (A + B) = 3 - 1 = 2

A : B = 3 : 1

Efficiency of B = $2 \times \frac{1}{4} = \frac{1}{2}$

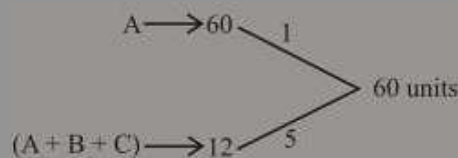
Time taken by B alone to complete the work = $\frac{48}{\frac{1}{2}} = 96 \text{ days}$

213. C is 5 times as productive as B. A takes 60 days to complete a task. If A, B and C work together they can complete the task in 12 days. In how many days can B complete the task if he worked alone ?

- (a) 18 (b) 27
(c) 90 (d) 72

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :



Efficiency of (B + C) = 4

C : B = 5 : 1

Work Efficiency of B = $4 \times \frac{1}{6} = \frac{2}{3}$

Time taken by B alone to complete the work = $\frac{60}{\frac{2}{3}} = 90 \text{ days}$

214. To do a certain work, the ratio of efficiency of A to that of B is 3 : 7. Working together, they can complete the work in $10\frac{1}{2}$ days. They work together for 8 days. 60% of the remaining work will be completed by A alone in :

- (a) $6\frac{1}{2}$ days (b) 4 days
(c) 5 days (d) $5\frac{1}{2}$ days

SSC CGL (Tier-II) 11-9-2019

Ans. (c) : Ratio of efficiencies of A and B = 3 : 7

Total time taken by (A + B) = $10\frac{1}{2}$ days

Total work = $(3+7) \times 10\frac{1}{2} = 10 \times \frac{21}{2} = 105$

Work done by (A + B) in 8 days = $10 \times 8 = 80$

Remaining work = $105 - 80 = 25$

Time taken by A to complete 60% of the remaining

work = $25 \times \frac{60}{100} \times \frac{1}{3} = 5 \text{ days}$

215. 3 men and 5 women together can complete a work in 6 days, whereas 4 men and 9 women together can do it in 4 days. How many women are required to do the same work in 7 days?

- (a) 10 (b) 14
(c) 12 (d) 15

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (c) Total Work = $(3M + 5W) \times 6 = (4M + 9W) \times 4$

$9M + 15W = 8M + 18W$

$M = 3W$

$\frac{M}{W} = \frac{3}{1}$

Let x women are required to the same work in 7 days.

\therefore Total work = $(3 \times 3 + 5 \times 1) \times 6 = 84$

$x \times 1 \times 7 = 84$

$x = 12$

216. To do a certain work, the ratio of the efficiencies of X and Y is 5 : 4. Working together, they can complete the same work in 10 days. Y alone starts the work and leaves after 5 days. The remaining work will be completed by X alone in:

- (a) 15 days (b) 14 days
(c) 12 days (d) 10 days

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : \therefore Ratio of efficiencies of X and Y = 5 : 4

Total work = $(5+4) \times 10 = 90$ units

5 day's work of Y = $5 \times 4 = 20$ units

Remaining work = $90 - 20 = 70$ units

Hence, Time taken by X to finish the remaining work

= $\frac{70}{5} = 14 \text{ days}$

217. A is twice as good a workman as B, and together they finish a piece of work in 13 days. In how many days will A alone finish the work?

- (a) $9\frac{1}{4}$ (b) 41
(c) $19\frac{1}{2}$ (d) 39

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (c) : Let A complete the work in x days

\therefore Time taken by B to complete the work = 2x days

1 day's work of (A+B) = $\frac{1}{13}$

$\Rightarrow \frac{1}{x} + \frac{1}{2x} = \frac{1}{13}$

$$\Rightarrow \frac{3}{2x} = \frac{1}{13}$$

$$\Rightarrow x = \frac{39}{2}$$

$$\Rightarrow x = 19\frac{1}{2} \text{ days}$$

Hence A will complete the work in $19\frac{1}{2}$ days

218. X can do a work in 3 days, Y does three times the same work in 8 days, and Z does five times the same work in 12 days. If they have to work together for 6 hours in a day, then in how much time can they complete the work?

- (a) 4 hours (b) 5 hours 20 minutes
(c) 4 hours 10 minutes (d) 5 hours

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) :

$$\begin{array}{l} X = 3 \xrightarrow{8} \\ y = 8/3 \xrightarrow{9} \\ z = 12/5 \xrightarrow{10} \end{array} \rightarrow 24(\text{LCM})$$

$$\text{Required time} = \frac{24}{27} \times 6 \text{ hours}$$

$$= \frac{16}{3} \text{ hours}$$

$$= 5 + \frac{1}{3} \times 60$$

$$= 5 \text{ hours } 20 \text{ minute}$$

219. A is twice as good a workman as B and together they finish a piece of work in 13 days. In how many days will B alone finish the work?

- (a) 42 (b) 21
(c) 39 (d) 18.5

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : Ratio of efficiencies of A and B = 2 : 1

\therefore A and B together do 3 units of work in 1 day.

$$\therefore \text{A and B together will work in } 13 \text{ days} = 3 \times 13 = 39 \text{ Unit}$$

$$\therefore \text{Time taken by B to complete the work} = \frac{39}{1} = 39 \text{ days}$$

220. 4 boys from school A and 6 boys from school B together can set up an exhibition in 5 days, which 5 boys from school A and 10 boys from school C together can do in 4 days of 3 boys from school B and 4 boys from school C together can do in 10 days. Then how many boys from school A can set up the exhibition in one day?

- (a) 20 (b) 40
(c) 60 (d) 80

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b)

$$(4A + 6B)5 = (5A + 10C)4 = (3B + 4C)10$$

$$20A + 30B = 20A + 40C$$

$$30B = 40C$$

$$3B = 4C$$

And, $20A + 40C = 30B + 40C$

$$20A = 30B$$

$$4A = 6B$$

Let n boys of school A do the same exhibition in 1 day.

$$nA \times 1 = (4A + 6B) \times 5$$

$$\therefore nA = (4A + 4A) \times 5 \quad (\because 6B = 4A)$$

$$nA = 8A \times 5$$

$$n = 40$$

221. Vivek can do a certain work in 14 days. Vishal is 75% more efficient than Vivek. How many days will Vishal alone take to do the same work?

- (a) 8 days (b) 6 days
(c) 9 days (d) 10 days

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a)

Ratio of efficiencies of Vishal and Vivek

$$= 100 : 175 = 4 : 7$$

Ratio of time taken by them = 7 : 4

Let the time taken by Vivek and Vishal be 7x, 4x respectively.

According to the question,

$$7x = 14$$

$$x = 2$$

$$\text{Time taken by Vishal} = 4x = 4 \times 2 = 8 \text{ days}$$

222. A works twice as fast as B and B works twice as fast as C. All three working together can finish a task in 4 days with the help of D. If D alone can finish the same task in 16 days, then in how many days will A alone 75% of the same task?

- (a) 6 (b) 8
(c) 7 (d) 9

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) Ratio of efficiencies of A, B and C = 4 : 2 : 1

$$\therefore 4x + 2x + x + \frac{1}{16} = \frac{1}{4}$$

$$7x = \frac{3}{16}$$

$$x = \frac{3}{112}$$

$$\therefore 4x = \frac{3}{28}$$

Time taken by A to complete 75% of the same task

$$= \frac{\frac{3}{28}}{\frac{3}{4}} = 7 \text{ days}$$

223. Working for 9 hours a day, X can finish a task in 3 days, Y can finish three times of the same task in 8 days, and Z can finish five times of the same task in 12 days. Working together, in how many hours will they complete the task?

- (a) 12 (b) 10
(c) 8 (d) 9

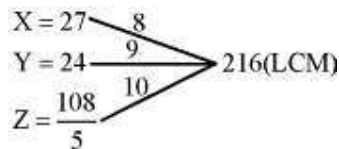
SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (c) : Total work = No. of working day \times efficiencies

\therefore Total no. of x hours = $3 \times 9 = 27$ hours

Total no. of y hours = $\frac{8}{3} \times 9 = 24$ hours

Total no. of z hours = $\frac{12}{5} \times 9 = \frac{108}{5}$



Total time taken by all to complete the task

$$= \frac{216}{(8+9+10)}$$

$$= \frac{216}{27} = 8\text{h}$$

224. P can work thrice as fast as Q. Working independently, Q can complete a task in 24 days. In how many days can P and Q together finish the same task?

- (a) 8 (b) 6
(c) 4 (d) 5

SSC CHSL -18/03/2020 (Shift-II)

Ans. (b) : Ratio of capacities of P and Q = 3 : 1

Total work = $24 \times 1 = 24$ units

Time taken by (P + Q) to complete the work

$$\text{together} = \frac{24}{3+1} = 6 \text{ days}$$

225. 25 men can complete a task in 16 days. Four days after they started working, 5 more men, with equal workmanship, joined them. How many days will be needed by all to complete the remaining task.

- (a) 15 days (b) 18 days
(c) 10 days (d) 12 days

SSC CHSL -18/03/2020 (Shift-I)

Ans. (c) : Let everyone take x days to complete the work.

$$\therefore 25 \times 16 = 25 \times 4 + (25+5) \times x$$

$$400 = 100 + 30x$$

$$30x = 300 \Rightarrow x = 10 \text{ days}$$

226. A can do a piece of work in 40 days. B does the same work with 60% more efficiency. How many days will B take to complete the work alone ?

- (a) 30 days (b) 18 days
(c) 15 days (d) 25 days

SSC MTS 7-10-2017 (Shift-I)

Ans. (d) : Ratio of efficiencies of A and B

$$= 100 : 160 = 5 : 8$$

Total work = $5 \times 40 = 200$ units

$$\text{Time taken by B to complete the work} = \frac{200}{8} = 25 \text{ days}$$

227. A can do a work in 15 days. B is 25% more efficient than A. In how many days, working together A and B will complete the same work?

- (a) $\frac{21}{4}$ (b) $\frac{24}{5}$
(c) $\frac{20}{3}$ (d) $\frac{25}{7}$

SSC MTS 13/08/2019 (Shift-II)

Ans. (c) : A can do a piece of work in 15 days.

Efficiencies of A and B

$$\begin{array}{cc} A & : & B \\ 100 & & 125 \\ 5 & : & 4 \\ \times 3 \downarrow & & \downarrow \times 3 \\ 15 & & 12 \end{array}$$

$$\text{Work done together} = \frac{A \times B}{A + B}$$

$$= \frac{15 \times 12}{15 + 12}$$

$$= \frac{15 \times 12}{27} = \frac{20}{3} \text{ days}$$

228. Some persons can do a piece of work in 84 days. Two times the number of such persons will do half of the same work in how many days?

- (a) 21 days (b) 14 days
(c) 16 days (d) 15 days

SSC MTS 09/08/2019 (Shift-I)

$$\text{Ans. (a) : } \therefore \frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2} \quad \therefore M_2 = 2M_1$$

$$\therefore \frac{M_1 \times 84}{1} = \frac{2M_1 \times D_2}{\frac{1}{2}}$$

$$84 = 4D_2$$

$$D_2 = 21 \text{ days}$$

229. A is 1.5 times as efficient as B. A & B together complete the work in 12 days. In how many days, A alone can complete the work?

- (a) 20 days (b) 26 days
(c) 24 days (d) 27 days

SSC MTS 14/08/2019 (Shift-III)

Ans. (a) : Ratio of efficiencies of A and B.

$$A : B = 3 : 2$$

$$\text{Total work} = (3 + 2) \times 12 = 60 \text{ units}$$

$$A \text{ will complete the whole work} = \frac{60}{3} = 20 \text{ days}$$

230. A is twice as good at writing a novel as B. Together they can finish writing the novel in 24 days. In how many days can A alone write the novel?

- (a) 24 (b) 18
(c) 32 (d) 36

SSC MTS 13/08/2019 (Shift-I)

Ans. (d) : Efficiency $A : B = 2 : 1$

$$\therefore 1 \text{ day's work of A and B} = 3 \text{ units}$$

$$\therefore 24 \text{ days' work of A and B} = (24 \times 3) = 72 \text{ units}$$

$$\therefore \text{Time taken by A to complete the work} = \frac{72}{2} = 36 \text{ days}$$

231. C can complete the work alone in 120 days. B is two times skilled than C, and A is three times skilled than B. In how many days will all of them complete the same work?

- (a) 13.33 (b) 16.67
(c) 12.5 (d) 15

SSC MTS 14/08/2019 (Shift-I)

Ans. (a) : Ratio of efficiencies of A, B and C

$$A : B : C = 6 : 2 : 1$$

$$\text{Total work done by C} = 1 \times 120 = 120 \text{ unit}$$

$$\therefore \text{Time taken by (A + B + C) to complete the whole work} = \frac{120}{9} = 13.33 \text{ days}$$

232. The ratio of the efficiencies of A, B and C to do a certain work is 7 : 3 : 5. Working together they can complete the work in 21 days. A and C worked together for 15 days. The remaining work will be completed by B alone in

- (a) 63 days (b) 60 days
(c) 54 days (d) 45 days

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (d) : $A : B : C = 7 : 3 : 5$ (Work efficiency)

Time taken by B to complete remains work

$$= \frac{\text{Work efficiency (A + B + C)} \times \text{Time} - (A + C)}{\text{Work efficiency of B}}$$

$$= \frac{15 \times 21 - 12 \times 15}{3} = \frac{315 - 180}{3} = \frac{135}{3} = 45 \text{ day}$$

233. 3 men, 4 women and 6 boys together can complete a work in 6 days. A woman does triple the work a man does and a boy does half the work a man does. How many women alone will be able to complete this work in 4 days?

- (a) 9 (b) 6
(c) 8 (d) 7

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (a) : According to the question.

$$1W = 3M \Rightarrow 1M = \frac{1}{3}W$$

$$1B = \frac{M}{2} = \frac{1}{2} \times \frac{1}{3}W = \frac{1}{6}W$$

$$3M + 4W + 6B = 1W + 4W + 1W = 6W$$

Let x women will complete the work in 4 days

$$W_1D_1 = W_2D_2$$

$$6 \times 6 = x \times 4$$

$$x = 9$$

234. A is 50% more efficient than B and C is 40% less efficient than B. Working together, they can complete a task in 10 days. In how many days will A alone complete 150% of that task

- (a) 33 (b) 35
(c) 31 (d) 28

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (c) : Let efficiencies of B is 100.

A	B	C
150	100	60

$$A : B : C = 150 : 100 : 60 = 15 : 10 : 6 \text{ (Work capacity)}$$

$$\text{Total work} = (15 + 10 + 6) \times 10 = 310 \text{ units}$$

$$\text{work of 150\%} = 310 \times \frac{150}{100} = 465 \text{ units}$$

$$\text{Time taken by A} = \frac{465}{15} = 31 \text{ day.}$$

(VI) Problems based on Work and Wages

235. A and B worked together and received a total of ₹18,000 for 15 days, A's efficiency in the work was 5 times that of B's. The daily wage of A (in ₹) was:

- (a) 800 (b) 600
(c) 1,200 (d) 1,000

SSC CGL (Tier-II) 03/02/2022

Ans : (d) Efficiency ratio of A and B = 5 : 1

$$15 \times 6 = 18000$$

$$90 = 18000$$

$$1 = 200$$

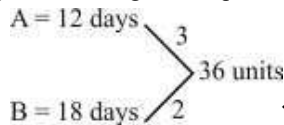
$$\text{Daily wage of A} = ₹5 \times 200 = 1000$$

236. A can complete a task in 12 days and B can complete the same task in 18 days. They start working together but A works for only 2 days. The remaining work is completed by B. If the total wage is ₹2,400, then what is B's share (in ₹)?

- (a) 1600 (b) 1800
(c) 1200 (d) 2000

SSC CHSL 27/05/2022 (Shift- III)

Ans. (d) : According to the question,



Work done by A in 2 day = $3 \times 2 = 6$ units
 And, remaining work is done by B = $36 - 6 \Rightarrow 30$ units
 We know that,
 Ratio of work done by A : B \Rightarrow Ratio of their wages
 $\Rightarrow A : B = 6 : 30$
 $\Rightarrow 1 : 5$
 \therefore B's share $\Rightarrow \frac{5}{6} \times 2400 = ₹2000$

237. A, B and C complete a work in 5 days, 8 days and 12 days, respectively. If they work together and get ₹9,800 for the work, then how much does A get?

- (a) ₹4,600 (b) ₹4,800
 (c) ₹4,200 (d) ₹5,800

SSC MTS 18/10/2021 (Shift-I)

Ans. (b) : The ratio of time of A, B and C = 5 : 8 : 12

$$\begin{aligned} \text{Ratio of efficiency} &= \frac{1}{5} : \frac{1}{8} : \frac{1}{12} \\ &= 24 : 15 : 10 \end{aligned}$$

\therefore Money distribution of work efficiency

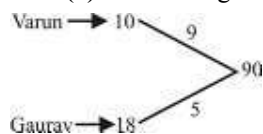
$$\begin{aligned} \therefore \text{Amount received by A} &= \frac{9800}{24+15+10} \times 24 \\ &= \frac{9800}{49} \times 24 \\ &= 200 \times 24 \\ &= ₹4800 \end{aligned}$$

238. Varun and Gaurav can dig a pond in 10 days and 18 days, respectively. After finishing that work together, they receive amount of ₹7,280. What is the share of Gaurav in the amount?

- (a) ₹2,600 (b) ₹2,800
 (c) ₹2,700 (d) ₹2,500

SSC CHSL 11/08/2021 (Shift-III)

Ans. (a) : According to the question,



$$\begin{aligned} \therefore \text{Share of Gavrav in the amount} &= \frac{5}{14} \times 7280 \\ &= ₹2600 \end{aligned}$$

239. The daily wages of P, Q and R are in the proportion 5 : 7 : 8 If Q earns ₹ 560 per day, then what are the daily wages (in ₹) of R and P, respectively?

- (a) 640 and 400 (b) 590 and 350
 (c) 350 and 590 (d) 400 and 640

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : Let daily wages of P, Q and R be 5x, 7x and 8x respectively.

According to the question,

$$7x = ₹560$$

$$x = ₹80$$

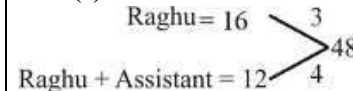
$$\therefore \text{Daily wages (in Rs.) of R and P are } 8 \times 80 \text{ and } 5 \times 80 = 640 \text{ and } 400$$

240. Raghu agrees to complete a work for Rs. 8,400 in 16 days. But by engaging an assistant, the work is completed in 12 days. Find the share of money/remuneration to be received by the assistant.

- (a) ₹2,500 (b) ₹2,000
 (c) ₹2,100 (d) ₹2,400

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (c) :



Work efficiency = Raghu : Assistant = 3 : 1

$$\text{Share of assistant remuneration} = 8400 \times \frac{1}{4} = ₹2100$$

241. A earns ₹180 per hour and works for 7 hours per day. B earns ₹160 per hour and works for 5 hours per day. What is the ratio of per day wages of A and B?

- (a) 40 : 61 (b) 33 : 20
 (c) 20 : 30 (d) 63 : 40

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

$$\begin{aligned} \text{Ans. (d) : Ratio of daily wages} &= (180 \times 7) : (160 \times 5) \\ &= 63 : 40 \end{aligned}$$

242. A works for 8 hours per day and earns ₹80 per hour. B works for 6 hours per day and earns ₹60 per hour. What is the ratio of daily wages of A and B?

- (a) 16 : 9 (b) 5 : 16
 (c) 9 : 10 (d) 16 : 5

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (a) :

$$\therefore 1 \text{ hours wages of A} = ₹ 80$$

$$\therefore 8 \text{ hours wages of A} = 8 \times 80 = ₹640$$

$$\therefore 1 \text{ hours wages of B} = ₹60$$

$$\therefore 6 \text{ hours wages of B} = 6 \times 60 = ₹360$$

$$\begin{aligned} \text{Ratio of daily wages of A and B} &= 640 : 360 \\ &= 64 : 36 = 16 : 9 \end{aligned}$$

243. Working alone A can do the task in 27 hours and B can do it in 54 hours. Find C's share (in Rs.) if A, B and C get paid ₹4,320 for completing a task in 12 hours on which they worked together.

- (a) 1440 (b) 960
(c) 1920 (d) 1280

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : Efficiency of C = $\frac{1}{12} - \left(\frac{1}{27} + \frac{1}{54} \right)$

$$= \frac{1}{12} - \frac{1}{18}$$

$$= \frac{3-2}{36} = \frac{1}{36}$$

∴ Ratio of efficiencies of A, B and C

$$= \frac{1}{27} : \frac{1}{54} : \frac{1}{36} = 4 : 2 : 3$$

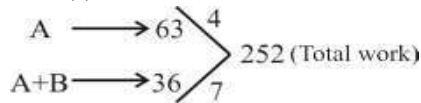
Hence, Share of C = $4320 \times \frac{3}{9}$
= ₹1440

244. If A had worked alone he would have taken 63 hours to do the task. What is B's share, if A and B work together on a task finishing it in 36 hours and they get paid Rs. 5,950 for it?

- (a) 3400 (b) 3600
(c) 2550 (d) 2750

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :



Efficiency of B = 7-4 = 3

Share of B = $\frac{3}{7} \times 5950$
= ₹2550

245. The wages of three labourers A, B and C are in the ratio 10:12:15. A's wage is increased in the ratio 5:6. B's wage is increased in the ratio 3:4 and C's wage is increased in the ratio 3:5. The new ratio of the wages of A:B:C is

- (a) 15:18:20 (b) 12:16:25
(c) 6:7:9 (d) 8:6:5

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Increase in A's Salary = $\frac{1}{5}$ Part

Increase in B's Salary = $\frac{1}{3}$ Part

Increase in C's Salary = $\frac{2}{3}$ Part

New ratio of wages = 12 : 16 : 25

246. A and B can do a piece of work in 6 days and 8 days, respectively. With the help of C, they completed the work in 3 days and earned ₹1,848. What was the share of C?

- (a) ₹ 462 (b) ₹ 231
(c) ₹ 924 (d) ₹ 693

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : According to the question.

1 day's work of C = $\frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8} \right)$

$$= \frac{8 - (4+3)}{24} = \frac{1}{24}$$

C can complete the work in 24 days

Ratio of efficiencies of A, B and C = $\frac{1}{6} : \frac{1}{8} : \frac{1}{24}$
= 4 : 3 : 1

Share of C = $\frac{1}{8} \times 1848 = ₹231$

247. 10 men working 5 hours/day earn ₹300. How much money will 15 men working 10 hours/day earn?

- (a) ₹600 (b) ₹900
(c) ₹650 (d) ₹800

SSC CHSL -19/10/2020 (Shift-II)

Ans. (b) : ∴ $\frac{M_1 H_1}{W_1} = \frac{M_2 H_2}{W_2}$

$\frac{10 \times 5}{300} = \frac{15 \times 10}{W_2} \Rightarrow W_2 = ₹900$

248. Kamal and Anil can dig a pond in 8 days and 14 days, respectively. If the total expense digging is ₹4,400, then how much money will Anil earn?

- (a) ₹1300 (b) ₹1500
(c) ₹1400 (d) ₹1600

SSC CHSL -19/03/2020 (Shift-II)

Ans. (d) : Ratio of wages of both = $\frac{1}{8} : \frac{1}{14} = 7 : 4$

Share of Anil = $\frac{4400 \times 4}{7+4}$
= $\frac{4400 \times 4}{11}$
= ₹1600

249. A earns ₹100 per hour and works 8 hours per day B earns ₹120 per hour and works 6 hours per day. What is the ratio of the wages per day of B and A?

- (a) 9 : 10 (b) 4 : 5
(c) 5 : 4 (d) 10 : 9

SSC CHSL (Tier-I) 09/07/2019 (Shift-II)

Ans. (a) : Ratio of daily wages of B and A
= $120 \times 6 : 100 \times 8$
= 9 : 10

250. P, Q and R undertook a work for ₹48000. Together P and Q complete $\frac{5}{12}$ th part of the work. What is the share (in Rs) of R?

- (a) 21000 (b) 28000
(c) 27000 (d) 31000

SSC MTS 9-10-2017 (Shift-I)

Ans : (b) Work done by R = $1 - \frac{5}{12} = \frac{7}{12}$
 \therefore Share of R = $\frac{7}{12} \times 48000 = ₹28000$

251. A can do a piece of work alone in 10 days. whereas B alone can do it in 15 days. They work together and get ₹ 2000 for their work. What is the share of B?

- (a) ₹ 1200 (b) ₹ 800
(c) ₹ 1000 (d) ₹ 1600

SSC MTS 19/08/2019 (Shift-I)

Ans. (b) : \therefore Efficiency $\propto \frac{1}{\text{Time}}$
 \therefore Ratio of efficiencies of A and B = $\frac{1}{10} : \frac{1}{15} = 3:2$
 Share of B = $2000 \times \frac{2}{5} = ₹800$

252. A and B together complete $\frac{13}{15}$ part of the work and B and C together complete $\frac{11}{20}$ Part of the work. If the difference in wages of A and C is ₹7600 then total wage is:

- (a) ₹24000 (b) ₹18000
(c) ₹36000 (d) ₹56000

SSC MTS 21/08/2019 (Shift-II)

Ans. (a) : \therefore A+B+C = 1 ———(i)
 $A+B = \frac{13}{15}$ ———(ii)
 and $B+C = \frac{11}{20}$ ———(iii)
 \therefore $C = 1 - \frac{13}{15} = \frac{2}{15}$
 and $A = 1 - \frac{11}{20} = \frac{9}{20}$ (equation (i) – equation (iii))
 \therefore $A - C = \frac{9}{20} - \frac{2}{15}$
 $= \frac{27-8}{60} = \frac{19}{60}$
 \therefore Wages of $\frac{19}{60}$ Part = 7600
 Total wages = $7600 \times \frac{60}{19} = ₹24000$

253. A and B can do a work in 15 days and 10 days respectively. They got a contract to complete a work for ₹75000. What will be B's share in the contract amount ?

- (a) 45,000 (b) 40,000
(c) 35,000 (d) 30,000

SSC CHSL 08/07/2019 (Shift-III)

Ans. (a) : 1 day's work of A = $\frac{1}{15}$
 1 day's work of B = $\frac{1}{10}$
 Efficiencies of A and B = $\frac{1}{15} : \frac{1}{10} = 2 : 3$
 Hence share of B = $\frac{3}{(2+3)} \times 75000 = ₹45000$

254. A and B can do a work in 15 days and 10 days respectively. They got a contract to complete a work for ₹35000. What will be B's share in the contract amount ?

- (a) ₹ 15000 (b) ₹ 21000
(c) ₹ 7000 (d) ₹ 14000

SSC CHSL 08/07/2019 (Shift-II)

Ans. (b) : Time taken by A to complete the work = 15 days
 Time taken by B to complete the work = 10 days
 Ratio of efficiencies of A and B = $\frac{1}{15} : \frac{1}{10}$
 $= 10 : 15 = 2 : 3$
 Share of B in contract amount = $\frac{3}{(2+3)} \times 35000$
 $= \frac{3}{5} \times 35000$
 $= ₹ 21000$

255. A and B can do a work in 15 days and 10 days respectively. They got a contract to complete a work for ₹75000. What will be A's share in contract amount ?

- (a) ₹ 40,000 (b) ₹ 30,000
(c) ₹ 45,000 (d) ₹ 35,000

SSC CHSL 09/07/2019 (Shift-I)

Ans. (b) :
 Ratio of efficiencies of A and B = $\frac{1}{15} : \frac{1}{10} = 2 : 3$
 Share of A in contract amount = $\frac{2}{5} \times 75000 = ₹30000$

256. A, B and C, working alone can do a piece of work in 15, 30 and 75 days respectively. They work together and get ₹1615 for completing the work. What is the difference in share of A and C?

- (a) ₹760 (b) ₹620
(c) ₹680 (d) ₹540

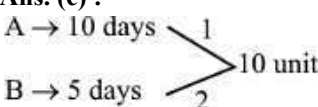
SSC MTS 05/08/2019 (Shift-I)

Ans. (a) : Ratio of 1 day's work of A, B and C
 $= \frac{1}{15} : \frac{1}{30} : \frac{1}{75} = 10 : 5 : 2$
 Difference in the shares of A and C
 $= 1615 \times \frac{(10 - 2)}{17} = 95 \times 8 = ₹760$

(VII) Miscellaneous

257. A and B can do a job in 10 days and 5 days, respectively. They worked together for two days, after which B was replaced by C and the work was finished in the next three days. How long will C alone take to finish 40% of the job?
 (a) 15 days (b) 10 days
 (c) 12 days (d) 18 days

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (c) :

 A → 10 days (1 unit)
 B → 5 days (2 units)
 2 days' work of (A+B) = (1+2) × 2 = 6 unit
 Efficiency of (A+C) = $\frac{(10 - 6)}{3} = \frac{4}{3}$
 Efficiency of C = $\frac{4}{3} - 1 = \frac{1}{3}$
 Time taken by C to finish 40% of the job
 $= \frac{10 \times \frac{40}{100}}{\frac{1}{3}} = 12$ days

258. A and B can do a job in 10 days and 5 days, respectively. They worked together for two days, after which B was replaced by C and the work was finished in the next three days. How long will C alone take to finish 60% of the job?
 (a) 18 days (b) 24 days
 (c) 51 days (d) 34 days

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : 2 days' work of (A+B) = $2 \left(\frac{1}{10} + \frac{1}{5} \right)$
 $= \frac{3}{5}$ Part
 Remaining work = $1 - \frac{3}{5} = \frac{2}{5}$
 \therefore Remaining work is completed by (A + C) in 3 days
 $\therefore 3 \left(\frac{1}{10} + \frac{1}{C} \right) = \frac{2}{5}$
 $\Rightarrow \frac{1}{C} = \frac{2}{15} - \frac{1}{10}$
 $\Rightarrow \frac{1}{C} = \frac{1}{30}$

Hence C alone will complete the work in 30 days.
 \therefore Time taken by C to complete 60% part of work
 $= 30 \times \frac{60}{100}$
 $= 18$ days.

259. To do a certain work A and B work on alternate days, with B beginning the work on the first day. A can finish the work alone in 48 days. If the work gets completed in $11\frac{1}{3}$ days, then B alone can finish 4 times the same work in:
 (a) 30 days (b) 24 days
 (c) 32 days (d) 27 days

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (d) : B works on odd days.
 A works on even days.
 So, B works for 6 days while A works for $5\frac{1}{3}$ days.
 $5\frac{1}{3}$ days' work of A = $\frac{1}{48} \times \frac{16}{3} = \frac{1}{9}$
 Remaining work = $1 - \frac{1}{9} = \frac{8}{9}$
 B completes $\frac{8}{9}$ work in 6 days
 B will complete the whole work $6 \times \frac{9}{8} = \frac{27}{4}$ days
 B will complete 4 times the work in 27 days.

260. A, B and C can complete a work in 42 days, 84 days, and 28 days respectively. A started the work, B joined him after 3 days. If C joined them after 5 days from the beginning of the work. Then how many days did A work until the work was completed?
 (a) 15 (b) 17
 (c) 18 (d) 20

SSC CHSL 02/07/2019 (Shift-II)

Ans. (b) : 1 day's work of A = $\frac{1}{42}$
 1 day's work of B = $\frac{1}{84}$
 1 day's work of C = $\frac{1}{28}$
 Let A work x days till the work is completed
 According to the question,
 $\frac{2x + x - 3 + 3x - 15}{84} = 1$
 $6x - 18 = 84$
 $6x = 84 + 18$
 $6x = 102$
 $x = 17$
 Hence A worked for 17 days.

16.

Pipes and Cisterns

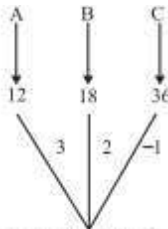
(I) Problems based on Tap and Tank

1. There are two water taps in a tank which can fill the empty tank in 12 hours and 18 hours respectively. It is seen that there is a leakage point at the bottom of the tank which can empty the completely filled tank in 36 hours. If both the water taps are opened at the same time to fill the empty tank and the leakage point was repaired after 1 hour, then in how much time the empty tank will be completely filled ?

- (a) 7 hours (b) 8 hours 24 minutes
(c) 7 hours 24 minutes (d) 7 hours 12 minutes

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) : Suppose, filling taps and leakage are respectively A, B & C.



Total capacity = 36 units

Total work = 36 units

Work done in first hour = $3 + 2 - 1 = 4$ units

Remaining work = $36 - 4 = 32$ units

Time required to fill the tank after the leakage is

$$\text{repaired} = \frac{32}{3+2} = 6\frac{2}{5} \text{ hour}$$

$$\text{Total time to fill the tank} = \left(1 + 6\frac{2}{5}\right) \text{ hour}$$

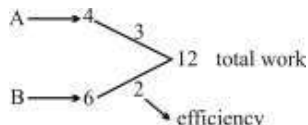
= 7 hour 24 minutes

2. A tap can fill a tank in 4 hours. Another tap can fill the same tank in 6 hours. If both the taps are opened at the same time. Then in how much time will the empty tank be filled completely?

- (a) 3 h (b) 2 h 24 min
(c) 2 h 30 min (d) 2 h

SSC CHSL 12/08/2021 (Shift-I)

Ans. (b) :



So, According to the question,

$$A + B \rightarrow \frac{12}{5} = 2 \text{ h } 24 \text{ m}$$

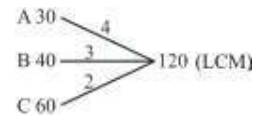
Hence, (A+B) will fill the empty tank in 2 h 24 m.

3. Pipes A, B and C can fill a tank in 30h, 40h and 60h respectively. Pipes A, B and C are opened at 7 a.m., 8 a.m. and 10 a.m., respectively on the same day. When will the tank be full ?

- (a) 10:00 PM (b) 9:20 PM
(c) 10: 20 PM (d) 9:40 PM

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :



Let Pipe A can fill = In x hour

Then, Pipe B can fill = In (x-1) hour

Pipe C can fill = (x-3) hour

$$\therefore 4x + 3(x-1) + 2(x-3) = 120$$

$$4x + 3x - 3 + 2x - 6 = 120$$

$$9x = 120 + 9$$

$$x = \frac{129}{9} = 14\frac{3}{9} = 14\frac{1}{3}$$

$$= 14 \text{ hour } + \frac{1}{3} \times 60 \text{ minute} = 14 \text{ hours } 20 \text{ minute}$$

Hence, Tank will be full 7:00 am + 14 hours 20 minute = 9 : 20 pm

4. Two pipes A and B can fill a tank in 12 hours and 18 hours, respectively. Both pipes are opened simultaneously. In how much time will the empty tank be filled completely?

- (a) 7 hours 12 minutes (b) 9 hours 30 minutes
(c) 8 hours (d) 10 hours 24 minutes

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : Time taken by pipe A and pipe B to fill the

$$\begin{aligned} \text{tank} &= \frac{12 \times 18}{12 + 18} \\ &= \frac{12 \times 18}{30} \\ &= 36/5 \text{ hours} \\ &= 7\frac{1}{5} \text{ hours} \\ &= 7 \text{ hours } 12 \text{ minute} \end{aligned}$$

5. When operated separately, pipe A takes 5 hours less than pipe B to fill a cistern, and when both pipes are operated together, the cistern gets filled in 6 hours. In how much time (in hours) will pipe B fill the cistern, if operated separately-

- (a) 15 hours (b) 18 hours
(c) 10 hours (d) 9 hours

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : Let, Pipe B fill the tank in = x hours
Then, pipe A can fill the tank in = (x-5) hours
According to the question,

$$\frac{1}{x} + \frac{1}{x-5} = \frac{1}{6}$$

$$\frac{x-5+x}{x(x-5)} = \frac{1}{6}$$

$$x^2 - 5x = 12x - 30$$

$$x^2 - 17x + 30 = 0$$

$$x^2 - 15x - 2x + 30 = 0$$

$$x(x-15) - 2(x-15) = 0$$

$$(x-15)(x-2) = 0$$

$$x = 15, \quad \begin{cases} x \neq 2 \\ x > 5 \end{cases}$$

Hence, Pipe B will take 15 hours to fill the tank.

6. **Two pipes A and B can fill a tank in 15 hours and 18 hours, respectively. Both pipes are opened simultaneously to fill the tank. In how many hours will the empty tank be filled ?**

- (a) $9\frac{2}{11}$ hours (b) $7\frac{2}{11}$ hours
(c) $10\frac{2}{11}$ hours (d) $8\frac{2}{11}$ hours

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : Pipe A and Pipe B can fill a tank in 15 hours and 18 hours respectively.

∴ Total capacity of tank = L.C.M of 15 & 18 = 90 unit

$$\text{Efficiency of A} = \frac{90}{15} = 6 \text{ unit / hours}$$

$$\text{Efficiency of B} = \frac{90}{18} = 5 \text{ unit / hours}$$

$$\begin{aligned} \text{Combined efficiency of pipe A and B} &= 6 + 5 \\ &= 11 \text{ unit/hours} \end{aligned}$$

$$\text{Time taken} = \frac{\text{Total capacity}}{\text{Efficiency of pipe A and B}}$$

$$= \frac{90}{11} = 8\frac{2}{11} \text{ hours}$$

7. **Pipes A and B together can fill an empty tank in $6\frac{3}{4}$ minutes. If A takes 3 minutes more than B to fill the tank, then the time (in minutes) in which A alone would fill one-third part of the tank is:**

- (a) 6 minutes (b) 4.5 minutes
(c) 5.5 minutes (d) 5 minutes

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) Let, Pipe B will take x minutes to fill the tank
Then, Pipe A will take (x + 3) minutes to fill the tank

∴ According to the question,

$$\frac{1}{x} + \frac{1}{x+3} = \frac{3}{20}$$

$$\frac{x+3+x}{x(x+3)} = \frac{3}{20}$$

$$\frac{2x+3}{x^2+3x} = \frac{3}{20}$$

$$40x + 60 = 3x^2 + 9x$$

$$3x^2 - 31x - 60 = 0$$

$$3x^2 - 36x + 5x - 60 = 0$$

$$3x(x-12) + 5(x-12) = 0$$

$$(x-12)(3x+5) = 0$$

$$\therefore x = 12$$

Hence, A will fill the tank in 15 min.

Time taken by A fill one third of tank =

$$15 \times \frac{1}{3} = 5 \text{ minutes}$$

8. **A tank is filled in 4 hours by three pipes A, B and C. The pipe C is twice as fast as B and pipe B is thrice as fast as A. How much time will pipe A alone take to fill the tank?**

- (a) 25 hours (b) 40 hours
(c) 32 hours (d) 30 hours

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b)

According to the question,

Ratio of efficiency of A, B and C = 1 : 3 : 6

⇒ Efficiency of (A + B + C) × total time = Efficiency of A × time taken by A

$$10 \times 4 = 1 \times \text{time taken by A}$$

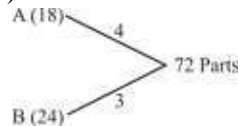
$$\text{Time taken by A} = 40 \text{ hours}$$

9. **Two pipes A and B can fill a tank in 18 minutes and 24 minutes respectively. If both the pipes are opened simultaneously, then after how much time should pipe B be closed so that the tank is full in 12 minutes?**

- (a) 6 minutes (b) 9 minutes
(c) 5 minutes (d) 8 minutes

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (d)



According to the question,

Part filled by Pipe A in 12 minutes = $12 \times 4 = 48$ Parts

Remaining Part = $72 - 48 = 24$ Parts

Time taken by Pipe B fill 24 Parts = $\frac{24}{3} = 8$ minutes

Hence, Pipe B should be closed after 8 minutes.

10. **Pipe A can fill a tank of capacity 350 litres in $3\frac{1}{2}$ minutes, pipe B can fill a tank of capacity 780 liters in $8\frac{2}{3}$ minutes. How long (in min) will it take to fill a tank of capacity 1615 liters, if both pipes are opened together?**

- (a) 8 (b) $8\frac{1}{2}$
(c) 9 (d) $7\frac{1}{2}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b)

Pipe A can fill a tank in 1 minute = $\frac{350 \times 2}{7} = 100$ litres

Pipe B can fill a tank in 1 minute = $\frac{780 \times 3}{26} = 90$ litres

Pipe A and Pipe B together fill the tank in

1 minute = $100 + 90 = 190$ litres

Time taken by pipe (A + B) to fill 1615 litres

$$= \frac{1615}{190} = 8\frac{1}{2} \text{ minute.}$$

11. Pipes A, B and C can fill a tank in 15, 30 and 40 hours, respectively. Pipes A, B and C are opened at 6 a.m., 8 a.m. and 10 a.m., respectively, on the same day. When will the tank be full?

- (a) 7:20 p.m. (b) 3:20 p.m.
(c) 5:20 p.m. (d) 11:20 p.m.

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : Let tank will be filled after 't' hours from 6:00 am

$$\therefore \frac{t}{15} + \frac{t-2}{30} + \frac{(t-4)}{40} = 1$$

$$\frac{8t + 4t - 8 + 3t - 12}{120} = 1$$

$$15t - 20 = 120$$

$$15t = 140$$

$$t = \frac{28}{3} = 9\frac{1}{3} \text{ hours} = 9 \text{ hours } 20 \text{ minutes}$$

Hence tank will be filled at 3:20 PM.

12. Tap A can fill a tank in 20 hours and tap B can fill the same tank in 30 hours. If both taps are opened together, then how much time will be taken to fill the tank?

- (a) 12 hours (b) 10 hours
(c) 24 hours (d) 16 hours

SSC CHSL -14/10/2020 (Shift-I)

Ans. (a) : Tap A and Tap B together fill the tank in 1 hour.

$$= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{1}{12}$$

Hence, tank will filled in 12 hours.

13. Tap A can fill a tank in 6 hours, tap B can fill the same tank in 8 hours and tap C can empty the same tank in 4 hours. If all three taps A, B and C are opened together, then how much time (in hours) will be taken to fill the tank?

- (a) 24 (b) 20
(c) 30 (d) 28

SSC CHSL -13/10/2020 (Shift-III)

Ans. (a) : According to the question,

Time taken to fill the tank when A, B and C are opened together

$$= \frac{1}{\frac{1}{6} + \frac{1}{8} - \frac{1}{4}}$$

$$= \frac{1}{4 + 3 - 6}$$

$$= \frac{1}{24}$$

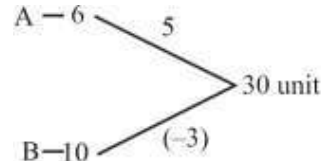
$$= 24 \text{ hours}$$

14. Tap A can fill a tank in 6 hours and tap B can empty the same tank in 10 hours. If both taps are opened together, then how much time (in hours) will be taken to fill the tank?

- (a) 18 (b) 15
(c) 16 (d) 20

SSC CHSL -15/10/2020 (Shift-I)

Ans. (b) :



Tap A can fill 5 units in 1 hours and Tap B can empty 3 units in 1 hours

\therefore Total Part filled by tap A and B in 1 hour = $5 - 3 = 2$ Unit

Hence, time taken to fill the tank = $\frac{30}{2} = 15$ hours

15. If $\frac{4}{7}$ of a cistern is filled in 32 minute, then what is the time (in minutes) needed to fill the remaining part?

- (a) 24 min (b) 16 min
(c) 18 min (d) 28 min

SSC MTS 9-10-2017 (Shift-II)

Ans. (a) : Time taken to fill $\frac{4}{7}$ part of tank = 32 minutes

\therefore Time taken to fill the whole tank = $32 \times \frac{7}{4} = 56$ minutes

\therefore Time taken to fill remaining part of tank

$$\left(1 - \frac{4}{7} = \frac{3}{7}\right) = 56 \times \frac{3}{7} = 24 \text{ minutes}$$

16. Three taps A, B and C can fill a tank in 10, 12 and 15 hours respectively. If all the taps are opened together, then in how many hours will the tank be filled?

- (a) 4 (b) 6
(c) 8 (d) 2

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : Part filled by Tap A in 1 hour = $\frac{1}{10}$ Part

Part filled by Tap B in 1 hour = $\frac{1}{12}$ Part

Part filled by Tap C in 1 hour = $\frac{1}{15}$ Part

Part filled by (A + B + C) in 1 hour

$$= \left(\frac{1}{10} + \frac{1}{12} + \frac{1}{15} \right)$$

$$= \frac{6+5+4}{60} = \frac{15}{60} = \frac{1}{4}$$

Hence, tank will be filled in 4 hours.

17. Two pipes P and Q can fill the tank alone in 20 and 30 hours respectively. If both pipes are opened together, then in how many hours will the tank be filled?

- (a) 12 hours (b) 24 hours
 (c) 8 hours (d) 15 hours

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : Part filled by pipe P in 1 hour = $\frac{1}{20}$

Part filled by pipe Q in 1 hour = $\frac{1}{30}$

Part filled by both pipe P and Q in 1 hour = $\left(\frac{1}{20} + \frac{1}{30} \right)$

$$= \frac{3+2}{60} = \frac{5}{60} = \frac{1}{12}$$

Hence, tank will be filled in 12 hours when opened together.

18. Three taps A, B and C can fill a tank in 20, 24 and 30 hours respectively. How long (in hours) would the three taps take to fill the tank if all of them are opened together?

- (a) 8 hours (b) 12 hours
 (c) 9 hours (d) 6 hours

SSC MTS 11-10-2017 (Shift-III)

Ans. (a) : According to the question,
 Part filled by (A + B + C) in 1 hour

$$= \frac{1}{20} + \frac{1}{24} + \frac{1}{30} = \frac{15}{120} = \frac{1}{8}$$

Hence, tank will be filled in 8 hours.

19. Three taps A, B and C can fill a tank in 40, 48 and 60 hours respectively. How long (in hours) would the three taps take to fill the tank if all them are opened together?

- (a) 12 hours (b) 16 hours
 (c) 10 hours (d) 8 hours

SSC MTS 10-10-2017 (Shift-I)

Ans : (b) According to the question,

A = 40 hours B = 48 hours C = 60 hours

\therefore 1 Part filled by (A + B + C) in 1 hour

$$= \frac{1}{40} + \frac{1}{48} + \frac{1}{60}$$

$$= \frac{18+15+12}{720}$$

$$= \frac{45}{720}$$

Hence, time taken to fill tank by (A + B + C) = $\frac{720}{45}$

= 16 hours

20. If $\frac{2}{5}$ th of a cistern is filled in 6 minute, then what is the time (in minutes) needed to fill the remaining part?

- (a) 8 minutes (b) 9 minutes
 (c) 12 minutes (d) 10 minutes

SSC MTS 10-10-2017 (Shift-II)

Ans. (b) : Given that,

$\frac{2}{5}$ part of cistern filled in = 6 minutes

Remaining $\left(1 - \frac{2}{5} = \frac{3}{5} \right)$ Part filled in = $\frac{6}{\frac{2}{5}} \times \frac{3}{5}$

$$= \frac{30}{2} \times \frac{3}{5}$$

$$= 3 \times 3 = 9 \text{ minutes}$$

21. If $\frac{3}{7}$ th of a cistern is filled in 36 minute, then what is the time (in minutes) needed to fill the remaining part?

- (a) 48 minutes (b) 42 minutes
 (c) 44 minutes (d) 52 minutes

SSC MTS 11-10-2017 (Shift-II)

Ans. (a) : $\frac{3}{7}$ th Part of cistern filled = 36 minutes

Whole tank filled = $\frac{36}{\frac{3}{7}} = 12 \times 7 = 84$ minutes

Remaining part = $1 - \frac{3}{7} = \frac{4}{7}$ Part

$\therefore \frac{4}{7}$ th Part will be filled = $84 \times \frac{4}{7} = 12 \times 4 = 48$ minutes

22. Three taps A, B and C can fill a tank in 50, 60 and 75 hours respectively. How long (in hours) would the three taps take to the tank if all of them are opened together?

- (a) 12 hours (b) 15 hours
 (c) 20 hours (d) 10 hours

SSC MTS 11-10-2017 (Shift-I)

Ans : (c) Part filled by tap A in 1 hour = $\frac{1}{50}$

Part filled by tap B in 1 hour = $\frac{1}{60}$

Part filled by tap C in 1 hour = $\frac{1}{75}$

Let time taken by Tap A, Tap B & Tap C = x hours

Part filled by tap (A + B + C) in hour = $\frac{1}{x}$

According to the Question,

$$\frac{1}{x} = \frac{1}{50} + \frac{1}{60} + \frac{1}{75}$$

$$\frac{1}{x} = \frac{6+5+4}{300}$$

$$\frac{1}{x} = \frac{15}{300}$$

$$\frac{1}{x} = \frac{1}{20}$$

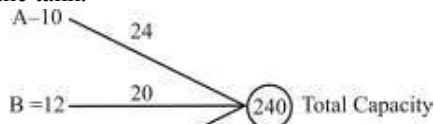
$$\boxed{x = 20}$$

Total time taken by three taps to fill tank = 20 hours

23. Pipe A can fill a tank in 10 hours. Pipe B can fill the same tank in 12 hours. Pipe C can empty the full tank in 16 hours. All the pipes are opened at 8:00 A.M. and Pipe A and B are closed at 10:00 A.M. After how much time from starting will the tank be empty?
- (a) 5 hours 52 minutes (b) 5 hours 24 minutes
(c) 4 hours 30 minutes (d) 4 hours 8 minutes

SSC MTS 19/08/2019 (Shift-I)

Ans. (a): ∵ Pipe A and B fill the tank but pipe C empty the tank.



∴ Part filled by (A + B - C) in 1 hour
 $= 24 + 20 - 15$
 $= 44 - 15$
 $= 29$ unit

∴ Part filled by (A + B) in 2 hours
 $= 29 \times 2$
 $= 58$ unit.

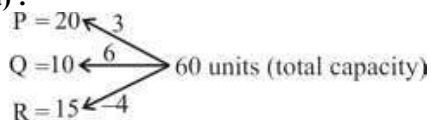
C can empty the tank $= \frac{58}{15}$
 $= 3$ hours 52 minutes

Hence, time taken to empty the tank in 2 hour + 3 hours 52 minutes
 $= 5$ hours 52 minutes

24. Two pipes P and Q can fill an empty tank in 20 min and 10 min respectively. R can empty a full tank in 15 minutes. If all three pipes are opened together, how much time (in minutes) will they take to fill the tank?
- (a) 12 minute (b) 18 minute
(c) 10 minute (d) 15 minute

SSC MTS 14/08/2019 (Shift-III)

Ans. (a) :



Time taken to fill the tank when all three pipes opened together

$$= \frac{60}{(3+6-4)}$$

$$\frac{60}{5} = 12 \text{ minutes}$$

25. Tap K can fill a tank in 8 hours and tap L can fill the same tank in 20 hours. In how many hours both tap K and L together can fill the same tank?
- (a) 20/3 hours (b) 60/11 hours
(c) 18/5 hours (d) 40/7 hours

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d): Tap K can fill a tank in = 8 hours, Tap L can fill the same tank in = 20 hours

Time taken by both tap K and L together fill the same

$$\text{tank} = \frac{x \times y}{x + y}$$

$$= \left(\frac{8 \times 20}{8 + 20} \right) \text{ hours}$$

$$= \frac{8 \times 20}{28}$$

$$= \frac{40}{7} \text{ hours}$$

26. Pipe C can fill a tank in 12 hours and pipe D can fill the same tank in 40 hours. In how many hours both pipe C and D together can fill the same tank?

- (a) $\frac{60}{7}$ hours (b) $\frac{60}{11}$ hours
(c) $\frac{120}{13}$ hours (d) $\frac{120}{11}$ hours

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : Both Pipe fill the tank $= \frac{C \times D}{C + D}$
 $= \frac{12 \times 40}{12 + 40} = \frac{120}{13}$ hours

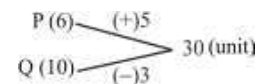
(II) When one tap performs the role of filling while the other one performs the role of emptying

27. The tap P can fill a cistern in 6 hours and tap Q can empty the full cistern in 10 hours. If both taps P and Q are kept open simultaneously, then in how many hours will the empty cistern be completely full?

- (a) 15 h (b) 18 h
(c) 16 h (d) 12 h

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) :



The tank filled by both the taps in 1 hour = 2 unit

Time taken to fill the whole tank $= \frac{30}{2} = 15$ hours

28. A pump can fill a tank with water in 1 hour. Because of a leak, it took $1\frac{1}{3}$ hours to fill the tank. In how many hours can the leak alone drain all the water of the tank when it is full?
- (a) 5 hours (b) 2 hours
(c) 4 hours (d) 1 hour

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Let all water will drain, due to leak in 'T' hours

According to the question,

$$\frac{1}{1} - \frac{1}{T} = \frac{1}{(4/3)}$$

$$\frac{1}{T} = 1 - \frac{3}{4}$$

$$\frac{1}{T} = \frac{1}{4}$$

$$T = 4 \text{ hours}$$

29. Two pipes A and B can fill a cistern in $12\frac{1}{2}$ hours and 25 hours, respectively. The pipes are opened simultaneously and it is found that due to a leakage in the bottom, it took 1 hour 40 minutes more to fill the cistern. When the cistern is full, in how much time will the leak empty the cistern?

- (a) 42 hours (b) 48 hours
(c) 50 hours (d) 45 hours

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (c) : Let, Cistern will be empty in 'T' hours

According to the question,

$$\frac{1}{(25/2)} + \frac{1}{25} - \frac{1}{T} = \frac{1}{(25/3) + (5/3)}$$

$$\frac{3}{25} - \frac{1}{T} = \frac{1}{10} \quad \therefore (A+B), \text{ fill the tank in } 25/3 \text{ hours}$$

$$\frac{1}{T} = \frac{3}{25} - \frac{1}{10}$$

$$\frac{1}{T} = \frac{6-5}{50}$$

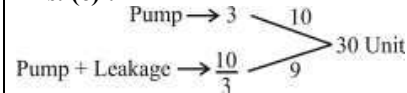
$$\frac{1}{T} = \frac{1}{50}$$

$$T = 50 \text{ hours}$$

30. A pump can fill a tank with water in 3 hours. Because of a leak, it took $3\frac{1}{3}$ hours to fill the tank. In how many hours can the leak alone drain all the water of the tank when it is full?
- (a) 21 hours (b) 15 hours
(c) 30 hours (d) 10 hours

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (c) :



Efficiency of leakage = $10 - 9 = 1$ Unit/hours

$$\therefore \text{Time taken to empty the tank} = \frac{30}{1}$$

$$= 30 \text{ hours}$$

31. Pipes A, B and C can fill an empty tank in $\frac{30}{7}$ hours, if all the three pipes are opened simultaneously. A and B are filling pipes and C is an emptying pipe. Pipe A can fill the tank in 15 hours and pipe C can empty it in 12 hours. In how long (in hours) can pipe B alone fill the empty tank?

- (a) 3 hours (b) 4 hours
(c) 5 hours (d) 6 hours

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) : When pipe A, B and C are opened together

it take $\frac{30}{7}$ hours to fill the tank.

$\frac{7}{30}$ Part filled in 1 hour

According to the question,

Pipe A and B are filling pipe

and C is an emptying pipe

Pipe A will take, to fill tank = 15 hours

Pipe C will take, to empty tank = 12 hours

$$\frac{1}{15} + B - \frac{1}{12} = \frac{7}{30}$$

$$B = \frac{7}{30} - \frac{1}{15} + \frac{1}{12} = \frac{14-4+5}{60} = \frac{1}{4}$$

\therefore Part filled by B in 1 hour = $1/4$

Time taken by B to fill the empty tank = $B =$

$$\frac{1}{\frac{1}{4}} = 4 \text{ hours}$$

32. When operated separately, pipe A takes 5 hours less than pipe B to fill a cistern, and when operated together, the cistern gets filled in 6 hours. In how much time (in hours) will pipe A fill the cistern, if operated separately?

- (a) 15 hours (b) 9 hours
(c) 18 hours (d) 10 hours

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (d): Let time taken by Pipe A to fill tank = x hour

\therefore ATQ,

$$\frac{1}{x} + \frac{1}{(x+5)} = \frac{1}{6}$$

$$\frac{2x+5}{x^2+5x} = \frac{1}{6}$$

$$12x+30 = x^2+5x$$

$$x^2 - 10x + 3x - 30 = 0$$

$$x(x-10)+3(x-10)=0$$

$$(x-10)(x+3)=0$$

$$\therefore x = -3 \text{ (Invalid)}$$

$$\text{Then } x = 10 \text{ (Valid)}$$

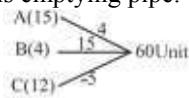
$$\therefore \text{ Pipe A will fill the tank in } = 10 \text{ hours}$$

33. Two pipes can fill a tank in 15 hours and 4 hours, respectively, while a third pipe can empty it in 12 hours. How long (in hours) will it take to fill the empty tank if all the three pipes are opened simultaneously?

- (a) $\frac{50}{7}$ hours (b) $\frac{15}{7}$ hours
 (c) $\frac{30}{7}$ hours (d) $\frac{20}{7}$ hours

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c): Hence, Pipe A and B are filling Pipe and Pipe C is emptying pipe.



$$\text{Time taken to fill the tank} = \frac{60}{4+15-5} = \frac{60}{14} = \frac{30}{7}$$

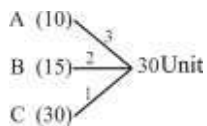
$$\therefore \text{ Hence, time} = \frac{30}{7} \text{ hours}$$

34. Pipes A, B and C can fill a tank in 10, 15 and 30 hours, respectively. D is an emptying pipe which alone can empty the full tank in x hours. A, B and C are opened together for 3 hours and then closed. Now D is opened which alone empties the tank in 30 hours. What is the value of x?

- (a) 45 hours (b) 40 hours
 (c) 60 hours (d) 50 hours

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d)



$$\text{Part filled by (A + B + C) in 3 hour} = 3 \times 6 = 18$$

$$\text{Pipe D will empty 18 Part of the tank} = 30 \text{ hours}$$

$$\text{Time taken by Pipe D to empty 30 part} = \frac{30}{18} \times 30 \text{ hours} \\ = 50 \text{ hours}$$

35. Pipes A and B can fill an empty tank in 6 and 8 hours respectively, while pipe C can empty the full tank in 10 hours. If all three pipes are opened together, then the tank will get filled in:

- (a) $6\frac{1}{5}$ hours (b) $5\frac{5}{23}$ hours
 (c) $7\frac{1}{2}$ hours (d) $4\frac{4}{23}$ hours

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b)

$$\text{Part filled by Pipe A in 1 hour} = \frac{1}{6}$$

$$\text{Part emptied by Pipe B in 1 hour} = \frac{1}{8}$$

$$\text{Part filled by Pipe C in 1 hour} = \frac{1}{10}$$

$$\text{Part filled by Pipes A, B \& C in 1 hour} = \frac{1}{6} + \frac{1}{8} - \frac{1}{10} \\ = \frac{20+15-12}{120} \\ = \frac{23}{120}$$

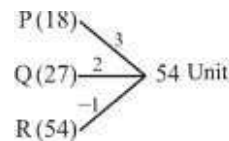
$$\text{Hence, time taken to fill tank} = \frac{120}{23} = 5\frac{5}{23} \text{ hours}$$

36. Pipes P and Q can fill a tank in 18 and 27 minutes, respectively, whereas pipe R can empty the full tank in 54 minutes. P and Q were opened together for 6 minutes and then closed and R was opened. The tank was emptied by R alone in:

- (a) 35 minutes (b) 45 minutes
 (c) 30 minutes (d) 40 minutes

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c)



$$\text{Part filled by Pipes P \& Q in 6 minutes}$$

$$(2+3) \times 6 = 30 \text{ unit}$$

$$\text{Time taken by Pipe R to empty 30 parts}$$

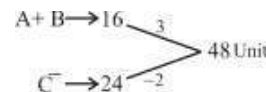
$$\frac{30}{1} = 30 \text{ minutes}$$

37. Pipe A and B together can fill a tank in 16 hours, whereas pipe C alone can empty the full tank in 24 hours. A and B were opened together for 10 hours and then closed. Pipe C was then opened. The tank will now be emptied by C in:

- (a) 12 hours (b) 15 hours
 (c) 18 hours (d) 10 hours

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (b)



$$\text{Part filled by pipes A \& B in 10 hours} = 3 \times 10 = 30 \text{ Unit}$$

$$\text{Time taken by pipe C to empty the tank} = \frac{30}{2} = 15 \text{ hours}$$

38. Taps A and B can fill a tank in 15 minutes and 10 minutes, respectively while tap C can empty the full tank in x minutes. If all the three taps are opened together, the tank is filled completely in 8 minutes. Tap C alone will empty $\frac{3}{8}$ th part of the tank in:

- (a) $10\frac{1}{2}$ minutes (b) 10 minutes
(c) $8\frac{1}{2}$ minutes (d) 9 minutes

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) According to the question,
Let, the time taken by C to empty the tank is x minute
When all three taps opened together,

$$\frac{8}{15} + \frac{8}{10} - \frac{8}{x} = 1, \quad \frac{8}{15} + \frac{8}{10} - 1 = \frac{8}{x}$$

$$\frac{16 + 24 - 30}{30} = \frac{8}{x}$$

$$x = 24 \text{ minutes}$$

∴ Time taken to empty $\frac{3}{8}$ Part = $24 \times \frac{3}{8} = 9$ minutes

39. Pipes A and B can empty a tank in 6 hours and 16 hours, respectively. C is a filling pipe. All the three pipes were opened together. They took 80 minutes to empty $\frac{5}{18}$ th of the tank. Pipe C alone can fill the tank in:

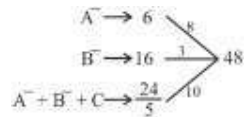
- (a) 48 hours (b) 36 hours
(c) 42 hours (d) 40 hours

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) When all three pipe are opened,
Time taken to empty the tank

$$= 80 \times \frac{18}{5} = 288 \text{ min}$$

$$= 288 \times \frac{1}{60} = \frac{24}{5} \text{ h} \quad (\because 1 \text{ min} = 1/60 \text{ h})$$



Efficiency of C = (8 + 3) – 10 = 1

Pipe C will fill the Tank = $\frac{48}{1} = 48$ hours

40. An inlet pipe can fill a tank in 10 hours and an outlet pipe can empty the completely filled tank in 20 hours. Both the pipes are opened at 6:30 am. when will the tank get filled?

- (a) 1 a.m. next day (b) 2 a.m. next day
(c) 12:00 midnight (d) 2:30 a.m. next day

SSC CHSL (Tier-I) 11/07/2019 (Shift-II)

Ans. (d) : Part filled by inlet pipe in 1 hour = $\frac{1}{10}$ Part

Emptied part by outlet pipe in 1 hour = $\frac{1}{20}$ Part

$$\begin{aligned} \text{Part filled by both pipes in 1 hour} &= \frac{1}{10} - \frac{1}{20} \\ &= \frac{1}{20} \text{ Part} \end{aligned}$$

$$\text{Time taken to fill the tank} = \frac{1}{\frac{1}{20}} = 20 \text{ hours}$$

$$6 : 30 \text{ am} + 20 \text{ hours} = 2 : 30 \text{ am}$$

Next day at 2 : 30 am.

41. Pipe A and B can empty a full tank in 20 and 15 hours respectively wherever C can full the tank alone in x hours. Three pipes are open together at the same time and to empty $(\frac{1}{18})$ th part of the tank it taken 40 min. What is the value of x.

- (a) 21 hours (b) 30 hours
(c) 26 hours (d) 24 hours

SSC MTS 21/08/2019 (Shift-III)

Ans. (b) : Time taken to empty $\frac{1}{18}$ part by all three

Pipes = 40 minutes

∴ Time taken to empty tank

$$= 40 \times 18 \text{ min}$$

$$= 720 \text{ min}$$

$$= \frac{720}{60} \text{ hr}$$

$$= 12 \text{ hr}$$

ATQ,

$$\frac{1}{x} = \frac{1}{20} + \frac{1}{15} - \frac{1}{12}$$

$$\frac{1}{x} = \frac{3+4-5}{60}$$

$$\frac{1}{x} = \frac{2}{60} \Rightarrow x = 30 \text{ hours}$$

42. One inlet pipe can fill the tank in 2 hours and outlet pipe can empty a tank in 3 hours. if the inlet and outlet pipe are opened together at the same time, then in how many hours an empty tank is filled?

- (a) 2 h (b) $\frac{3}{2}$ h
(c) 3 h (d) 6 h

SSC MTS 20/08/2019 (Shift-III)

Ans. (d): According to the question,

$$\text{Part filled by inlet and outlet pipe in 1 hour} = \frac{1}{2} - \frac{1}{3}$$

$$= \frac{3-2}{6} = \frac{1}{6} \text{ Part}$$

∴ Time taken to fill an empty tank = 6 hours

43. A pipe can fill a tank in 56 hours. Due to leak at the bottom of tank it takes 16 hours more to fill the tank completely. In what time only leak can empty the $83\frac{1}{3}\%$ part of tank?
- (a) 126 hours (b) 210 hours
(c) 252 hours (d) 105 hours

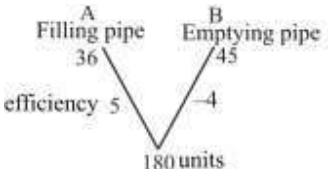
SSC MTS 20/08/2019 (Shift-I)

Ans. (b) : Let, capacity of tank is 56 litre.
Pipe fill 1 litre in 1 hour
It takes 16 hours more to fill = $56 + 16 = 72$ hours
 $83\frac{1}{3}\%$ Part of tank \Rightarrow
 $56 \times \frac{250}{3 \times 100} = \frac{140}{3}$ litres
Tank will be empty due to leakage
16 Litre = 72 hours
 $\therefore \frac{140}{3}$ litres, Time taken to empty tank
 $\frac{72}{16} \times \frac{140}{3} = 210$ hours

44. Pipe A can fill a tank in 36 minutes and Pipe B can empty the same tank in 45 minutes. If both Pipes are opened simultaneously, then time (in hours) taken to fill half the capacity of tank is:
- (a) 2 hours (b) 1.5 hours
(c) 1.25 hours (d) 1.75 hours

SSC MTS 13/08/2019 (Shift-I)

Ans. (b) :



Half capacity of tank = $180 \times \frac{1}{2} = 90$ units
 \therefore Pipes A and B fill in 1 hour = $(5 - 4)$ Unit = 1 Unit
 \therefore Time taken to fill half of the tank = $\frac{90}{60} = 1.5$ hours

45. Pipe A can fill a tank in 6 hours. Pipe B can fill the same tank in 8 hours. Pipe A, B and C together can fill the same tank in 12 hours. Then which of the following statements is true for pipe C?
- (a) It can fill the tank in 4 hours 40 minutes
(b) It can fill the tank in 4 hours 48 minutes
(c) It can empty the tank in 4 hours 48 minutes
(d) It can empty the tank in 4 hours 40 minutes

SSC MTS 02/08/2019 (Shift-I)

Ans. (c) : Part of tank filled by (A + B + C) in 1 hour

$$A + B + C = \frac{1}{12}$$

$$\frac{1}{6} + \frac{1}{8} + C = \frac{1}{12}$$

$$C = \frac{1}{12} - \frac{1}{6} - \frac{1}{8}$$

$$C = \frac{2 - 4 - 3}{24}$$

$$C = \frac{2 - 7}{24}$$

$$C = \frac{-5}{24} \text{ Part}$$

\therefore Pipe C is outlet pipe
then, time taken to empty the tank
 $= \frac{24}{5} = 4\frac{4}{5}$ hrs = 4 hrs + $\frac{4}{5} \times 60$
 $= 4$ hrs 48 min.

46. Pipe V_1 can fill an empty tank in 8 hours. Pipe V_2 can fill the same tank in 16 hours. Pipe V_3 can empty the same completely filled tank in 12 hours. If three pipes are opened simultaneously, then in how much time will the tank get completely filled?
- (a) $\frac{41}{3}$ hours (b) $\frac{42}{11}$ hours
(c) $\frac{38}{5}$ hours (d) $\frac{48}{5}$ hours

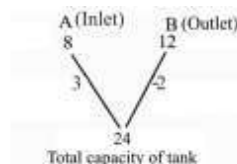
SSC MTS 08/08/2019 (Shift-II)

Ans. (d) : Part filled by all the three pipes
 $= \frac{1}{8} + \frac{1}{16} - \frac{1}{12}$
Time taken to fill tank in 1 hour = $\frac{6 + 3 - 4}{48}$
 $= \frac{9 - 4}{48} \Rightarrow \frac{5}{48}$ Part
Hence, time taken by V_1 , V_2 and V_3 to completely filled the tank = $\frac{48}{5}$ hours.

47. An inlet pipe takes 8 hours to fill a tank. An outlet pipe takes 12 hours to empty it. If both pipes are opened simultaneously, in how many hours will the tank be filled?
- (a) 36 hours (b) 8 hours
(c) 24 hours (d) 12 hours

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (c) : Let A is the inlet pipe and B is the outlet pipe.



Part of tank filled by A and B in 1 hour

$$3 - 2 = 1 \text{ unit}$$

∴ Time taken to fill 1 unit part = 1 hour

Time taken to fill 24 unit part = 24 hours

or

Pipe A will fill tank in 8 hours and pipe B will empty the tank in 12 hours

According to the question,

Part filled by Pipes A & B in 1 hour

$$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$$

Hence, tank will be filled in 24 hours.

48. Pipes A and B can fill a tank in 30 minutes and $37\frac{1}{2}$ minutes, respectively. C is an outlet pipe.

When all the three pipes are opened together, the tank is full in 25 minutes. In how much time (in minutes) can C alone empty $\frac{2}{5}$ th part of the tank?

- (a) 30 minutes (b) 20 minutes
(c) 24 minutes (d) 25 minutes

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (b): Part of tank filled by A, B and C in 1 minute.

$$A + B + C = \frac{1}{25} \text{ (Where C is emptying pipe)}$$

$$\frac{1}{30} + \frac{2}{75} + C = \frac{1}{25}$$

$$C = \frac{1}{25} - \left(\frac{1}{30} + \frac{2}{75} \right) = \frac{-1}{50}$$

∴ C alone can empty the tank in 50 minutes

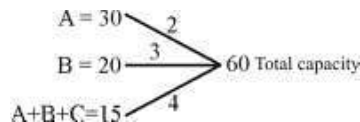
Then time taken to empty $\frac{2}{5}$ Part by C = $50 \times \frac{2}{5} = 20$ minutes

49. Pipes A and B can fill a tank in 30 and 20 minutes respectively. There is also an emptying pipe C attached to the tank. If all the three pipes are opened together, the tank is filled in 15 minutes. If the tank is one-third empty, then C alone will empty the tank completely in

- (a) 20 minutes (b) 30 minutes
(c) 40 minutes (d) 60 minutes

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (c) :



∴ Efficiency of (A + B + C) in 1 minute = 4

$2 + 3 + C = 4 \Rightarrow C = -1$ (Where negative sign indicates emptying the tank)

∴ Work efficiency of C = 1 Unit

Then, C will empty $\frac{2}{3}$ of the tank

$$= \frac{60 \times \frac{2}{3}}{1} = 40 \text{ min}$$

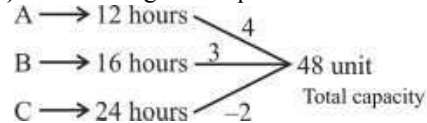
(III) When in between the tap is opened or closed

50. Pipes A and B can fill a tank in 12 hours respectively and pipe C can empty the full tank in 24 hours. All three pipes are opened together, but after 4 hours pipe B is closed. In how many hours, the empty tank will be completely filled ?

- (a) 18 (b) 32
(c) 28 (d) 14

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (a) : According to the question :-



Part of tank filled by (A+B-C) in 4 hours = $(4+3-2) \times 4 = 20$ unit

After 4 hours pipe B is closed,

time taken to fill remaining part by (A-C)

$$= \frac{48-20}{(4-2)} = \frac{28}{2} = 14$$

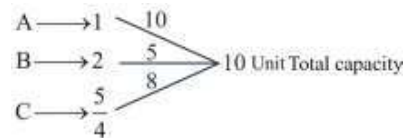
∴ Hence total time = $4 + 14 = 18$ hours

51. Pipes A and B can fill a tank in one hour and two hours respectively while pipe C can empty the filled up tank in one hour and fifteen minutes. A and C are turned on together at 9 am After 2 hours, only A is closed and B is turned on. When will the tank be emptied?

- (a) 10:30 am (b) 12:20 pm
(c) 11:30 am (d) 12:10 pm

SSC CGL (TIER-I)-2018 - 06.06.2019 (Shift-I)

Ans. (b) : According to the question :-



Part of tank filled by (A-C) in 2 hours

$$= (10 \times 2) - (8 \times 2) = 4 \text{ Unit}$$

When A is closed, and then B is opened

Part emptied in 1 hour = $8 - 5 = 3$ unit.

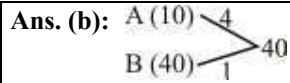
$$\therefore \text{Time taken to empty 4 unit} = \frac{1}{3} \times 4 \times 60 = 80 \text{ minutes}$$

∴ Tank will be empty at 12 : 20 PM.

52. Pipes A and B can fill a tank in 10 hours and 40 hours, respectively. C is an outlet pipe attached to the tank. If all the three pipes are opened simultaneously, it takes 80 minutes more time than A and B together take to fill the tank. A and B are kept opened for 7 hours and then closed and C was opened. C will now empty the tank in:

- (a) 42 hours (b) 49 hours
 (c) 45.5 hours (d) 38.5 hours

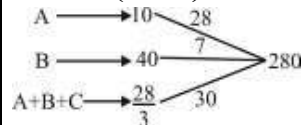
SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)



Time taken by pipes A and B to fill the tank = $\frac{40}{5} = 8$ hr

Pipes A and B fill the tank in 8 hours. If pipe C is opened together with pipes A and B then, tank will be

filled in $\left(8 + \frac{80}{60}\right) = \frac{28}{3}$ hours



∴ Efficiency of C = -5

Note – Here (-) sign shows it is outlet pipe

Part filled by pipes A and B in 7 hours = 35×7

Time taken by pipe C to empty the tank

$$= \frac{35 \times 7}{5} = 49 \text{ hours}$$

53. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, whereas pipe C can empty the full tank in 40 hours. All three pipes are opened together, but pipe C is closed after 10 hours. After how many hours will the remaining part of the tank be filled?

- (a) $5\frac{1}{2}$ hours (b) 2 hours
 (c) $2\frac{1}{2}$ hours (d) 5 hours

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Part filled by pipes A, B & C in 1 hour

$$= \frac{1}{16} + \frac{1}{24} - \frac{1}{40}$$

$$= \frac{5}{48} - \frac{1}{40}$$

$$= \frac{25-6}{240}$$

$$= \frac{19}{240}$$

Part filled by pipes A, B & C in 10 hours = $\frac{190}{240}$

$$= \frac{19}{24}$$

Remaining Part = $1 - \frac{19}{24} = \frac{5}{24}$ Part

Part filled by pipes A & B in 1 hour = $\frac{1}{16} + \frac{1}{24} = \frac{5}{48}$

∴ Time taken by pipes (A + B) to fill $\frac{5}{24}$ th part

$$= \frac{5}{24} \times \frac{48}{5} = 2 \text{ hours}$$

54. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, whereas pipe C can empty the full tank in 40 hours. All three pipes are opened together, but pipe A is closed after 10 hours. After how many hours will the remaining part of the tank be filled?

- (a) 10 hours (b) 20 hours
 (c) $15\frac{1}{2}$ hours (d) $12\frac{1}{2}$ hours

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : Part filled by pipes A, B and C in 10 hours

$$= 10 \left(\frac{1}{16} + \frac{1}{24} - \frac{1}{40} \right)$$

$$= 10 \left(\frac{15+10-6}{240} \right)$$

$$= 10 \times \frac{19}{240}$$

$$= \frac{19}{24} \text{ part}$$

$$\text{Remaining Part} = 1 - \frac{19}{24} = \frac{5}{24}$$

$$\text{Part filled by pipes B \& C in 1 hour} = \left(\frac{1}{24} - \frac{1}{40} \right)$$

$$= \frac{5-3}{120}$$

$$= \frac{2}{120} = \frac{1}{60}$$

$$\therefore \text{Time taken by B \& C to fill } \frac{5}{24} \text{ th Part} = 60 \times \frac{5}{24} = \frac{25}{2}$$

$$= 12\frac{1}{2} \text{ hours}$$

55. Pipes A, B, C together can fill a cistern in 12 hours. All the three pipes are opened together for 4 hours and then C is closed. A and B together take 10 hours to fill the remaining part of the cistern. C alone will fill two-thirds of the cistern in:

- (a) 50 hours (b) 48 hours
 (c) 40 hours (d) 60 hours

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c)

$$\text{Part filled by pipes A, B \& C} = \frac{4}{12} = \frac{1}{3}$$

$$\text{Remaining part} = 1 - \frac{1}{3} = \frac{2}{3}$$

$$\frac{2}{3} \text{ part filled by pipe A \& B} = 10 \text{ hours}$$

$$\text{A \& B fill the tank} = \frac{10 \times 3}{2} = 15 \text{ hours}$$

Hence, pipe C will fill in 1 hour $= \frac{1}{12} - \frac{1}{15} = \frac{1}{60}$

Pipe C filled the whole tank in 60 hours

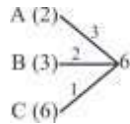
Hence, $\frac{2}{3}$ part filled in $= \frac{60 \times 2}{3} = 40$ hours

56. Three pipes, A, B, C can fill an empty cistern in 2, 3 and 6 hours respectively. They are opened together. After what time should B be closed, so that the cistern gets filled in exactly 1 hr 15 min?

- (a) 15 minutes (b) 20 minutes
(c) 45 minutes (d) 30 minutes

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d)



Part filled by pipes A & C in 1 hour 15 minutes
 $= (3 + 1) \times 1.25 = 5$ part

Remaining $= 6 - 5 = 1$ part

Pipe B will fill 1 Part in $= \frac{1}{2} = 0.5$ hour

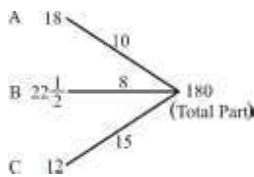
Hence, pipe B should be closed after 30 minute so that cistern will be filled in 1 hour 15 minutes.

57. Pipes A and B can fill a tank in 18 minutes and $22\frac{1}{2}$ minutes, respectively while pipe C can empty the full tank in 12 minutes. A and B are opened together for 6 minutes and then closed. Now C is opened. C alone will empty the tank in _____.

- (a) 5 minutes (b) $8\frac{2}{5}$ minutes
(c) $7\frac{1}{5}$ minutes (d) 6 minutes

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c)



Part filled by pipes A & B in 6 minutes $= (10 + 8) \times 6 = 108$ Part

Now, pipe C will empty 108 parts in $= \frac{108}{15} = \frac{36}{5}$

$= 7\frac{1}{5}$ minutes

58. Pipes A and B can fill a tank in 36 hours and 48 hours, respectively. Both pipes are opened together for 9 hours and then A is closed. Pipe B alone will fill the remaining part of the tank now in:

- (a) $20\frac{1}{2}$ hours (b) 24 hours
(c) 27 hours (d) 25 hours

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) Pipes A & B fill in 9 hours

$$= \frac{9}{36} + \frac{9}{48}$$

$$= \frac{1}{4} + \frac{3}{16}$$

$$= \frac{7}{16}$$

Remaining part $= 1 - \frac{7}{16} = \frac{9}{16}$

$\frac{9}{16}$ part filled by B $= 48 \times \frac{9}{16} = 27$ hours

(IV) When the Taps are opened alternatively

59. An inlet pipe A originating from a river can fill a reservoir in 30 days. And an outlet pipe B, which is capable of emptying the completely filled reservoir in 50 days and drains out the water from the reservoir to an irrigation canal. The pipes are opened on alternate days starting with A. On which days from the beginning will the reservoir get completely filled for the first time?

- (a) 75th (b) 147th
(c) 150th (d) 74th

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) : Part filled by pipe A in 1 day $= \frac{1}{30}$

Part emptied by pipe B in 1 day $= \frac{1}{50}$

Part filled by both pipes A & B in 2 days $= \frac{1}{30} - \frac{1}{50}$

$$= \frac{2}{150} = \frac{1}{75}$$

Part filled in $73 \times 2 = 146$ days $= \frac{73}{75}$

Remaining Part $= 1 - \frac{73}{75} = \frac{2}{75}$

Pipe A will fill $\frac{2}{75}$ Part in 1 day.

Hence, number of days $= 146 + 1 = 147$ days.

\Rightarrow Reservoir is completely filled in 147th days.

(V) Miscellaneous

60. In 6 minutes, $\frac{4}{13}$ of a bucket is filled. How much time will it take to fill the remaining bucket?

- (a) 13 minutes 30 seconds
(b) 14 minutes 30 seconds
(c) 11 minutes 30 seconds
(d) 12 minutes 30 seconds

SSC CGL (Tier-II) 29/01/2022

Ans : (a) $\frac{4}{13}$ parts filled in = 6 minutes

1 part filled in = $\frac{6 \times 13}{4}$ minutes

Remaining part = $1 - \frac{4}{13} = \frac{9}{13}$ part

$\frac{9}{13}$ parts filled in = $\frac{6 \times 13}{4} \times \frac{9}{13}$ minutes

= $\frac{54}{4}$ minutes

= 13 minutes 30 seconds.

61. Three pipes, A, B and C, can fill a cistern in 12, 18 and 24 minutes, respectively. If all the pipes are opened together for 7 minutes, what will be the volume of the water that overflows as the percentage of the total volume of the cistern?

- (a) $23\frac{2}{3}\%$ (b) $23\frac{1}{3}\%$
 (c) $26\frac{7}{18}\%$ (d) $26\frac{5}{18}\%$

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (c) Part filled by pipes A, B & C in 7 minutes

$$= \frac{7}{12} + \frac{7}{18} + \frac{7}{24}$$

$$= \frac{42 + 28 + 21}{72} = \frac{91}{72} \text{ Part}$$

Overflowed = $\frac{91}{72} - 1 = \frac{19}{72}$ Part

$$\text{Required percentage} = \frac{19}{72} \times 100$$

$$= 26\frac{7}{18}\%$$

62. Pipes A and B are filling pipes while pipe C is an emptying pipe. A and B can fill a tank in 72 and 90 minutes respectively. When all the three pipes are opened together, the tank gets filled in 2 hours. A and B are opened together for 12 minutes, then closed and C is opened. The tank will be empty after :

- (a) 12 minutes (b) 15 minutes
 (c) 18 minutes (d) 16 minutes

SSC CGL (Tier-II) 13-09-2019

Ans. (c) : Let Pipe C can empty the tank in x hours

According to the question :-

$$\frac{1}{72} + \frac{1}{90} - \frac{1}{x} = \frac{1}{120} \quad (\because 2 \text{ hours} = 120 \text{ minutes})$$

$$\frac{1}{72} + \frac{1}{90} - \frac{1}{120} = \frac{1}{x}$$

$$\frac{5+4-3}{360} = \frac{1}{x}$$

$$x = 60 \text{ minutes}$$

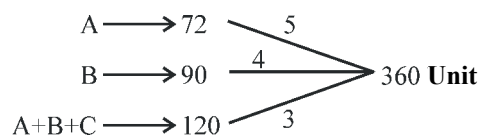
Part filled by pipes A & B in 12 minutes = $\frac{12}{72} + \frac{12}{90}$

$$= \frac{1}{6} + \frac{2}{15}$$

$$= \frac{5+4}{30} = \frac{3}{10}$$

Time taken to empty $\frac{3}{10}$ part by Pipe C = $\frac{3}{10} \div \frac{1}{60}$
 = 18 minutes

OR



Efficiency of C = -6

Part filled by pipes A & B = $9 \times 12 = 108$ Unit

Time taken to empty by pipe C = $\frac{108}{6} = 18$ minutes

63. Pipes A and B can fill a tank in 16 hours and 24 hours, respectively, and pipe C alone can empty the full tank in x hours. All the pipes were opened together at 10:30 a.m., but C was closed at 2:30 p.m. If the tank was full at 8:30 p.m. on the same day, then what is the value of x ?

- (a) 48 hours
 (b) 96 hours
 (c) 45 hours
 (d) 64 hours

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : ∵ Pipe A and B can fill a tank in 16 hrs and 24 hrs respectively. and Pipe C alone can empty the full tank in x hrs.

Pipe A and Pipe B work for = 10 : 30 AM to 8 : 30 PM = 10 hrs

Pipe C work for = 10 : 30 AM to 2 : 30 PM = 4 hrs

According to the question,

$$\frac{10}{16} + \frac{10}{24} - \frac{4}{x} = 1$$

$$\frac{30+20}{48} = 1 + \frac{4}{x}$$

$$\frac{50}{48} = 1 + \frac{4}{x} \Rightarrow \frac{25}{24} - 1 = \frac{4}{x}$$

$$x = 24 \times 4 = 96 \text{ hr}$$

17.

Speed, Time and Distance

(I) Problems based on Speed, Time and Distance

1. With an average speed of 60 km/h, a train reaches its destination on time. If it goes with an average speed of 45 km/h, it is late by 20 minutes. The distance covered by the train is

- (a) 30 km (b) 40 km
(c) 50 km (d) 60 km

SSC CHSL 03/06/2022 (Shift- II)

Ans. (d) : Let the distance covered by the train = x km
According to the question,

$$\frac{x}{45} - \frac{x}{60} = \frac{20}{60}$$

$$\frac{4x - 3x}{180} = \frac{1}{3}$$

$$\frac{x}{180} = \frac{1}{3}$$

$$x = 60 \text{ km}$$

2. Ram is travelling at a speed of 72 km per hour while Shyam is travelling at a speed of 90 km per hour. what is the difference in their speeds (in metres per second)?

- (a) 5 (b) 4
(c) 6 (d) 7

SSC CHSL 26/05/2022 (Shift- III)

Ans. (a) : According to the question,
Speed of Shyam (in m/s) – Speed of Ram (in m/s)

$$90 \times \frac{5}{18} - 72 \times \frac{5}{18} \Rightarrow 25 - 20 \Rightarrow \boxed{5 \text{ m/s}}$$

3. Two trains are running on parallel tracks in the same direction at the speed of 80 km/h, and 90 km/h respectively. The trains crossed each other in 3 minutes. If the length of one train is 230 m, then what is the length (in m) of the other train

- (a) 270 (b) 250
(c) 230 (d) 300

Ans : (a) Let 1st train length is x m.

$$D = S \times T$$

$$D = (90 - 80) \times 3 \times 60 \times \frac{5}{18}$$

$$D = \frac{10 \times 180 \times 5}{18}$$

$$D = 500$$

$$500 = 230 + x$$

$$x = 500 - 230$$

$$x = 270 \text{ m.}$$

4. A person travels 5x distance at a speed of 5 km/h, x distance at a speed of 5 km/h, and 4x distance at a speed of 6 km/h, and takes a total of 112 minutes. What is the total distance (in km) travelled by the person?

- (a) 8 (b) 10
(c) 9 (d) 12

SSC CGL (Tier-I) 13/04/2022 (Shift-III)

Ans : (b) Total time = $\frac{D_1}{V_1} + \frac{D_2}{V_2} + \frac{D_3}{V_3}$

$$= \frac{5x}{5} + \frac{x}{5} + \frac{4x}{6} = x + \frac{x}{5} + \frac{2x}{3}$$

$$\frac{112}{60} = \frac{28x}{15} \Rightarrow x = 1 \text{ km}$$

$$\therefore \text{Total distance} = 5x + x + 4x = 10x = 10 \text{ km}$$

5. A journey of 900 km is completed in 11 h. If two -fifth of the journey is completed at the speed of 60 km/h, at what speed (in km/h) is the remaining journey completed?

- (a) 108 (b) 72
(c) 84 (d) 90

SSC CGL (Tier-I) 12/04/2022 (Shift-III)

Ans.(a) From question,

900 km journey completed in 11 hours

$$\frac{2}{5} \text{ of the journey} = \frac{2}{5} \times 900 = 360 \text{ km}$$

$$\text{Time taken to complete 360 km} = \frac{360}{60} = 6 \text{ hours}$$

$$\text{Remaining time} = 11 - 6 = 5 \text{ hours}$$

$$\text{Remaining distance} = 900 - 360 = 540 \text{ km}$$

$$\therefore \text{Required speed} = \frac{540}{5} = 108 \text{ km/h}$$

6. A covered a distance of 240 km at a certain speed. Had his speed been 8 km/h less, then the time taken would have been one hour more for covering the same distance. How much time (in hours) will he take to cover a distance of 480 km at his original speed?

- (a) 9 (b) 11
(c) 10 (d) 8

SSC CGL (Tier-II) 29/01/2022

Ans : (c) Let original speed be x km/h.

$$\therefore D = \frac{S_1 \times S_2}{\Delta S} \times \Delta t$$

$$240 = \frac{x(x-8)}{8} \times 1$$

$$\Rightarrow x(x-8) = 240 \times 8$$

$$\Rightarrow x^2 - 8x - 1920 = 0$$

$$\Rightarrow x^2 - 48x + 40x - 1920 = 0$$

$$\Rightarrow x(x-48) + 40(x-48)$$

$$\Rightarrow (x-48)(x+40)$$

$$\Rightarrow x = 48 \text{ km} \quad [\because x = -40 \text{ km/h can't be possible}]$$

Time taken to cover 480 km at original speed

$$= \frac{480}{48} \text{ hours}$$

$$= 10 \text{ hours.}$$

7. While covering a distance of 51 km, a man noticed that after walking for one hour and 40 minutes, the distance covered by him was $\frac{5}{12}$ of the remaining distance. What was his speed?
- (a) 7 km/h (b) 10 km/h
(c) 8 km/h (d) 9 km/h

SSC MTS 18/10/2021 (Shift-I)

Ans. (d) : Let, man's speed = x km/h

Covered distance in $\frac{5}{3}$ h or 1 hour 40 minute =

$$= \frac{5x}{3} \text{ km}$$

According to the question,

$$\frac{5}{12} \left(51 - \frac{5x}{3} \right) = \frac{5x}{3}$$

$$\frac{153 - 5x}{3} = \frac{5x}{3} \times \frac{12}{5}$$

$$153 - 5x = 12x$$

$$17x = 153$$

$$x = 9$$

Hence, man's speed = 9 km/h

8. A train covers a distance of 275 km in $2\frac{1}{2}$ hours with a uniform speed. The time taken to cover a distance of 440 km with the same speed is:

(a) $4\frac{1}{2}$ hours (b) 6 hours

(c) 5 hours (d) 4 hours

SSC MTS 06/10/2021 (Shift-I)

Ans. (d) :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Given,

$$275 \text{ km.} \rightarrow 2\frac{1}{2} = \frac{5}{2} \text{ hours}$$

$$\text{Speed} = \frac{275}{\frac{5}{2}} = \frac{550}{5} = 110 \text{ km/h}$$

Now, according to the question,

$$\text{When speed are same} = \frac{440}{110} \text{ km} = 4 \text{ hours}$$

Hence time taken to cover a distance of 440 km will be 4 hours.

9. Amit covers a certain distance on his bike at a speed of 40 km/h in 15 min. If he wants to cover the same distance in 12 min, then what should his speed be?

- (a) 60 km/h (b) 50 km/h
(c) 72 km/h (d) 32 km/h

SSC MTS 11/10/2021 (Shift-I)

Ans. (b) : According to the question,

$$\text{Distance covered in 15 minutes} = 40 \times \frac{15}{60} = 10 \text{ km}$$

Speed of Amit covered 10 km distance in 12 minutes

$$= \frac{10}{\frac{12}{60}} = 50 \text{ km/h}$$

10. Dimple is travelling at a speed of 90 km per hour on a highway, while Sachin is travelling at a speed of 108 km per hour. What is the difference between in their speeds, in meters per second?

- (a) 5 (b) 3
(c) 4 (d) 6

SSC CHSL 09/08/2021 (Shift-I)

Ans. (a) : Difference between their speed (in m/s)

$$= (108 - 90) \times \frac{5}{18}$$

$$= 18 \times \frac{5}{18} = 5 \text{ m/s}$$

11. If a car covers a certain distance in 1 hour 24 minutes by covering two-third of the distance at 52 km/h and the rest at 65 km/h, then find the total distance.

- (a) 78 km (b) 163.8 km
(c) 75.8 km (d) 46.8 km

SSC MTS 27/10/2021 (Shift-I)

Ans. (a) : Let total distance = x km

$$\frac{2x}{52} + \frac{x}{65} = 1 + \frac{24}{60}$$

$$\frac{2x}{3 \times 13 \times 4} + \frac{x}{3 \times 13 \times 5} = \frac{7}{5}$$

$$\frac{1}{39} \times \frac{(10x + 4x)}{20} = \frac{7}{5}$$

$$14x = 28 \times 39$$

$$x = 78 \text{ km}$$

12. A and B travel the same distance at speeds of 8 km/h and 12 km/h, respectively. If B takes 30 minutes less than that taken by A, what in the distance (in km) travelled by each one of them?
- (a) 12 (b) 10
(c) 15 (d) 8

SSC MTS 22/10/2021 (Shift-I)

Ans. (a) : Speed of A = 8 km/h
Speed of B = 12 km/h
Let Total distance is d.
According to the question,
$$\frac{d}{8} - \frac{d}{12} = \frac{30}{60}$$
$$\frac{3d - 2d}{24} = \frac{1}{2}$$
$$\therefore d = 12$$

Hence distance travelled by each one of them is 12 km.

13. A car covers a certain distance moving at a constant speed of 50 km/h in 3 hours. How much more time would it have taken to cover the same distance if the speed had been only 40 km/h?
- (a) 30 minutes (b) 45 minutes
(c) 10 minutes (d) 1 hour

SSC MTS 20/10/2021 (Shift-I)

Ans. (b) : Distance = Speed \times Time
= 50 \times 3 = 150 km
Time = $\frac{\text{Distance}}{\text{Speed}}$
= $\frac{150}{40} = 3.75$ h
taken more time = 3.75 - 3.00 = 0.75
= 0.75 \times 60 = 45 minutes

14. A person crosses a 900-metre long street in 6 minutes. The speed of the person in km/h is:
- (a) 9 (b) 10
(c) 15 (d) 12

SSC MTS 12/10/2021 (Shift-I)

Ans. (a) : $t = \frac{6}{60} = \frac{1}{10}$ h.
 $d = \frac{900}{1000} = \frac{9}{10}$ km.
Speed = $\frac{d}{t}$
= $\frac{\frac{9}{10}}{\frac{1}{10}} = \frac{9}{1} = 9$ km

15. A takes 8 hours more than the time taken by B to cover a distance of 160 km. If A doubles his speed, he takes 3 hours more than B to cover the same distance. The speed (in km/h) of B is:
- (a) 72 (b) 70
(c) 75 (d) 80

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (d) : Let speed of A and B are V_1 and V_2 .
Let time taken by B = t hours

$$\therefore V_1(t+8) = V_2 \times t \quad \text{----- (I)}$$

$$2V_1 \times (t+3) = V_2 \times t \quad \text{----- (II)}$$

By equation (I) and (II)

$$\frac{V_1}{V_2} = \frac{t}{t+8} = \frac{t}{2(t+3)}$$

$$\therefore 2(t+3) = (t+8)$$

$$t = 2\text{h}$$

$$\therefore \text{Speed of B} = \frac{160}{2} = 80 \text{ km/h}$$

16. One-fifth of a journey is covered at a speed of 30 km/h, one-fourth of the journey at a speed of 25 km/h and the rest at 60 km/h. What is the average speed (in km/h, correct to one decimal place) for the whole journey?

- (a) 38.7 (b) 30.6
(c) 40.5 (d) 25.4

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) : Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$\frac{1}{5}, \frac{1}{4}$ and 1 (Let total distance = $5 \times 4 \times 1 = 20$ km)

4, 5 and 11 km respectively the distance covered by the speed of 30, 25 and 60 km/h.

According to the question,

$$\begin{aligned} \text{Average speed} &= \frac{20}{\frac{4}{30} + \frac{5}{25} + \frac{11}{60}} \\ &= \frac{20}{\frac{2}{15} + \frac{1}{5} + \frac{11}{60}} = \frac{20}{\frac{8+12+11}{60}} \\ &= \frac{20 \times 60}{31} = 38.70 \text{ km/h} \end{aligned}$$

17. Ashok completes a journey in 7 hours. He travels the first half of the journey at the speed of 24 km/h and the second half of it at the speed of 32 km/h. The total distance of the journey is:

- (a) 190 km (b) 192 km
(c) 194 km (d) 188 km

SSC CHSL 13/04/2021 (Shift-I)

Ans. (b) : Average speed = $\frac{2xy}{x+y}$
= $\frac{2 \times 24 \times 32}{(24+32)}$

$$= \frac{192}{7} \text{ km/h}$$

Hence distance travelled by Ashok in 7 hours

$$= \frac{192}{7} \times 7 = 192 \text{ km}$$

18. A man covers $\frac{5}{12}$ of a total journey by train, $\frac{7}{18}$ of the journey by bus and the remaining 7 km on foot. His total journey (in km) is:
- (a) 35 km (b) 40 km
(c) 32 km (d) 36 km

SSC CHSL 10/08/2021 (Shift-III)

Ans. (d) : Let the total distance be D.

$$\therefore D = \frac{5}{12}D + \frac{7}{18}D + 7$$

$$\Rightarrow D = \frac{29D}{36} + 7$$

$$\Rightarrow \frac{7D}{36} = 7$$

$$\Rightarrow D = 36 \text{ km}$$

\therefore The total distance covered by a man is 36 km.

19. Two persons P and Q are 844 m apart. They both start cycling simultaneously in the same direction with speeds of 12 m/s and 8 m/s, respectively. In how much time will P overtake Q?
- (a) 3 minutes and 18 seconds
(b) 3 minutes and 24 seconds
(c) 3 minutes and 31 seconds
(d) 3 minutes and 20 seconds

SSC CHSL 15/04/2021 (Shift-II)

Ans : (c) Relative speed of two cyclists = $12 - 8 = 4 \text{ m/sec}$

Time after which they will overtake = $844/4 = 211 \text{ sec}$
= 3 min 31 sec

\therefore The time taken by P to overtake Q is 3 min 31 sec.

20. An athlete runs an 800 m race in 96 seconds. His speed (in km/h) is:
- (a) 30 km/h (b) 25 km/h
(c) 40 km/h (d) 20 km/h

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a): Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{800 \text{ m}}{96 \text{ sec}} = \frac{25}{3} \text{ m/sec}$

$$= \frac{25}{3} \times \frac{18}{5}$$

$$\text{Speed} = 30 \text{ km/h}$$

21. A delivery boy started from his office at 10 a.m. to deliver an article. He rode his scooter at a speed of 32 km/h. He delivered the article and waited for 15 minutes to get the payment. After the payment was made, he reached his office at 11.25 a.m., travelling at a speed of 24 km/h. Find the total distance travelled by the boy.
- (a) 32 km (b) 35 km
(c) 40 km (d) 30 km

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Let the distance between the office and delivery place = x km
According to the question,

$$\frac{x}{32} + \frac{1}{4} + \frac{x}{24} = 1 \frac{5}{12} \quad \left[\because \text{Time} = \frac{\text{Distance}}{\text{speed}} \right]$$

$$\frac{x}{32} + \frac{x}{24} = \frac{17}{12} - \frac{1}{4}$$

$$\frac{7x}{96} = \frac{7}{6}$$

$$\boxed{x = 16}$$

Hence, the total distance travelled by the boy = $2x = 2 \times 16 = 32 \text{ km}$

22. A man walks at a speed of 8 km/h. After every kilometre, he takes a rest for 4 minutes. How much time will he take to cover a distance of 6 km?
- (a) 69 minute (b) 60 minute
(c) 65 minute (d) 70 minute

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c): Time taken to cover a distance of 6 km

$$= \frac{6}{8} = \frac{3}{4} \text{ h} = \frac{3}{4} \times 60 = 45 \text{ min}$$

\therefore The man takes a rest for 4 minutes on each km

\therefore Total time = $45 + 4 \times 5 = 45 + 20 = 65 \text{ min}$

23. A man travelled a distance of 42 km in 5 hours. He travelled partly on foot at the rate of 6 km/h and partly on bicycle at the rate of 10 km/h. The distance travelled on foot is:
- (a) 15 km (b) 12 km
(c) 10 km (d) 18 km

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the distance travelled on foot = x km

$$\frac{x}{6} + \frac{42 - x}{10} = 5$$

$$\frac{5x + 126 - 3x}{30} = 5$$

$$2x + 126 = 150$$

$$2x = 24$$

$$x = 12 \text{ km}$$

24. Amit travelled a distance of 50 km in 9 hours. He travelled partly on foot at 5 km/h and partly by bicycle at 10 km/h. The distance travelled on the bicycle is:
- (a) 12 km (b) 13 km
(c) 10 km (d) 11 km

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (c) : Let the distance travelled by Amit by the bicycle is x km,

$$\frac{x}{10} + \frac{50 - x}{5} = 9$$

$$\frac{x + 100 - 2x}{10} = 9$$

$$100 - x = 90$$

$$x = 10 \text{ km}$$

25. A plane flies a distance of 1800 km in 5 hours. What is the average speed in meters/second?
- (a) 200 (b) 10
(c) 20 (d) 100

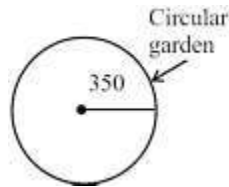
SSC CGL (Tier-II) 21-02-2018

Ans. (d) : Time = 5 hours
 Distance = 1800 km.
 Speed (m/s) = $\frac{1800}{5} \times \frac{5}{18}$
 = $\boxed{100\text{m/s}}$

26. A man is running at the speed of 20 km/hr. What is time (in seconds) taken by man to cover one round of a circular garden of radius 350 metres?
 (a) 412 (b) 336
 (c) 396 (d) 376

SSC CGL (Tier-II) 18-02-2018

Ans. (c) :



Given-

Speed of the man = 20 km/h, $r = 350$ m.
 $= 20 \times \frac{5}{18}$ m/s

Perimeter (P) = $2\pi r$
 $= 2 \times \frac{22}{7} \times 350$

Time = $\frac{2 \times \frac{22}{7} \times 350}{20 \times \frac{5}{18}} = 396$ (Second)

27. A bullet shoots 500m in 0.2 seconds. What is its speed in km/hr ?
 (a) 1000 (b) 900
 (c) 100 (d) 9000

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Speed of bullet = $\frac{500}{0.2} = 2500$ m/sec
 $= 2500 \times \frac{18}{5}$ km/hr
 $= 9000$ km/hr.

28. A car covers 630 km in 20 hours. Calculate its average speed in meters/second ?
 (a) 8.25 (b) 7.75
 (c) 8.75 (d) 7.25

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Average speed = $\frac{630}{20} \times \frac{5}{18} = 8.75$ m/sec

29. A bullet fired from a rifle travels at an average speed of 2520 km/hr. It hits the target after 0.2 seconds. How far (in m) is the target from the rifle ?
 (a) 70 (b) 140
 (c) 100 (d) 200

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :

Distance of target from the rifle = $2520 \times \frac{5}{18} \times 0.2$
 $= 140$ m.

30. A racing car going at an average speed of 108 km/hr takes 15 minutes to complete a lap on a racing track. By how much should it increase its speed (in km/hr) to complete the lap in 12 minutes?
 (a) 24 (b) 21
 (c) 27 (d) 30

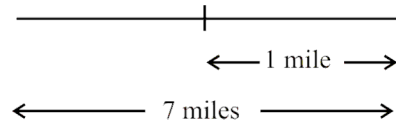
SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Total distance covered = $108 \times \frac{15}{60} = 27$ km
 Required speed to complete 1 lap in 12 minutes
 $= \frac{27}{12} = 27 \times 5 = 135$ km/h
 Increase in speed = $135 - 108 = 27$ km/h

31. B starts 4 minutes after A from the same point, for a place at a distance of 7 miles from the starting point. A on reaching the destination turns back and walks a mile where he meets B. If A's speed is a mile in 8 minutes then B's speed is a mile in _____ minutes.
 (a) 9 (b) 12
 (c) 10 (d) 8

SSC CGL (Tier-II) 17-2-2018

Ans. (c) :



Total distance travelled by A = $7 + 1 = 8$ miles
 Total distance travelled by B = $7 - 1 = 6$ miles
 Let the speed of B = x miles/min

According to the question-

Time taken by A = time taken by B + 4 minutes

$\frac{8}{1} = \frac{6}{x} + 4$ minutes
 $\frac{8}{8} = \frac{6}{x}$

$60 = \frac{6}{x}$

$x = \frac{6}{10}$

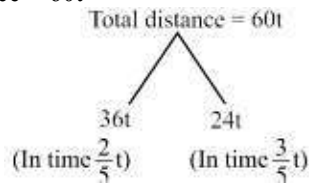
Hence, Time taken by B to walk 1 mile = 10 minutes.

32. Travelling at 60 km/h, a person reaches his destination in a certain time. He covers 60% of his journey in $\frac{2}{5}$ of the time. At what speed (in km/h) should he travel to cover the remaining journey so that he reaches the destination on right time?
 (a) 48 (b) 40
 (c) 42 (d) 36

SSC CGL (Tier-II) 11-9-2019

Ans. (b): Let the person cover a certain distance in t hours.

Total distance = $60t$



$$\therefore \text{Speed} = \frac{24t}{\frac{3}{5}t} = 40 \text{ km/h}$$

33. The ratio between the speeds of two trains is 2:5. If the first train runs 350 km in 5 hours, then the sum of the speeds (in km/h) of both the trains is :

- (a) 265 (b) 245
(c) 180 (d) 350

SSC CHSL 08/07/2019 (Shift-II)

Ans. (b) : Speed of first train = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{350}{5} = 70 \text{ km/h}$$

The ratio of the speeds of both trains = 2 : 5

Let the speed of both trains is $2x$ and $5x$

According to the question,

$$2x = 70$$

$$\Rightarrow x = 35 \text{ km/h}$$

$$\begin{aligned} \text{Sum of the speed of both trains} &= 2x + 5x \\ &= 70 + 175 \\ &= 245 \text{ km/h} \end{aligned}$$

34. The platform of a station 400 metre long starts exactly where the last span of a bridge 1.2 km long ends. How long will a train 200 metre long and travelling at the speed of 72 km/h take to cover the distance between the starting point of the span of the bridge and the far end of the platform ?

- (a) 1.5 min (b) 1.6 min
(c) 1.2 min (d) 1.8 min

SSC CHSL 11/07/2019 (Shift-I)

Ans. (a) Distance covered by train = $400 + 1200 + 200$
 $= 1800 \text{ m}$

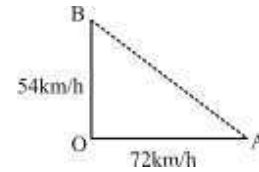
$$\begin{aligned} \text{Time} &= \frac{1800}{72 \times \frac{5}{18}} = 90 \text{ Seconds} \\ &= 1.5 \text{ minutes} \end{aligned}$$

35. Two cars start from the same place at the same time at right angles to each other. Their speeds are 54 km/hr and 72 km/hr, respectively. After 20 seconds the distance between them will be:

- (a) 500 m (b) 720 m
(c) 540 m (d) 480 m

SSC CHSL -17/03/2020 (Shift-III)

Ans. (a) :



Speed of first car = 54 km/hr

$$= \frac{54 \times 5}{18} \text{ m/sec} = 15 \text{ m/sec}$$

Speed of second car = 72 km/hr

$$= \frac{72 \times 5}{18} \text{ m/sec} = 20 \text{ m/s}$$

\therefore After 20 Seconds

Distance covered by first car = 15×20 ,

$$\left[\because S = \frac{D}{T} \right]$$

$$OB = 300 \text{ m}$$

Distance covered by second car = 20×20

$$OA = 400 \text{ m.}$$

$$\begin{aligned} \therefore AB^2 &= OB^2 + OA^2 \\ &= (300)^2 + (400)^2 \\ &= 90000 + 160000 \\ &= 250000 \end{aligned}$$

$$AB = 500 \text{ m.}$$

Hence After 20 seconds the distance between both cars = 500 m.

36. A car moves a distance of 600 km with uniform speed. The number of hours taken for the journey is $\frac{2}{3}$ of the number representing speed in km/h. The time taken to cover the distance is:

- (a) 15 hours (b) 18 hours
(c) 24 hours (d) 20 hours

SSC CHSL -26/10/2020 (Shift-III)

Ans. (d) : According to the question,

$$\text{Time} = \frac{2}{3} \times \text{Speed}$$

Time : Speed = 2 : 3

\therefore Distance = Speed \times Time

$$\therefore 3x \times 2x = 600$$

$$6x^2 = 600 \Rightarrow x^2 = 100$$

$$x = 10$$

The time taken to cover the total distance = $2 \times 10 = 20$ hours

37. Abhi finishes a journey by car in 9 hours. He travels the first half of the journey at a speed of 40 km/h and the second half of the journey at a speed of 50 km/h. The total distance covered is:

- (a) 350 km (b) 450 km
(c) 400 km (d) 300 km

SSC CHSL -26/10/2020 (Shift-II)

Ans. (c) : Let the total distance = $2d$ km

According to the question,

$$\frac{d}{40} + \frac{d}{50} = 9$$

$$\frac{90d}{40 \times 50} = 9$$

$$d = 200 \text{ km.}$$

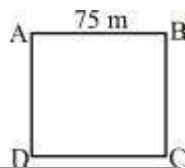
$$\begin{aligned} \text{Total Distance} &= 2d = 2 \times 200 \\ &= 400 \text{ km.} \end{aligned}$$

38. How much time (in minutes) will a dog take to run around a square field of side 75 m if it runs at the speed of 6 km/hr?

- (a) 2.5 (b) 3
(c) 3.6 (d) 1.8

SSC CHSL -19/10/2020 (Shift-III)

Ans. (b) :



$$\begin{aligned} \therefore \text{Perimeter of square} &= 4 \times \text{Side} \\ &= 4 \times 75 = 300 \text{ m} \end{aligned}$$

\therefore Speed of the dog =

$$\frac{\text{Total distance}}{\text{Time}} = \frac{\text{Perimeter of square}}{\text{Time}}$$

$$\begin{aligned} \therefore \text{Time} &= \frac{300}{6 \times \frac{5}{18}} = \frac{300 \times 18}{30} = 180 \text{ Seconds} = 3 \\ &\text{minutes} \end{aligned}$$

39. The diameter of a wheel is 49 cm. The number of revolutions in which it will have to cover a distance of 770 m, is:

- (a) 500 (b) 600
(c) 400 (d) 700

SSC CHSL -19/10/2020 (Shift-II)

Ans. (a) :

$$\frac{\text{Number of revolutions} \times \text{circumference of wheel}}{\text{Total distance}}$$

\therefore Number of revolutions =

$$\begin{aligned} \frac{770}{2\pi R} &= \frac{770}{2 \times \frac{22}{7} \times \frac{49}{2} \times 10^{-2}} \\ &= \frac{770 \times 100}{22 \times 7} = 500 \end{aligned}$$

40. Mohan travels three equal distances at speeds of 12 km/h, 18 km/h and 24 km/h. If he takes a total of 13 hours, then what is the total distance covered?

- (a) 216 km (b) 218 km
(c) 214 km (d) 212 km

SSC CHSL -19/10/2020 (Shift-II)

Ans. (a) : \therefore Let the equal distance is d .

$\therefore t_1 + t_2 + t_3 = T$ (Total time)

$$\frac{d}{12} + \frac{d}{18} + \frac{d}{24} = 13$$

$$\frac{6d + 4d + 3d}{72} = 13 \quad \Rightarrow 13d = 13 \times 72$$

$$d = 72 \text{ km}$$

$$\therefore \text{Total distance covered} = 3d = 3 \times 72 = 216 \text{ km}$$

41. A person walks a distance from point A to B at 15 km/h, and from point B to A at 30 km/h. If he takes 3 hours to complete the journey, then what is the distance from point A to B?

- (a) 25 km (b) 30 km
(c) 10 km (d) 15 km

SSC CHSL -16/10/2020 (Shift-III)

Ans. (b) : Let the time taken to cover a distance from point A to B = t hours.

\therefore The time taken to cover a distance from B to A = $(3 - t)$ hours

Again let the distance from point A to B = x km

According to the question

$$15 = \frac{x}{t} \quad \left[\text{Speed} = \frac{\text{Distance}}{\text{Time}} \right]$$

$$\text{or } x = 15t \quad \text{---(i)}$$

$$\text{Again } 30 = \frac{x}{(3-t)}$$

$$\text{or } x = 30(3-t) \quad \text{---(ii)}$$

From the equation (i) and (ii)

$$\begin{aligned} 15t &= 30(3-t) \\ &= 90 - 30t \end{aligned}$$

$$\text{or } 45t = 90 \Rightarrow t = 2 \text{ hours.}$$

$$\therefore \text{Distance } x = 15t = 15 \times 2 = 30 \text{ km.}$$

42. Mohan covers a distance of 2.5 km by scooter at the rate of 30 km/h. The time taken by Mohan to cover the given distance in minutes is:

- (a) 5 (b) 8
(c) 6 (d) 10

SSC CHSL -15/10/2020 (Shift-I)

Ans. (a) : The time taken by Mohan to cover a distance of 2.5 km

$$= \frac{\text{Distance}}{\text{Speed}} = \frac{2.5}{30}$$

$$= \frac{25}{300} = \frac{1}{12} \text{ hours}$$

$$= \frac{1}{12} \times 60 \text{ minutes}$$

$$= 5 \text{ minutes}$$

43. A car is running at a speed of 64 km/h to cover a certain distance in 40 min. At what speed should the car run to reduce the time of the journey to 30 min?

- (a) 85.33 km/h (b) 54 km/h
(c) 74.65 km/h (d) 84.78 km/h

SSC CHSL -15/10/2020 (Shift-II)

Ans. (a) : Speed of the car = 64 km/hr
 Time taken to cover the distance = 40 minutes

$$= \frac{40}{60} \text{ hours} = \frac{2}{3} \text{ hours}$$

$$\therefore \text{The distance covered by car} = 64 \times \frac{2}{3}, [S = \frac{D}{T}]$$

$$= \frac{128}{3} \text{ km.}$$
 Let the speed of the car is increased to x km/hr then the time = 30 minutes

$$= \frac{30}{60} \text{ hours}$$

$$= \frac{1}{2} \text{ hours}$$

$$\therefore \text{Distance covered} = x \times \frac{1}{2}$$

$$= \frac{x}{2} \text{ km}$$

$$\therefore \frac{x}{2} = \frac{128}{3}$$

$$x = \frac{256}{3}$$

$$x = 85.33 \text{ km/hr}$$

44. The distance between the places H and O is D units. The average speed that gets a person from H to O in a stipulated time is S units. He takes 20 minutes more time than usual if he travels at 60 km/h, and reaches 44 minutes early if he travels at 75 km/h. The sum of the numerical values of D and S is:
 (a) 384 (b) 344
 (c) 358 (d) 376

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : Let the usual time = t
 From $v_1 t_1 = v_2 t_2$ (\because Distance is equal)

$$60 \times \left(t + \frac{20}{60} \right) = 75 \left(t - \frac{44}{60} \right)$$

$$4 \left(t + \frac{1}{3} \right) = 5 \left(t - \frac{11}{15} \right)$$

$$t = \frac{4}{3} + \frac{11}{3} = \frac{15}{3} = 5 \text{ hours.}$$

$$\therefore \text{Distance} = D = v_1 t_1$$

$$= 60 \times \left(5 + \frac{20}{60} \right) = \frac{60 \times 16}{3} = 320 \text{ km}$$

$$\therefore \text{The Average speed in stipulated time (S)} = \frac{D}{t} = \frac{320}{5} = 64 \text{ km/hr}$$

$$\therefore D + S = 320 + 64 = 384$$

45. A man divided his journey into three parts of distances of 18 km., 20 km and 27 km. He travelled the distances at the speeds of 6 km/h, 5 km/h and 9 km/h respectively. What was his average speed during the entire journey?

- (a) 5.5 km/h (b) 6.5 km/h
 (c) 7.5 km/h (d) 4.5 km/h

SSC CHSL -12/10/2020 (Shift-II)

Ans. (b) : Time taken in the first part of the journey = $\frac{18}{6} = 3\text{h}$
 Time taken in the second part = $\frac{20}{5} = 4\text{h}$
 Time taken in the third part = $\frac{27}{9} = 3\text{h}$

$$\therefore \text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{18+20+27}{3+4+3} = \frac{65}{10} = 6.5 \text{ km/h}$$

46. Richa travels from A to B at the speed of 15km/h, from B to C at 20 km/h, and from C to D at 30 km/h. If AB = BC = CD, then find the Richa's average speed.

- (a) 17 km/h (b) 20 km/h
 (c) 18 km/h (d) 19 km/h

SSC CHSL -12/10/2020 (Shift-I)

Ans. (b) : Let the distance = x km

$$\therefore \text{Total time} = \frac{x}{15} + \frac{x}{20} + \frac{x}{30} = \frac{4x+3x+2x}{60} = \frac{9x}{60}$$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{3x}{9x/60} = \frac{3x \times 60}{9x}$$

$$= 20 \text{ km/h}$$

47. An athlete crosses a distance of 900 m in 10 minutes. What is his speed in km per hour?

- (a) 3.6 km/h (b) 5.4 km/h
 (c) 6.9 km/h (d) 4.8 km/h

SSC CHSL -14/10/2020 (Shift-III)

Ans. (b) : Speed of athlete = $\frac{900}{10 \times 60} \text{ m/s}$

$$= \frac{3}{2} \times \frac{18}{5} \text{ km/h} = 5.4 \text{ km/h}$$

48. A car covers 150 km in 5 hours. If it travels at one-third its usual speed, then how much more time will it take to cover the same distance?

- (a) 8 hours (b) 10 hours
 (c) 14 hours (d) 12 hours

SSC CHSL -19/03/2020 (Shift-II)

Ans. (b) : $\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$$\therefore \text{Speed of the car} = \frac{150}{5} = 30 \text{ km/hr}$$
 One third speed of the car = $30 \times \frac{1}{3} = 10 \text{ km/hr}$

$$\therefore \text{Now the time taken by car} = \frac{\text{Distance}}{\text{speed}}$$

$$= \frac{150}{10} = 15 \text{ hours}$$

$$\therefore \text{More time taken by car} = 15 - 5 = 10 \text{ hours}$$

49. A person covers 700 m distance in 6 minutes. What is his speed in km/h?
 (a) 4.23 km/h (b) 6 km/h
 (c) 2.45 km/h (d) 7 km/h

SSC CHSL -18/03/2020 (Shift-II)

Ans. (d) : Distance = 700 m = $\frac{700}{1000}$ km = $\frac{7}{10}$ km
 Time = 6 = $\frac{6}{60}$ h = $\frac{1}{10}$ h.
 Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{\frac{7}{10}}{\frac{1}{10}} = 7$ km/h

50. Ravi starts for his school from his house on his cycle at 8:20 a.m. If he runs his cycle at a speed of 10 km/h, he reaches his school 8 minutes late, and if he drives the cycle at a speed of 16 km/h, he reaches his school 10 minutes early. The school starts at:
 (a) 8:50 a.m. (b) 9:40 a.m.
 (c) 8:40 a.m. (d) 9:00 a.m.

SSC CHSL -18/03/2020 (Shift-I)

Ans. (d): Let the distance of school from house = x km
 According to the question, $\frac{x}{10} - \frac{x}{16} = \frac{18}{60}$
 $\frac{16x - 10x}{160} = \frac{3}{10}$
 $\frac{6x}{16} = 3 \Rightarrow x = 8$ km
 Time taken to reach school at the speed of 10 km/hr
 Time = $\frac{\text{Distance}}{\text{Time}} = \left(\frac{8}{10} \times 60\right)$ minutes = 48 minutes.
 \therefore The school starts at time = 8:20 + (48-8) minutes = 9:00 am

51. A car travels 105 km in 3 hours and a train travels 252 km in 4 hours. The ratio of speed of the car to that of the train is:
 (a) 9 : 11 (b) 2 : 7
 (c) 5 : 9 (d) 3 : 5

SSC CHSL -17/03/2020 (Shift-II)

Ans. (c) : Speed of the car = $\frac{105}{3}$
 $\left(\because \text{Speed} = \frac{\text{Distance}}{\text{Time}}\right)$
 = 35 km/hr
 Speed of the train = $\frac{252}{4} = 63$ km/hr
 \therefore The ratio of speed of the car to that of the train = $\frac{35}{63} = \frac{5}{9} = 5:9$

52. How much time will a horse take to run around a square field of side 175 m if it runs at the speed of 15 km/hr?
 (a) 180 sec (b) 155 sec
 (c) 175 sec (d) 168 sec

SSC CHSL -17/03/2020 (Shift-II)

Ans. (d) : Speed of the horse = 15 km/hr
 = $\frac{15 \times 5}{18}$ m/sec
 \therefore Length of the side of square = 175 m
 \therefore Perimeter of square field = 175 \times 4m
 According to the question,
 time = $\frac{175 \times 4}{15 \times \frac{5}{18}} = \frac{175 \times 4 \times 18}{15 \times 5} = 168$ Seconds

53. Mohan finished a journey by scooter in 5 hours. He travels the first half of the journey at 30 km/h and the second half of the journey at 20 km/h. The distance covered by him is:
 (a) 100 km (b) 130 km
 (c) 140 km (d) 120 km

SSC CHSL -19/03/2020 (Shift-III)

Ans. (d) : When two equal distances are covered at the speed of x km/h and y km/hr respectively then,
 Average speed = $\frac{2xy}{x+y}$
 \therefore Average speed = $\frac{2 \times 30 \times 20}{30+20} = \frac{2 \times 30 \times 20}{50} = 24$ km/hr
 \therefore the time taken by Mohan to cover the distance from the scooter = 5h
 \therefore Distance covered by Mohan = speed \times time = 24 \times 5 = 120 km.

54. A man travelled a distance of 35 km in 5 hours. He travelled partly on foot at the rate of 4 km/h and the rest by bicycle at the rate of 9 km/h. The distance travelled on foot is:
 (a) 10 km (b) 8 km
 (c) 12 km (d) 15 km

SSC CHSL -20/10/2020 (Shift-II)

Ans : (b) $t_1 + t_2 = T$ (Total time)
 Let the distance travelled on foot = x km
 Distance travelled by bicycle = (35-x) km
 $\frac{x}{4} + \frac{35-x}{9} = 5$
 $9x + 140 - 4x = 36 \times 5$
 $5x = 180 - 140$
 $5x = 40$
 $x = 8$
 The distance travelled on foot = 8 km

55. **Rahul and Mithun travel a distance of 30 km. The sum of their speeds is 70 km/h and the total time taken by both to travel the distance is 2 hours 6 minutes. The difference between their speeds is:**

- (a) 30 km/h (b) 20 km/h
(c) 35 km/h (d) 25 km/h

SSC CHSL -20/10/2020 (Shift-I)

Ans : (a) Let the speed of Rahul = x km/h, speed of Mithun = (70-x) km/h

$$\frac{30}{x} + \frac{30}{70-x} = 2 \text{ hour } 6 \text{ minutes} = \frac{21}{10}$$

$$\frac{30 \times 70}{x(70-x)} = \frac{21}{10}$$

$$x(70-x) = 1000$$

$$x(70-x) = 50 \times 20$$

$$x = 50$$

Speed of Rahul = 50 km/h, Speed of Mithun = 20 km/h

The difference between their speeds = 50 - 20 = 30 km/h

56. **A man is walking at a speed of 12 km/h. After every km, he takes rest for 3 minutes. How much time will he take to cover a distance of 6 km?**

- (a) 45m (b) 42m
(c) 40m (d) 48m

SSC CHSL -21/10/2020 (Shift-III)

Ans. (a) Total time taken when man does not take rest

$$\frac{6 \text{ km}}{12 \text{ kmph}} = \frac{1}{2} \text{ hour} = 30 \text{ min}$$

The time taken to rest 3 minutes per km = 3 × 5 = 15 min

Time taken in total journey = 30 + 15 = 45 min

57. **Ritik can cover a certain distance in 18 hours if he walks at the rate of 10 km/hr. If he covers the same distance by bus at the rate of 45 km/hr, then what is the time (in hours) taken by him?**

- (a) 2 (b) 4
(c) 8 (d) 6

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) In first condition-

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$\text{Distance} = 10 \times 18 = 180 \text{ km.}$$

$$\text{In second condition} = \text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Time} = \frac{180}{45} = 4 \text{ hours}$$

58. **A man travels 3 hours of the journey at a speed of 100 km/hr and remaining 2 hours of the journey at 120 km/hr. what is the average speed (in km/hr) of the entire journey?**

- (a) 105 (b) 110
(c) 108 (d) 107

SSC MTS 10-10-2017 (Shift-I)

Ans : (c) Average speed of entire journey

$$\begin{aligned} &= \frac{\text{Total distance}}{\text{Total time}} \\ &= \frac{(3 \times 100 + 2 \times 120)}{2 + 3} = \frac{540}{5} \\ &= 108 \text{ km/hr} \end{aligned}$$

59. **A car travels at a speed of 25 m/s for 8 hours. What is the distance (in km) travelled by the car?**

- (a) 360 (b) 720
(c) 450 (d) 900

SSC MTS 9-10-2017 (Shift-I)

Ans: (b) Speed = $\frac{\text{Distance}}{\text{Time}}$.or,

$$\text{Distance} = \text{Speed} \times \text{time}$$

According to the question,

$$\text{speed} = 25 \text{ m/s} = 25 \times \frac{18}{5} \text{ km/h}$$

$$\text{Time} = 8 \text{ h}$$

$$\begin{aligned} \therefore \text{Distance} &= 25 \times \frac{18}{5} \times 8 \\ &= 720 \text{ km.} \end{aligned}$$

60. **Mahesh can cover a certain distance in 24 hours if he walks at the rate of 10 km/hr. If he covers the same distance by a car at the rate of 16 km/hr, then what is the time (in hours) taken by him?**

- (a) 12 (b) 9
(c) 15 (d) 18

SSC MTS 9-10-2017 (Shift-II)

Ans. (c) : Distance = Speed × Time

$$\text{Distance} = 10 \times 24 = 240 \text{ km}$$

Again,

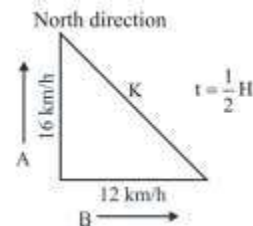
$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{240}{16} = 15 \text{ hours}$$

61. **Two cyclists A and B run their cycles at average speed of 16 km/hr and 12 km/hr respectively. If A runs in North direction and B in East direction beginning from the same origin at the same time, what will be the minimum distance between the two cyclists after half an hour ?**

- (a) 14 km (b) $2\sqrt{14}$ km
(c) $\sqrt{10}$ km (d) 10 km

SSC MTS 7-10-2017 (Shift-I)

Ans. (d) :



$$K^2 = (16)^2 + (12)^2$$

$$K^2 = 256 + 144$$

$$K^2 = 400$$

$$K = 20 \text{ km/h}$$

According to the question,
Distance = Speed \times Time

$$\text{Minimum distance} = 20 \times \frac{1}{2} = 10 \text{ km}$$

62. The ratio of speeds of two aircraft is 11 : 18. If the first aircraft travels 1650 km in 3 hours then what is the speed of other aircraft in (m/s)?

- (a) 270 (b) 200
(c) 225 (d) 250

SSC MTS 14/08/2019 (Shift-I)

Ans. (d) : Let the speed of two aircraft is 11x and 18x

$$\therefore \text{Speed of first aircraft} = \frac{1650}{3} = 550 \text{ km/h}$$

$$\therefore 11x = 550$$

$$x = 50 \text{ km}$$

$$\therefore \text{speed of second aircraft} = 18x = 18 \times 50 = 900 \text{ km/h} = 900 \times \frac{5}{18} = 250 \text{ m/s}$$

63. A car travels 420 km in 7 hours. How much the speed of car is to be increased to cover the distance in 6 hours ?

- (a) 7.5 km/h (b) 10 km/h
(c) 8 km/h (d) 5 km/h

SSC MTS 14/08/2019 (Shift-I)

Ans. (b) : Let the speed of car is x and y

$$\therefore \text{Total distance} = 420 \text{ km}$$

$$\therefore \text{Speed of car } x = \frac{420}{7} = 60 \text{ km/h}$$

$$\therefore \text{Speed of car } y = \frac{420}{6} = 70 \text{ km/h}$$

Hence the speed of car x will have to be increased (70-60) = 10 km/hr to cover the distance in 6 hours.

64. A travels 15 km with a speed of 30 km/h. He travels another 25 km with a speed of 10 km/h. What is his average speed for the entire journey?

- (a) $\frac{40}{3}$ km/h (b) $\frac{80}{3}$ km/h
(c) 20 km/h (d) 12 km/h

SSC MTS 02/08/2019 (Shift-I)

$$\text{Ans. (a) : Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{15 + 25}{\frac{15}{30} + \frac{25}{10}} \quad \left\{ \because \text{Time} = \frac{\text{Distance}}{\text{Speed}} \right\}$$

$$= \frac{40}{\frac{1}{2} + \frac{5}{2}}$$

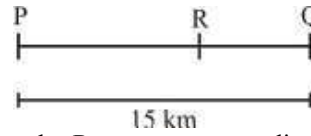
$$= \frac{40}{\frac{6}{2}} = \frac{40}{3} \text{ km/hr.}$$

65. Alok starts walking from P at the speed of 6 km/h towards Q. Raman starts at same time from P towards Q at the speed of 9 km/h. Raman reaches Q and turns back and starts walking towards P. He meets Alok at R. If PQ is 15 km, then what is PR ?

- (a) 20 km (b) 12 km
(c) 15 km (d) 18 km

SSC MTS 05/08/2019 (Shift-I)

Ans. (b) :



The time taken by Raman to cover a distance of 15 km

$$= \frac{15}{9} = \frac{5}{3} \text{ hr}$$

The distance covered by Alok in $\frac{5}{3}$ hours

$$= \frac{5}{3} \times 6 = 10 \text{ km}$$

Hence remaining distance = 15 - 10 = 5 km/h

Relative speed = 9 + 6 = 15 km/h

Hence, the time taken to cover a distance of 5 km = 5/15 = 1/3 hours

Distance covered by Raman in 1/3 hr

$$PQ = 9 \times \frac{1}{3} = 3 \text{ km.}$$

Hence the distance (PR) = PQ - RQ

$$= 15 - 3 = 12 \text{ km.}$$

66. Speed of a man is 45 km/h. In how much time (in seconds) will he take to cover a distance of 225 metres?

- (a) 24 (b) 16
(c) 18 (d) 22

SSC MTS 19/08/2019 (Shift-I)

Ans. (c) : Speed of man = 45 km/h

$$= 45 \times \frac{5}{18} = \frac{25}{2} \text{ m/s}$$

$$\text{Distance Covered} = 225 \text{ m}$$

$$\therefore \text{Time taken to cover a distance} = \frac{\text{Distance covered}}{\text{Speed of man}}$$

$$= \frac{225}{\left(\frac{25}{2}\right)} = \frac{450}{25}$$

$$= \frac{90}{5} = 18 \text{ Sec.}$$

67. A motor car moves at a speed of 72 km/h after and 54 km/h before repairing respectively. It covers X distance in 6 hours after repairing. How much time (in hours) will it take to cover 5X distance before repairing?

- (a) 40 (b) 45
(c) 30 (d) 36

SSC MTS 09/08/2019 (Shift-I)

Ans. (a) : $\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$

After repairing..

$$72 = \frac{x}{6}$$

$$\boxed{x = 432}$$

Before repairing,

$$54 = \frac{5x}{t}$$

$$54 = \frac{5 \times 432}{t}$$

$$9 = \frac{5 \times 72}{t}$$

$$t = 40 \text{ hr.}$$

68. A man travels from P to Q at the speed of 60 km/h and travels from Q to P at the speed of 90 km/h. What is the average speed of the man for the whole journey?

- (a) 75 km/h (b) 78 km/h
(c) 70 km/h (d) 72 km/h

SSC MTS 08/08/2019 (Shift-II)

Ans. (d) : $\text{Average speed} = \frac{2S_1 S_2}{S_1 + S_2}$

$$= \frac{2 \times 60 \times 90}{(60 + 90)}$$

$$= \frac{2 \times 60 \times 90}{150}$$

$$= 72 \text{ km/hr}$$

69. A car travels 18 km of distance in 24 minutes. The speed of bus is two times the speed of car. What is time taken by bus to cover a distance of 135 km?

- (a) 48 minute (b) 90 minute
(c) 50 minute (d) 75 minute

SSC MTS 06/08/2019 (Shift-I)

Ans. (b) : Let the speed of car = x km/h

Then the speed of bus = 2x km/h

According to the question, $x = \frac{18 \times 60}{24} = 45 \text{ km/h}$

The time taken by bus = $\frac{135}{45 \times 2} \times 60 = 90 \text{ minutes.}$

70. If Shivaan travels at 19 km/hr then what is the time (in min) taken by him to travel distance of 665m?

- (a) 3 (b) $2\frac{1}{10}$
(c) $1\frac{1}{2}$ (d) 2

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Speed of Shivaan = 19 km/h =

$$19 \times \frac{5}{18} \text{ m/sec}$$

Then the time taken to cover a distance of 664 m

$$= \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{665 \text{ m}}{19 \times \frac{5}{18} \text{ m/sec}} = \frac{665 \times 18}{19 \times 5} \text{ sec}$$

$$= \frac{133 \times 18}{19} \times \frac{1}{60} \text{ minute} = \frac{21}{10} = 2\frac{1}{10} \text{ minute}$$

71. A bus covers 10 km of distance in 12 minutes. If its speed is reduced by 25 km/h, then how much is the total time taken to cover the same distance?

- (a) 36 (b) 13
(c) 15 (d) 24

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : $\therefore S = \frac{d}{t}$

$$S = \frac{10}{\frac{12}{60}} \Rightarrow S = 50 \text{ km/hr}$$

According to the question,

$$\text{New speed} = 50 - 25 = 25 \text{ km/hr}$$

The time taken to cover a distance of 10 km,

$$\text{Time} = \frac{10}{25} \text{ hr}$$

$$= \frac{10}{25} \times 60 \text{ min} = 24 \text{ min}$$

72. A person travels 390 km in 3.25 hours. His speed in m/s will be:

- (a) $33\frac{1}{3}$ (b) 24
(c) $30\frac{2}{3}$ (d) 25

SSC MTS 21/08/2019 (Shift-III)

Ans. (a) : $\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$$= \frac{390}{\frac{13}{4}} \text{ km/hr} = 120 \text{ km/hr}$$

$$= 120 \times \frac{5}{18} = 20 \times \frac{5}{3} \Rightarrow \frac{100}{3} \text{ m/sec}$$

$$= 33\frac{1}{3} \text{ m/sec}$$

73. Mohit goes to his office at the speed of 10 m/s and returns to his home at the speed of x km/hr. If average speed of Mohit for the whole journey is 12 m/s, then what is the value of x?

- (a) 25 km/hr (b) 15 km/hr
(c) 36 km/hr (d) 54 km/hr

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (d) : Average speed = $\frac{2xy}{x+y}$

$$12 = \frac{2 \times 10 \times x}{10+x}$$

$$120 + 12x = 20x$$

$$8x = 120$$

$$x = 15 \text{ m/s}$$

$$x = 15 \times \frac{18}{5} = 54 \text{ km/h}$$

74. Manish goes to his hometown at the speed of 40 km/hr and returns to his home at the speed of Y km/hr. Distance between his home and home town is 360 km. If he takes total 21 hours, then what is the value of Y?

- (a) 25 km/hr (b) 28 km/hr
(c) 30 km/hr (d) 33 km/hr

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : $\frac{360}{40} + \frac{360}{y} = 21$

$$\frac{360}{y} = 12$$

$$y = 30 \text{ km/hr}$$

75. A man travels the first part of his journey at 80 km/h and the second part at 120 km/h, and covers a total distance of 3840 km to his destination in 40 hours. How long did the first part of his journey last?

- (a) 24 hours (b) 18 hours
(c) 36 hours (d) 12 hours

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a) : $t_1 + t_2 = T$ (Total time)

$$\frac{x}{80} + \frac{(3840-x)}{120} = 40$$

$$3x + 2(3840-x) = 40 \times 240$$

$$3x + 7680 - 2x = 40 \times 240$$

$$x = 9600 - 7680$$

$$x = 1920$$

Time taken to complete the first part

$$= \frac{1920}{80} = 24 \text{ hours}$$

(II) When Distance is Constant

76. A bus covered 360 km in 6 hours. If it travels at one-fourth of its usual speed, then how much more time will it take to cover the same distance?

- (a) 18 hours (b) 14 hours
(c) 12 hours (d) 16 hours

SSC CHSL 11/08/2021 (Shift-I)

Ans. (a) : When distance is same,

Then, $S_1 t_1 = S_2 t_2$

$$S \times 6 = \frac{S}{4} \times (6+t) \quad (\text{Let required time} = t)$$

$$24 = t + 6$$

$$t = 18 \text{ hours}$$

77. A boy increases his speed to $\frac{9}{5}$ times of his original speed. By doing this, he reaches his school 40 minutes before the usual time. How much time (in minutes) does he take usually?

- (a) 45 (b) 90
(c) 30 (d) 120

Ans. (b) : Ratio of the speed of boy = 5:9

∴ Distance is constant

∴ Ratio of the time = $\frac{9:5}{-4}$

∴ 4 units = 40 minutes

∴ 9 units = 90 minutes

Hence, he takes 90 minutes usually

78. A starts walking at 4 kmph and after 4 hours. B starts cycling from the same point as that of A in the same direction at 10 kmph. After how much distance from the starting point will B catch up with A (Correct to two decimal places)?

- (a) 25.67 km (b) 26.67 km
(c) 24.67 km (d) 23.67 km

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (b) : Let B will catch A after t hours.

In this case, the distance travelled by both of them will be equal.

$$4(4+t) = 10 \times t$$

$$8 + 2t = 5t$$

$$3t = 8$$

$$t = \frac{8}{3} \text{ hours}$$

∴ Required Distance = $10t = 10 \times \frac{8}{3} = 26.67 \text{ km}$

79. Walking at $\frac{3}{5}$ of his usual speed, a person reaches his office 20 minutes late than the usual time. Find the usual time taken by him to reaches his office :

- (a) 25 (b) 40
(c) 30 (d) 20

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-III)

Ans. (c) : Speed $\rightarrow 5 : 3$

Time $\rightarrow 3 : 5$ (Distance is constant)

2 \rightarrow 20 minute

3 \rightarrow 30 minute

∴ Usual Time = 30 minutes

80. Walking at $\frac{3}{4}$ of his usual speed, a person reaches his office 18 minutes late than the usual time. Find the usual time taken by him to reach his office:

- (a) 60 (b) 72
(c) 54 (d) 45

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-II)

Ans. (c) : Speed $\rightarrow 4 : 3$

Time $\rightarrow 3 : 4$ (\because Distance is constant)

1 \rightarrow 18 min

\therefore Usual time (3 units) = 54 min

81. Train A takes 45 minutes more than train B to travel a distance of 450 km. Due to engine trouble speed of train B falls by a quarter, so it takes 30 minutes more than Train A to complete the same journey. What is the speed of Train A (in km/hr)?

- (a) 90 (b) 120
(c) 100 (d) 110

SSC CGL (Tier-II) 17-2-2018

Ans. (c) : Ratio of speed of train B =

$$= 1 : \left(1 - \frac{1}{4}\right) = 4 : 3$$

The ratio of the time taken by train B = 3 : 4

Let the time taken by B is 3x and 4x respectively.

According to the question–

$$4x - 3x = 45 + 30 = 75 \text{ minutes}$$

Initially, the time taken by train B (3x) = 225 minute

Initially, the time taken by train A = 225 + 45 = 270 minute

$$= 4.5 \text{ hours}$$

$$\therefore \text{Speed of train A} = \frac{450}{4.5} = 100 \text{ km/h}$$

82. Two cars A and B travel from one city to another, at the speeds of 72 km/hr and 90 km/hr respectively. If car B takes 1 hour lesser than car A for the journey, then what is the distance (in km) between the two cities?

- (a) 270 (b) 360
(c) 240 (d) 400

SSC CGL (Tier-II) 17-2-2018

Ans. (b): Let the distance between the two cities = x km

And the time taken by car A = t hours

According to the question–

$$72 \times t = 90 \times (t-1)$$

$$72t = 90t - 90$$

$$t = \frac{90}{18} = 5 \text{ hours}$$

$$\therefore x = 72 \times 5 = 360 \text{ km}$$

83. A takes 30 minutes more than B to cover a distance of 15 km at a certain speed, But if A doubles his speed, he takes one hour less than B to cover the same distance. What is the speed (in km/h) of B?

- (a) 5 (b) 6
(c) $6\frac{1}{2}$ (d) $5\frac{1}{2}$

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-II)

Ans. (b) : Let the initial speed of A be x

$$\frac{15}{x} - \frac{15}{2x} = \frac{1}{2} + 1 = \frac{3}{2}$$

$$\frac{15}{2x} = \frac{3}{2}$$

$$x = 5$$

$$\text{The time taken by A} = \frac{15}{5} = 3 \text{ h}$$

$$\text{Speed of B} = \frac{15}{2\frac{1}{2}}$$

$$= 6 \text{ km/h}$$

84. A and B are travelling towards each other from the points P and Q respectively. After crossing each other, A and B take $6\frac{1}{8}$ hours and 8 hours, respectively to reach their destinations Q and P, respectively. If the speed of B is 16.8 km/h, then the speed (in km/h) of A is:

- (a) 19.8 (b) 20.4
(c) 19.2 (d) 20.8

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-I)

Ans. (c) : $\frac{V_A}{V_B} = \sqrt{\frac{t_B}{t_A}}$ (By formula)

$$\frac{V_A}{16.8} = \sqrt{\frac{8 \times 8}{49}}$$

$$\frac{V_A}{16.8} = \frac{8}{7}$$

$$V_A = 19.2 \text{ km/h}$$

85. Walking at $\frac{7}{9}$ of his usual speed, a person reaches his office 10 minutes late than the usual time. Find the usual time taken by him to reach his office:

- (a) 35 (b) 27
(c) 42 (d) 30

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (a) : When the distance is constant, then speed is inversely proportional to time.

Speed of the person $\rightarrow 9 : 7$

Time $\rightarrow 7 : 9$

2 \rightarrow 10 minutes

7 \rightarrow 35 minutes

usual time = 35 minutes

86. Walking $\frac{5}{7}$ of his usual speed, a person reaches his office 10 minutes late than the usual time. Find the usual time taken by him to reach his office:

- (a) 35 (b) 25
(c) 30 (d) 28

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-I)

Ans. (b) : Let the initial speed of the person = x units
According to the question,

$$\text{Speed of the person} = \frac{5}{7}x \text{ units}$$

And the person used to take t time to reach office earlier
i.e now takes (t + 10) time

$$\therefore x \times t = \frac{5}{7}x(t+10)$$

$$7t = 5t + 50$$

$$2t = 50$$

$$t = 25$$

That means the person took 25 minutes to reach the office.

OR

Trick:

Speed $\rightarrow 7 : 5$

Time $\rightarrow 5 : 7$ (\because Distance is constant)

2 \rightarrow 10 minutes

5 \rightarrow 25 minutes

\therefore usual time = 25 minutes

87. A student takes 1.25 hours to travel from home to school at a speed of 4 km/h. By what percentage should he increase his speed to reduce the time by 25% to cover the same distance from school to home?

(a) $33\frac{1}{3}\%$ (b) 45%

(c) 25% (d) 50%

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-I)

Ans. (a): Ratio of the time = 100 : 75
= 4 : 3

\therefore Distance is constant

\therefore Ratio of the speed = 3 : 4

Hence percentage increase in speed = $\frac{1}{3} \times 100 = 33\frac{1}{3}\%$

88. A car traveling at an average speed of 72 km/hr takes 9 minutes to travel a certain distance. By how much should it increase its speed (in km/hr) to travel the same distance in 8 minutes?

(a) 8 (b) 9

(c) 7 (d) 6

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

Time \times Speed = Distance

$$S_1T_1 = S_2T_2$$

$$72 \times 9 = S_2 \times 8$$

$$S_2 = 81 \text{ km/h}$$

Hence increase in speed = (81-72)km/h
= 9km/h

89. A jogger covered a certain distance at some speed. Had he moved 3 km/hr faster, he would have taken 20 minutes less. If he had moved 1 km/hr slower, he would have taken 10 minutes more. What is the distance (in km) that he jogged?

(a) 9 (b) 10

(c) 12 (d) 8

SSC CGL (Tier-II) 9-3-2018

Ans. (c) : Distance = $\frac{s_1 \times s_2}{s_1 - s_2} \times (t_1 - t_2)$

Let the certain speed = s km/h

$$\frac{s \times (s+3)}{3} \times \frac{20}{60} = \frac{s(s-1)}{1} \times \frac{10}{60}$$

$$\frac{2(s+3)}{3} = s-1$$

$$2s+6 = 3s-3$$

$$s = 9 \text{ km/h}$$

$$\therefore \text{Distance covered} = \frac{9 \times (9+3)}{3} \times \frac{20}{60} = 12 \text{ km}$$

90. Ramesh travels by bus from city A to city B at an average speed of 44 km/hr. Suresh travels by taxi from city A to city B at an average speed of 77 km/hr and takes 3 hours lesser than time taken by Ramesh. What is the distance (in km) between the two cities?

(a) 363 (b) 308

(c) 280 (d) 336

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : Let the distance between the cities = x km

$$\frac{x}{44} - \frac{x}{77} = 3$$

$$\frac{7x-4x}{308} = 3$$

$$x = 308 \text{ km}$$

91. To cover a distance of 416 km, a train A takes $2\frac{2}{3}$ hours more than train B. If the speed of A

is doubled, it would take $1\frac{1}{3}$ hours less than B.

What is the speed (in km/h) of train A ?

(a) 54 (b) 56

(c) 52 (d) 65

SSC CGL 2018 (Tier-II) 13-09-2019

Ans. (c) : Let the speed of the train = x km/h

Speed of train B = y km/h

$$\frac{416}{x} - \frac{416}{y} = \frac{8}{3} \dots\dots(1)$$

$$\text{Again } \frac{416}{y} - \frac{416}{2x} = \frac{4}{3} \dots\dots(2)$$

From equation (1) + (2)

$$\frac{416}{x} - \frac{416}{2x} = 4$$

$$\frac{416}{2x} = 4$$

$$x = 52 \text{ km/h}$$

92. Walking at 60% of his usual speed, a man reaches his destination 1 hour 40 minutes late. His usual time (in hours) to reach the destination is :

- (a) $3\frac{1}{4}$ (b) $2\frac{1}{2}$
 (c) $3\frac{1}{8}$ (d) $2\frac{1}{4}$

SSC CGL 2018 (Tier-II) 13-09-2019

Ans. (b) : Let the certain distance = x km
 Certain Time = y km/h

$$\text{Usual speed} = \frac{x}{y}$$

$$\frac{x}{y \times \frac{3}{5}} - \frac{x}{y} = 1 + \frac{40}{60}$$

$$\frac{5}{3} \times \frac{x}{y} - \frac{x}{y} = \frac{5}{3}$$

$$\frac{x}{y} \left(\frac{5}{3} - 1 \right) = \frac{5}{3}$$

$$\frac{x}{y} \times \frac{2}{3} = \frac{5}{3}$$

$$\text{Usual time} = \frac{5}{2} = 2\frac{1}{2} \text{ hr}$$

OR

Trick:

$$60\% = \frac{3}{5}$$

Speed $\rightarrow 5 : 3$

Time $\rightarrow 3 : 5$ (\because distance is constant)

$$2 \text{ Unit} = 1 + \frac{40}{60} \text{ hours}$$

$$2 \text{ Unit} = \frac{5}{3}$$

$$3 \text{ Unit} = \frac{5}{2} = 2\frac{1}{2} \text{ hours}$$

93. A and B started their journeys from X to Y and Y to X, respectively. After crossing each other, A and B completed the remaining parts of their journeys in $6\frac{1}{8}$ h and 8 h respectively. If the speed of B is 28 km/h, then the speed (in km/h) of A is :
 (a) 40 (b) 32
 (c) 42 (d) 36

SSC CGL 2018 (Tier-II) 11-9-2019

Ans. (b) :

$$\frac{V_A}{V_B} = \sqrt{\frac{t_B}{t_A}} \text{ (from the formula)}$$

$$\frac{V_A}{28} = \sqrt{\frac{8 \times 8}{49}}$$

$$\frac{V_A}{28} = \frac{8}{7}$$

$$V_A = 32 \text{ Km/h}$$

94. A man starts from his house and travelling at 30 km/h, he reaches his office late by 10 minutes, and travelling at 24 km/h, he reaches his office late by 18 minutes. The distance (in km) from his house to his office is:

- (a) 16 (b) 20
 (c) 18 (d) 12

SSC CGL 2018 (Tier-II) 12-09-2019

Ans. (a) : Distance = $\frac{V_1 V_2}{V_1 - V_2} \times \left(\frac{t_1 - t_2}{60} \right)$

$$\therefore \text{Distance from home to office} = \frac{30 \times 24}{6} \times \frac{8}{60} = 16 \text{ km}$$

95. A train covers 400 km at a uniform speed. If the speed had been 10 km/h more, it would have taken 2 hours less for the same journey. What is the usual time taken (in hours) by train to complete the journey?

- (a) 15 (b) 10
 (c) 12 (d) 8

SSC CPO-SI 25/11/2020 (Shift-II)

Ans. (b) : Let the usual speed = V km/h

$$\text{Distance} = \frac{V \times (V + 10)}{10} \times 2$$

$$400 = \frac{V(V + 10)}{5}$$

$$V(V + 10) = 2000$$

$$= 40 \times 50$$

$$V = 40 \text{ km/h}$$

$$\text{Usual time} = \frac{400}{40} = 10 \text{ hours}$$

96. A person covers a distance of 300 km and then returns to the starting point. The time taken by him for the outward journey is 5 hours more than the time taken for the return journey. If he returned at a speed of 10 km/h more than the speed of going, what was the speed (in km/h) for the outward journey?

- (a) 25 (b) 30
 (c) 20 (d) 15

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c) : Let the speed of a person while going = x km/hr

Then speed while returning = (x+10) km/hr

\therefore From the question,

$$\frac{300}{x} - \frac{300}{(x+10)} = 5 \quad \left(\text{Time} = \frac{\text{Distance}}{\text{speed}} \right)$$

$$\Rightarrow \frac{300(x+10) - 300x}{x(x+10)} = 5$$

$$\Rightarrow 300x + 3000 - 300x = 5x(x+10)$$

$$\Rightarrow 3000 = 5x(x+10)$$

$$\Rightarrow 600 = x^2 + 10x$$

$$\Rightarrow x^2 + 10x - 600 = 0$$

$$\Rightarrow x^2 + 30x - 20x - 600 = 0$$

$$\Rightarrow x(x + 30) - 20(x + 30) = 0$$

$$\Rightarrow (x - 20)(x + 30) = 0$$

$\therefore x = -30$ (Invalid)

$x = 20$ (Valid)

Hence required speed (x) = 20 km/hr

97. A bus covers a 50-kilometre distance in 1 hour 15 minutes, whereas the same distance is covered by a car in 45 minutes. What is the ratio of the speed of the bus to the speed of the car?

- (a) 1 : 3 (b) 5 : 3
(c) 3 : 1 (d) 3 : 5

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d): \therefore Distance covered by both vehicles is equal.

$$\therefore \text{Time} \propto \frac{1}{\text{Speed}}$$

Bus Car

Time = 75 : 45

Then speed of Bus : Speed of car

45 : 75 = 3 : 5

98. A person has to travel a distance of 30km. He finds that he has covered $\frac{5}{6}$ of the distance in 3 hours and 20 minutes. What is his speed in km/h?

- (a) 6.3 (b) 5.4
(c) 6 (d) 7.5

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (d) Total distance = 30km

$$\frac{5}{6} \text{ distance of } 30\text{km} = 30 \times \frac{5}{6} = 25\text{km}$$

$$\text{Total time} = 3 \text{ hour } 20 \text{ minutes} = \frac{10}{3} \text{ hours}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{25}{\frac{10}{3}} = 7.5\text{km/h}$$

99. A person takes 40 minutes more than his usual time when he covers a distance of 20km at 5km/h. If he covers the same distance at 8km/h, he takes x minutes less than the usual time. What is the value of x?

- (a) 50 (b) 54
(c) 45 (d) 48

SSC CPO-SI - 11/12/2019 (Shift-II)

Ans. (a) $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$$\frac{20}{5} - \frac{20}{8} = \frac{40 + x}{60}$$

$$\frac{160 - 100}{40} = \frac{40 + x}{60}$$

$$\frac{40 + x}{60} = \frac{60}{40}$$

$$80 + 2x = 180$$

$$2x = 100$$

$$x = 50$$

100. A and B started travelling towards each other at the same time, from places X to Y and Y to X, respectively. After crossing each other, A and B took 2.45 hours and 4.05 hours to reach Y and X, respectively. If the speed of B was 8.4 km/h, then what was the speed (in km/h) of A?

- (a) 12.6 (b) 9.9
(c) 10.8 (d) 11.7

SSC CPO-SI - 11/12/2019 (Shift-I)

Ans. (c): From the formula

$$\frac{V_A}{V_B} = \sqrt{\frac{t_B}{t_A}}$$

$$\frac{V_A}{8.4} = \sqrt{\frac{4.05}{2.45}} = \frac{9}{7}$$

$$V_A = 10.8 \text{ km/h}$$

101. If Abhi travels a certain distance at 6km/h, he reaches his destination 12 minutes early, but if he travels at 4 km/h, he reaches his destination 10 minutes late. The speed (in km/h) at which he should travel to reach his destination on time is _____.

- (a) $4\frac{5}{7}$ (b) $5\frac{4}{4}$
(c) $5\frac{1}{8}$ (d) $4\frac{3}{7}$

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) Let the certain distance = x km

And certain time = t hours

According to the question

$$\frac{x}{4} - \frac{x}{6} = \frac{10 + 12}{60} = \frac{22}{60} \text{ minutes}$$

$$\frac{2x}{24} = \frac{22}{60} \text{ hours}$$

$$x = \frac{22}{5} \text{ km}$$

Certain time

(t) = Time taken to travel at the speed of 6 km/h

$$+ \frac{12}{60} \text{ hours}$$

$$t = \frac{22}{6} + \frac{12}{60} = \frac{11}{15} + \frac{12}{60} = \frac{14}{15}$$

$$\therefore \text{Certain Speed} = \frac{\text{Certain distance}}{\text{Certain Time}} = \frac{22}{\frac{14}{15}} = \frac{22 \times 15}{5 \times 14}$$

$$= 4\frac{5}{7} \text{ km/h}$$

102. A person travelled from station A to station B at 40 km/h and from B to A at 30km/h. The entire journey took 6.3 hours. What is the distance (in km) between A and B?

- (a) 117 (b) 108
(c) 99 (d) 91

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b) Let the time taken by the person to travel from station A to B = t hours.

∴ Distance = Speed × Time

$$40 \times t = 30 \times (6.3 - t)$$

$$4t = 18.9 - 3t$$

$$t = 2.7$$

$$\begin{aligned} \therefore \text{Distance between A and B} &= 40 \times t \\ &= 40 \times 2.7 = 108\text{km} \end{aligned}$$

103. The ratio of speeds of A and B is 3:5. If A takes 24 minutes more than B to cover a certain distance, then how much time (in minutes) will B take to cover the same distance?

- (a) 36 (b) 18
(c) 40 (d) 20

SSC CHSL 03/07/2019 (Shift-II)

Ans. (a): Let the time taken by B to cover the distance = x min

We know that,

$$\text{Speed} \times \text{Time} = \text{Distance}$$

According to the question,

$$A \times (x + 24) = B \times x$$

$$3 \times (x + 24) = 5 \times x$$

$$3x + 72 = 5x$$

$$2x = 72$$

$$x = 36 \text{ minutes}$$

104. A train covers 360 km at a uniform speed. If the speed had been 10 km/h more, it would have taken 3 hours less for the same journey. What is the speed of the train (in km/h)?

- (a) 30 (b) 50
(c) 25 (d) 40

SSC CHSL 04/07/2019 (Shift-II)

Ans. (a) : Let the speed of the train = x km/h

According to the question,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$3 = \frac{360}{x} - \frac{360}{x+10}$$

$$\Rightarrow 3 = \frac{360x + 3600 - 360x}{x^2 + 10x}$$

$$3x^2 + 30x = 3600$$

$$\Rightarrow x^2 + 10x - 1200 = 0$$

$$\Rightarrow x^2 + (40 - 30)x - 1200 = 0$$

$$\Rightarrow x^2 + 40x - 30x - 1200 = 0$$

$$\Rightarrow x(x + 40) - 30(x + 40) = 0$$

$$(x + 40)(x - 30) = 0$$

$$x - 30 = 0$$

$$x = 30$$

Hence the speed of the train = 30 km/h.

105. A train covers a certain distance in 45 minutes. If its speed is reduced by 5 km/h, it takes 3 minutes more to cover to same distance. The distance (in km) is :

- (a) 64 (b) 80
(c) 60 (d) 54

SSC CHSL 04/07/2019 (Shift-I)

Ans. (c) : Let the distance is x km-

$$\text{Time} = 45 \text{ minute} = \frac{3}{4} \text{ hours}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{x}{\frac{3}{4}} \times 4 = \frac{4x}{3} \text{ km/h}$$

According to the question,

$$\frac{4x}{3} - 5 = \frac{x}{45+3} \times 60$$

$$\frac{4x - 15}{3} = \frac{5x}{4}$$

$$16x - 60 = 15x$$

$$x = 60\text{km.}$$

Hence the distance is 60 km.

106. A car covers 25 km at a uniform speed. If the speed had been 8 km/h more, it would have taken 10 hours less for the same journey. What is the speed of the car (in km/h) ?

- (a) 4 (b) 2.5
(c) 2 (d) 3

SSC CHSL 05/07/2019 (Shift-I)

Ans. (c) : Let the speed of the car = s km/h

$$\text{Distance} = \frac{s_1 s_2}{s_1 \sim s_2} \times (t_1 \sim t_2)$$

$$25 = \frac{s \times (s+8)}{8} \times 10$$

$$5 = \frac{s(s+8)}{4}$$

$$s(s+8) = 20 = 2 \times 10$$

$$\therefore s = 2 \text{ km/h}$$

107. A man travelled a distance of 1200 km in 16 hours. He travelled partly by car at a speed of 40 km/h, and partly by train at a speed of 80 km/h. What is the distance travelled by car?

- (a) 80 km (b) 96 km
(c) 120 km (d) 100km

SSC CHSL -19/10/2020 (Shift-I)

Ans. (a) : Let the distance covered by car = x km

$$t_1 + t_2 = T$$

$$\frac{x}{40} + \frac{(1200-x)}{80} = 16$$

$$2x + (1200-x) = 16 \times 80$$

$$x + 1200 = 1280$$

$$x = 80 \text{ km}$$

Hence, the total distance covered by car = 80km.

108. A man walks from point X to Y at a speed of 20 km/h, but comes back from point Y to X at a speed of 25 km/h. Find his average speed.

- (a) $25\frac{2}{9}$ km/h (b) $22\frac{2}{9}$ km/h
 (c) $24\frac{2}{9}$ km/h (d) $23\frac{2}{9}$ km/h

SSC CHSL -17/03/2020 (Shift-I)

Ans. (b) : ∴ Let the speed of man is V_1 and V_2

$$\begin{aligned} \therefore \text{Average speed} &= \frac{2V_1V_2}{V_1+V_2} \\ &= \frac{2 \times 20 \times 25}{45} = \frac{200}{9} = 22\frac{2}{9} \text{ km/h} \end{aligned}$$

109. Given that the lengths of the paths of a ball thrown with different speeds by two boys are the same, if they take 0.6 sec and 1 sec respectively to cover the same length, what is the average speed of travel for the first throw, its the same for the second is 96 km/h ?

- (a) 200 km/h (b) 150 km/h
 (c) 100 km/h (d) 160 km/h

SSC CHSL 10/07/2019 (Shift-II)

Ans. (d) : Let the speed of first and second throw is V_1 km/h and V_2 km/h

According to the question,

From $V_1 t_1 = V_2 t_2$

$$V_1 \times 0.6 = 96 \times 1$$

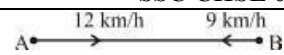
$$V_1 = 16 \times 10 = 160 \text{ km/h}$$

110. A man travels a certain distance at the speed of 12 km/h and returns to the starting point at the speed of 9 km/h. The total time taken by him for the entire journey is $2\frac{1}{3}$ hours. The total

distance (in km) covered by him is :

- (a) 25 (b) 12
 (c) 24 (d) 28

SSC CHSL 01/07/2019 (Shift-III)

Ans. (c) 

$$\text{Average speed} = \frac{2xy}{x+y}$$

$$\text{Average speed} = \frac{2 \times 12 \times 9}{12+9}$$

$$\text{Average speed} = \frac{2 \times 12 \times 9}{21}$$

Total distance = Average speed \times Total time

$$\text{Total Distance} = \frac{2 \times 12 \times 9}{21} \times \frac{7}{3}$$

$$\text{Total Distance} = 24 \text{ km}$$

111. If a student walks with speed 30% more than the usual speed, he reaches 15 min earlier to his destination. How much time (in minutes) does he take to reach his destination normally?

- (a) 45 (b) 65
 (c) 50 (d) 39

SSC MTS 14/08/2019 (Shift-III)

Ans. (b) : $30\% = \frac{3}{10}$

Let the Actual speed = $10x$

Unrealistic speed = $13x$

Let the real time taken to reach destination = t

According to the question,

Actual distance = Unrealistic distance

$$10x \times t = 13x \times \left(t - \frac{15}{60}\right)$$

$$10t = 13t - \frac{13}{4}$$

$$3t = \frac{13}{4}$$

$$t = \frac{13}{12}$$

$$t = 65 \text{ minutes}$$

112. A woman travelling at 13% of her usual speed reaches her office 12 minute early. Her usual time to cover the journey is:

- (a) 52 hr (b) 0.48 hr
 (c) 2 hr (d) 1 hr

SSC MTS 13/08/2019 (Shift-II)

Ans. (a) : Speed = v

Time = t

From the question,

$$v \times t = v \times \frac{130}{100}(t-12)$$

$$10t = 13(t-12)$$

$$10t = 13t - 156$$

$$3t = 156$$

$$t = 52 \text{ hr}$$

113. A sport car going at an average speed of 108 km/h takes 15 minutes to complete a lap on a racing track. How much speed (in km/h) should be increased to complete the lap in 9 minutes?

- (a) 180 (b) 108
 (c) 72 (d) 100

SSC MTS 09/08/2019 (Shift-I)

Ans. (c) : ∴ Distance is constant

And distance = Speed \times Time

Let the new speed = x km/h

$$\text{Then, } 108 \times \frac{15}{60} = x \times \frac{9}{60}$$

$$x = 180 \text{ km/h}$$

$$\begin{aligned} \text{Hence increase in speed} &= 180 - 108 \\ &= 72 \text{ km/hr} \end{aligned}$$

114. A takes 10 minutes more than B in covering a certain distance. If their speeds are in the ratio of 3:4, then what is the time taken by B to cover the same distance?

- (a) 40 minutes (b) 30 minutes
 (c) 50 minutes (d) 20 minutes

SSC MTS 07/08/2019 (Shift-II)

Ans. (b) : Let, The time taken by B = t
 The time taken by A = t + 10
 \therefore Distance is same
 $\therefore V_1 t_1 = V_2 t_2$
 $3x \times (t + 10) = 4x \times t$
 $3t + 30 = 4t$
 $t = 30$ minutes

115. The average speed of train is 54 km/h covers a distance in 200 minutes. what should be the speed of train to cover the same distance in 90 minutes?

- (a) 120 (b) 60
 (c) 180 (d) 220

SSC MTS 20/08/2019 (Shift-III)

Ans. (a) : Speed = $\frac{\text{Distance}}{\text{Time}}$
 Distance = Speed \times Time
 \therefore The distance is fixed in both cases
 $\therefore s_1 t_1 = s_2 t_2$
 $54 \times 200 = s_2 \times 90$
 $6 \times 20 = s_2$
 $s_2 = 120$ km/hr

116. If the speed of a train is increased by 30% it takes 36 minutes less to cover the same distance. What is the time taken (in hours) to cover the same distance with the original speed?

- (a) 2.6 (b) 3.2
 (c) 2.4 (d) 3.5

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a) : When the distance is equal then,
 From $v_1 t_1 = v_2 t_2$
 $v \times t = \frac{v \times 130}{100} \times \left(t - \frac{36}{60} \right)$
 $t = \frac{13}{10} t - \frac{13 \times 36}{600}$
 $3t = \frac{13 \times 36}{60}$
 $t = \frac{13 \times 12}{60} = \frac{13}{5} = 2.6$ hours

(III) When Time is Constant

117. The speed of train A is 25 km /h more than the speed of train B. A takes 4 hours less time to travel a distance of 300km than what train B takes to travel 250 km. What is the speed (in km/h) of A?

- (a) 65 (b) 50
 (c) 60 (d) 70

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-I)

Ans. (b) : Let the speed of train B = x km/h
 Then, the speed of train A = (x + 25) km/h
 According to the question,

$$\frac{250}{x} - \frac{300}{x + 25} = 4$$

$$250x + 6250 - 300x = 4x^2 + 100x$$

$$4x^2 + 150x - 6250 = 0$$

$$\Rightarrow 2x^2 + 75x - 3125 = 0$$

$$\Rightarrow 2x^2 + 125x - 50x - 3125 = 0$$

$$\Rightarrow x(2x + 125) - 25(2x + 125) = 0$$

$$\Rightarrow (x - 25)(2x + 125) = 0$$

$$\Rightarrow x - 25 = 0 \quad \text{or} \quad 2x + 125 = 0$$

$$\Rightarrow x = 25 \quad \text{or} \quad x = \frac{-125}{2} \text{ (Invalid)}$$

Hence it is clear that the speed of train A = x + 25 = 25 + 25 = 50 km/h

118. A and B move together towards each other at the same time at the speed 10 km/hr and 20 km/hr respectively and the distance between them is 49 km. before 5 minutes of meeting together what is the distance (in m) between them?

- (a) 1600 (b) 1800
 (c) 2500 (d) 2000

SSC MTS 20/08/2019 (Shift-I)

Ans. (c) : From the question,
 Relative speed = (10 + 20) = 30 km/h
 Before 5 minutes distance between them
 $= 30 \times \frac{5}{18} \times 5 \times 60$
 $= 2500$ m.

119. Neeraj covers two distances of 10 km and 20 km in 1 hour and 5 hours respectively. What will be the average speed of Neeraj for the whole journey?

- (a) 4 km/hr (b) 7 km/hr
 (c) 5 km/hr (d) 6 km/hr

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (c): The total distance covered by Neeraj = (10+20) km.
 $= 30$ km.
 The total time taken by Neeraj = (1+5) hours = 6 hours

Average speed of Neeraj = $\frac{\text{Total Distance}}{\text{Total time}}$
 $= \frac{30}{6} = 5$ km/hr

120. Kivand and Dinesh travel a distance of 60 km such that the speed of Kivand is faster than Dinesh. The sum of their speeds is 80 km/h and the total time taken by both is 3 hours 12 minutes, find the speed of Kivand?

- (a) 50 km/h (b) 40 km/h
 (c) 45 km/h (d) 30 km/h

SSC MTS 20/08/2019 (Shift-I)

Ans. (a) : Let, speed of Kivand = x km/h
According to the question,

$$\frac{60}{x} + \frac{60}{80-x} = \frac{16}{5}$$

$$\frac{15}{x} + \frac{15}{80-x} = \frac{4}{5}$$

$$\frac{80-x+x}{80-x+x} = \frac{4}{75}$$

$$6000 = 320x - 4x^2$$

$$x^2 - 80x + 1500 = 0$$

$$(x - 50)(x - 30) = 0$$

$$\Rightarrow x = 50$$

\therefore Speed of Kivand = 50 km/h

121. A man on a tour travels first 360 km by train at 72 km/s, the next 160 km on a motor cycle at 12.80 km/h and the last 200 km by on a bicycle at 16 km/h. Ignoring the buffer times between the different modes of travel, what is the average speed (in m/s) for his tour?

- (a) 6.67 (b) 7.33
(c) 4.33 (d) 5.67

SSC MTS 16/08/2019 (Shift-I)

Ans. (a) : Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{360+160+200}{\frac{360}{72} + \frac{160}{12.8} + \frac{200}{16}}$$

$$= \frac{720}{5+12.5+12.5}$$

$$\Rightarrow \frac{720}{30}$$

$$\Rightarrow 24 \text{ km/hr}$$

$$\Rightarrow 24 \times \frac{5}{18} = 4 \times \frac{5}{3} \text{ m/sec}$$

$$\Rightarrow \frac{20}{3} \text{ m/sec} = 6.67 \text{ m/sec}$$

(IV) Problem based on Average speed

122. A man goes from C to D at 40 Km/h and he returns from D to C at X km/h. If the average speed of the man for the whole journey is 60 km/h, then what is the value of x?

- (a) 100 (b) 120
(c) 110 (d) 80

SSC MTS 08/08/2019 (Shift-III)

Ans. (b) : Average speed = $\frac{2S_1S_2}{S_1+S_2}$

$$60 = \frac{2 \times 40 \times S_2}{40 + S_2}$$

$$60(40 + S_2) = 80 S_2$$

$$2400 + 60 S_2 = 80 S_2$$

$$20 S_2 = 2400$$

$$S_2 = 120$$

123. A person covers 40% of a distance at a speed of 60 km/h and the remaining distance at a speed of 40 km/h. What will be the average speed in km/h for the entire journey ?

- (a) $\frac{600}{13}$ (b) $\frac{600}{11}$
(c) $\frac{500}{13}$ (d) $\frac{500}{11}$

SSC CHSL 11/07/2019 (Shift-III)

Ans. (a) : Let the total distance = 100 km

Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{100}{\frac{40}{60} + \frac{60}{45}} = \frac{100}{\frac{2}{3} + \frac{3}{2}} = \frac{600}{13}$$

124. A person goes from point A to B and comes back. His averages speed for the whole journey is 30 km/hr. If his speed while going from A to B is 24 km/hr, then what will the speed of person (in km/hr) while coming back from B to A.

- (a) 35 (b) 40
(c) 45 (d) 38

SSC MTS 11-10-2017 (Shift-I)

Ans : (b)

Average speed = $\frac{2xy}{x+y}$

$$30 = \frac{2 \times 24 \times y}{24 + y}$$

$$30(24 + y) = 48y$$

$$720 + 30y = 48y$$

$$48y - 30y = 720$$

$$18y = 720$$

$$y = \frac{720}{18}$$

$$y = 40$$

Hence the speed of return from B to A = 40 km/hr

125. A person goes from point S to T and comes back, His average speed for the whole journey is 70 km/hr. If his speed while coming back from T to S is 80 km/hr, then what will be the speed of the person (in km/hr) while going from S to T ?

- (a) 58.13 (b) 62.22
(c) 60 (d) 65

SSC MTS 11-10-2017 (Shift-I)

Ans : (b)

Average speed = $\frac{2xy}{x+y}$

$$70 = \frac{2 \times 80 \times x}{80 + x}$$

$$560 + 7x = 16x, \quad 560 = 16x - 7x$$

$$9x = 560$$

$$x = \frac{560}{9}, \quad x = 62.22$$

Hence the speed while going from S to T = 62.22 km/hr.

126. A man goes to a place on car at a speed of 160 km/h and comes back at lower speed. If the average speed is 64 km/h in total, then the return speed (in km/h) is:

- (a) 25 (b) 80
(c) 40 (d) 60

SSC MTS 13/08/2019 (Shift-III)

Ans. (c) : \therefore Average speed = $\frac{2S_1 \times S_2}{S_1 + S_2}$

$$64 = \frac{2 \times 160 \times S_2}{160 + S_2}$$

$$64 \times 160 + 64S_2 = 2 \times 160 \times S_2$$

$$64 \times 160 = 320S_2 - 64S_2$$

$$64 \times 160 = 256S_2$$

$$S_2 = 40 \text{ km/hr.}$$

127. A Person covered 50% of a certain distance 2 km/h, 25% of the distance at 4 km/h and the remaining distance at 8 km/h His average speed (in km/h) for the entire Journey was :-

- (a) 32/33 (b) 16/3
(c) 32/11 (d) 14/3

SSC Sel. Post Phase VII (M.L.) 15-10-19 (Shift-I)

Ans. (c) : Let total distance = d km
According to the question,

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{d}{\frac{d}{2 \times 2} + \frac{d}{4 \times 4} + \frac{d}{4 \times 8}}$$

$$= \frac{d \times 32}{8d + 2d + d} = \frac{32}{11} \text{ km/h}$$

(V) Miscellaneous

128. An athlete crosses a distance of 3600 m in 12 minutes. what is his speed (in km/h)?

- (a) 15 (b) 17
(c) 18 (d) 16

SSC CHSL 07/06/2022 (Shift- II)

Ans. (c) : Given that -

Distance (d) = 3600 m

Time (t) = 12 min

$$\therefore \text{Speed (s)} = \frac{\text{Distance (d)}}{\text{Time(t)}}$$

$$\Rightarrow s = \frac{3600}{12 \times 60}$$

$$\Rightarrow s = 5 \text{ m/sec}$$

$$\Rightarrow s = 5 \times \frac{18}{5} \text{ km/h}$$

$$\therefore \boxed{s = 18 \text{ km/h}}$$

129. In a 1200 m race, the ratio of the speeds of two contestants Meenal and Nitu is 5 : 7. If Meenal has a start of 500 m, then Meenal wins by:

- (a) 200 m (b) 240 m
(c) 250 m (d) 225 m

SSC CHSL 09/06/2022 (Shift- I)

Ans. (a) : \therefore Distance \propto Speed

Speed of Meenal and Nitu = 5 : 7

Ratio of distance covered by Meenal and Nitu = 5 : 7

12 unit = 1200 m

1 unit = 100 m

Meenal's speed = 500 m/s, Nitu's speed = 700 m/s

According to the question,

Time taken to cover 700 m distance by Meenal =

$$\frac{700}{500} = 1.4 \text{ sec}$$

Distance covered by Nitu in 1.4 sec = $700 \times 1.4 = 980$ m

Hence, Meenal wins = $1200 - 980 = 220$ m

130. With an average speed of 42 km/h, a train reaches its destination in time. If it move with an average speed of 14 km/h, it is late by 35 minutes. The length of the journey is:

- (a) 12.25 km (b) 12.15 km
(c) 10.25 km (d) 11.25 km

SSC CHSL 27/05/2022 (Shift- III)

Ans. (a) : We know that -

$$\text{Distance} = \frac{\text{Speed}_1 \times \text{Speed}_2}{\text{Difference of speed}} \times \text{Time difference}$$

$$\therefore \text{Distance} = \frac{42 \times 14}{42 - 14} \times \frac{35}{60}$$

$$\Rightarrow \frac{42 \times 14}{28} \times \frac{35}{60} \Rightarrow \boxed{12.25 \text{ km}}$$

131. Akhil rides first 12 km at a speed of 16 km/h and further 6 km at a speed of 20 km/h. Find his average speed (in km/h).

- (a) $18\frac{1}{5}$ (b) $17\frac{1}{7}$
(c) $17\frac{1}{2}$ (d) $16\frac{4}{5}$

SSC CGL (Tier-I) 19/04/2022 (Shift-III)

$$\text{Ans. (b) Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{(12 + 6)}{\left(\frac{12}{16} + \frac{6}{20}\right)}$$

$$= \frac{18 \times 80}{(60 + 24)}$$

$$= \frac{18 \times 80}{84}$$

$$= \frac{120}{7} = 17\frac{1}{7} \text{ km/h}$$

132. A car covers a distance of 48 km at a speed of 40 km/h and another 52 km with a speed of 65 km/h. What is the average speed of the car (in km/h) for the total distance covered?

- (a) 52 (b) 53
(c) 50 (d) 52.5

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c) Average speed of the car = $\frac{48+52}{\frac{48}{40} + \frac{52}{65}}$
 $= \frac{48+52}{1.2+0.8} = \frac{100}{2}$
 $= 50 \text{ km/h}$

133. A truck covers a distance of 384 km at a certain speed. If the speed is decreased by 16 km/h it will take 2 hours more to cover the same distance 75% of its original speed (in km/h) is:

- (a) 54 (b) 45
(c) 42 (d) 48

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d)

Let the original speed = x km/h

$$\frac{384}{x-16} - \frac{384}{x} = 2$$

$$384 \left[\frac{1}{x-16} - \frac{1}{x} \right] = 2$$

$$384 \left[\frac{x-x+16}{x(x-16)} \right] = 2$$

$$x^2 - 16x = 3072$$

$$x^2 - 16x - 3072 = 0$$

$$x^2 - 64x + 48x - 3072 = 0$$

$$x(x-64) + 48(x-64) = 0$$

$$(x-64)(x+48) = 0$$

$$\therefore x = -48 \text{ (Invalid)}$$

$$\therefore x = 64$$

$$x \times \frac{75}{100} = 64 \times \frac{3}{4} = 48 \text{ km/h}$$

OR

Trick:

$$\text{Distance} = \frac{s_1 s_2}{s_1 \sim s_2} \times (t_1 \sim t_2)$$

Let the original speed of the track = s km/h

$$384 = \frac{s(s-16)}{16} \times 2$$

$$s(s-16) = 384 \times 8$$

$$s(s-16) = 64 \times 48$$

$$\therefore s = 64 \text{ km/h}$$

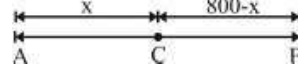
$$\text{Hence } 64 \times \frac{75}{100} = 48 \text{ km/h}$$

134. The distance between two stations A and B is 800 km. A train X starts from A and moves towards B at 40 km/h and another train Y starts from B and moves towards A at 60 km/h. How far from station A will they cross each other?

- (a) 380 km (b) 300 km
(c) 360 km (d) 320 km

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (d) : Let both trains will meet at a distance of x km from station A.



\therefore Time is equal.

$$\frac{x}{40} = \frac{800-x}{60}$$

$$\frac{x}{2} = \frac{800-x}{3}$$

$$3x = 1600 - 2x$$

$$5x = 1600$$

$$x = 320$$

135. A train without stoppage travels with an average speed of 70 km/h and with stoppage, it travels with the average speed of 56 km/h. How many minutes, does the train stop on an average per hour?

- (a) 14 (b) 12
(c) 15 (d) 16

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) :

The time of stop of the train per hour =

$$\left(\frac{x-y}{x} \right) \times 60 \text{ min}$$

Where x = Speed of the train without stoppage

y = Speed of the train with stoppage

Hence, the time of stop of the train per hour

$$= \frac{70-56}{70} \times 60$$

$$= \frac{14}{70} \times 60 = 2 \times 6 = 12 \text{ minutes}$$

136. A train without stoppage travels with an average speed of 50 km/h, and with stoppage, it travels with an average speed of 40 km/h. For how many minutes does the train stop on an average per hour?

- (a) 12 (b) 14
(c) 13 (d) 15

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (a) : Speed of the train without stoppage = 50 km/h

Speed of the train with stoppage = 40 km/h

Hence, The time of stop of the train per hour

$$= \left(\frac{50-40}{50} \right) \times 60 \text{ min}$$

$$= \frac{10}{50} \times 60 \text{ minute}$$

$$= 12 \text{ minute}$$

137. A person returns from his office at one-fourth of the speed at which he goes to his office. If the average speed during the whole trip is 15 km/h, then what would have been his speed while going to the office?

- (a) $\frac{75}{8}$ km/h (b) 9 km/h
 (c) $\frac{17}{3}$ km/h (d) $\frac{15}{2}$ km/h

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (a) : Let the speed from office to home = v

\therefore Speed from home to office = $\frac{v}{4}$

\therefore Average speed = $\frac{2v_1v_2}{v_1+v_2}$, Where $v_1 = v$, $v_2 = \frac{v}{4}$

$$\therefore 15 = \frac{2 \times v \times \frac{v}{4}}{v + \frac{v}{4}} = \left(\frac{2 \frac{v^2}{4}}{\frac{5v}{4}} \right) \Rightarrow 15 = \frac{2v}{5}$$

$$v = \frac{75}{2}$$

Speed of going from home to office = $\frac{v}{4} = \frac{75}{8}$

- 138. A and B start moving towards each other from places X and Y, respectively, at the same time. The speed of A is 20% more than that of B. After meeting on the way, A and B take $2\frac{1}{2}$ hours and x hours, now to reach Y and X, respectively. What is the value of x?**

- (a) $3\frac{2}{3}$ (b) $3\frac{1}{2}$
 (c) $3\frac{3}{5}$ (d) $3\frac{2}{5}$

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-II)

Ans. (c) : Let the speed of B = 5 km/h
 Speed of A = 6 km/h

$$\therefore \left(\frac{V_A}{V_B} \right)^2 = \frac{t_B}{t_A} \quad (\text{Formula})$$

$$\left(\frac{6}{5} \right)^2 = \frac{x}{\frac{36}{5}}$$

$$\frac{36}{25} = \frac{2x}{5}$$

$$x = \frac{18}{5} = 3\frac{3}{5} \text{ hours}$$

- 139. Place A and B are 144 km apart. Two cars start simultaneously, one from A and the other from B. If they move in the same direction, they meet after 12 hours, but if they move towards each other they meet after $\frac{9}{8}$ hours. The speed (in km/h) of the car moving at a faster speed, is:**

- (a) 64 (b) 60
 (c) 70 (d) 72

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (c) : Let the speed of the fast moving car = x km/h

Speed of the slow moving car = y km/h

$$\frac{144}{x-y} = 12$$

$$x - y = 12 \dots\dots (1)$$

$$\text{Again, } \frac{144}{x+y} = \frac{9}{8}$$

$$x + y = 128 \dots\dots (2)$$

On solving equation (1) and (2)

$$x = 70, \quad y = 58$$

- 140. Two cyclists X and Y start at the same time from place A and go towards place B at a speed of 6 km/h and 8 km/h, respectively. Despite stopping for 15 minutes during the journey, Y reaches 10 minutes earlier than X. The distance between the places A and B is:**

- (a) 16.5 km (b) 8 km
 (c) 6 km (d) 10 km

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (d) : Let the distance between the places A and B = x km

$$\frac{x}{6} - \frac{x}{8} = \frac{25}{60}$$

$$\frac{x}{24} = \frac{5}{12}$$

$$x = 10 \text{ km}$$

- 141. The two trains leave Varanasi for Lucknow at 11:00 a.m. and at 11:30 a.m., respectively and travel at a speed of 110 km/h and 140km/h, respectively. How many kilometers from Varanasi will both trains meet?**

- (a) $256\frac{2}{3}$ km (b) $255\frac{1}{3}$ km

- (c) $246\frac{1}{3}$ km (d) $238\frac{2}{3}$ km

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (a) : Distacne covered by the first train in 30

$$\text{minutes} = 110 \times \frac{1}{2} = 55 \text{ km}$$

Time taken by second train to cover the distance of

$$= \frac{55}{140-110} = \frac{55}{30} \text{ hours}$$

$$\text{Required distance} = 140 \times \frac{55}{30}$$

$$= \frac{770}{3} = 256\frac{2}{3} \text{ km}$$

- 142. Two cars A and B leave Delhi at 8:30 a.m. and at 9 a.m. for Shimla, respectively. They travel at the speeds of 40km/h and 50km/h respectively. How many kilometers away from Delhi will the two cars be together?**

- (a) 45 km (b) 100 km
 (c) 200 km (d) 5 km

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (b) : Let both the cars will meet after t hours of running of car A.

$$40 \times t = 50 \times \left(t - \frac{1}{2} \right)$$

$$4t = 5t - \frac{5}{2}$$

$$t = \frac{5}{2} \text{ hours}$$

$$\therefore \text{ Required distance} = 40 \times \frac{5}{2} = 100 \text{ km}$$

143. The distance between two station, A and B is 575 km. A train starts from station 'A' at 3:00 p.m. and moves towards station 'B' at an average speed of 50 km/h. Another train starts from station 'B' at 3:30 p.m. and moves towards station 'A' at an average speed of 60 km/h. How far from station 'A' will the trains meet?

- (a) 275 km (b) 225 km
(c) 300 km (d) 325 km

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-III)

Ans. (a) :

Let the distance covered by first train in $\frac{1}{2}$ hr

$$\text{Distance} = 50 \times \frac{1}{2} = 25 \text{ km}$$

Remaining distance = 575 – 25 = 550 km

Both trains will meet at a distance of x km from station B.

$$\therefore \frac{550 - x}{50} = \frac{x}{60}$$

$$3300 - 6x = 5x$$

$$11x = 3300$$

$$x = 300$$

$$\therefore \text{ Distance from station A} = 25 + (550 - 300) = 275 \text{ km}$$

144. X and Y are two stations which are 280 km apart. A train starts at a certain time from X and travels towards Y at 60 km/h. After 2 hours, another train starts from Y and travels towards X at 20 km/h. After how many hours does the train leaving from X meets the train which left from Y?

- (a) 3 hours (b) 6 hours
(c) 2 hours (d) 4 hours

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-I)

Ans. (d) : The distance covered by first train in 2 hours = $60 \times 2 = 120$ km

Suppose both train will meet after t hours of running of second train.

$$120 + 60t + 20t = 280$$

$$80t = 160$$

$$t = 2 \text{ hours}$$

$$\text{Required time} = 2 + 2 = 4 \text{ hours}$$

145. A takes 2 hours 30 minutes more than B to walk 40 km. If A doubles his speed, then he can make it in 1 hour less than B. What is the average time taken by A and B to walk a 40 km distance?

- (a) 6 hours (b) 7 hours 15 minutes
(c) 5 hours 15 minutes (d) 5 hours 45 minutes

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (d) Let the speed of A is V_1 and speed of B is V_2 . According to the first condition—

$$\frac{40}{v_1} - \frac{40}{v_2} = 2\frac{1}{2} \text{ hours}$$

$$\Rightarrow \frac{40}{v_1} - \frac{40}{v_2} = \frac{5}{2} \text{ (i)}$$

According to the second condition,

$$\frac{40}{v_2} - \frac{40}{2v_1} = 1 \text{ (ii)}$$

From equation (i) and (ii)

$$\frac{40}{2v_1} = \frac{5}{2} + 1$$

$$40 \times \frac{1}{2v_1} = \frac{7}{2}$$

$$\Rightarrow \frac{40}{v_1} = 7 \text{ (iii)}$$

Putting the value in equation (i) from equation (iii)

$$7 - \frac{40}{v_2} = \frac{5}{2}$$

$$\Rightarrow \frac{40}{v_2} = \frac{9}{2} \text{ (iv)}$$

$$\therefore \text{ Average time} = \frac{\left(7 + \frac{9}{2} \right)}{2}$$

$$= \frac{23}{4} \text{ hours}$$

$$= 5 \text{ hour } 45 \text{ minutes}$$

OR

Trick:

Speed of A $\rightarrow 1 : 2$

The time taken by A $\rightarrow 2 : 1$ (\because Distance is constant)

$$1 \rightarrow \left(2\frac{1}{2} + 1 \right) = \frac{7}{2}$$

$$2 \rightarrow 7 \text{ hours}$$

Initially time taken by A = 7 hours

The time taken by B = $4\frac{1}{2}$ hours

$$\text{Average} = \frac{7 + 4\frac{1}{2}}{2} = \frac{23}{4} = 5 \text{ hours } 45 \text{ minutes}$$

146. A person travels a distance of 300 km and then returns to the starting point. The time taken by him for the outward journey is 5 hours more than the time taken for the return journey. If he returns at a speed of 10 km/h more than the speed of going, what is the average speed (in km/h) for the entire journey?

- (a) 20 (b) 15
(c) 24 (d) 30

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (c) : Let the speed of going of the person = x km/h

Then speed of returning = (x+10) km/h

According to the question, $\frac{300}{x} - \frac{300}{x+10} = 5$

$$\frac{1}{x} - \frac{1}{x+10} = \frac{5}{300}$$

$$\frac{x+10-x}{x(x+10)} = \frac{1}{60}$$

$$x^2 + 10x = 600$$

$$x^2 + 10x - 600 = 0$$

$$x^2 + 30x - 20x - 600 = 0$$

$$x(x+30) - 20(x+30) = 0$$

$$(x-20)(x+30) = 0$$

$$\Rightarrow x - 20 = 0 \Rightarrow x = 20 \text{ km/h}$$

Hence average speed = $\frac{2 \times 20 \times 30}{20 + 30}$

$$= \frac{1200}{50}$$

$$= 24 \text{ km/h}$$

- 147. A takes 2 hours 30 minutes more than B to walk 40 km. If A doubles his speed, then he can make it in 1 hour less than B. How much time (in hours) does A require for walking a 40 km distance ?**

- (a) 5 (b) 9
(c) 6 (d) 7

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : Ratio of speed of A = 1 : 2

Ratio of the time taken by A = 2 : 1

$$1 \rightarrow 3\frac{1}{2}$$

$$2 \rightarrow 7 \text{ hours}$$

Hence the time taken by A to cover the distance of 40 km = 7 hours

- 148. A person travels a distance of 240 km, partly by train and the rest by bus. He takes 3½ hours if he travels 150km by train and the rest by bus. If he travels 140km by bus and the rest by train, he takes 3¾ hours. What is the speed of the train?**

- (a) 70km/h (b) 75km/h
(c) 72km/h (d) 80km/h

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) Let the speed of the train = x km/h

Speed of the bus = y km/h

According to the question,

$$\frac{150}{x} + \frac{90}{y} = \frac{7}{2}$$

$$\frac{100}{x} + \frac{140}{y} = \frac{11}{3}$$

Let $\frac{1}{x} = a$, $\frac{1}{y} = b$

$$150a + 90b = \frac{7}{2}$$

$$300a + 180b = 7 \quad \dots(i)$$

$$100a + 140b = \frac{11}{3}$$

$$300a + 420b = 11 \quad \dots(ii)$$

From equation (i) and (ii)

$$240b = 4$$

$$b = \frac{1}{60}$$

$$b = \frac{1}{60} \text{ Putting in equation (i)}$$

$$300a + 180 \times \frac{1}{60} = 7$$

$$a = \frac{4}{300} = \frac{1}{75}$$

Speed of the train $x = \frac{1}{a} = 75 \text{ km/h}$

- 149. Amit travelled from A to B at an average speed of 80 km/h. He covered the first 75% distance in two-thirds of the time and the remaining distance at a constant speed of x km/h. What is the value of x ?**

- (a) 54 (b) 56
(c) 60 (d) 64

SSC CHSL 02/07/2019 (Shift-II)

Ans. (c) : Let the total distance is 80 km and the total time is 1 hour.

Hence the time taken to cover the distance of initial

$$75\% \text{ i.e. } 80 \times \frac{75}{100} = 60 \text{ km.}$$

$$\text{Remaining distance} = 80 - 60 = 20 \text{ km,}$$

$$\text{Remaining time} = 1 - \frac{2}{3} = \frac{1}{3} \text{ hr}$$

The speed to cover the remaining 20km in 1/3 hr

$$= \frac{20}{1/3} = 60 \text{ km/hr}$$

Hence the value of x will be 60km/hr.

- 150. If I travel by bus, I reach my office by 15 minutes late. If I travel by car, I reach my office 10 minutes before. If the distance between my house and my office is 25 km, then the difference between inverse average speed of the bus and the car in seconds per meter is :**

(a) $\frac{3}{25}$ (b) $\frac{3}{20}$

(c) $\frac{3}{10}$ (d) $\frac{3}{50}$

SSC CHSL 09/07/2019 (Shift-III)

Ans. (d) : Let the average speed of bus and car is x and y km respectively.

$$\frac{25}{x} - \frac{25}{y} = \frac{25}{60}$$

$$\frac{1}{x} - \frac{1}{y} = \frac{1}{60} \text{ hr/km}$$

$$\frac{1}{x} - \frac{1}{y} = \frac{1}{60} \times \frac{18}{5} = \frac{3}{50} \text{ Second /meter}$$

151. The ratio between the speeds of the two trains is 2 : 5. If the first train runs 250 km in 5 hours, then what is the sum of the speeds (in km/hr) of both trains ?

- (a) 180 (b) 150
(c) 165 (d) 175

SSC CHSL 2018 09/07/2019 (Shift-II)

Ans. (d) : Let the speed of the first train = 2x km/h
Speed of the second train = 5x km/h
According to the question

$$\text{Speed of the first train} = 2x = \frac{250}{5}$$

$$x = 25 \text{ km/h}$$

$$\begin{aligned} \text{Sum of the speed of both train} &= 2x + 5x \\ &= 7x \\ &= 7 \times 25 \\ &= 175 \text{ km/h} \end{aligned}$$

152. A train travels from P to Q at the speed of u km/h then from Q to R (QR = 2PQ) at the speed of 34 km/h then returns from R to P at the speed of $\frac{u}{2}$ km/h. What is the average speed (in km/h) of the train to start the journey from P and return to P ?

- (a) $\frac{18u}{23}$ (b) $\frac{3u}{2}$
(c) $\frac{4u}{3}$ (d) $\frac{16u}{23}$

SSC CHSL 11/07/2019 (Shift-II)

Ans. (a): Let the distance from P to Q = x km
According to the question,
Then, QR = 2PQ = 2x km
And RP = PQ + QR = x + 2x = 3x km

$$\text{Time taken while going from P to Q} = \frac{x}{u} \text{ hours}$$

$$\text{Time taken while going form Q to R} = \frac{2x}{3u} \text{ hours}$$

$$\text{Time taken while going form R to P} = \frac{3x}{\frac{u}{2}} = \frac{6x}{u} \text{ hours}$$

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

$$= \frac{x + 2x + 3x}{\frac{x}{u} + \frac{2x}{3u} + \frac{6x}{u}}$$

$$\frac{6x}{\frac{x}{u} \left(1 + \frac{2}{3} + 6 \right)}$$

$$\frac{6x}{x \times (23)} = \frac{6x \times 3u}{23x}$$

$$\begin{aligned} &\frac{u \times 3}{23} \\ &= \frac{18u}{23} \text{ km/h} \end{aligned}$$

153. A man is walking at a speed of 12 km per hour. After every kilometre, he takes rest for 4 minutes, How much time (in minutes) will he take to cover a distance of 8 kilometres?

- (a) 68 (b) 64
(c) 60 (d) 72

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) : The man covers distance of 12 km in 1 hour

$$\text{The man covers distance of 1 km} = \frac{1}{12} \times 60 = 5 \text{ min}$$

The man covers distance of 8 km in 40 min

He rests 7 times in a distance of 8 km.

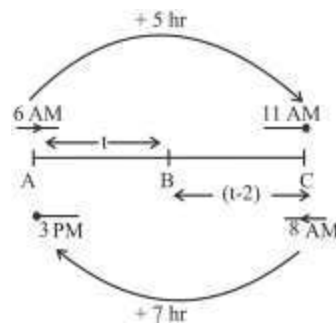
$$\begin{aligned} \text{Total time} &= 40 + (7 \times 4) \\ &= 68 \text{ minutes} \end{aligned}$$

154. A train starts from A at 6 AM and reaches B at 11 AM on the same day. Another train start from B at 8 AM and reaches A at 3 PM on the same day. At what time the two trains will have crossed each other?

- (a) 9:45 AM (b) 8:45 AM
(c) 10:30 AM (d) 7:45 AM

SSC MTS 08/08/2019 (Shift-III)

Ans. (a):



Let both trains meet at C

If a train running from A to 6 AM, reaches C after t hour.

Then the train running from B to 8 am will reach at c after (t-2) hours

According to the question,

$$\frac{t}{5} + \frac{(t-2)}{7} = 1$$

$$\frac{7t + 5(t-2)}{35} = 1$$

$$7t + 5t - 10 = 35$$

$$12t = 35 + 10$$

$$t = \frac{45}{12} \text{ hr}$$

$$t = 3\frac{9}{12} \text{ hr}$$

$$t = 3 \text{ hr } \frac{9}{12} \times 60 \text{ min} \Rightarrow t = 3 \text{ hr } 45 \text{ min}$$

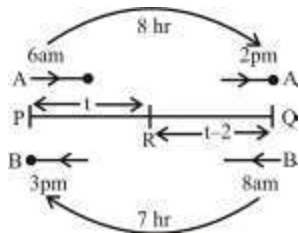
\therefore Time of meeting = 6:00 AM + 3:45 hr = 9:45 AM

155. A man leaves from P at 6 am and reaches Q at 2 pm on the same day. Another man leaves Q at 8 am and reaches P at 3 pm on the same day. At what time do they meet?

- (a) 11 : 46 am (b) 11 : 24 am
(c) 10 : 48 am (d) 11 : 00 am

SSC MTS 02/08/2019 (Shift-I)

Ans. (c) :



Let both person meet at place R. from 6am a person A, reaches R after t hours then from 8am person B, will reach R after (t - 2) hours.

Then,

$$\Rightarrow \frac{t}{8} + \frac{(t-2)}{7} = 1$$

$$\Rightarrow \frac{7t + 8(t-2)}{56} = 1$$

$$\Rightarrow 7t + 8t - 16 = 56$$

$$\Rightarrow 15t = 56 + 16$$

$$\Rightarrow 15t = 72$$

$$t = \frac{72}{15}$$

$$t = 4\frac{12}{15} \text{ hr}$$

$$t = 4 \text{ hr } \frac{12}{15} \times 60 \text{ min}$$

$$t = 4 \text{ hr } 48 \text{ min}$$

Time of meeting = 6am + 4hr 48 min
= 10 : 48 am

156. The average speed of a car is 600 m/min. If a runner covers 100 m in 9.6 seconds then in comparison car moves at what slow speed to the runner?

- (a) $\frac{5}{24}$ (b) $\frac{1}{2}$
(c) $\frac{7}{12}$ (d) $\frac{5}{12}$

SSC MTS 05/08/2019 (Shift-III)

Ans. (d) :

Average speed of the car = 600m/minute

$$= \frac{600}{60} \text{ m/sec} = 10 \text{ m/sec}$$

Average speed of the runner = $\frac{100}{9.6}$ m/sec

$$= \frac{1000}{96} \text{ m/sec}$$

Required difference = $\left(\frac{1000}{96} - 10\right)$ m/sec

$$= \frac{40}{96} = \frac{5}{12} \text{ m/sec}$$

157. Each wheel of a bus is making 7 revolutions per second. If the diameter of a wheel is 56 cm, then the speed of the bus (in cm/sec) would be:

- (a) 616 (b) 1232
(c) 1000 (d) 176

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) : Distance travelled by the wheel in one revolution = $2\pi r$

$$= 2 \times \frac{22}{7} \times \frac{56}{2}$$

$$= 176 \text{ cm.}$$

\therefore Distance travelled by the wheel in 7 revolutions

$$= 176 \times 7 \text{ cm}$$

$$= 1232 \text{ cm}$$

\therefore Speed = $\frac{\text{Distance}}{\text{Time}}$

$$= \frac{1232 \text{ cm}}{1 \text{ sec}} = 1232 \text{ cm/sec}$$

158. A motorcycle is moving at the speed of 25 km/hr and its speed is increased by 7 km/hr at the end of each hour. How much time it will take to cover a distance of 225 km?

- (a) 11/2 hr (b) 7 hr
(c) 13/2 hr (d) 6 hr

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (a) : Distance covered in the first hour = 25 km

Distance covered in the second hour = 32 km

Distance covered in the third hour = 39 km

Distance covered in the fourth hour = 46 km

Distance covered in the fifth hour = 53 km

Remaining distance = $225 - (25 + 32 + 39 + 46 + 53)$

$$= 225 - 195 = 30 \text{ km}$$

Speed of motorcycle in sixth hour = $53 + 7$

$$= 60 \text{ km/h}$$

\therefore The time taken to cover distance of 30 km

$$= \frac{30}{60} = \frac{1}{2} \text{ hr}$$

$$\text{Total Time} = 5 + \frac{1}{2} = \frac{11}{2} \text{ hrs}$$

18.

Problems Related to Train

(I) Simple Problems related to Train

1. A train has to cover a distance of 900 km in 25 hours. What should be its average speed in meters/second ?

- (a) 20 (b) 10
(c) 18 (d) 36

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : Distance = 900 km

Time = 25 hours

$$\text{Speed} = \frac{900}{25} = 36 \text{ km/hr}$$

$$\text{Speed (m/sec)} = 36 \times \frac{5}{18} = 10 \text{ m/sec.}$$

2. A train running with a speed of 45 km/hr, crosses a telephone pole. If the length of train is 810 meters, then what is the time taken (in seconds) by the train to cross the pole?

- (a) 66 (b) 64.8 (c) 68 (d) 67.2

SSC MTS 10-10-2017 (Shift-III)

Ans. (b) : Speed of train = 45 km/hr

$$= 45 \times \frac{5}{18} = \frac{25}{2} \text{ m/sec.}$$

Length of train = 810 meters

Time = ?

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \text{Time} = \frac{810}{\frac{25}{2}} = \frac{810 \times 2}{25}$$

$$\Rightarrow \text{Time} = 64.8 \text{ seconds}$$

Hence, the train will take 64.8 seconds to cross the pole.

3. A 600 metres long train can cross a 1200 metres long platform in 36 seconds. In how much time (in seconds) can it cross a bridge 2200 metres long ?

- (a) 56 (b) 52
(c) 48 (d) 44

SSC MTS 19/08/2019 (Shift-I)

Ans. (a) : Let the length of bridge, platform and train are h, L and l respectively and speed of train is V.

$$\begin{aligned} \text{Speed of train} &= \frac{\ell + L}{T} \\ &= \frac{600 + 1200}{36} = \frac{1800}{36} = \frac{100}{2} \\ &= 50 \text{ m/sec.} \end{aligned}$$

According to the question,

Time taken by the train to cross the bridge

$$= \left(\frac{\ell + h}{V} \right)$$

$$= \frac{600 + 2200}{50} = \frac{2800}{50} = 56 \text{ seconds}$$

4. A train that is running at the speed of 72 km/h crosses an electric pole in 36 seconds. The length of the train (in metres) is:

- (a) 360 m (b) 460 m
(c) 720 m (d) 620 m

SSC CHSL -13/10/2020 (Shift-III)

Ans. (c) : Speed of train = 72 km/h

$$= 72 \times \frac{5}{18} = 20 \text{ m/sec}$$

Time taken to cross the electric pole = 36 seconds

Length of train = l meters

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$20 = \frac{\ell}{36}$$

$$l = 720 \text{ meters}$$

5. A train of length 350 m crosses a bridge of length 250 m in 20 seconds. What is the speed of the train (in km/h)?

- (a) 95 (b) 88
(c) 72 (d) 108

SSC CHSL -12/10/2020 (Shift-III)

Ans. (d) : Length of train = 350 m

Length of bridge = 250 m

Time = 20 seconds

$$\therefore \text{Speed} = \frac{350 + 250}{20} = 30 \text{ m/s}$$

$$= 30 \times \frac{18}{5} \text{ km/h} = 108 \text{ km/h}$$

6. A train 150 m long is running at 90 km/h. How long (in seconds) will it take to clear a platform that is 300 m long?

- (a) 50 (b) 12
(c) 6 (d) 18

SSC CHSL -16/10/2020 (Shift-I)

Ans. (d) : \therefore Speed of train = 90 km/hr

$$= \frac{90 \times 5}{18} \text{ m/sec.}$$

$$= 25 \text{ m/sec.}$$

∴ Time taken for the train to cross the platform = $\frac{\text{Total Distance}}{\text{Speed}}$

$$\left[\because \text{Speed} = \frac{\text{Distance}}{\text{Time}} \right]$$

$$= \frac{150\text{m} + 300\text{m}}{25\text{m/s}}$$

$$= \frac{450}{25}$$

$$= 18 \text{ seconds}$$

7. The distance covered by a train in $(x + 1)$ hours is $(x^3 + 1)$ km. What is the speed of the train?
 (a) $(x^3 - 1)$ km/h (b) $(x^2 - x + 1)$ km/h
 (c) $(x^2 + x + 1)$ km/h (d) $(x + 1)$ km/h
SSC CHSL -16/10/2020 (Shift-III)

Ans. (b) : Speed of Train = $\frac{\text{Distance}}{\text{Time}}$

$$= \frac{(x^3 + 1)}{(x + 1)}$$

$$= \frac{(x + 1)(x^2 - x + 1)}{x + 1}$$

$$\Rightarrow (x^2 - x + 1) \text{ km/h.}$$

8. A jet ski goes upstream at a speed of 48 km/hr and comes back the same distance at 80 km/hr. Find the average speed (in km/hr) for the total journey?
 (a) 64 (b) 62
 (c) 66 (d) 60
SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Average speed = $\frac{2xy}{x + y} = \frac{2 \times 48 \times 80}{(48 + 80)}$

$$= \frac{2 \times 48 \times 80}{128} = 60 \text{ km/hr}$$

9. A man walking at a rate of 4 km/h crossed a tunnel in 18 minutes. What is the length of the tunnel in meters?
 (a) 1200 (b) 1600
 (c) 1400 (d) 1800
SSC CHSL 19/04/2021 (Shift-III)

Ans. (a) : Let the distance be x.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow 4 \times \frac{5}{18} = \frac{x}{18 \times 60}$$

$$\Rightarrow \frac{20}{18} = \frac{x}{1080}$$

$$\Rightarrow 18x = 21600$$

$$\Rightarrow x = 1200 \text{ m}$$

∴ The length of the tunnel is 1200m.

10. A 240-m long train crosses a 360-m long tunnel in 30 seconds. What is the speed on the train (in km/h)?
 (a) 72 (b) 43.2
 (c) 60 (d) 28.8
SSC CGL (Tier-I) 21/04/2022 (Shift-III)

Ans : (a)

$$\text{Speed of train} = \frac{\text{The sum of train and tunnel length}}{\text{Taken time to cross tunnel}}$$

$$\text{Speed of train} = \frac{240 + 360}{30}$$

$$= \frac{600}{30} = 20 \text{ m/s}$$

Now, speed of train = $20 \times \frac{18}{5} = 72 \text{ km/h}$

11. If 300 metres long train takes 30 seconds to cross a pole then what is the speed (in km/hr) of the train?
 (a) 18 (b) 36
 (c) 54 (d) 72
SSC MTS 9-10-2017 (Shift-III)

Ans : (b) According to the question,
 Length of train = Total distance = 300 meters
 Time = 30 seconds

$$\text{Speed} = \frac{300}{30} = 10 \text{ m/sec.}$$

$$\text{or } 10 \times \frac{18}{5} \Rightarrow 2 \times 18 = 36 \text{ km/hr}$$

12. A 450 meters long train crosses a bridge 650 meters long in 36 seconds. What is speed (in km/hr) of the train?
 (a) 110 (b) 125
 (c) 150 (d) 95
SSC MTS 9-10-2017 (Shift-I)

Ans: (a) Required speed = $\frac{450 + 650}{36}$

$$= \frac{1100}{36} \text{ m/sec.} = \frac{1100}{36} \times \frac{18}{5} \text{ km/hr}$$

$$= 110 \text{ km/hr}$$

13. If 200 meters long train takes 40 seconds to cross pole, then what is the speed ((in km/h) of the train.
 (a) 9 (b) 18 (c) 36 (d) 45
SSC MTS 10-10-2017 (Shift-II)

Ans. (b) : Length of train = 200 meters
 Time taken to cross the pole = 40 second

$$\therefore \text{Speed of train} = \frac{200}{40} = 5 \text{ m/sec.}$$

$$= 5 \times \frac{18}{5} = 18 \text{ km/h}$$

14. If 350 meters long train takes 14 seconds to cross a pole, then what is the speed (in km/hr) of the train?
 (a) 54 (b) 72 (c) 90 (d) 36
SSC MTS 11-10-2017 (Shift-II)

Ans. (c) : Distance = 350m.

Time = 14 seconds

Speed = ?

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{350}{14} = 25 \text{ m/sec}$$

$$\text{or } 25 \times \frac{18}{5} = 90 \text{ km/hr}$$

15. A train with 72 km/h speed crosses a stationary pole in 35 seconds. How much time (in minutes) does it take to cross 1.1 km long bridge?

- (a) 2.5 (b) 3
(c) 2 (d) 1.5

SSC MTS 08/08/2019 (Shift-I)

Ans. (d) : Distance = Speed \times Time

$$\text{Length of train} = 72 \times \frac{5}{18} \times 35 = 700 \text{ meters}$$

According to the question,

Time taken by the train to cross that bridge

$$= \frac{1100 + 700}{72 \times \frac{5}{18}}$$

$$= \frac{1800}{20} = 90 \text{ sec or } 1.5 \text{ minutes}$$

16. A train moves at the speed of 80 km/h and crosses a platform in 0.75 minutes. If the length of the train is equal to the length of the platform then what is the length of the platform?

- (a) 400 m (b) 480 m
(c) 450 m (d) 500 m

SSC MTS 07/08/2019 (Shift-II)

Ans. (d) : Let,

Length of train = ℓ = Length of platform

According to the question,

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}} \Rightarrow 80 \times \frac{5}{18} = \frac{\ell + \ell}{0.75 \times 60}$$

$$\frac{200}{9} = \frac{2\ell}{45}$$

$$\therefore \ell = 500 \text{ m}$$

17. A train travelling at the speed of 108 km/h crosses a pole in 32 seconds. The length (in m) of the train is:

- (a) 960 (b) 1024
(c) 1200 (d) 1240

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) : Distance = Speed \times Time

$$\text{Length of train} = 108 \times \frac{5}{18} \times 32$$

$$= 30 \times 32 = 960 \text{ meters}$$

18. A train of length 342m is running at 54km/h. In how much time (in seconds) will it cross a bridge of length 438m?

- (a) 48 (b) 52
(c) 50 (d) 54

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (b) Speed of train = 54km/h = $54 \times \frac{5}{18}$ m/sec

$$= 15 \text{ m/sec}$$

$$\therefore \text{Total distance} = \text{Length of train} + \text{Length of bridge} \\ = 342 + 438 = 780 \text{ m}$$

$$\therefore \text{Time taken to cross the bridge} = \frac{\text{Total distance}}{\text{Speed}}$$

$$= \frac{780}{15} = 52 \text{ seconds.}$$

19. The speed of a train is $2\frac{1}{6}$ times the speed of a car. The car covers 486 km in 9 hours. How much distance will the train cover in 6 hours?

- (a) 712 km (b) 702 km
(c) 612 km (d) 732 km

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (b)

$$\text{Speed of car} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{486}{9} = 54 \text{ km/h}$$

According to the question,

$$\text{Speed of train} = \text{Speed of car} \times 2\frac{1}{6}$$

$$= 54 \times \frac{13}{6} = 117 \text{ km/h}$$

$$\text{Distance covered by train in 6 hours} = \text{Time} \times \text{Speed} \\ = 6 \times 117 = 702 \text{ km}$$

20. A train crosses a pole in 12 sec and a bridge of length 170 m in 36 sec. Then the speed of the train is:

- (a) 25.5 km/h (b) 30.75 km/h
(c) 10.8 km/h (d) 32.45 km/h

SSC CGL (Tier-I)-2019 - 03/03/2020 (Shift-I)

Ans. (a) : Let the length of train = ℓ m

$$\text{Speed of train} = \frac{\ell}{12} = \frac{\ell + 170}{36}$$

$$3\ell = \ell + 170$$

$$\ell = 85 \text{ m}$$

$$\therefore \text{Speed of train} = \frac{85}{12} \times \frac{18}{5} = 25.5 \text{ km/h}$$

21. A train takes $2\frac{1}{2}$ hours less for a journey of 300 km, if its speed is increased by 20 km/h from its usual speed. How much time will it take to cover a distance of 192 km at its usual speed?

- (a) 2.4 hours (b) 3 hours
(c) 6 hours (d) 4.8 hours

SSC CGL (Tier-I)-2019 - 05/03/2020 (Shift-I)

Ans. (d) : Let the usual speed of train = x km/h
According to the question,

$$\frac{300}{x} - \frac{300}{x+20} = \frac{5}{2}$$

$$300 \left[\frac{x+20-x}{x(x+20)} \right] = \frac{5}{2}$$

$$x^2 + 20x - 2400 = 0$$

$$x = -60 \text{ or } 40$$

$$\therefore x = 40 \text{ km/h}$$

$$\text{Required time} = \frac{192}{40} = 4.8 \text{ hours}$$

22. A train of length 212 m is running at 45km/h. In what time (in seconds) will it cross a platform of length 188m.

- (a) 42 (b) 40
(c) 36 (d) 32

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) Speed of train = 45km/h

$$= 45 \times \frac{5}{18} = \frac{25}{2} \text{ m/sec}$$

∴ To cross the platform, the train must travel a distance equal to the length of the platform & length of the train.

$$\therefore \text{Distance} = 188\text{m} + 212\text{m} = 400\text{m}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\frac{25}{2} = \frac{400}{\text{Time}}$$

$$\text{Time} = \frac{400 \times 2}{25} = 32\text{sec}$$

Trick: From Formula

$$V_T = \frac{T_L + P_L}{t}$$

$$45 \times \frac{5}{18} = \frac{212 + 188}{t}$$

$$t = \frac{400 \times 2}{25} = 32 \text{ sec}$$

(II) When the Train/Person Moves in Opposite Direction of other Train/Person

23. A railway engine passes two bridges of lengths 400 m and 235 m in 100 seconds and 60 seconds, respectively. Twice the length of the railway engine (in m) is:

- (a) 24 (b) 25
(c) 12.5 (d) 12

SSC CGL (Tier-I) 18/04/2022 (Shift-II)

Ans. (b) According to the question,

Let l is length of railway engine.

$$\text{So, } \frac{l+400}{100} = \frac{l+235}{60} \Rightarrow 3l+1200 = 5l+1175$$

$$25 = 2l$$

$$l = \frac{25}{2}$$

Now, twice the length of the railway engine

$$= 2 \times l = 2 \times \frac{25}{2}$$

$$= 25 \text{ m}$$

24. Two cars A and B travel from one city to another city at speeds of 60 km/hr and 108 km/hr respectively. If car B takes 2 hours lesser time car A for the journey then what is the distance (in km) between the two cities?

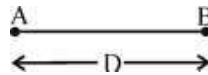
- (a) 240 (b) 270
(c) 300 (d) 330

SSC CGL (Tier-II) 19-02-2018

Ans. (b) :

$$A = 60 \text{ km/h}$$

$$B = 108 \text{ km/h}$$



Let the car A complete the journey in t hours.

According to the question–

$$S_1 T_1 = S_2 T_2$$

$$60 \times t = 108 \times (t-2)$$

$$5t = 9(t-2)$$

$$t = \frac{18}{4} \text{ hours}$$

Hence, distance between the two cities = $60 \times t$

$$= 60 \times \frac{18}{4} = 270 \text{ km}$$

Trick: From formula–

$$\frac{D}{V_1} \sim \frac{D}{V_2} = \text{Difference in time}$$

$$\frac{D}{60} - \frac{D}{108} = 2$$

$$9D - 5D = 2 \times 540$$

$$4D = 2 \times 540$$

$$D = 270 \text{ km}$$

25. A train X running at 74 km/h crosses another train Y running at 52 km/h in the opposite direction in 12 seconds. If the length of Y is two-thirds that of X, then what is the length of Y (in m)?

- (a) 210 (b) 252
(c) 168 (d) 200

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (c): Relative speed of train X and train Y

$$= (74 + 52) \text{ km/h}$$

$$= 126 \times \frac{5}{18} \text{ m/s}$$

$$= 35 \text{ m/s}$$

Let the length of train X be L

$$\therefore \text{Length of train Y} = \frac{2L}{3}$$

According to the question,

$$\frac{\left(L + \frac{2L}{3}\right)}{35} = 12$$

$$\frac{5L}{35 \times 3} = 12$$

$$L = 252 \text{ meters}$$

Hence, the length of train Y = $\frac{2L}{3}$

$$= \frac{2 \times 252}{3}$$

$$= 2 \times 84 = 168 \text{ meters}$$

Trick: From formula,

$$VA + VB = \frac{l_1 + l_2}{C_T} \quad \text{Where, } C_T = \text{Crossing Time}$$

$$\therefore (74 + 52) \times \frac{5}{18} = \frac{l + \frac{2}{3}l}{12}$$

$$126 \times \frac{5}{18} = \frac{5l}{3 \times 12} \Rightarrow 7 \times 3 \times 12 = l$$

$$l = 252 \text{ meters}$$

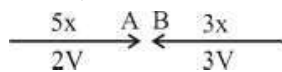
$$\therefore l_2 = 252 \times \frac{2}{3} = 168 \text{ meters}$$

26. The ratio of lengths of train A and B is 5:3 and the ratio of their speeds is 2:3. Travelling in opposite direction the train A taken $2\frac{1}{2}$ minutes to cross B. What is the time (in min) taken by A to cross a stationary pole

- (a) 2 (b) 3
(c) $\frac{125}{32}$ (d) $\frac{25}{16}$

SSC MTS 21/08/2019 (Shift-III)

Ans. (c) : 1st situation,



Let the lengths of trains = 5x, 3x

And speed = 2V, 3V

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

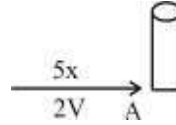
$$(2V + 3V) = \frac{5x + 3x}{\frac{5}{2}}$$

$$5V = \frac{8x}{5} \times 2$$

$$5V = \frac{16x}{5}$$

$$\frac{x}{V} = \frac{25}{16}$$

2nd Situation,



$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$2V = \frac{5x}{t}$$

$$t = \frac{5x}{2V}$$

$$t = \frac{5}{2} \times \frac{25}{16}$$

$$t = \frac{125}{32} \text{ min}$$

27. Two trains running in opposite directions on parallel tracks at speeds of 42km/h and 57km/h take 18 seconds to cross each other. If the length of one train is 270m then the length of the other train is:

- (a) 230m (b) 225m
(c) 250m (d) 242m

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) Relative speed = 42 + 57 = 99 km/h

$$= 99 \times \frac{5}{18} \text{ m/sec}$$

$$= \frac{55}{2} \text{ m/sec}$$

Let the length of 2nd train = x m

$$\therefore \text{Distance} = \text{Time} \times \text{Speed}$$

$$270 + x = 18 \times \frac{55}{2}$$

$$x = 495 - 270$$

$$\therefore x = 225 \text{ m}$$

Trick: From formula,

$$VA + VB = \frac{l_1 + l_2}{C_T}$$

Where C_T = Time taken to cross each other

$$\therefore (42 + 57) \times \frac{5}{18} = \frac{270 + l_2}{18}$$

$$99 \times 5 = 270 + l_2$$

$$495 - 270 = l_2$$

$$l_2 = 225 \text{ m}$$

28. A train X running at 74 km/h crosses another train Y running at 52 km/h in the opposite direction in 12 seconds. If the length of Y is two-thirds that of X, then what is the length of X (in m) ?

- (a) 168 (b) 210
(c) 200 (d) 252

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : According to the question,

$$\text{Speed of train X} = 74 \text{ km/h} = 74 \times \frac{5}{18} = \frac{185}{9} \text{ m/sec}$$

$$\text{Speed of train Y} = 52 \text{ km/h} = 52 \times \frac{5}{18} = \frac{130}{9} \text{ m/sec}$$

Let the length of train X = ℓ

$$\text{Then, the length of train Y} = \frac{2}{3}\ell$$

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \frac{185}{9} + \frac{130}{9} = \frac{\ell + \frac{2}{3}\ell}{12}$$

$$\Rightarrow \frac{315}{9} = \frac{5\ell}{36} \Rightarrow \ell = 252 \text{ m}$$

Hence, the length of train = 252 m

Trick:

$$V_A + V_B = \frac{\ell_1 + \ell_2}{C_T}$$

(Where C_T = Time taken to cross each other)

$$\therefore (74 + 52) \times \frac{5}{18} = \frac{(3\ell + 2\ell)}{12}$$

$$\left(\because \frac{X_l}{Y_l} = \frac{3}{2} \right)$$

$$\frac{126 \times 5}{18} = \frac{5\ell}{12}$$

$$\ell = \frac{126 \times 12}{18} = 84$$

Hence, the length of train X = 3ℓ
 = 3×84
 = 252 m.

29. The distance between two stations A and B is 428 km. A train starts from station 'A' at 6:00 a.m. and moves towards station 'B' at an average speed of 48 km/h. Another train starts from station 'B' at 6:20 a.m. and moves towards station 'A' at an average speed of 55 km/h. At what time will the trains meet?

- (a) 10:20 a.m. (b) 10:00 a.m.
 (c) 10:40 a.m. (d) 9:40 a.m.

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-III)

Ans. (a) : Let the two trains meet after t hours of starting of train A

$$48t + 55 \left(t - \frac{1}{3} \right) = 428$$

$$48t + 55t - \frac{55}{3} = 428$$

$$103t = 428 + \frac{55}{3} = \frac{1339}{3}$$

$$t = \frac{13}{3} \text{ hours} = 4 \text{ hours } 20 \text{ minutes}$$

$$\therefore \text{Time} = 10 : 20 \text{ a.m.}$$

Trick:

Distance covered by 1st train in 20 minutes

$$= \frac{48 \times 20}{60} = 16 \text{ km}$$

Remaining distance = $428 - 16 = 412 \text{ km}$

From relative speed,

$$V_A + V_B = \frac{D}{t}$$

$$(48 + 55) = \frac{412}{t}$$

$$t = \frac{412}{103} = 4 \text{ h}$$

\therefore Trains will meet each other = 6:00 + 0:20 + 4h
 = 10:20 am

30. A train 500 m long passes a railway platform 400 m long in one minute with uniform speed. What is the time (in second) taken by the train to pass a man riding a motorbike travelling opposite to the direction of the train at a speed of 18 km/h?

- (a) 25 (b) 48
 (c) 54 (d) 30

SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : Total distance = $500 + 400 = 900 \text{ m}$

Speed of train in m/sec = $900/60 = 15 \text{ m/sec}$

$$\text{Relative speed} = 15 + 18 \times \frac{5}{18} = 20 \text{ m/sec}$$

Time taken by the train to pass a man riding a motorbike = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{500}{20} = 25 \text{ sec.}$

31. A train is running at a speed of 99 km/h. If the train is 565 m long then what will be the time (in seconds) taken by it to cross a 975 m long tunnel?

- (a) 54 (b) 56
 (c) 40 (d) 42

SSC CHSL 06/08/2021 (Shift-II)

Ans. (b) : Speed = $\frac{\text{Distance}}{\text{Time}}$

$$99 \times \frac{5}{18} = \frac{(565 + 975)}{\text{Time}}$$

$$99 \times \frac{5}{18} = \frac{1540}{\text{Time}}$$

$$\text{Time} = \frac{1540 \times 2}{11 \times 5} = \frac{140 \times 2}{5} = 28 \times 2 = 56$$

32. A train crosses a platform 180m long in 60 sec at a speed of 72 km/h. The time taken by the train to cross an electric pole is:

- (a) 51 sec (b) 5.1 min
(c) 0.51 min (d) 5.1 sec

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (a) : Let the length of train = ℓ

$$\therefore \ell + 180 = \left(72 \times \frac{5}{18}\right) \times 60$$

$$\ell = 1200 - 180 = 1020 \text{ m}$$

$$\text{Required Time} = \frac{1020}{72 \times \frac{5}{18}} = 51 \text{ seconds}$$

33. Two bikers A and B start ride at 75 km/hr and 60 km/hr respectively towards each other. They meet after 20 minutes. How far (in km) were they from each other when they started?

- (a) 60 (b) 45
(c) 30 (d) 15

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Distance covered in 20 min at the speed of

$$75 \text{ km/h} = 75 \times \frac{20}{60} = 25 \text{ km}$$

$$\text{Distance covered in 20 min at the speed of 60 km/h} \\ = 60 \times \frac{20}{60} = 20 \text{ km}$$

$$\text{Hence, distance between both bikers} = (25 + 20) \text{ km} \\ = 45 \text{ km}$$

Trick:

$$\text{Distance} = \text{Relative Speed} \times \text{Time}$$

$$= (75 + 60) \times \frac{20}{60}$$

$$= \frac{135}{3} = 45 \text{ km.}$$

34. Two cyclists A and B start cycling at 21 km/hr and 24 km/hr towards each other. They meet after 1 hour and 12 minutes. How far (in km) were they from each other when they started?

- (a) 48 (b) 42
(c) 54 (d) 36

SSC CGL (Tier-II) 18-02-2018

Ans. (c) :

$$\text{Relative Speed} = (21 + 24) = 45 \text{ km/h}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$1 \frac{1}{5} = \frac{\text{Distance}}{45}$$

$$45 \times \frac{6}{5} = \text{Distance}$$

$$\text{Distance} = 54 \text{ km}$$

Trick: From formula,

$$\text{Relative speed} = (V_A + V_B) = \frac{D}{T}$$

$$(21 + 24) = \frac{D}{1 \frac{1}{5}}$$

$$\therefore \text{Distance} = \frac{45 \times 6}{5} = 54 \text{ km}$$

35. Train A and B start at the same time. Train A travels at 55 km/hr from station X to station Y and train B travels at 80 km/hr from station Y to station X. They cross each other after 1 hour and 36 minutes. What is the distance (in km) between stations X and Y?

- (a) 196 (b) 232
(c) 240 (d) 216

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Time = 1 hour 36 minutes

$$= 1 + \frac{3}{5} = \frac{8}{5} \text{ hours}$$

Distance between station X & Y = Relative speed \times Time

$$= (55 + 80) \times \frac{8}{5} = 135 \times \frac{8}{5} = 216 \text{ km}$$

Trick : From formula,

$$\text{Relative speed} = (V_A + V_B) = \frac{D}{T}$$

$$\therefore (55 + 80) = \frac{D}{\frac{8}{5}}$$

$$\text{Distance (D)} = \frac{135 \times 8}{5} = 216 \text{ km}$$

36. Renu was sitting inside train A which was travelling at 50 km/h. Another train B whose length was three times the length of A crossed her in the opposite direction in 15 seconds. If the speed of train B was 58 km/h then the length of train A (in m) is:

- (a) 150 (b) 180
(c) 210 (d) 160

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Let the length of train A = l

$$\therefore \text{Length of train B} = 3l$$

Speed of train A = 50 km/h

Speed of train B = 58 km/h

Time taken to cross each other in opposite direction = 15 seconds

\therefore From relative speed,

$$V_A + V_B = \frac{\text{Length of train B}}{\text{Time}}$$

$$\therefore (50 + 58) \times \frac{5}{18} = \frac{3l}{15}$$

$$\Rightarrow 108 \times \frac{5}{18} = \frac{3l}{15}$$

$$15 \times 30 = 3l$$

$$\therefore l = 150 \text{ m}$$

Trick:

$$\text{Relative speed} = (V_A + V_B) = \frac{\text{Length of train}}{\text{Time taken to cross each other}}$$

$$\therefore (50 + 58) \times \frac{5}{18} = \frac{3l}{15}$$

$$\frac{108 \times 25}{18} = l$$

\therefore Length of train (l) = 150m

37. The speed of train A is 16km/h less than the speed of train B. To cover a distance of 384 km, B takes 4 hours less time than A. What is the speed (in km/h) of train B?

- (a) 45 (b) 32
(c) 48 (d) 50

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) Let the speed of train B = x km/h
Speed of train A = $(x - 16)$ km/h

$$\therefore \frac{384}{x-16} - \frac{384}{x} = 4$$

$$384 \left[\frac{x-x+16}{x(x-16)} \right] = 4$$

$$x^2 - 16x - 1536 = 0$$

$$x^2 - 48x + 32x - 1536 = 0$$

$$x(x-48) + 32(x-48) = 0$$

$$(x-48)(x+32) = 0$$

$\therefore x = 48$ km/h.

38. The ratio between the speeds of two trains is 2:5. If the first train covers 350 km in 5 hours, then the speed (in km/h) of the second train is :

- (a) 165 (b) 180
(c) 175 (d) 150

SSC CHSL 08/07/2019 (Shift-I)

Ans. (c) : Let the speed of trains = $2x$ km/h & $5x$ km/h

$$\text{Speed of 1st train} = \frac{350}{5} = 70 \text{ km/h}$$

According to the question,

$$2x = 70$$

$$x = 35$$

$$\text{Speed of 2nd train} = 5x \text{ km/h}$$

$$= 5 \times 35$$

$$= 175 \text{ km/h}$$

39. Two trains start at the same time from stations A and B, 1800 km apart and proceed towards each other at an average speed of 44 km/h and 46 km/h respectively. Where will the trains meet?

- (a) 920 km from station A
(b) 900 km from station B
(c) 880 km from station A
(d) 880 km from station B

SSC CHSL –16/10/2020 (Shift-II)

Ans. (c) :: Distance between station A and B = 1800 km

\therefore Both the train start moving towards each other

$$\therefore \text{Relative speed} = (44+46) \text{ km/hr} \\ = 90 \text{ km/hr}$$

$$\text{Meeting time of both train} = \frac{1800}{90} = 20 \text{ hrs.}$$

$$\therefore \text{Distance travelled by train from station A} = 44 \times 20 \\ \text{km} = 880 \text{ km}$$

Hence, both the trains will meet at a distance of 880 km from station A.

40. A train travels the distance between stations P and Q at a speed of 126 km/h while in the opposite direction it comes back at 90 km/h. Another train travels the same distance at the average speed of the first train. The time taken by the second train to travel 525 km is:

- (a) 5 hours (b) 4 hours
(c) 4 hours 20 min (d) 5 hours 20 min

SSC CHSL –14/10/2020 (Shift-II)

Ans. (a) : Speed of 2nd train = Average speed of 1st

$$\text{train} = \frac{2 \times 126 \times 90}{(126 + 90)} = 105 \text{ km/h}$$

$$\text{Time taken by 2nd train} = \frac{525}{105} = 5 \text{ hours}$$

41. How long (in seconds) will a train of a length 320 m running at a speed of 67 km/h take to cross a man moving in opposite direction at a speed of 5 km/h?

- (a) 18.5 (b) 16
(c) 15 (d) 17.5

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (b) : Length of train = 320 meter

Speed of train = 67 km/h

Speed of a man = 5 km/h

Relative speed = $(67+5)$ km/h = 72 km/h

$$= 72 \times \frac{5}{18} = 20 \text{ m/s}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{320}{20} = 16 \text{ second}$$

(III) When the Train/Person Moves in Same Direction of other Train/ Person

42. The speed of a train is 78 km/h. It crosses a tunnel in 45 s and overtakes a person walking at a speed of 6 km/h in the same direction in 15s. The length (in m) of the tunnel is:

- (a) 675 (b) 650
(c) 975 (d) 780

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Let the length of train = l m.
According to the question,

$$l = (78-6) \times \frac{5}{18} \times 15 = 300 \text{ m.}$$

$$l + \text{Length of tunnel} = 78 \times \frac{5}{18} \times 45$$

$$300 + \text{Length of tunnel} = 975$$

$$\text{Length of tunnel} = 675 \text{ m.}$$

43. A 180m long train moving at the speed of 20 m/s will take how much time (in sec) to overtake a child moving in the same direction at the speed of 10 m/sec?

- (a) 12 (b) 36
(c) 15 (d) 18

SSC MTS 21/08/2019 (Shift-I)

Ans. (d) : Speed of train = 20 m/sec
Length of train = 180 m
Speed of a child = 10 m/sec
Time = ?

When a train crosses a person going in the same direction then their relative speed decreases
Hence, the time taken by the train to cross the child

$$\frac{\text{Distance}}{\text{Speed}} = \frac{(180) \text{ m}}{(20-10) \text{ m/sec}} = \frac{180}{10} \text{ sec} = 18 \text{ sec}$$

44. A train travelling at the speed of x km/h crossed a 200 m long platform in 30 seconds and overtook a man walking in the same direction at the speed of 6 km/h in 20 seconds. What is the value of x ?

- (a) 56 (b) 60
(c) 54 (d) 50

SSC CGL (Tier-II) 11-09-2019

Ans. (b) : According to the question,

$$\text{Length of train} = (x-6) \times \frac{5}{18} \times 20 = \frac{50(x-6)}{9} \text{ m}$$

Now, Speed of train-

$$x \times \frac{5}{18} = \frac{\frac{50(x-6)}{9} + 200}{30}$$

$$\frac{25x}{3} = \frac{50(x-6)}{9} + 200$$

$$\frac{25x}{3} - \frac{50(x-6)}{9} = 200$$

$$\frac{75x - 50x + 300}{9} = 200$$

$$25x + 300 = 1800$$

$$25x = 1500$$

$$x = 60 \text{ km/h}$$

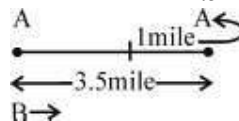
45. B starts 4.5 minutes after A from the same point for a place at a distance of 3.5 miles from the starting point. A on reaching the destination turns back and walk a mile where he meets B. If A's speed is a mile in 6 minutes then B's speed is a mile in _____ minutes.

- (a) 8 (b) 10
(c) 12 (d) 9

SSC CGL (Tier-II) 19-02-2018

Ans. (d) :

Total distance travelled by A = $(3.5+1)$ miles
= 4.5 miles



And distance travelled by B = $(3.5-1)$
= 2.5 miles

According to the question,

$$\therefore \text{Speed of A} = \frac{1}{6} \text{ mile/minute}$$

Hence, time taken by A = $\frac{\text{Distance}}{\text{Speed}}$
= 4.5×6
= 27.0 minutes

And time taken by B to walk a distance of 2.5 miles
= $27-4.5$
= 22.5 minutes

Hence, time taken by B to walk a distance of 1 mile
= $\frac{22.5}{2.5}$
= 9 minutes

Trick:

Total distance covered by A = $3.5 + 1 = 4.5$ miles
Total time taken by A = $4.5 \times 6 = 27$ minutes
B covered a distance in 22.5 minutes
 $(27-4.5=22.5) = 3.5-1$
= 2.5 miles

\therefore Time taken to cover 1 mile = $\frac{22.5}{2.5} = 9$ minutes

46. The distance between two railway stations is 1176 km. To cover this distance an express train takes 5 hours less than a passenger train while the average speed of the passenger train is 70 km/h less than that of the express train. The time taken by the passenger train to complete the travel is:

- (a) 23 hours (b) 17 hours
(c) 18 hours (d) 12 hours

SSC CHSL -13/10/2020 (Shift-I)

Ans. (d) : Let, if the speed of express train is x then the speed of passenger train will be $(x-70)$

Time taken by express train = $\frac{\text{Distance}}{\text{Speed}} = \frac{1176}{x}$

Time taken by passenger train = $\frac{1176}{x-70}$

According to the question,

$$\frac{1176}{x} + 5 = \frac{1176}{x-70}$$

$$5 = \frac{1176}{x-70} - \frac{1176}{x}$$

$$5 = 1176 \left[\frac{x - x + 70}{(x - 70)x} \right]$$

$$(x-70)x = 1176 \times 14$$

$$(x-70)x = 98 \times 12 \times 14$$

$$(x-70)x = 98 \times 168$$

$$(x-70)x = (168-70)168$$

$$x = 168$$

$$\text{Time taken by passenger train} = \frac{1176}{168 - 70}$$

$$= \frac{1176}{98}$$

$$= 12 \text{ hours}$$

47. The lengths of train A and B are in the ratio of 2 : 3. They pass a station pole in 4 seconds and 5 seconds respectively. In what time (in seconds) will they cross each other when they move in the same direction?

- (a) 50 (b) 45
(c) 48 (d) 40

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a) : Let, $l_1 = 20 \text{ m}$, $t_1 = 4$
 $l_2 = 30 \text{ m}$, $t_2 = 5 \text{ sec}$.

$$V_1 = \frac{l_1}{t_1} = \frac{20}{4} = 5 \text{ m/sec.}$$

$$V_2 = \frac{l_2}{t_2} = \frac{30}{5} = 6 \text{ m/sec.}$$

According to the question,

$$V_2 \sim V_1 = \frac{l_1 + l_2}{T}$$

$$(6 - 5) = \frac{20 + 30}{T}$$

$$T = 50 \text{ sec.}$$

(IV) Miscellaneous

48. A train leaves station A at 8 am and reaches station B at 12 noon. A car leaves station B at 8 :30 am and reaches station A at the same time when the train reaches station B. At what time do they meet ?

- (a) 10 : 22 am (b) 10 : 08 am
(c) 9 : 38 am (d) 9 : 52 am

SSC CGL-(Tier-I) 16/08/2021 (Shift II)

Ans. (b) : Let, total distance between station A and B = $x \text{ km}$
 Time taken by train to cover $x \text{ km} = 4 \text{ hours}$
 Time taken by car to cover $x \text{ km} = 3.5 \text{ hours}$
 $= \frac{7}{2} \text{ hours}$
 $\therefore \text{Speed of train} = \frac{x}{4} \text{ km/h}$

$$\text{Speed of car} = \frac{x}{\frac{7}{2}} = \frac{2x}{7} \text{ km/h}$$

$$\text{Distance covered by train in half hour} = \frac{x}{4} \times \frac{1}{2} = \frac{x}{8} \text{ km}$$

$$\therefore \text{Remaining distance} = x - \frac{x}{8}$$

$$= \frac{7x}{8} \text{ km}$$

Let, time when they will meet = $y \text{ hours}$

$$\therefore y \times \frac{x}{4} + y \times \frac{2x}{7} = \frac{7x}{8}$$

$$\Rightarrow x \left(\frac{y}{4} + \frac{2y}{7} \right) = \frac{7x}{8}$$

$$\Rightarrow \frac{7y + 8y}{28} = \frac{7}{8}$$

$$\Rightarrow \frac{15y}{28} = \frac{7}{8}$$

$$\therefore y = \frac{28 \times 7}{8 \times 15}$$

$$= \frac{49}{30}$$

= 1 hour 38 minutes

\therefore Train and car will meet at 8:30 am + 1 hour 38 minutes = 10:08 am

49. A journey of 96 km takes one hour less by a fast train (A) than by a slow train (B). If the average speed of B is 16 km/h less than that of A, then the average speed (in km/h) of A is:

- (a) 60 (b) 64
(c) 54 (d) 48

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-III)

Ans. (d) : Let the speed of train A be $x \text{ km/h}$

\therefore Speed of train B = $(x - 16) \text{ km/h}$

According to the question,

$$\frac{96}{x-16} - \frac{96}{x} = 1$$

$$\Rightarrow 96 \left[\frac{x - x + 16}{(x-16)x} \right] = 1$$

$$\Rightarrow \frac{16}{x^2 - 16x} = \frac{1}{96}$$

$$\Rightarrow x^2 - 16x - 1536 = 0$$

$$\Rightarrow x^2 - 48x + 32x - 1536 = 0$$

$$\Rightarrow x(x - 48) + 32(x - 48) = 0$$

$$\Rightarrow (x - 48)(x + 32) = 0$$

$$\Rightarrow x - 48 = 0 \text{ or } x + 32 = 0$$

$$\Rightarrow x = 48 \text{ or } x = -32 \text{ (Invalid)}$$

Hence, the average speed of train A = $x \text{ km/h} = 48 \text{ km/h}$

Trick: $\frac{D}{V_1} - \frac{D}{V_2} = T_D$ Where, T_D = Difference in time

$$\frac{96}{V-16} - \frac{96}{V} = 1$$

From option,

On taking $V = 48$

$$\frac{96}{32} - \frac{96}{48} = 1$$

$$3 - 2 = 1$$

[1=1] [That's satisfied]

$\therefore V_1 = 48 \text{ km/h}$

50. A train without stoppage travels with an average speed of 80 km/h and with stoppage, it travels with an average speed of 72 km/h. For how many minutes does the train stop on an average per hour?

- (a) 6 (b) 8
(c) 7 (d) 9

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-III)

Ans. (a) :

Average stoppage time of a train per hour

$$= \frac{\text{Difference in speed}}{\text{Speed without stoppage}}$$

$$= \frac{80 - 72}{80}$$

$$= \frac{8}{80} = \frac{1}{10} \text{ hours} = \frac{1}{10} \times 60 = 6 \text{ minute}$$

Trick:

1h ——— 80 km → Without stoppage

1h ——— 72 km → Discontinuously

Difference in distance = 8 km

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\therefore \text{Time} = \frac{8}{80} \times 60 = 6 \text{ minute,}$$

51. A train without stoppage travels with an average speed of 65 km/h and with stoppage, it travels with an average speed of 52 km/h. For how many minutes does the train stop on an average per hour?

- (a) 13 (b) 15
(c) 12 (d) 14

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-I)

Ans. (c) :

\therefore Average hourly stopping time of a train

$$= \left(\frac{x - y}{x} \right) \times 60 \text{ minute}$$

Where, $x = 65 \text{ km/h}$ non stop average speed

$y = 52 \text{ km/h}$ average of stopping speed

\therefore Average hourly stopping time of a train

$$= \left(\frac{65 - 52}{65} \right) \times 60 = \frac{13}{65} \times 60$$

$$= \frac{60}{5} = 12 \text{ minutes}$$

Trick:

1h ——— 65 km → without stoppage

1h ——— 52 km → Discontinuously

Difference in distance = 13 km

$$\therefore \text{Time of} = \frac{13}{65} \times 60$$

$$= 12 \text{ minutes}$$

52. A train without stoppage travel with an average speed of 80 km/h and with stoppage, it travels with an average speed of 64 km/h. For how many minutes does the train stop on an average per hour?

- (a) 8 (b) 12
(c) 14 (d) 10

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (b) : If a train travels at an average speed of $x \text{ km/h}$ without stopping and at an average speed of $y \text{ km/h}$ with stoppage then average stopping time by

$$\text{train per hour} = \frac{x - y}{x} \times 60 \text{ minutes}$$

$$\therefore \text{Required time} = \frac{80 - 64}{80} \times 60 \text{ minutes}$$

$$= \frac{16}{80} \times 60 \text{ minutes}$$

$$= 12 \text{ minutes}$$

Trick: From formula,

$$\text{Hourly stoppage time} = \frac{\text{Speed difference}}{\text{Non stop speed}} \times 60$$

$$\therefore \text{Required time} = \left(\frac{80 - 64}{80} \right) \times 60 = 12 \text{ min}$$

53. A train X travelling at 60 km/h overtakes another train Y 225 m long and completely passes it in 72 seconds. If the trains had been going in opposite directions, they would have passed each other in 18 seconds. The length (in m) of X and the speed (in km/h) of Y are, respectively:

- (a) 245 and 45 (b) 245 and 54
(c) 255 and 36 (d) 255 and 40

SSC CGL (Tier-I)-2019 – 09/03/2020 (Shift-II)

Ans. (c): Let the length of train $X = \ell \text{ m}$.

Speed of train $Y = V \text{ km/h}$

$$\ell + 225 = (60 - V) \times \frac{5}{18} \times 72$$

$$\ell + 225 = (60 - V) \times 20 \dots\dots\dots (1)$$

$$\text{Again, } \ell + 225 = (60 + V) \times \frac{5}{18} \times 18$$

$$\ell + 225 = (60 + V) \times 5 \dots\dots\dots (2)$$

From equation (1) and equation (2),

$$20(60 - V) = 5(60 + V)$$

$$240 - 4V = 60 + V$$

$$5V = 180$$

$$V = 36 \text{ km/h}$$

From equation (i),

$$\ell + 225 = 24 \times 20$$

$$\ell = 480 - 225 = 255 \text{ meters}$$

54. Flight A usually takes 1 hour more than Flight B to travel a distance of 7200 km. Due to engine trouble speed of flight B falls by a factor of 1/6th, so it takes 36 minutes more than Flight A to complete the same journey. What is the speed of Flight A (in km/hr) ?
 (a) 800 (b) 900
 (c) 750 (d) 720

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : For Flight B due to engine failure

Speed → 6 : 5

Time → 5 : 6

1 unit = 1 hour 36 minutes

1 unit = $1 + \frac{6}{10} = \frac{16}{10}$ hours

Thus, time taken by B = $5 \times \frac{16}{10} = 8$ hours

∴ Time taken by A = 9 hours

∴ Speed of A = $\frac{7200}{9} = 800$ km/hr.

55. Places A and B are 396 km apart. Train x leaves from A for B and train y leaves from B for A at the same time on the same day on parallel tracks. Both trains meet after 5½ hours. The speed of y is 10 km/h more than that of x. What is the speed (in km/h) of y?

- (a) 31 (b) 54
 (c) 56 (d) 41

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : Distance between A & B = 396 km

Let the speed of x = a km/h

Speed of y = (a+10) km/h

∴ From rule of relative speed

Relative speed of (x+y) = $\frac{396}{\frac{11}{2}} = 36 \times 2 = 72$ km/h

⇒ a + a + 10 = 72

⇒ 2a = 62

⇒ a = 31 km/h

∴ Speed of y = (10 + 31) = 41 km/h

56. A train travelling at the speed of x km/h crossed a 300 m long platform in 30 seconds, and overtook a man walking in the same direction at 6 km/h in 20 seconds. What is the value of x?

- (a) 96 (b) 60
 (c) 102 (d) 48

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (a) : Let the length of train = ℓ meters

Distance = Speed × Time

$(\ell+300) = x \times \frac{5}{18} \times 30 = \frac{25x}{3}$

$\ell = \frac{25x}{3} - 300$ _____(i)

Again, $\ell = (x-6) \times \frac{5}{18} \times 20$ _____(ii)

From eq. (i) & (ii)

$$\frac{25x}{3} - 300 = \frac{50x}{9} - \frac{100}{3}$$

$$\frac{25x}{3} - \frac{50x}{9} = 300 - \frac{100}{3}$$

$$\frac{25x}{9} = \frac{800}{3}$$

$$x = 96 \text{ km/h}$$

57. The diameter of a cycle wheel is 126cm. A cyclist takes 16½ minutes to reach the destination at a speed of 72km/hr. How many revolutions will the wheel make during the journey? (Take $\pi = 22/7$)
 (a) 4500 (b) 5200
 (c) 4000 (d) 5000

SSC CPO-SI - 12/12/2019 (Shift-II)

Ans. (d) : Diameter of wheel = 126 cm

Circumference of wheel = Diameter × π

$$= 126 \times \frac{22}{7} = 18 \times 22 = 396 \text{ cm}$$

Speed of cycle = 72 km/hr

Time taken to reach = $16 \frac{1}{2}$ minutes = $\frac{33}{120}$ hour

Total distance travelled = Time × Speed

$$= \frac{33}{120} \times 72 = 19.8 \text{ km}$$

$$= 1980000 \text{ cm}$$

No. of revolutions = $\frac{1980000}{396} = 5000$

58. The speed of two railway engines is in the ratio 5:4. If they move on parallel tracks in the same direction and if the slower engine is ahead of the faster engine by 8km when the latter starts then how far will the faster engine have to travel before it overtakes the slower one?

- (a) 48 (b) 36
 (c) 32 (d) 40

SSC CPO-SI - 09/12/2019 (Shift-I)

Ans. (d)

Let, in time t after covering (D + 8) km distance the faster engine will overtake.

Ratio of speeds of engines = 5:4

Let the speed of engines are 5x and 4x respectively

∴ $D_1 S_2 = D_2 S_1$

$$(D + 8) \times 4x = D \times 5x$$

$$4D + 32 = 5D$$

$$D = 32 \text{ km}$$

Distance covered by faster engine = $D + 8 = 32 + 8 = 40$ km

59. A train covers a certain distance in 45 minutes. If its speed is reduced by 5 km/h, it takes 5 minutes more to cover the same distance. The distance (in km) is :

- (a) 35 (b) 40
(c) 37.5 (d) 32.5

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (c) : Let the real speed and time of train are V and t respectively

\therefore When the distance is fixed

From, $V_1 t_1 = V_2 t_2$,

$$V \times t = (V - 5) \times (t + 5)$$

$$V \times 45 = (V - 5) \times 50$$

$$9V = 10V - 50$$

$$V = 50 \text{ km/h}$$

\therefore Certain distance covered by train = $V \times t$

$$= \frac{50 \times 45}{60} = 37.5 \text{ km}$$

60. A boy standing by the side of a railway track finds that an up-train crosses him in 8 sec and a down-train of twice the length of that of the up-train crosses him in 20 sec. How long (in seconds) will the two trains take to cross each other?

- (a) 15 (b) $13\frac{1}{3}$
(c) 20 (d) $12\frac{1}{3}$

SSC CHSL 10/07/2019 (Shift-I)

Ans. (b) : Let the speed of up and down both are V_1 and V_2 and according to the question length of 1st train (up) is l and length of 2nd train is $2l$.

When the train is opposite direction,

$$\Delta V = \frac{\text{Total distance}}{\text{Total Time}} = \frac{l + 2l}{T}$$

$$V_1 + V_2 = \frac{3l}{T}$$

$$\frac{l}{8} + \frac{2l}{20} = \frac{3l}{T} \Rightarrow \frac{36l}{160} = \frac{3l}{T}$$

$$T = \frac{160}{12} = \frac{40}{3} = 13\frac{1}{3} \text{ seconds}$$

61. A train takes 45 minutes to cover a certain distance at a speed of 80 km/h. If the speed is increased by 125%, then how long will it take the train to cover $\frac{8}{5}$ of the same distance?

- (a) 25 minutes (b) 30 minutes
(c) 32 minutes (d) 28 minutes

SSC CHSL -26/10/2020 (Shift-I)

Ans. (c) : 45 minutes = $\frac{3}{4}$

Speed = 80 km/h

$$\text{Distance} = 80 \times \frac{3}{4} = 60 \text{ km}$$

If the speed of the train is increased by 125%,

$$\text{the speed of the train} = 80 + 80 \times \frac{125}{100} = 180 \text{ km/h}$$

According to the question,

Time taken to covered by increased speed

$$= \frac{60}{180} \times \frac{8}{5} \times 60 = 32 \text{ minutes}$$

62. A train covers a distance in 30 min if it runs at a speed of 54 km/h on an average. The speed at which the train must run to reduce the time of the journey to 20 min is:
- (a) 81 km/h (b) none of these
(c) 75 km/h (d) 60 km/h

SSC CHSL -18/03/2020 (Shift-III)

Ans. (a) : Distance = Speed \times Time

Let the speed of the train to cover the distance in 20 min is V km/h

$$54 \times \frac{30}{60} = V \times \frac{20}{60}$$

$$V = 81 \text{ km/h}$$

63. The speed of a train is 220% of the speed of a car. The car covers a distance of 950 km in 19 hours. How much distance will the train cover in $3\frac{1}{2}$ hours?

- (a) 385km (b) 375km
(c) 285km (d) 380km

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a) According to the question,

$$\therefore \text{Speed of car} = \frac{950}{19} = 50 \text{ km/h}$$

$$\therefore \text{Speed of train} = 50 \times \frac{220}{100} = 110 \text{ km/h}$$

Hence, distance covered by train in $3\frac{1}{2}$ hours

$$= 110 \times \frac{7}{2} = 385 \text{ km}$$

64. A train covers a distance of 12km in 12 minutes. If its speed is decreased by 5km/h, then the time taken by it to cover the distance of 22km will be:

- (a) 24 minutes (b) 22 minutes
(c) 18 minutes (d) 20 minutes

SSC CHSL -21/10/2020 (Shift-I)

Ans. (a) Time taken by train to covered a distance of 12

$$\text{km} = 12 \text{ minutes} = \frac{12}{60} = \frac{1}{5} \text{ hours}$$

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{12}{1/5} = 60 \text{ km/h}$$

$$\text{Decreased speed} = 60 - 5 = 55 \text{ km/h}$$

\therefore Time taken to covered a distance of 22 km

$$= \frac{\text{Distance}}{\text{Speed}} = \frac{22}{55} \times 60 = 24 \text{ minutes}$$

65. A train taken 1 min to cross a stationary pole. To cross a bridge whose length is double of the train how much time will be taken by the train (in seconds)?

- (a) 150 (b) 90
(c) 120 (d) 180

SSC MTS 05/08/2019 (Shift-III)

Ans. (d):
 In crossing the pole, the train will cover a distance equal to its length.
 Let the length of train is x & speed is y .
 Then, $60 = \frac{x}{y} \Rightarrow x = 60y$
 Again, time taken by train to cross the bridge
 Time = Distance/speed
 Time = $\frac{\text{Lengths of train} + \text{Length of bridge}}{\text{Speed of train}}$
 Time = $\frac{x + 2x}{y} = \frac{3x}{x/60}$ [$\because x = 60y$]
 Time = $3 \times 60 = 180$ seconds

66. Two trains each having a length of 160 meters moving in opposite direction crossed each other in 9 seconds. If one train crossed a 200- metre-long platform in 18 seconds, then the ratio of their speeds is:
 (a) 2 : 3 (b) 9 : 7
 (c) 5 : 8 (d) 3 : 4

SSC MTS 13/08/2019 (Shift-III)

Ans. (b) : Let the speed of trains are S_1 and S_2 respectively.
 Then, $S_1 + S_2 = \frac{160 + 160}{9}$
 $S_1 + S_2 = \frac{320}{9}$ (i)
 And, $S_1 = \frac{160 + 200}{18}$
 $S_1 = \frac{360}{18}$
 $S_1 = 20$ (ii)
 From eq. (i) and (ii),
 $20 + S_2 = \frac{320}{9}$
 $S_2 = \frac{320}{9} - 20$
 $S_2 = \frac{320 - 180}{9}$
 $S_2 = \frac{140}{9}$
 \therefore Required ratio, $S_1 : S_2 = 20 : \frac{140}{9} = 1 : \frac{7}{9} = 9 : 7$

67. The ratio of length of two trains is 6: 5 and the ratio of their speed is 3:2. The ratio of time taken by them to cross a pole is:
 (a) 3 : 5 (b) 4 : 5
 (c) 5 : 6 (d) 5 : 8

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (b) : Ratio of length of trains = 6 : 5
 Ratio of speed of trains = 3 : 2
 \therefore The ratio of the time taken by both the trains to cross the pole = $\frac{T_1}{T_2} = \frac{\frac{6}{5}}{\frac{3}{2}} = \frac{2}{5} = 4 : 5$

68. The length of platform is double of the length of train. Speed of the train is 144 km/hr. If train crosses the platform in 30 seconds, then what is the length of the platform?
 (a) 600 metres
 (b) 800 metres
 (c) 500 metres
 (d) 400 metres

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (b) : Length of Train = x meters
 Length of platform = $2x$ meters
 According to the question,
 $\frac{x + 2x}{144 \times \frac{5}{18}} = 30$
 $3x = 30 \times 40$
 $x = 400$ metres
 Length of platform = $2x = 2 \times 400 = 800$ metres

69. Train A takes 1 hour more than train B to travel a distance of 720 km. Due to engine trouble, speed of train B falls by one third, so it takes 3 hours more than Train A to complete the same journey? What is the speed of Train A (in km/hr)?
 (a) 80 (b) 90
 (c) 60 (d) 70

SSC CGL (Tier-II) 19-02-2018

Ans. (a) :
 Let the speed of train A = x km/h
 Speed of train B = y km/h
 Train B takes 't' hours to cover the distance of 720 km.
 According to the question,
 $S \times T = D$
 $y \times t = 720$ ——— B (Train)
 And $\Rightarrow x \times (t + 1) = 720$
 Again according to the question,
 From $S_1 T_1 = S_2 T_2$
 $y \times t = y \times \frac{2}{3} (t + 1 + 3)$
 $3t = 2t + 8$
 $t = 8$ h
 Then, speed of train A = $\frac{720}{(t+1)} = \frac{720}{(8+1)} = 80$ km/h.

19.

Boat and Stream

(I) Problems based on Speed of Boat or Swimmer

1. If a boat goes upstream at a speed of 24 km/hr and comes back the same distance at 40 km/hr. What is the average speed (in km/hr) for the total journey.
- (a) 32 (b) 30
(c) 31 (d) 33

SSC CGL (Tier-II) 21-02-2018

Ans. (b) :

$$\begin{aligned} \therefore \text{Average speed} &= \frac{2V_1 \cdot V_2}{V_1 + V_2} \\ &= \frac{2 \times 24 \times 40}{24 + 40} \\ &= \frac{2 \times 24 \times 40}{64} = \boxed{30 \text{ km/h}} \end{aligned}$$

2. The speed of a boat downstream is 150% more than its speed upstream. If the time taken by the boat for going 80 km downstream and 50 km upstream is 8.2 hours, then what is the speed (in km/h) of the boat downstream?
- (a) 16 (b) 30
(c) 25 (d) 24

SSC CHSL 15/04/2021 (Shift-I)

Ans. (c) : Let upstream speed = x km/h

$$\text{Downstream speed} = x \times \frac{250}{100} = \frac{5x}{2} \text{ km/h}$$

According to the question,

$$\frac{80}{\frac{5x}{2}} + \frac{50}{x} = 8.2$$

$$\frac{160 + 50 \times 5}{5x} = 8.2$$

$$160 + 250 = 41x$$

$$x = \frac{410}{41} = 10 \text{ km/h}$$

$$\text{Hence downstream speed} = \frac{5x}{2} = \frac{5 \times 10}{2} = 25 \text{ km/h}$$

3. A boat can go 15 km downstream and 8 km upstream in 2 h. It can go 20 km downstream and 12 km upstream in 2 h 50 min. What is the speed (in km/h) of the boat while going downstream?
- (a) 20 (b) 18
(c) 15 (d) 16

SSC CHSL 12/08/2021 (Shift-I)

Ans. (c) : According to the question,

Let,

$$\frac{1}{A+B} = x, \quad \frac{1}{A-B} = y$$

$$\left(\frac{15}{A+B} + \frac{8}{A-B} = 2h \right) \rightarrow (15x + 8y = 2) \times 4$$

$$\frac{20}{A+B} + \frac{12}{A-B} = 2h50m = \frac{17}{6} \rightarrow$$

$$\left(20x + 12y = \frac{17}{6} \right) \times 3$$

Now,

$$60x + 32y = 8$$

$$60x + 36y = 17/2$$

$$\underline{\quad \quad \quad - \quad \quad \quad -}$$

$$y = \frac{1}{8} \text{ or, } A - B = 8$$

$$x = \frac{1}{15} \text{ or, } A + B = 15$$

Hence, the speed of boat in downstream = $A + B = 15$ km/h

4. A boat can cover a distance of 7.2 km downstream and 3.2 km upstream in 2 hours. It can also cover 1.5 km downstream and 0.6 km upstream in 24 minutes. What is the speed of the boat when going downstream (in km/h)?

(a) $4\frac{1}{2}$ km (b) $7\frac{1}{2}$ km

(c) 6 km (d) 5 km

SSC CGL (TIER-I)-2018 - 07.06.2019 (Shift-I)

Ans. (c) : Let the speed of the boat in downstream be x km/hr and speed of boat in upstream be y km/hr. According to the question,

$$\frac{7.2}{x} + \frac{3.2}{y} = 2$$

$$7.2y + 3.2x = 2xy$$

$$72y + 32x = 20xy \quad \dots\dots\dots(i)$$

$$\frac{1.5}{x} + \frac{0.6}{y} = \frac{24}{60}$$

$$1.5y + 0.6x = \frac{24}{60}xy$$

$$15y + 6x = \frac{240}{60}xy$$

$$15y + 6x = 4xy \quad \dots\dots\dots(ii)$$

Multiplying by 5 in equation (ii),

$$75y + 30x = 20xy$$

Hence $72y + 32x = 75y + 30x$

$$-3y = -2x \Rightarrow y = \frac{2}{3}x$$

Putting the value of y in equation (i)

$$72 \times \frac{2}{3}x + 32x = 20x \times \frac{2}{3}x$$

$$48x + 32x = \frac{40x^2}{3}$$

$$80x = \frac{40x^2}{3}$$

$$x = \frac{80 \times 3}{40} = 6 \text{ km/hr}$$

5. The time taken by a boat to travel 13 km downstream is the same as time taken by it to travel 7 km upstream. If the speed of the stream is 3 km/h, then how much time (in hours) will it take to travel a distance of 44.8 km in still water?

- (a) $4\frac{13}{25}$ hours (b) $5\frac{2}{5}$ hours
 (c) $5\frac{3}{5}$ hours (d) $4\frac{12}{25}$ hours

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (d) : Let the speed of boat in still water = x km/h
 According to the question,

$$\frac{13}{x+3} = \frac{7}{x-3}$$

$$13x - 39 = 7x + 21$$

$$6x = 60$$

$$x = 10$$

$$\text{Required time} = \frac{44.8}{10} = \frac{448}{100} = \frac{112}{25} = 4\frac{12}{25} \text{ hours}$$

6. A boat can go 3 km upstream and 5 km downstream in 55 minutes. It can also go 4 km upstream and 9 km downstream in 1 hour 25 minutes. In how much time (in hours) will it go 43.2 km downstream?

- (a) 4.4 (b) 3.6
 (c) 4.8 (d) 5.4

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (b) : Let the speed of boat in downstream = x km/h

The speed of boat in upstream = y km/h

$$\frac{3}{y} + \frac{5}{x} = \frac{55}{60} = \frac{11}{12} \dots\dots\dots(i)$$

$$\text{Again } \frac{4}{y} + \frac{9}{x} = \frac{17}{12} \dots\dots\dots(ii)$$

On multiplying by 4 in equation (i) and by 3 in equation (ii),

On subtracting,

$$\frac{12}{y} + \frac{20}{x} = \frac{44}{12}$$

$$\frac{12}{y} + \frac{27}{x} = \frac{51}{12}$$

$$\underline{\underline{\quad - \quad - \quad - \quad}}$$

$$\frac{-7}{x} = \frac{-7}{12}$$

$$x = 12$$

$$\therefore \text{ Required time} = \frac{43.2}{12} = 3.6 \text{ hrs}$$

7. A boat can go 3.6 km upstream and 5.4 km downstream in 54 minutes, while it can go 5.4 km upstream and 3.6 km downstream in 58.5 minutes. The time (in minutes) taken by the boat in going 10 km downstream is:

- (a) 45 (b) 50
 (c) 48 (d) 54

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (b): Let the speed of boat in downstream = x km/min

Speed of boat in upstream = y km/min

$$\frac{3.6}{y} + \frac{5.4}{x} = 54$$

$$\frac{0.2}{y} + \frac{0.3}{x} = 3 \dots\dots\dots(i)$$

$$\frac{5.4}{y} + \frac{3.6}{x} = 58.5$$

$$\frac{0.6}{y} + \frac{0.4}{x} = 6.5 \dots\dots\dots(ii)$$

On solving equation (i) and (ii),

$$\frac{0.9}{x} - \frac{0.4}{x} = 9 - 6.5$$

$$\frac{0.5}{x} = 2.5$$

$$x = \frac{1}{5}$$

$$\text{Required time} = \frac{10}{\frac{1}{5}} = 50 \text{ minutes}$$

8. In a stream running at 3 km/h, a motorboat goes 12 km upstream and back to the starting point in 60 min. Find the speed of the motorboat in still water. (in km/h)

- (a) $2(2 + \sqrt{17})$ (b) $2(4 + \sqrt{15})$
 (c) $3(2 + \sqrt{17})$ (d) $3(4 + \sqrt{17})$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) : Let the speed of boat in still water = x km/h

$$\frac{12}{x-3} + \frac{12}{x+3} = 1 \quad \Rightarrow [\because 60 \text{ min} = 1 \text{ hour}]$$

$$12 \left[\frac{x+3+x-3}{x^2-9} \right] = 1$$

$$24x = x^2 - 9$$

$$x^2 - 24x - 9 = 0$$

$$x = \frac{24 \pm \sqrt{576 + 36}}{2}$$

$$= \frac{24 \pm \sqrt{612}}{2} = 12 \pm 3\sqrt{17}$$

Taking the positive sign,

$$= 3(4 + \sqrt{17}) \text{ km/h}$$

9. A man can row a distance of 900 meters against the stream in 12 minutes and returns to the starting point in 9 minutes. What is the speed (in km/h) of the man in still water ?

- (a) 6 (b) $4\frac{1}{2}$
(c) 5 (d) $5\frac{1}{4}$

SSC CGL (Tier-II) 13-09-2019

Ans. (d):

$$\text{Speed of man in upstream} = \frac{900}{12 \times 60} \times \frac{18}{5} = \frac{9}{2} \text{ km/h}$$

$$\text{Speed of man in downstream} = \frac{900}{9 \times 60} \times \frac{18}{5} = 6 \text{ km/h}$$

$$\text{Speed of man in still water} = \frac{\frac{9}{2} + 6}{2} = \frac{21}{4} = 5\frac{1}{4} \text{ km/h}$$

10. A motorboat goes 24 km in 2 hour along the stream and 10 km in 1 hour against the stream. The speed of the motorboat in still water in kilometres per hour, is:

- (a) 11 (b) 14
(c) 10 (d) 12

SSC CHSL -19/03/2020 (Shift-I)

Ans. (a) : Let the speed of motorboat in still water is x km/hr and if the speed of the stream is y km/h, then the speed of motor boat in still water.

According to the question,

$$x + y = 12 \quad \text{---(1)}$$

$$x - y = 10 \quad \text{---(2)}$$

$$2x = 22$$

$$x = 11 \text{ km/hr}$$

Hence speed of motorboat in still water is 11 km/hr.

11. Speed of a boat along the current and against the current are 16km/hr and 12 km/hr respectively. What is the speed of boat (in km/hr) in still water?

- (a) 2 (b) 7
(c) 14 (d) 12

SSC MTS 10-10-2017 (Shift-I)

Ans : (c) Speed of boat in downstream = 16 km/hr
And in upstream = 12 km/hr

$$\text{Speed of boat in still water} = \frac{x + y}{2}$$

$$= \frac{16 + 12}{2} = 14 \text{ km/hr}$$

12. Speed of a boat along the current and against the current are 10 km/hr and 8 km/hr respectively. What is the speed of boat (in km/h.) in still water.

- (a) 2 (b) 9
(c) 4.5 (d) 6

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) : Speed of boat in downstream = 10 Km/h

Speed of boat in upstream = 8 Km/h

$$\text{Speed of boat in still water} = \frac{10 + 8}{2} = 9 \text{ Km/h}$$

13. A boat covers 3km upstream and $4\frac{1}{2}$ km downstream in 45 minutes whereas it covers 3.6 km upstream and 2.4 km downstream in 39 minutes. What is the downstream speed of the boat (in km/h)?

- (a) 12 (b) 16
(c) 9 (d) 10

SSC MTS 20/08/2019 (Shift-I)

Ans. (a) : Let, the speed of boat in still water = x km/h and speed of stream is y km/h

Now,

Speed of boat in downstream = (x + y)

And upstream speed = (x - y)

From the question,

$$\frac{3}{(x - y)} + \frac{9}{2(x + y)} = \frac{45}{60} \quad \text{---(I)}$$

$$\frac{(3.6)}{(x - y)} + \frac{2.4}{(x + y)} = \frac{39}{60} \quad \text{---(II)}$$

In equation (I) multiplying by 1.2 and subtracting equation (ii) from equation (i)

$$\frac{3.6}{(x - y)} + \frac{10.8}{2(x + y)} = \frac{54}{60}$$

$$\frac{3.6}{(x - y)} + \frac{5.4}{(x + y)} = \frac{54}{60} \quad \text{---(I)}$$

$$\frac{3.6}{(x - y)} + \frac{2.4}{(x + y)} = \frac{39}{60} \quad \text{---(II)}$$

$$\frac{3}{(x + y)} = \frac{54}{60} - \frac{39}{60}$$

$$\frac{3}{(x + y)} = \frac{15}{60}$$

Hence, the speed of boat in downstream x+y=12 km/h

14. The speed of a boat in still water is 6 km/h. Time taken by the boat to cover a certain distance upstream is 3 hours more than the time taken to cover the same distance downstream. If the speed of the stream is 2 km/h, then what is the total distance, upstream and downstream, covered by the boat?

- (a) 72 km (b) 24 km
(c) 48 km (d) 36 km

SSC MTS 08/08/2019 (Shift-I)

Ans. (c) : Let the distance covered by the boat in each direction (downstream & upstream) = x km

Speed of boat in downstream = 6 + 2 = 8 km/h

Speed of boat in upstream = 6 - 2 = 4 km/h

$$\therefore \frac{x}{4} - \frac{x}{8} = 3$$

$$\frac{x}{8} = 3$$

$$x = 24$$

\therefore Total covered distance upstream and downstream by boat = x + x = 24 + 24 = 48 km

15. A boat can travel 10 km upstream and 20 km downstream in 7 hours. It can travel 20 km upstream and 10 km downstream in 11 hours. What is the speed of boat in still water?
 (a) 2 km/h (b) 8 km/h
 (c) 6 km/h (d) 4 km/h

SSC MTS 19/08/2019 (Shift-II)

Ans. (c) : Let
 Speed of boat in downstream = a km/h
 Speed of boat in upstream = b km/h

$$\frac{10}{b} + \frac{20}{a} = 7 \quad \dots\dots (i)$$

$$\frac{20}{b} + \frac{10}{a} = 11 \quad \dots\dots (ii)$$

From equation (i) $\times 2$ - equation (ii)

$$\frac{30}{a} = 3$$

$$a = 10$$

Putting the value of a in equation (i)

$$\frac{10}{b} = 7 - 2$$

$$b = 2$$

Speed of boat in still water = $\frac{a+b}{2} = \frac{10+2}{2} = 6$ km/h

16. A boat travels 20 km/h. in upstream and 30 km/h in downstream. What is the speed of the boat in still water?
 (a) 26 km/h (b) 24 km/h
 (c) 25 km/h (d) 22.50 km/h

SSC MTS 16/08/2019 (Shift-III)

Ans. (c) : Let the speed of boat in still water = x km/h
 Speed of stream = y km/h
 As per question.
 $x - y = 20$ ———(i)
 $x + y = 30$ ———(ii)
 From equation (i) + (ii) ,
 $2x = 50 \Rightarrow x = 25$
 Hence speed of boat in still water = 25 km/h

17. The downstream speed of boat is 14 km/h. The upstream speed of boat is 10 km/h. What is the time taken in covering a distance of 72 km in still water?
 (a) 8 hours (b) 6 hours
 (c) 4 hours (d) 12 hours

SSC MTS 06/08/2019 (Shift-I)

Ans. (b) : Speed of boat in still water = x km/h
 Let the speed of stream = y km/h
 According to the question, $(x+y) = 14$ km/h
 And $(x-y) = 10$ km/h
 From equation (i) + (ii)
 $2x = 24$
 $x = 12$ km/h
 Time taken by boat to cover a distance of 72 km in still water = $\frac{72}{12} = 6$ hours

18. Ajay can row his boat in still water, at a speed of 6 km/h. If the speed of the stream is 4 km/h, how will he take to distance of 30 km downstream?
 (a) 2 hours (b) 5 hours
 (c) 4 hours (d) 3 hours

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : Speed of boat in still water = 6 km/h
 And speed of stream = 4 km/h
 \therefore Speed of boat in downstream = $6+4 = 10$ km/h.
 Time taken by Ajay to go 30 km in the downstream
 $= \frac{30}{10} = 3$ hours.

(II) Problems based on Speed of Stream

19. A boat covered a distance of 15 km upstream in 5 hours and a distance of 42 km downstream in 6 hours. The speed of the stream in km/h is:
 (a) 3 (b) 1.5
 (c) 2 (d) 2.5

SSC CHSL -14/10/2020 (Shift-I)

Ans. (c) : Speed of boat in downstream = $\frac{42}{6} = 7$ km/h
 Speed of boat in upstream = $\frac{15}{5} = 3$ km/h
 Speed of the stream = $\frac{7-3}{2} = 2$ km/h

20. The speed of a boat in still water is 8 km/hr. It covers a distance of 52 km upstream in 8 hours. What is the speed (in km/hr) of the stream?
 (a) 1.5 (b) 2
 (c) 3 (d) 2.5

SSC MTS 10-10-2017 (Shift-III)

Ans. (a) : Let the speed of stream = x km/hr
 Then the relative speed of boat in upstream = $(8 - x)$ km/hr

Since, Speed = $\frac{\text{Distance}}{\text{Time}}$

$$(8 - x) = \frac{52}{8}$$

$$(8 - x) = \frac{13}{2}$$

$$16 - 2x = 13$$

$$\Rightarrow 2x = 16 - 13$$

$$2x = 3$$

$$x = \frac{3}{2}$$

$$x = 1.5$$
 km/hr

21. Speed of a boat along the current and against the current are 16 km/h and 10 km/h respectively. What is the speed (in km/hr) of the current.
 (a) 2 (b) 3
 (c) 4 (d) 1

SSC MTS 10-10-2017 (Shift-II)

Ans. (b) : Given—
 Speed of boat in downstream = 16 km/hr
 And in upstream = 10 km/hr
 Speed of stream = $\frac{1}{2}$ (downstream speed – upstream speed)
 $= \frac{1}{2} \times (16 - 10)$ km/hr
 $= \frac{1}{2} \times 6$ km/hr
 $= 3$ km/hr

22. In one hour, a man rows his canoe against the stream at 11 km/h and along the stream at 23 km/h. What is the speed (in km/h) of stream?
 (a) 6 (b) 5
 (c) 17 (d) 16.5

SSC MTS 14/08/2019 (Shift-III)

Ans. (a) : Let the speed of boat in still water = x km/h
 And speed of stream = y km/h
 According to the question,
 $x - y = 11$ (i)
 And $x + y = 23$ (ii)
 From equation (i) – (ii),
 $-2y = -12 \Rightarrow y = 6$
 Hence the speed of stream (y) = 6 km/h.

(III) Problems based on Time

23. Ravi can row a boat in still water at the speed of 14 km/h. If a river is flowing at the speed of 2 km/h and Ravi takes 3 hours to cover a certain distance upstream, then how much time will he take to cover the same distance downstream?
 (a) 2 h 20 m (b) 2 h
 (c) 2 h 15 m (d) 2 h 30 m

SSC CHSL 06/08/2021 (Shift-I)

Ans. (c) : In upstream
 $V_R - V_S = \frac{\text{Total distance (D)}}{3}$
 $14 - 2 = \frac{D}{3}$
 $D = 36$ km
 \therefore Time taken by Ravi to cover the distance D in downstream = $\frac{36}{14+2} = \frac{36}{16} = \frac{9}{4} = 2\frac{1}{4} = 2$ h 15 m

24. A boat can travel with a speed of 19 km/h in still water. If the speed of the stream is 3 km/h, then what will be the total time (in hours) taken by the boat to go 88 km downstream and 24 km upstream?
 (a) 4.5 (b) 5
 (c) 4 (d) 5.5

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : Speed of boat in downstream = $19 + 3 = 22$ km/h
 Speed of boat in upstream = $19 - 3 = 16$ km/h

According to the question,

$$\text{Time taken by boat in downstream} = \frac{88}{22} = 4 \text{ hour}$$

$$\text{Time taken by boat in upstream} = \frac{24}{16} = 1.5$$

$$\text{Total time taken by boat in downstream and upstream} = 4 + 1.5 = 5.5 \text{ hours}$$

25. A person can row a distance of 4 km upstream in one hour 20 minutes and can row back to the starting point in just 24 minutes. How much time (in hours) will he take to row 13 km in still water?

- (a) $2\frac{1}{2}$ (b) $3\frac{1}{2}$
 (c) 2 (d) 3

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (c) : Let, Speed of boat in still water = x km/hr
 speed of stream = y km/hr

Time taken to cover 4 km distance in upstream

$$\frac{4}{x - y} = 1\frac{20}{60} = \frac{80}{60} = \frac{4}{3}$$

$$x - y = 3 \quad \text{.....(i)}$$

Time taken to return

$$\frac{4}{x + y} = \frac{24}{60} = \frac{2}{5}$$

$$x + y = 10 \quad \text{.....(ii)}$$

From equation (i) and (ii),

$$x + y = 10$$

$$x - y = 3$$

$$\text{Speed of boat (x)} = \frac{13}{2}$$

Time taken to cover a distance of 13 km in still

$$\text{water} = \frac{13}{\frac{13}{2}} = 2 \text{ hours}$$

26. A boat goes 30 km upstream in 3 hours and downstream in 1 hour. How much time (in hours) will this boat take to cover 60 km in still water?

- (a) 6 (b) 3
 (c) 2 (d) 5

SSC CGL–(Tier-I) 20/08/2021 (Shift III)

Ans. (b) : Speed of boat in upstream = $\frac{30}{3} = 10$ km/h

$$\text{Speed of boat in downstream} = \frac{30}{1} = 30 \text{ km/h}$$

$$\text{Speed of boat in still water} = \frac{10 + 30}{2} = 20 \text{ km/h.}$$

$$\text{Required time} = \frac{60}{20} = 3 \text{ hours.}$$

27. Sunil can row a boat 20 km upstream in 1 hour 15 minutes. If the speed of the current of the river is 2 km/h, then how much time will he take to row the boat 30 km downstream?

- (a) 1 h 10 m (b) 1 h 45 m
(c) 1 h 30 m (d) 1 h 20 m

SSC CHSL 10/08/2021 (Shift-I)

Ans. (c) : Let speed of boat = x km/h
upstream speed = (x-2) km/h
downstream speed = (x+2) km/h

According to the question,

$$(x-2) \times \frac{5}{4} = 20$$

$$\Rightarrow x - 2 = 16$$

$$\Rightarrow x = 18$$

$$\text{Downstream speed} = 18 + 2 = 20 \text{ km/hr}$$

$$\therefore \text{Time taken by boat to cover 30km downstream}$$

$$= \frac{30}{20} = 1.5 \text{ hr} = 1 \text{ hr } 30 \text{ min}$$

28. The speed of a boat in still water is 18 km/h and the speed of the current is 6 km/h. In how much time (in hours) will the boat travel a distance of 90 km upstream and the same distance downstream?

- (a) 12 hours (b) $11\frac{1}{4}$ hours
(c) 10 hours (d) $9\frac{1}{2}$ hours

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : Let the speed of boat in still water = x km/h and speed of stream = y km/h

Speed of boat in upstream = (x-y)

speed of boat in downstream = (x+y)

$$\therefore \text{Total time taken} = \frac{90}{24} + \frac{90}{12} = 90 \left(\frac{1+2}{24} \right)$$

$$= \frac{90}{8} = 11\frac{1}{4} \text{ hours}$$

29. The speed of a boat in still water is 15 km/h. The speed of the current is 3 km/h. In how much time (in hours) will the boat travel a distance of 54km upstream and the same distance downstream?

- (a) $7\frac{1}{2}$ hours (b) 7 hours
(c) 6 hours (d) $6\frac{1}{2}$ hours

SSC MTS 22/08/2019 (Shift-II)

Ans. (a) : Speed of boat in still water = 15 km/h

Speed of stream = 3 km/h

Time taken to cover the distance in downstream

$$= \frac{54}{15+3} = 3 \text{ hours}$$

$$\text{Time taken to cover the distance in upstream} = \frac{54}{15-3}$$

$$= \frac{54}{12} = 4\frac{1}{2} \text{ hrs}$$

$$\text{Total time taken} = 4\frac{1}{2} + 3 = 7\frac{1}{2} \text{ hours.}$$

(iv)

Miscellaneous

30. Anup can row 33 km downstream and 35 km upstream in 8 hours. He can also row 44 km downstream and 28 km upstream in the same time. How much time (in hours) will he take to row 55 km downstream and 14 km upstream?

- (a) 9 (b) 6
(c) 8 (d) 7

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (d) Let, speed of downstream = a km/hr

Speed of upstream = b km/hr

According to the question,

$$\frac{33}{a} + \frac{35}{b} = 8 \text{(i)}$$

$$\frac{44}{a} + \frac{28}{b} = 8 \text{(ii)}$$

From eqⁿ (i) and (ii),

$$\frac{33}{a} + \frac{35}{b} = \frac{44}{a} + \frac{28}{b}$$

$$\Rightarrow \frac{44}{a} - \frac{33}{a} = \frac{35}{b} - \frac{28}{b}$$

$$\Rightarrow \frac{11}{a} = \frac{7}{b}$$

$$\therefore \frac{a}{b} = \frac{11}{7}$$

$$\therefore \frac{55}{11} + \frac{14}{7} = 5 + 2 = 7 \text{ hours}$$

Hence, option (d) is correct.

31. A boat covers a round trip journey two points A and B in a river in T hours. If its speed in still water becomes 2 times, it would take $\frac{80}{161}$ T hours for the same journey. Find the ratio of its speed in still water to the speed of the river?

- (a) 11 : 1 (b) 161 : 40
(c) 1 : 11 (d) 2 : 1

SSC CGL-(Tier-I) 2308/2021 (Shift I)

Ans. (a) : Let boat's speed in still water = x km/h

Speed of the stream = y km/h

Let total distance = k km

$$\frac{k}{x+y} + \frac{k}{x-y} = T \text{(i)}$$

$$\frac{k}{2x+y} + \frac{k}{2x-y} = \frac{80}{161} T \text{(ii)}$$

$$\frac{1}{2x+y} + \frac{1}{2x-y} = \frac{80}{161} \times \frac{T}{k}$$

$$\frac{1}{2x+y} + \frac{1}{2x-y} = \frac{80}{161} \times \left(\frac{1}{x+y} + \frac{1}{x-y} \right) \text{ [from eq}^n \text{1]}$$

$$\frac{4x}{4x^2 - y^2} = \frac{80}{161} \times \frac{2x}{x^2 - y^2}$$

$$160x^2 - 40y^2 = 161x^2 - 161y^2$$

$$x^2 = 121y^2$$

$$\frac{x}{y} = \frac{11}{1} = 11:1$$

32. A boat goes 27 km upstream and 33 km downstream in 6 hours. In the same time it can go 36 km upstream and 22 km downstream. How much time will it take to go 36 km upstream and 44 km downstream ?

- (a) 8 h 30 m (b) 8 h 10 m
(c) 8 h (d) 7 h 50 m

SSC CGL-(Tier-I) 16/08/2021 (Shift III)

Ans. (c) : Let the speed of boat = a km/hr
And the speed of stream = b km/hr
According to the question,

$$\Rightarrow \frac{33}{a+b} + \frac{27}{a-b} = \frac{22}{a+b} + \frac{36}{a-b}$$

$$\Rightarrow 11/a + b = 9/a - b$$

$$\Rightarrow 11a - 11b = 9a + 9b$$

$$\Rightarrow a = 10b$$

then,

$$\Rightarrow \frac{33}{10b+b} + \frac{27}{10b-b} = 6$$

$$\Rightarrow \frac{3}{b} + \frac{3}{b} = 6$$

$$\Rightarrow b = 1$$

Speed of downstream = 10 + 1 = 11 km/hr

Speed of upstream = 10 - 1 = 9 km/hr

then,

$$= 44/11 + 36/9$$

$$= 4 + 4 = 8$$

∴ It will take 8 hours to go 36 km upstream and 44 km downstream.

33. If a boat goes upstream at a speed of 21 km/h and comes back the same distance at 28 km/h. What is the average speed (in km/hr) for the total journey?

- (a) 24.5 (b) 24
(c) 25 (d) 25.4

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : Average speed of boat = $\frac{2 \times 28 \times 21}{28 + 21}$

$$= \frac{2 \times 28 \times 21}{49} = 24 \text{ km/h}$$

34. If a boat goes upstream at a speed of 18 km/hr and comes back the same distance at 30 km/hr. What is the average speed (in km/hr) for the total journey?

- (a) 22.5 (b) 24
(c) 20.5 (d) 25

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Speed of boat in upstream = 18 km/hr
Speed of boat in downstream = 30 km/hr

$$\left[\text{Average speed of boat} = \frac{2xy}{x+y} \right]$$

$$= \frac{2 \times 18 \times 30}{(18+30)} = 22.5 \text{ km/hr}$$

35. Abhi rows upstream a distance of 28 km in 4 h and rows downstream a distance of 50 km in 2h. To row a distance of 44.8 km in still water, he will take :

- (a) 2.4 h (b) 2.2 h
(c) 2.8 h (d) 3.2 h

SSC CGL (Tier-II) 11-9-2019

Ans. (c) :

Let Speed of boat in still water = x km/h

And speed of stream = y km/h

According to the question

$$(x - y) = \frac{28}{4} \Rightarrow x - y = 7 \text{ -----(i)}$$

$$x + y = \frac{50}{2} \Rightarrow x + y = 25 \text{ -----(ii)}$$

Equation (i) + equation (ii)

$$2x = 32 \Rightarrow x = 16 \text{ km/h}$$

Time taken by Ajay to cover 44.8 km distance in still water = $\frac{44.8}{16} = 2.8\text{h}$

36. A boat takes 80 minutes to row 12 km upstream and 60 minutes to row 15 km downstream. How long will it take to row a distance of 36 km in still water?

- (a) 2 hours (b) 3 hours
(c) 4 hours (d) 2.5 hours

SSC MTS 13/08/2019 (Shift-II)

Ans. (b) :

Speed of boat in upstream

$$(x-y) = \frac{12}{80} \times 60 = 9 \text{ km -----(i)}$$

Speed of boat in downstream

$$(x+y) = \frac{15}{60} \times 60 = 15 \text{ km -----(ii)}$$

$$x - y = 9$$

$$\frac{x + y = 15}{2x = 24}$$

$$2x = 24$$

$$x = 12 \text{ km/h}$$

$$\text{Required time} = \frac{36 \text{ Km}}{12 \text{ Km/h}} = 3 \text{ hours}$$

20.

Age Problems

1. Three years ago, the ratio of the age of father to that of his son was 8 : 3. After 4 years, their ages will be in the ratio 11 : 5, what is the present age (in years) of the father?
 (a) 52 (b) 51
 (c) 48 (d) 55

SSC CGL (Tier-I) 18/04/2022 (Shift-III)

Ans. (b) Let, the ages of father and son 3 years before be $8x$ years and $3x$ years respectively. According to the question,

$$\begin{aligned} \therefore \frac{8x+3+4}{3x+3+4} &= \frac{11}{5} \\ \Rightarrow \frac{8x+7}{3x+7} &= \frac{11}{5} \\ \Rightarrow 40x+35 &= 33x+77 \\ \Rightarrow 7x &= 42 \end{aligned}$$

$$\boxed{x = 6}$$

\therefore Age of father before 3 years = $8 \times 6 = 48$ years
 Age of son before 3 years = $3 \times 6 = 18$ years
 Then, present age of father = $48 + 3 = 51$ years

Hence, option (b) is correct.

2. The present ages of A and B are in the ratio 9:10. The ratio of their ages 8 years from now will be 11:12. What will be the sum of their ages (in years) after 3 years from now?
 (a) 78 (b) 76
 (c) 82 (d) 84

SSC CHSL 15/04/2021 (Shift-I)

Ans. (c) : Let, the present ages of A and B is $9x$ and $10x$ respectively.

According to the question,

$$\begin{aligned} \frac{9x+8}{10x+8} &= \frac{11}{12} \\ 108x+96 &= 110x+88 \\ 2x &= 8 \\ x &= 4 \end{aligned}$$

Now, the sum of their ages after 3 year from now
 $\Rightarrow (9x+3) + (10x+3)$
 $= (9 \times 4 + 3) + (10 \times 4 + 3)$
 $= 39 + 43 = 82$

3. The average age of Akhil and Sunita is 51 years, of Sunita and Veena is 31 years, and that of Veena and Akhil is 33 years. The age of Veena is:
 (a) 13 years (b) 49 years
 (c) 53 years (d) 17 years

SSC MTS 27/10/2021 (Shift-I)

$$\begin{aligned} \text{Ans. (a) : Akhil + Sunita} &= 51 \times 2 = 102 \quad \dots(i) \\ \text{Sunita + Veena} &= 31 \times 2 = 62 \quad \dots(ii) \\ \text{Veena + Akhil} &= 33 \times 2 = 66 \quad \dots(iii) \end{aligned}$$

Adding equation (i), (ii) and (iii)

$$2[\text{Akhil + Sunita + Veena}] = 102 + 62 + 66$$

$$(\text{Akhil + Sunita + Veena}) = \frac{230}{2} = 115$$

$$\begin{aligned} \text{Age of Veena} &= 115 - (\text{Age of Akhil} + \text{Age of Sunita}) \\ &= 115 - 102 = 13 \text{ years.} \end{aligned}$$

4. Nalini's younger brother is 12 years old. If the ratio of the age of Nalini to that of her brother is 7:6, then what will be ratio in their ages 6 years hence?
 (a) 10:9 (b) 13:12
 (c) 17:15 (d) 10:6

SSC CHSL 10/08/2021 (Shift-I)

$$\text{Ans. (a) : Nalini's age} = \frac{12}{6} \times 7 = 14 \text{ years}$$

$$\text{Required ratio} = (14+6):(12+6) = 10 : 9$$

5. The ratio between the present ages of A and B is 3 : 5. If the ratio of their ages after five years becomes 13 : 20, then the present age of B is:
 (a) 30 year (b) 35 year
 (c) 40 year (d) 32 year

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (b) : Let the present age of A and B is $3x$ and $5x$ years respectively.

According to the question,

$$\begin{aligned} \frac{3x+5}{5x+5} &= \frac{13}{20} \\ 60x+100 &= 65x+65 \\ 5x &= 35 \\ x &= 7 \end{aligned}$$

$$\begin{aligned} \text{Hence, present age of B} &= 5x = 5 \times 7 \\ &= 35 \text{ years} \end{aligned}$$

6. The ratio of the present ages of A and B is 8 : 9. After 9 years, this ratio will become 19 : 21. C is 3 years younger to B. What is the present age (in years) of C?
 (a) 51 (b) 48
 (c) 49 (d) 52

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : Let the present age of A and B is $8x$ and $9x$ years respectively.

\therefore From the question,

$$\frac{8x+9}{9x+9} = \frac{19}{21}$$

$$168x + 189 = 171x + 171$$

$$3x = 18$$

$$x = 6$$

Present age of C = $9x - 3 = 54 - 3 = 51$ years.

7. The ratio of the ages of A and B, four years ago, was 4 : 5. Eight years from now, the ratio of the ages of A and B will be 11 : 13. What is the sum of their present ages?

- (a) 72 years (b) 96 years
(c) 80 years (d) 76 years

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (c) Let the present age of A is $4x + 4$ and present age of B is $5x + 4$.

According to the question,

$$\Rightarrow \frac{4x+4+8}{5x+4+8} = \frac{11}{13}$$

$$\Rightarrow \frac{4x+12}{5x+12} = \frac{11}{13}$$

$$\Rightarrow 52x + 156 = 55x + 132$$

$$\Rightarrow 3x = 24$$

$$\Rightarrow \boxed{x = 8}$$

Hence, Present age of A = $4x + 4 = 36$ years

Present age of B = $5x + 4 = 44$ years

Sum of present ages of A and B = $36 + 44$

= 80 years

8. The ratio of the present ages of A and B is 8 : 15. Eight years ago, the ratio of their ages was 6 : 13. What will be the ratio of ages of A and B after 8 years from now?

- (a) 9 : 14 (b) 5 : 8
(c) 5 : 9 (d) 10 : 17

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (d) : Let the present age of A = $8x$
present age of B = $15x$

According to the question,

$$\frac{8x-8}{15x-8} = \frac{6}{13}$$

$$\Rightarrow 104x - 104 = 90x - 48$$

$$\Rightarrow 14x = 56$$

$$\Rightarrow \boxed{x = 4}$$

∴ Present age of A = 32 years

Present age of B = 60 years

Ratio of their ages after 8 years = $\frac{32+8}{60+8}$

$$= \frac{40}{68} = \frac{10}{17} \Rightarrow 10:17$$

9. The ratio of the ages of A and B, 8 years ago, was 2 : 3. Four years ago, the ratio of their ages was 5 : 7. What will be the ratio of their ages 8 years from now?

- (a) 5 : 6 (b) 3 : 4
(c) 7 : 8 (d) 4 : 5

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-I)

Ans. (d) : Let the ages of A and B, 8 years ago was $2x$ and $3x$ years respectively

According to the question,

Four years ago their ages ratio \Rightarrow

$$\therefore \frac{2x+4}{3x+4} = \frac{5}{7}$$

$$14x + 28 = 15x + 20$$

$$x = 8$$

Therefore, the present age of A & B is $2x + 8$, $3x + 8$

Ratio of their ages 8 years from now = $(2x+16) : (3x+16)$

$$= 32 : 40 = 4 : 5$$

10. The ratio of present ages of Simi and Seema is 5 : 4. After 9 years the ratio of their ages will be 8 : 7. What is Simi's present age (in years)?

- (a) 12 (b) 15
(c) 24 (d) 21

SSC CGL (Tier-II) 21-02-2018

Ans. (b) : Let the present ages of Simi and Seema is $5x$ and $4x$ respectively.

According to the question,

$$\frac{5x+9}{4x+9} = \frac{8}{7}$$

$$\Rightarrow 35x + 63 = 32x + 72$$

$$\Rightarrow 3x = 9$$

$$\Rightarrow x = 3$$

Present age of Simi = $5x = 5 \times 3$

$$= \boxed{15 \text{ years}}$$

11. The ratio of ages of the father and mother was 11:10 when their son was born. The ratio of ages of the father and mother will be 19 : 18 when the son will be twice his present age. What is the ratio of present ages of father and mother ?

- (a) 15 : 14 (b) 14 : 13
(c) 16 : 15 (d) 17 : 16

SSC CGL (Tier-II) 20-02-2018

Ans. (a) : Let the present age of son = y

And, the present age of father and mother is $11x$ and $10x$ respectively.

According to the question

$$\frac{11x+2y}{10x+2y} = \frac{19}{18}$$

$$198x + 36y = 190x + 38y$$

$$8x = 2y$$

$$\frac{x}{y} = \frac{1}{4} \Rightarrow \text{On comparing } \Rightarrow x = 1, y = 4$$

Ratio of present ages of father and mother:-

$$\begin{aligned} &= \frac{11x + y}{10x + y} = \frac{11 + 4}{10 + 4} \\ &= \frac{15}{14} = 15 : 14 \end{aligned}$$

12. The ratio of present ages of Rahul and his sister is 3:4. Before 10 years the ratio of their ages was 13:19. What is Rahul's present age (in years) ?

- (a) 36 (b) 48
(c) 42 (d) 54

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : Let the present ages of Rahul and his sister is $3x$ and $4x$ respectively.

Before 10 years their ages was $(3x - 10)$ and $(4x - 10)$ respectively.

According to the question,

$$\frac{3x - 10}{4x - 10} = \frac{13}{19} \Rightarrow 57x - 190 = 52x - 130$$

$$5x = 60$$

$$x = 12$$

$$\text{Present age of Rahul} = 3x$$

$$= 3 \times 12$$

$$= 36 \text{ years}$$

13. The ratio of present ages of Ajay and Vijay is 2:3. 4 years ago the ratio of their ages was 3:5. What is Vijay's present age (in years) ?

- (a) 16 (b) 8
(c) 32 (d) 24

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Let the present age of Ajay and Vijay is $2x$ and $3x$ respectively.

According to the question,

$$\therefore \frac{2x - 4}{3x - 4} = \frac{3}{5}$$

$$10x - 20 = 9x - 12$$

$$x = 8$$

$$\text{Hence, Present age of Vijay} = 3x = 3 \times 8 = 24 \text{ years}$$

14. Ravi is 12 years younger than Surya. Ravi's age is 40% of the sum of his and Surya's age. What will be Surya's age 9 years hence?

- (a) 36 (b) 24
(c) 33 (d) 45

SSC CGL (Tier-II) 17-2-2018

Ans. (d) : Let the age of Surya = x years

\therefore Age of Ravi = $(x - 12)$ years

According to the question,

$$x - 12 = (x + x - 12) \times \frac{40}{100}$$

$$5x - 60 = 4x - 24$$

$$x = 36$$

$$\text{Age of Surya after 9 years} = 36 + 9 = 45 \text{ years.}$$

15. One year ago, the ratio of the age (in years) of A to that of B was 4 : 3. The ratio of their respective ages, 3 years from now, will be 6 : 5. What will be the ratio of respective ages of A and B, 9 years from now ?

- (a) 10 : 9 (b) 8 : 7
(c) 9 : 8 (d) 7 : 6

SSC CGL (Tier-II) 11-9-2019

Ans. (c) :

Let one year ago, age of A = $4x$ years

And one year ago age of B = $3x$ years

\therefore Present age of A and B is $4x + 1$, $3x + 1$ respectively.

According to the question-

$$\frac{4x + 1 + 3}{3x + 1 + 3} = \frac{6}{5} \Rightarrow \frac{4x + 4}{3x + 4} = \frac{6}{5}$$

$$20x + 20 = 18x + 24$$

$$x = 2$$

The ratio of ages of A and B, 9 years from now.

$$= \frac{4x + 1 + 9}{3x + 1 + 9} = \frac{4 \times 2 + 10}{3 \times 2 + 10} = \frac{18}{16}$$

$$= 9 : 8$$

16. 5 years ago, the ratio of the age of A to that of B was 4 : 5. Five years hence, the ratio of the age of A to that of B will be 6 : 7. If, at present age of C is 10 years younger than B, then what will be the ratio of the present age of A to that of C ?

- (a) 3 : 2 (b) 5 : 3
(c) 4 : 3 (d) 5 : 4

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : 5 years ago-

Let the age of A = $4x$

Age of B = $5x$

Present Age of A = $(4x + 5)$

Present Age of B = $(5x + 5)$

According to the question,

$$\frac{(4x + 5) + 5}{(5x + 5) + 5} = \frac{6}{7}$$

$$28x + 70 = 30x + 60$$

$$2x = 10$$

$$x = 5$$

Hence, the present age of A = $(4x + 5) = 25$ years

Present age of B = $(5x + 5) = (5 \times 5 + 5) = 30$ years

\therefore Present age of C = B - 10

$$= 30 - 10 = 20 \text{ years}$$

\therefore The ratio of the present age of A to that of C = $25 : 20 = 5 : 4$

17. Seven years ago, the ratio of the ages of A and B was 4:5. Eight years hence, the ratio of the ages of A and B will be 9:10. What is the difference between their present ages in years?

- (a) 3 (b) 6
(c) 4 (d) 2

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : Let 7 years ago, age of A = $4x$

Age of B = $5x$

Present age of A = $(4x+7)$ years

Present age of B = $(5x+7)$ years

According to the question,

$$\frac{(4x+7)+8}{(5x+7)+8} = \frac{9}{10}$$

$$\Rightarrow 40x + 150 = 45x + 135$$

$$\Rightarrow 5x = 15$$

$$\Rightarrow x = 3$$

\therefore Present age of A = $4 \times 3 + 7 = 19$ years

Present age of B = $5 \times 3 + 7 = 22$ years

Difference between their present ages = $22 - 19$
= 3 years

18. The present ages of A and B are in the ratio 3:4. Twelve years ago, their ages were in the ratio 2:3. The sum of the present ages of A and B (in years) is:

- (a) 48 (b) 72
(c) 60 (d) 84

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : Let the present age of A and B is $3x$ and $4x$ years respectively.

$$\therefore \frac{3x-12}{4x-12} = \frac{2}{3}$$

$$9x - 36 = 8x - 24$$

$$x = 12$$

\therefore The sum of the present ages of A and B = $3x + 4x$
= $7x = 7 \times 12 = 84$ years

19. Seven years ago, the ratio of the ages of A and B was 4 : 5. Eight years hence, the ratio of the ages of A and B will be 9 : 10. What is the sum of their present ages in years?

- (a) 56 (b) 41
(c) 32 (d) 82

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (b) : Let, 7 years ago the age of A and B was $4x$ and $5x$ years respectively.

According to the question,

After 8 years.

$$\frac{4x+7+8}{5x+7+8} = \frac{9}{10}$$

$$40x + 150 = 45x + 135$$

$$5x = 15$$

$$x = 3$$

$$\begin{aligned} \text{Sum of their present ages} &\Rightarrow 4x + 7 + 5x + 7 \\ &= 9x + 14 \\ &= 9 \times 3 + 14 \\ &= 41 \text{ years} \end{aligned}$$

20. Seven years ago, the ages (in years) of A and B were in the ratio 4:5 and 7 years hence, their ages will be in the ratio 5:6. What will be the ratio of their ages 5 years from now?

- (a) 34:41 (b) 31:33
(c) 33:40 (d) 33:34

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) Let, 7 year ago the age of A and B was $4x$ and $5x$ years respectively.

According to the question,

After 7 year,

$$\frac{(4x+7)+7}{(5x+7)+7} = \frac{5}{6}$$

$$24x + 84 = 25x + 70$$

$$x = 14$$

From the question,

Present age of A + 5 year

$$= 4x + 7 + 5 \Rightarrow 4 \times 14 + 12 = 68 \text{ year}$$

Present age of B + 5 year

$$= 5x + 7 + 5 \Rightarrow 5 \times 14 + 12 = 82 \text{ years}$$

Ratio of ages of A to that of B = $68 : 82 = 34 : 41$

21. The ages of Fatima and Ahmed are in the ratio 3: 8. The sum of their present ages is 44 years. The difference of their ages is:

- (a) 30 years (b) 11 years
(c) 24 years (d) 20 years

SSC CHSL –26/10/2020 (Shift-III)

Ans. (d) : Let the age of Fatima = $3x$ years

And, Age of Ahmed = $8x$ years

Sum of their ages = $3x + 8x = 44$

$$11x = 44$$

$$x = 4$$

Age of Fatima = $3x = 3 \times 4 = 12$ years

Age of Ahmed = $8x = 8 \times 4 = 32$ years

Difference of their ages = $32 - 12$

$$= 20 \text{ years.}$$

22. The ratio of present ages (in years) of a father and son is 15 : 8. Six years ago, the ratio of their ages was 13 : 6. What is the father's present age?

- (a) 65 years (b) 45 years
(c) 78 years (d) 58 years

SSC CHSL –19/10/2020 (Shift-III)

Ans. (b) : Let the present ages of father and son is $15x$ and $8x$ years respectively.

According to the question:-

$$\frac{15x - 6}{8x - 6} = \frac{13}{6}$$

$$90x - 36 = 104x - 78$$

$$14x = 42$$

$$x = 3$$

\therefore Present age of father = $15x = 15 \times 3 = 45$ years

- 23. Six years ago, the average of the ages of Ravi, Mohan and Govind was 32 years. If Shyam joins them now, the average of the ages of all four of them is 36 years. The present age of Shyam is:**

- (a) 32 years (b) 35 years
(c) 30 years (d) 40 years

SSC CHSL -14/10/2020 (Shift-I)

Ans. (c) : Total sum of age of Ravi, Mohan and Govind at present = $(32 \times 3) + (6 \times 3)$
= $96 + 18 = 114$ years

Total ages of all four of them = $36 \times 4 = 144$ years

Hence, Present age of Shyam = $144 - 114 = 30$ years

- 24. The ratio of a man's age to his father's age is 4 : 5, and the ratio of his age to his son's age is 6 : 1. Four years ago these ratio were 11 : 14 and 11 : 1, respectively. The ratio of the age of the grandfather to that of the grandson 12 years from now will be:**

- (a) 18 : 5 (b) 14 : 3
(c) 18 : 7 (d) 12 : 5

SSC CHSL -13/10/2020 (Shift-II)

Ans. (a) : Let the present age of man and his father is $4x$ and $5x$ years respectively.

And, present age of man and his son is $6y$ and y years respectively.

Four years ago ratio of age of man to his father = $11 : 14$

Four years ago ratio of age of man to his son = $11 : 1$

According to the question,

$$\frac{(4x - 4)}{(5x - 4)} = \frac{11}{14}$$

$$56x - 56 = 55x - 44$$

$$x = 12$$

Present age of man = $4 \times 12 = 48$ years

Present age of father = $5 \times 12 = 60$ years

The ratio of age of man to his son's age = $6y : y$

$$6y = 48$$

$$y = 8$$

Present age of son = $y = 8$ years

12 years after age ratio of man' father to that of his son = $72 : 20 = 18 : 5$

- 25. The ratio of present ages of mother and son is 4 : 1. After 14 years the ratio of their ages will become 2 : 1. What is the present age of the mother (in years)?**

- (a) 36 (b) 24
(c) 32 (d) 28

SSC MTS 21/08/2019 (Shift-II)

Ans. (d) : Let the present age of mother = $4x$

And present age of son = x

According to the question,

$$\frac{4x + 14}{x + 14} = \frac{2}{1}$$

$$4x + 14 = 2x + 28$$

$$4x - 2x = 28 - 14$$

$$2x = 14$$

$$\boxed{x = 7}$$

Then the present age of mother

$$= 4x$$

$$= 4 \times 7$$

$$= 28 \text{ years.}$$

- 26. Ramesh is three times elder than Suresh. After 2 years Ramesh will be two times elder than Suresh. What is the present age of Ramesh (in years)?**

- (a) 4 (b) 6
(c) 3 (d) 2

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Let the age of Suresh = x years

Then age of Ramesh = $3x$ years

After two years \Rightarrow Age of Suresh = $x + 2$,

Age of Ramesh = $3x + 2$

According to the question:-

$$\text{Hence } (3x + 2) = 2(x + 2) \Rightarrow x = 2$$

Hence, the age of Ramesh = $3 \times 2 = 6$ years

- 27. The ratio of present ages of A and B is 5 : 3. 9 years before the ratio of their ages was 23:12. what will be the ratio of their ages after 15 years?**

- (a) 35 : 24 (b) 7 : 5
(c) 34 : 25 (d) 3 : 2

SSC MTS 20/08/2019 (Shift-I)

Ans. (a) : Let the present age of A = $5x$

Present age of B = $3x$

According to the question,

9 year before ratio of their ages.

$$\frac{5x - 9}{3x - 9} = \frac{23}{12}$$

$$60x - 108 = 69x - 207$$

$$9x = 99$$

$$x = 11$$

15 years from now.

$$A \Rightarrow 5x + 15 = 5 \times 11 + 15 = 70 \text{ years}$$

$$B \Rightarrow 3x + 15 = 3 \times 11 + 15 = 48 \text{ years}$$

Ratio of their ages $\Rightarrow A : B = 70 : 48$

$$\boxed{A : B = 35 : 24}$$

28. Ravi's age is $\frac{3}{5}$ of Shyam's ages. After x years the ratio of the ages of Ravi and Shyam becomes $5:7$. If initially the sum of their ages is 32, then what is the value of x ?

- (a) 2 (b) 4
(c) 8 (d) 7

SSC MTS 08/08/2019 (Shift-I)

Ans. (c) : Let the ages of Ravi and Shyam be $3x$ and $5x$ respectively.

$$\therefore 3x + 5x = 32 \text{ (Given)}$$

$$8x = 32$$

$$x = 4$$

$$\therefore \text{Age of Ravi} = 3 \times 4 = 12 \text{ years}$$

$$\therefore \text{Age of Shyam} = 5 \times 4 = 20 \text{ years}$$

According to the question,

After x years the ratio of the ages of Ravi and Shyam will be $5 : 7$.

$$\frac{12+x}{20+x} = \frac{5}{7}$$

$$84 + 7x = 100 + 5x$$

$$2x = 16$$

$$\boxed{x = 8 \text{ years}}$$

29. The sum of the present ages of a father and his son is 78 years. After five years, the ratio of their ages becomes $7 : 4$. Find the present age of father.

- (a) 45 (b) 51
(c) 55 (d) 50

SSC MTS 08/08/2019 (Shift-II)

Ans. (b) : Let the present age of father = x years

Then the present age of son = $(78 - x)$ years.

According to the question,

$$\frac{x+5}{78-x+5} = \frac{7}{4}$$

$$\frac{x+5}{83-x} = \frac{7}{4}$$

$$4x + 20 = 581 - 7x$$

$$11x = 581 - 20$$

$$11x = 561$$

$$x = 51 \text{ years.}$$

Hence, present age of father = 51 years

30. The ratio of the age of father and his son is $3:1$. If the product of their ages is 432, then what is the sum of their ages?

- (a) 36 years (b) 48 years
(c) 60 years (d) 54 years

SSC MTS 08/08/2019 (Shift-III)

Ans. (b) : Let the age of father = $3x$

And the age of son = x

According to the question,

$$3x \times x = 432$$

$$3x^2 = 432$$

$$x^2 = 144$$

$$\boxed{x = 12}$$

$$\begin{aligned} \text{Sum of ages of father and son} &= 3x + x = 4x \\ &= 4 \times 12 = 48 \text{ years} \end{aligned}$$

31. The present age of Manoj is twice the sum of the ages of his two children. After 20 years, the age of Manoj will become equal to the sum of the ages of his two children. What is the present age of Manoj?

- (a) 40 years (b) 30 years
(c) 36 years (d) 35 years

SSC MTS 08/08/2019 (Shift-III)

Ans. (a) : Let the age of children is a and b —

And the age of Manoj = m

According to the question,

$$m = 2(a+b)$$

After 20 years.

$$(m + 20) = (a + 20 + b + 20)$$

$$m + 20 = (a + b) + 40$$

$$m = (a + b) + 20 \quad (\because m = 2(a + b))$$

$$m = \frac{m}{2} + 20 \quad (a + b) = \frac{m}{2}$$

$$m - \frac{m}{2} = 20$$

$$\frac{m}{2} = 20$$

$$m = 40 \text{ years}$$

Hence, present age of Manoj is 40 years.

32. Five years ago, the ratio of the ages of A and B was $3 : 4$. Five years from now, the ratio of their ages will be $4 : 5$. What is the ratio of A and B, 10 years from now?

- (a) 9 : 11 (b) 6 : 7
(c) 5 : 6 (d) 7 : 9

SSC MTS 22/08/2019 (Shift-II)

Ans. (a) : Let, Five years ago

Age of A = $3x$ years, Age of B = $4x$ years

And, present age of A and B is $(3x + 5)$ and $(4x + 5)$ years respectively.

According to the question,

$$\frac{3x+5+5}{4x+5+5} = \frac{4}{5}$$

$$15x + 50 = 16x + 40$$

$$x = 10$$

After 10 years from now—

$$\text{Age of A} = (3x + 5) + 10 = 3 \times 10 + 15 = 45 \text{ years}$$

$$\text{Age of B} = (4x + 5) + 10 = 4 \times 10 + 15 = 55 \text{ years}$$

$$\text{Required ratio} = 45 : 55$$

$$= 9 : 11$$

33. The average age of mother and father is 28 years. The average age of mother, father and their son is 20 years. What is the age of the son?

- (a) 4 years (b) 3 years
(c) 6 years (d) 5 years

SSC MTS 05/08/2019 (Shift-III)

Ans. (a) : According to the question,
Sum of ages of mother and father = $28 \times 2 = 56$ years
Sum of age of mother, father and son = $20 \times 3 = 60$ year
Hence, Age of son = $(60 - 56) = 4$ years

34. Kartik's father age is four times the age of Kartik. Three years ago, Kartik's father age was seven times the age of Kartik. The present age of Kartik is:

- (a) 12 years (b) 6 years
(c) 9 years (d) 8 years

SSC MTS 14/08/2019 (Shift-III)

Ans. (b) : Let the age of Kartik = x years
Kartik's father age = $4x$ years
According to the question,
 $(4x - 3) = (x - 3) \times 7$
 $4x - 3 = 7x - 21$
 $3x = 18$
 $x = 6$
Hence, the present age of Kartik = 6 years

35. Five years ago, the ratio of the ages of a father and his son was 5 : 3. Which of the following cannot be the ratio of their ages 10 years from now?

- (a) 3 : 2 (b) 8 : 7
(c) 6 : 5 (d) 7 : 3

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (d) : Let, Five years ago, the ages of father and his son was $5x$ and $3x$ respectively.

\therefore According to the question,

From option (d),

The ratio of ages of father and son after 10 years.

$$\Rightarrow \frac{5x + 5 + 10}{3x + 10 + 5} = \frac{7}{3}$$

$$15x + 45 = 21x + 105$$

$$6x = -60$$

$$x = -10$$

Putting the value of option (d) in the above equation gives a negative value, So age will not be negative.

36. Five years ago, the average of the ages of 4 persons was 40 years. If a new person joins the group now, then the average of the ages all five persons is 46 years. The age of the fifth person (in years) is :

- (a) 50 (b) 48
(c) 47 (d) 55

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a) : 5 years ago, total age of 4 persons = $4 \times 40 = 160$ years

\therefore Their present age = $160 + 20 = 180$ years

\therefore Total age of 5 persons after adding one person to the group = $5 \times 46 = 230$ years

\therefore Age of the 5th person = $230 - 180 = 50$ years

37. Four years ago, the ratio of the ages of A and B was 9 : 13. Eight years after, the ratio of the ages of A and B will be 3 : 4. What will be the ratio of their ages 4 years hence?

- (a) 11 : 15 (b) 7 : 9
(c) 5 : 7 (d) 9 : 11

SSC Sel. Post Phase VIII (M.L.) 09.11.20 (Shift-III)

Ans (a) : Let 4 years ago age of A and B were $9x$ and $13x$ respectively.

Present age A : B = $(9x + 4) : (13x + 4)$

According to the question

After 8 year from now ratio of their ages \rightarrow

$$\frac{(9x + 4) + 8}{(13x + 4) + 8} = \frac{3}{4}$$

$$36x + 48 = 39x + 36$$

$$3x = 12$$

$$x = 4$$

\therefore After 4 years from present ratio of their ages \Rightarrow

$$A : B = (9x + 4 + 4) : (13x + 4 + 4)$$

$$= (36 + 8) : (52 + 8) = 44 : 60 = 11 : 15$$

38. Four year ago, the ratio of the ages (in years) of A and B was 8:9 The ratio of their ages, 8 year from now, will be 11:12 What is the sum of their present ages in years?

- (a) 84 (b) 68
(c) 59 (d) 76

SSC Sel. Post Phase VII (M.L.) 15.10.19 (Shift-I)

Ans. (d) : Let, 4 years ago age of A and B were $8x$ and $9x$ respectively.

According to the question,

After 8 years

$$\frac{8x + 4 + 8}{9x + 4 + 8} = \frac{11}{12}$$

$$\frac{8x + 12}{9x + 12} = \frac{11}{12}$$

$$96x + 144 = 99x + 132$$

$$3x = 12$$

$$x = 4$$

Hence, sum of present age of A and B

$$\Rightarrow 8x + 4 + 9x + 4$$

$$= 17x + 8$$

$$= 17 \times 4 + 8$$

$$\Rightarrow 68 + 8 = 76 \text{ years}$$

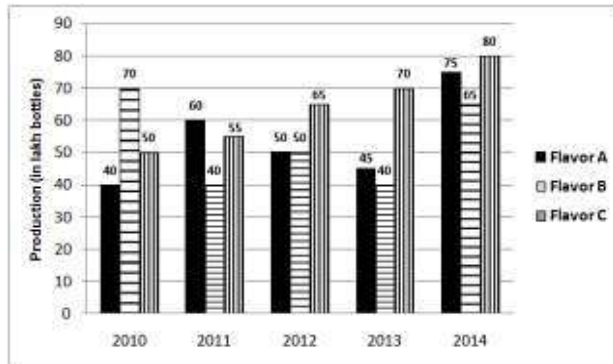
21.

Data Interpretation

(I) Problems based on Bar-Graph

1. A soft drink company prepares drinks of three different flavours– A, B and C. The production of the three flavours over a period of five years from 2010 to 2014 has been expressed in the given bar graph. Study the graph and answer the question that follows:

Production of three different flavours A, B and C (in lakh bottles) by a company over five years.



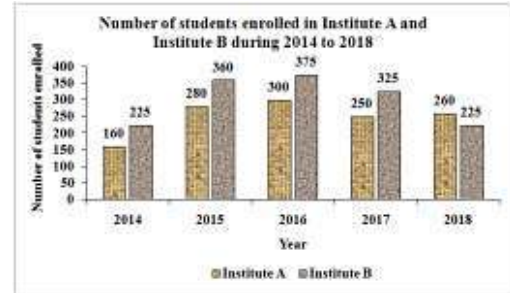
The difference between the average production of flavour A in 2012, 2013 and 2014 and the average production of flavour C in 2012, 2013 and 2014 is:

- (a) 10 lakh bottles
- (b) 12 lakh bottles
- (c) 18 lakh bottles
- (d) 15 lakh bottles

SSC CHSL 06/08/2021 (Shift-I)

Ans. (d) : Average production of flavour A in 2012, 2013 and 2014 = $\frac{50 + 45 + 75}{3} = \frac{170}{3}$
 Average production of flavour C in 2012, 2013 and 2014 = $\frac{65 + 70 + 80}{3} = \frac{215}{3}$
 \therefore Required difference = $\frac{215}{3} - \frac{170}{3} = \frac{45}{3}$
 = 15 lakh bottles

2. Study the following bar graph that shows the number of students enrolled for different courses in institutes A and B during 5 years, and answer the question that follows.



The average number of students (per year) enrolled in B during 2015, 2016 and 2018 is what percentage more than the number of students enrolled in A during 2016 (correct to one decimal place)?

- (a) 7.6%
- (b) 8.5%
- (c) 5.8%
- (d) 6.7%

SSC MTS 13/10/2021 (Shift-I)

Ans. (d) : Average number of students enrolled in B during 2015, 2016 and 2018 = $\frac{360 + 375 + 225}{3}$

$$= \frac{960}{3} = 320$$

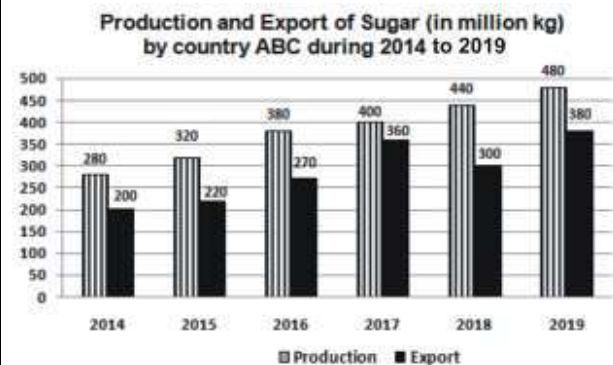
Number of students enrolled in A during 2016 = 300

$$\text{Required \%} = \frac{(320 - 300)}{300} \times 100$$

$$= \frac{20 \times 100}{300} = 6.66$$

$$= 6.7\%$$

3. Study the given graph and answer the question that follows.



For which of the following years was the increase in the production of sugar as compared to that in its preceding year between 8% and 10%?

- (a) 2018 (b) 2017
(c) 2019 (d) 2015

SSC CHSL 09/08/2021 (Shift-I)

Ans. (c) : From the given options—

$$(a) 2018 \rightarrow \frac{440 - 400}{400} \times 100 = 10\%$$

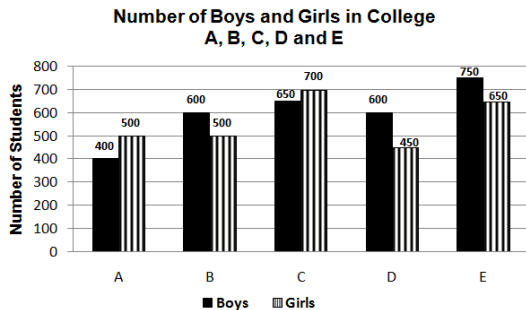
$$(b) 2017 \rightarrow \frac{400 - 380}{380} \times 100 = 5.26\%$$

$$(c) 2019 \rightarrow \frac{480 - 440}{440} \times 100 = 9.09\%$$

$$(d) 2015 \rightarrow \frac{320 - 280}{280} \times 100 = 14.28\%$$

Hence, 2019 is the required answer.

4. Study the given bar graph and answer the question that follows:



What is the ratio of the boys taken together in colleges A, B and C to the girls taken together in all 5 colleges?

- (a) 35 : 61 (b) 33 : 56
(c) 37 : 59 (d) 31 : 56

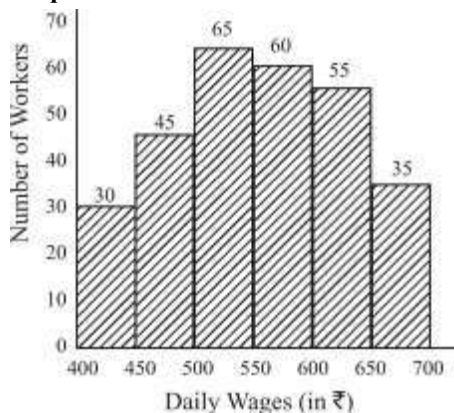
SSC CHSL 09/08/2021 (Shift-I)

Ans. (b) : Total number of boys in colleges A, B and C = 400 + 600 + 650 = 1650

Total number of girls in all five colleges = 500 + 500 + 700 + 450 + 650 = 2800

Hence, required ratio = 1650 : 2800 = 33 : 56

5. Study the given graph which shows the number of workers with their daily wages and answer the question that follows:



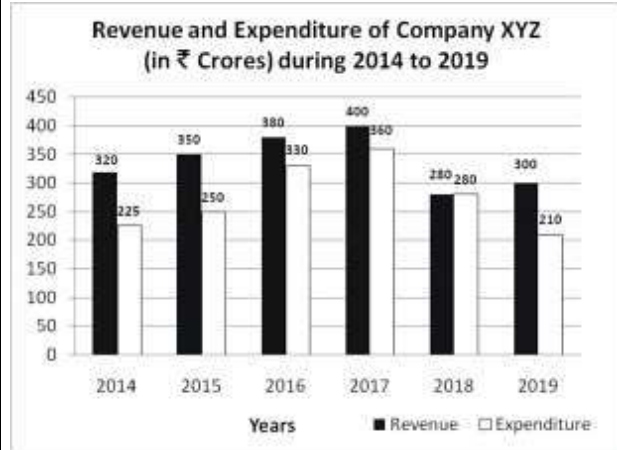
What is the ratio of the total number of workers whose daily wages are ₹450 or above but less than ₹500 to the total number of workers whose daily wages are ₹650 or above?

- (a) 9:7 (b) 5:2
(c) 2:5 (d) 7:9

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Required ratio = 45 : 35 = 9 : 7

6. Study the given graph and answer the question that follows:



The total revenue of the company in 2014, 2016 and 2018 is what percentage of the total expenditure in 2015 to 2017 and 2019 (correct to one decimal place)?

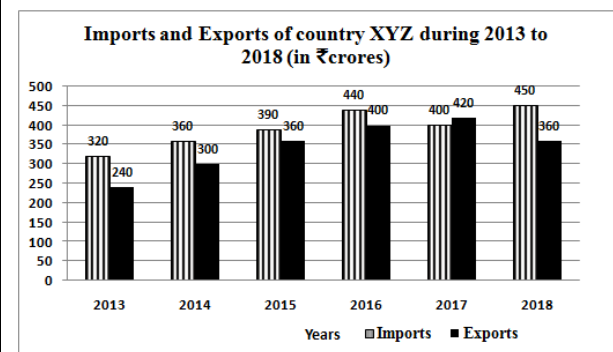
- (a) 85.2% (b) 84.3%
(c) 83.4% (d) 81.6%

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Total revenue of the company for the years 2014, 2016 and 2018 = 320 + 380 + 280 = ₹980 crore
Total expenditure of the company for the years 2015, 2016, 2017 and 2019 = 250 + 330 + 360 + 210 = ₹1150 crore

$$\therefore \text{Required percentage} = \frac{980}{1150} \times 100 = 85.2\%$$

7. Study the given graph and answer the question that follows.



In the years 2019, if the imports increased by the same percentage as that in 2018 over its previous year, then what was the amount (in ₹ crores) of the imports in the year 2019?

- (a) 495
 (b) 504
 (c) 508.50
 (d) 506.25

SSC CHSL 15/04/2021 (Shift-I)

Ans. (d) : Percentage increase of the imports in 2018

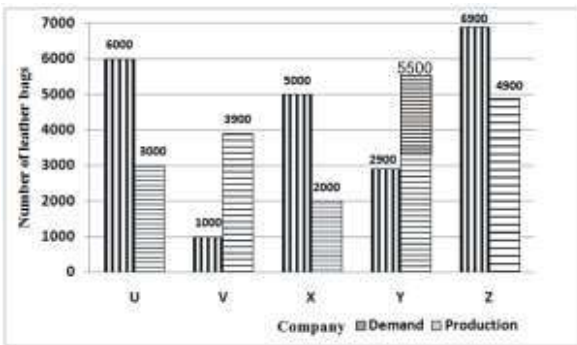
$$= \frac{450 - 400}{400} \times 100 = 12.5\%$$

As per the question,

$$\text{Amounts of imports in 2019} = 450 \times \frac{112.5}{100} = ₹506.25$$

8. Study the graph and answer the question that follows.

The given chart represents the demand and production of leather bags of five companies U, V, X, Y and Z.



If the production of leather bags by company Y is equal to 'm' times of the production of leather bags by company X, then the value of 'm' is:

- (a) 3.25
 (b) 2.5
 (c) 3
 (d) 2.75

SSC CHSL 15/04/2021 (Shift-I)

Ans. (d) :

Production of leather bags by company Y = 5500

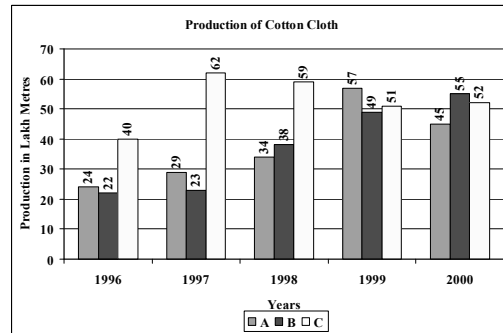
Production of leather bags by company X = 2000

According to the question,

$$5500 = m \times 2000$$

$$m = \frac{5500}{2000} = 2.75$$

9. The following graph shows the production of cotton cloth (in lakh metres) by three companies A, B and C over five years.



In which years was the average production of the companies, more than 38 lakh metres?

- (a) 1997, 1998, 1999, 2000
 (b) 1998, 1999, 2000
 (c) 1997
 (d) 1999

SSC MTS 02/11/2021 (Shift-I)

Ans. (b) : Average production of the companies in the year 1996

$$= \frac{24 + 22 + 40}{3}$$

$$= \frac{86}{3} = 28.66$$

Average production of the companies in the year 1997

$$= \frac{29 + 23 + 62}{3}$$

$$= \frac{114}{3} = 38$$

Average production of the companies in the year 1998

$$= \frac{34 + 38 + 59}{3}$$

$$= \frac{131}{3} = 43.66$$

Average production of the companies in the year 1999

$$= \frac{57 + 49 + 51}{3}$$

$$= \frac{157}{3} = 52.33$$

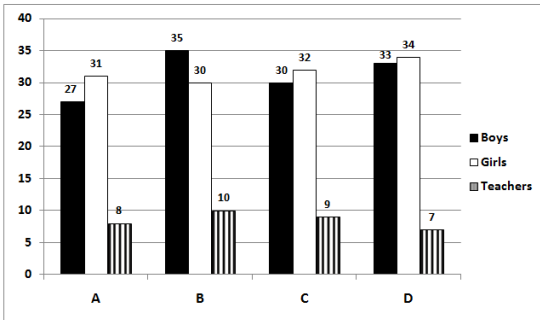
Average production of the companies in the year 2000

$$= \frac{45 + 55 + 52}{3}$$

$$= \frac{152}{3} = 50.66$$

Hence it is clear that the average production of the companies more than 38 lakh meters were 1998, 1999 and 2000 years.

10. The given bar-graph shows the number of boys and girls in classes A, B, C and D in a school, and the number of teachers allotted to each class.



Which class has the least percentage of girls?

- (a) B (b) D
(c) C (d) A

SSC CHSL 19/04/2021 (Shift-I)

Ans. (a) : Percentage of girls,

$$A \rightarrow \frac{31}{58} \times 100 = 53.44\%$$

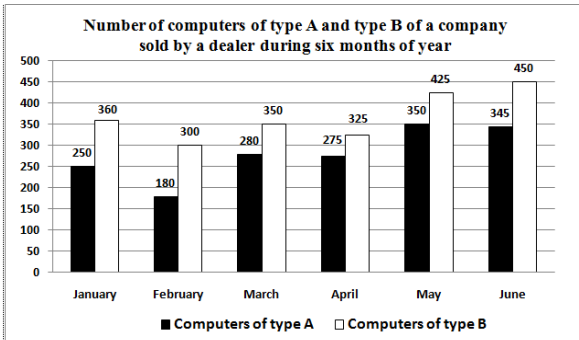
$$B \rightarrow \frac{30}{65} \times 100 = 46.15\%$$

$$C \rightarrow \frac{32}{62} \times 100 = 51.61\%$$

$$D \rightarrow \frac{34}{67} \times 100 = 50.74\%$$

Hence, percentage of girls are least in class B.

11. Study the given graph and answer the question that follows.



The total number of computers of type A sold in January and May is what percentage less than the total number of computers of type B sold from March to May? (correct to one decimal place)

- (a) 40.9 (b) 54.5
(c) 83.3 (d) 45.5

SSC CHSL 19/04/2021 (Shift-I)

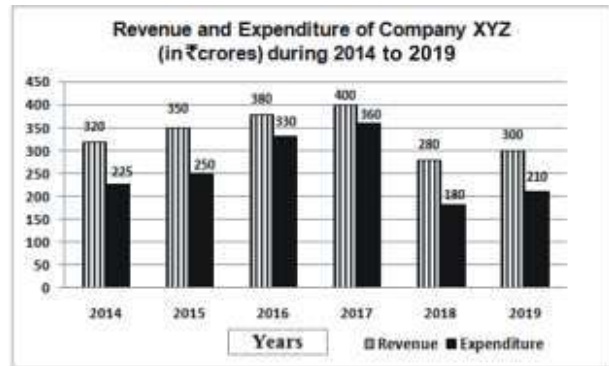
Ans. (d) : Total number of computers of type A sold in January and May = $250 + 350 = 600$

Total number of computers of type B sold in March to May = $350 + 325 + 425 = 1100$

$$\text{Hence, Required percentage} = \frac{(1100 - 600)}{1100} \times 100$$

$$= \frac{500}{1100} \times 100 = 45.5\%$$

12. Study the given graph and answer the question that follows.



What is the ratio of the total revenue of the company in 2015 and 2018 to the total expenditure in 2017 and 2018?

- (a) 9 : 10 (b) 6 : 5
(c) 7 : 6 (d) 5 : 4

SSC CHSL 19/04/2021 (Shift-I)

Ans. (c) : Total revenue of the company in 2015 and 2018 = $350 + 280 = 630$

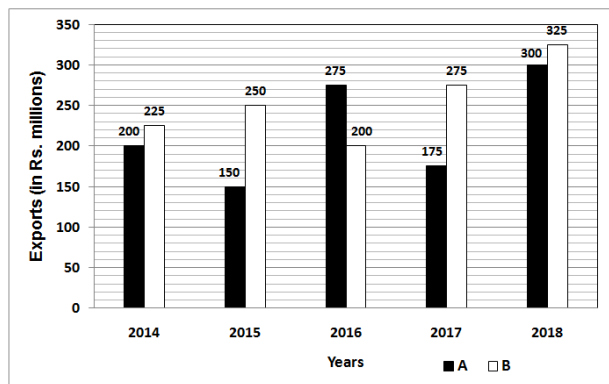
Total expenditure of the company in 2017 and 2018 = $360 + 180 = 540$

Hence, Required ratio = $630 : 540$

$$= 7 : 6$$

13. Study the given bar graph and answer the question that follows.

The bar graph shows the exports of cars of types A and B (in ₹ million).



What is the ratio of the total exports of cars of type A in 2016 and 2018 to the total exports of cars of type B in 2015 and 2017?

- (a) 23 : 21 (b) 15 : 29
(c) 18 : 23 (d) 21 : 23

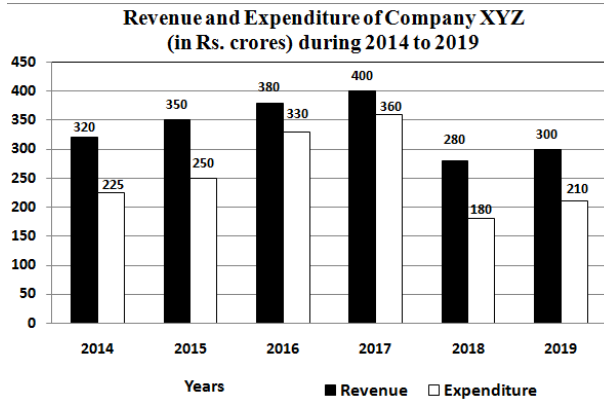
SSC CHSL 10/08/2021 (Shift-I)

Ans. (a) : Required ratio = $(275 + 300) : (250 + 275)$

$$= 575 : 525$$

$$= 115 : 105 = 23 : 21$$

14. Study the given graph and answer the question that follows.



By what percentage is the average expenditure of the company in 2014, 2016 and 2018 less than the revenue in 2017?

- (a) 37.5% (b) 56.25%
(c) 63.27% (d) 38.75%

SSC CHSL 10/08/2021 (Shift-I)

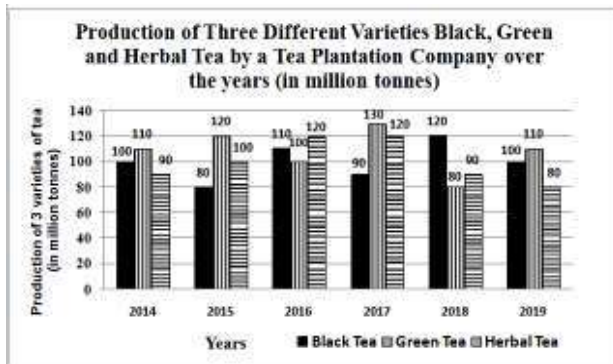
Ans. (d) : Average expenditure of the company in 2014, 2016 and 2018 = $\frac{225 + 330 + 180}{3} = \frac{735}{3} = 245$

Revenue of the company in 2017 = 400

Required percentage = $\frac{(400 - 245)}{400} \times 100 = 38.75\%$

15. Study the given bar graph and answer the question that follows.

A tea plantation company produces three varieties of tea—black tea, green tea and herbal tea. The production of three varieties (in million tonnes) over a period of six years from 2014 to 2019, has been shown in the bar graph here. The X-axis represents the years and the Y-axis displays the production of the three varieties in million tonnes.



The total production of green tea in 2016 and 2018 is what percentage of the total production of herbal tea in 2015 and 2017?

- (a) 83.4 (b) 85.6
(c) 79.7 (d) 81.8

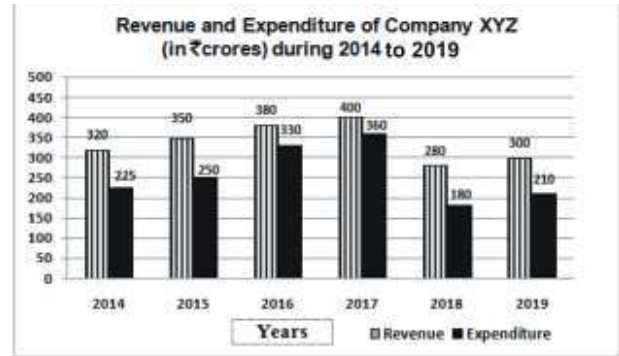
SSC CHSL 06/08/2021 (Shift-I)

Ans. (d) : Total production of green tea in 2016 and 2018 = 100 + 80 = 180

Total production of herbal tea in 2015 and 2017 = 100 + 120 = 220

\therefore Required percentage = $\frac{180}{220} \times 100 = 81.8\%$

16. Study the given graph and answer the question that follows.



In which year was the percentage increase in the revenue as compared to that in its preceding year below 6%?

- (a) 2015 (b) 2017
(c) 2019 (d) 2016

SSC CHSL 12/04/2021 (Shift-I)

Ans : (b) From the given options,

(a) 2015 $\rightarrow \frac{(350 - 320)}{320} \times 100 = 9.37\%$

(b) 2017 $\rightarrow \frac{(400 - 380)}{380} \times 100 = 5.26\%$

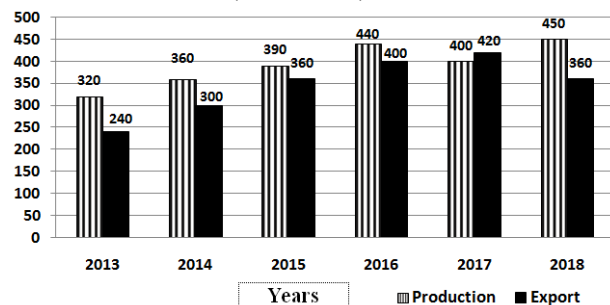
(c) 2019 $\rightarrow \frac{(300 - 280)}{280} \times 100 = 7.14\%$

(d) 2016 $\rightarrow \frac{(380 - 350)}{350} \times 100 = 8.57\%$

Hence in the year 2017, the percentage increase in the revenue as compared to that in its preceding year is below 6%.

17. Study the given graph and answer the question that follows.

Imports and Exports of Country XYZ during 2013 to 2018 (in ₹ crores)



What is the ratio of the total exports in 2014 and 2017 to the total production in 2015 and 2018?

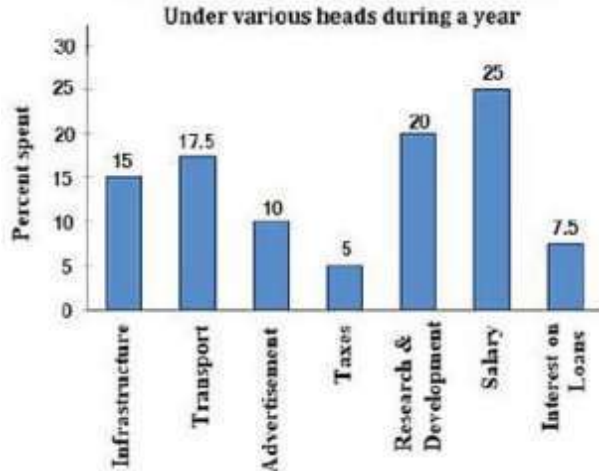
- (a) 5:6 (b) 6:7
(c) 14:15 (d) 3:2

SSC CHSL 12/04/2021 (Shift-I)

Ans : (b) Required ratio = 720 : 840 = 6 : 7

18. Study the given graph and answer the question that follows.

Percentage distribution of total expenditure of a company



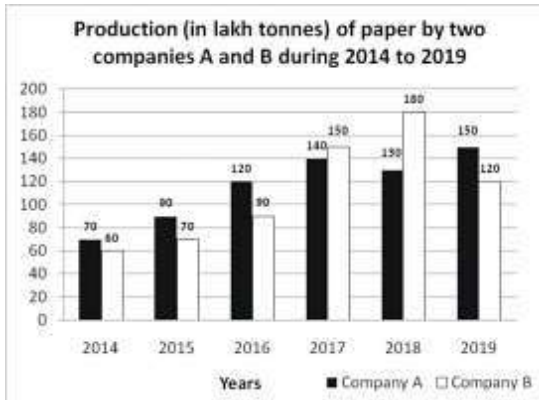
The expenditure on Interest on Loans is by what percentage more than the expenditure on Taxes?

- (a) 25% (b) 30%
(c) 50% (d) 40%

SSC CHSL 12/04/2021 (Shift-I)

Ans : (c) Required % = $\frac{7.5-5}{5} \times 100 = 50\%$

19. Study the given graph and answer the question that follows.



The average production of paper by company B in 2014, 2017 and 2018 was $13\frac{1}{2}\%$ less than the production of paper by company A in the year:

- (a) 2016
(b) 2018
(c) 2017
(d) 2019

SSC CHSL 04/08/2021 (Shift-I)

Ans. (d) : Average production of paper by company B in the year 2014, 2017 and 2018

$$= \frac{60+150+180}{3} = \frac{390}{3} = 130$$

Production of paper by company A from year 2014 to 2019 is 70, 90, 120, 140, 130 and 150 respectively.

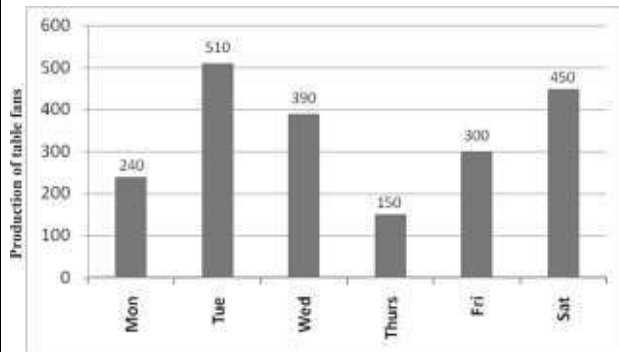
From option (d)

Production of company A in the year 2019 = 150

Average production of company B = 130

$$\begin{aligned} \text{Required percentage} &= \frac{150-130}{130} \times 100 \\ &= \frac{20}{130} \times 100 \\ &= 20 \times \frac{2}{13} \\ &= \frac{40}{13} = 13\frac{1}{3}\% \end{aligned}$$

20. The given bar graph shows the production of table fans in a factory during one week. Study the bar graph and answer the question that follows.



The production of fans on Tuesday is what percentage of the total production of fans during the week?

- (a) 30% (b) 25%
(c) 20% (d) 24%

SSC CHSL 16/04/2021 (Shift-I)

Ans. (b) : From the given bar graph

The production of fans on Tuesday = 510 fans

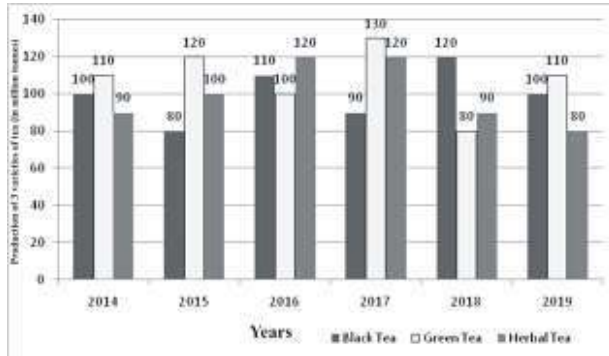
and the production of fans during the week

$$= 240+510+390+150+300+450 = 2040 \text{ fans}$$

$$\text{Required percentage} = \frac{510}{2040} \times 100 = 25\%$$

21. Study the given bar graph and answer the question that follows.

A tea plantation company produces three varieties of tea—black tea, green tea and herbal tea. The production of three varieties (in million tonnes) over a period of six years from 2014 to 2019, has been shown in the bar graph here. The X-axis represents the years and the Y-axis displays the production of the three varieties in million tonnes.



The average value of the combined production of black tea and herbal tea from 2014 to 2019 is what percent (up to 1 decimal place) of the average value of the production of green tea during the same period?

- (a) 91.4 (b) 92.4
(c) 91.3 (d) 92.3

SSC CHSL 16/04/2021 (Shift-I)

Ans. (d) : The average value of the combined production of black tea and herbal tea from 2014 to

$$2019 = \frac{190 + 180 + 230 + 210 + 210 + 180}{12}$$

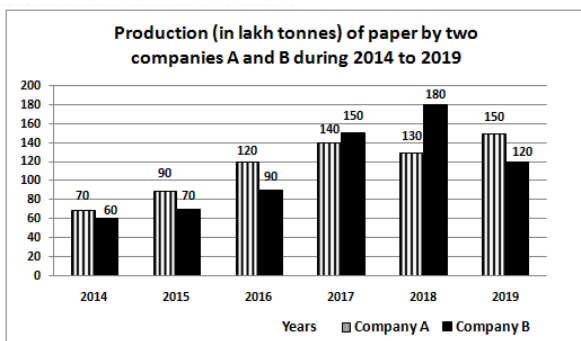
$$= \frac{1200}{12} = 100 \text{ tonnes}$$

Average amount of the production of green tea

$$= \frac{110 + 120 + 100 + 130 + 80 + 110}{6} = \frac{650}{6} \text{ tonnes}$$

$$\text{Required percentage} = \frac{100 \times 6}{650} \times 100 = 92.3\%$$

22. Study the given graph and answer the question that follows.



The total production of paper by company B in 2015 and 2017 to 2019 was what percentage less than 90% of the total production of paper by company A in 2014 to 2019 (correct to one decimal place)?

- (a) 17.5% (b) 21.2%
(c) 22.4% (d) 19.6%

SSC CHSL 12/08/2021 (Shift-I)

Ans. (a) : Total production of paper by company B in 2015 and 2017

to 2019 = 70 + 150 + 180 + 120 = 520

90% of the total production of paper by company A in 2014 to 2019

$$= (70 + 90 + 120 + 140 + 130 + 150) \times 90\%$$

$$= 700 \times 90\% = 630$$

Hence,

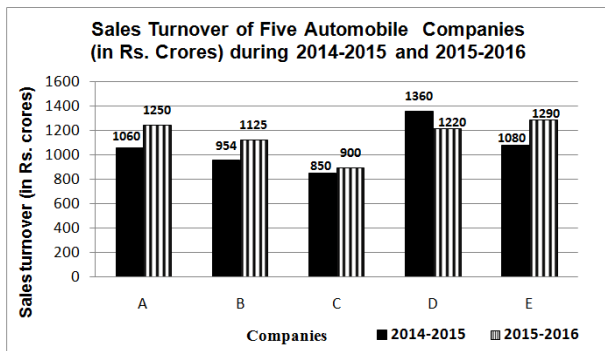
$$\text{Required percentage} = \frac{630 - 520}{630} \times 100 = 17.4603$$

$$= 17.5$$

23. Study the given bar graph and answer the question that follows.

The given bar graph represents the sales Turnover (in ₹ crore) of five automobile companies A, B, C, D and E during 2014-2015 and 2015-2016. The X-axis represents the companies, and the Y-axis shows the sales Turnover (in ₹ crore).

(The data shown here is only for mathematical exercise. They do not represent the actual figures of the company.)



By what percentage is the average sales turnover of all the companies combined in 2015-2016 more than the average sales turnover of the companies A, C and E in 2014-2015 (to the nearest whole number)?

- (a) 25 (b) 18
(c) 20 (d) 16

SSC CHSL 13/04/2021 (Shift-I)

Ans. (d) :

Average sales turnover of all the companies combined

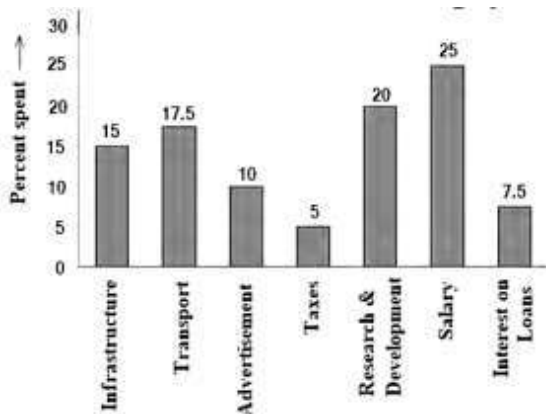
$$\text{in 2015-2016} = \frac{1250 + 1125 + 900 + 1220 + 1290}{5}$$

$$= \frac{5785}{5} = 1157$$

Average sales turnover of the companies A, C and E in 2014-2015 = $\frac{1060+850+1080}{3} = \frac{2990}{3} \approx 997$

$$\text{Required percentage} = \frac{160}{997} \times 100 \approx 16\%$$

24. The bar graph shows the percentage distribution of total expenditure of a company under various expense heads during a year.



The total expenditure of the company in the year is how many times the expenditure on Research & Development?

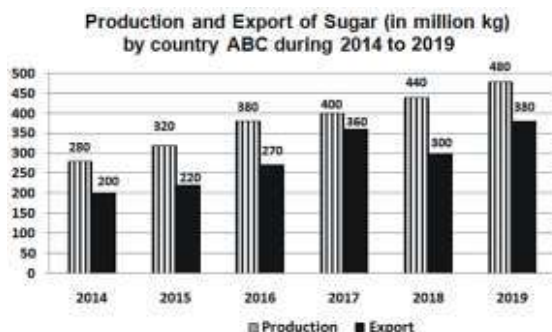
- (a) 5 (b) 4
(c) 6 (d) 7

SSC CHSL 13/04/2021 (Shift-I)

Ans. (a) : Required number =

$$= \frac{15+17.5+10+5+20+25+7.5}{20} = 5$$

25. Study the given graph and answer the question that follows.



By what percentage is the average export of sugar in 2016, 2017 and 2018 less than the production in 2017?

- (a) 25.8% (b) 29%
(c) 22.5% (d) 20%

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : Total average export of sugar

$$= \frac{(2016+2017+2018)}{3} = \frac{270+360+300}{3} = \frac{930}{3} =$$

310

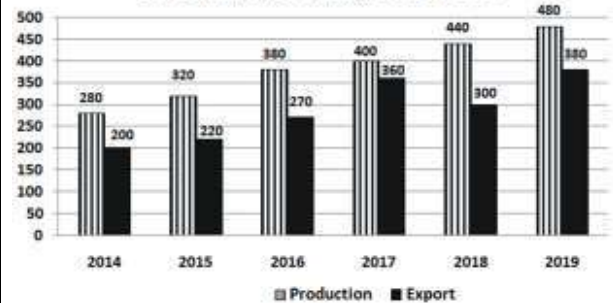
Sugar production in 2017 = 400

Hence,

$$\text{Less\%} = \frac{400-310}{400} \times 100 = \frac{90}{400} \times 100 = 22.5\%$$

26. Study the given graph and answer the question that follows.

Production and Export of Sugar (in million kg) by country ABC during 2014 to 2019



What is the ratio of the total production of sugar in 2014 and 2018 to the total export in 2015 and 2019?

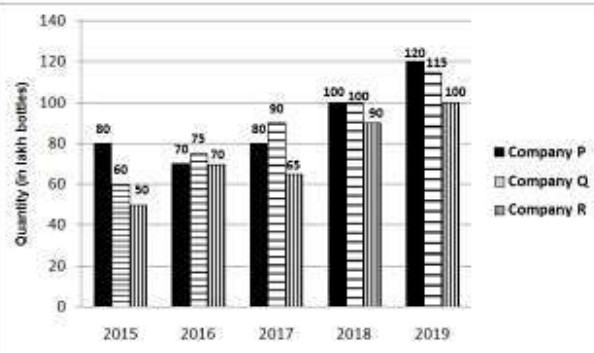
- (a) 36 : 35 (b) 6 : 5
(c) 9 : 8 (d) 7 : 6

SSC CHSL 13/04/2021 (Shift-I)

$$\text{Ans. (b) : Required ratio} = (280+440) : (220 + 380) = 720 : 600 = 6 : 5$$

27. Study the given bar graph and answer the question that follows.

The bar graph indicates the production of sugar (in lakh tonnes) by three different sugar companies P, Q and R over the years 2015 to 2019.



By what percentage is the total production of sugar by company P from the year 2015 to 2019 more than the total production of sugar by company R from the year 2015 to 2019?

- (a) 18% (b) 18.5%
(c) 20% (d) 15%

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : Total production of sugar by company P from the year 2015 to 2019 = $80 + 70 + 80 + 100 + 120 = 450$

Total production of sugar by company R from the year 2015 to 2019

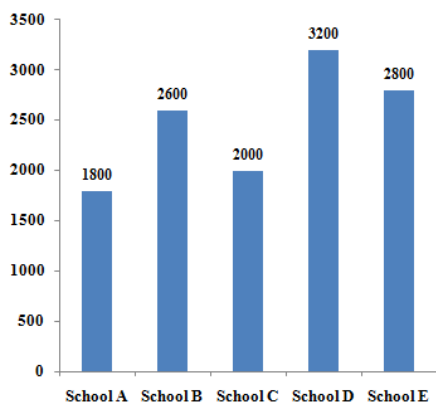
$$= 50 + 70 + 65 + 90 + 100 = 375$$

$$\text{Required\%} = \frac{75}{375} \times 100 = 20\%$$

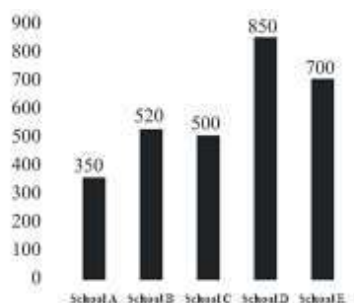
Direction (Q.No. 28-30):

Study the following bar graph and answer the questions given below.

Total number of boys and girls in schools A, B, C, D and E.



Difference between the number of boys and girls in schools A, B, C, D and E.



28. The number of boys in school B is what percentage of the total number of students in that school?

- (a) 60% (b) 50%
(c) 55% (d) 40%

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : According to the given graph

For school B,

$$B + G = 2600 \text{ ---(1)}$$

$$B - G = 520 \text{ ---(2)}$$

Solving the equations (1) & (2),

$$B = 1560 \text{ \& } G = 1040$$

$$\text{Required ratio} = \frac{1560}{2600} = \frac{3}{5}$$

Hence the number of boys in school B is $\frac{3}{5} \times 100 = 60\%$ of the total number of students in that school.

29. What is the ratio of number of boys to the number of girls in school E?

- (a) 7 : 4 (b) 5 : 4
(c) 5 : 3 (d) 4 : 3

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) : According to given graph

For school E,

$$B + G = 2800 \text{ ---(1)}$$

$$B - G = 700 \text{ ---(2)}$$

Solving the equations (1) & (2),

$$B = 1750 \text{ \& } G = 1050$$

Hence the ratio of the number of boys to the number of girls in school E = $\frac{1750}{1050} = 5 : 3$

30. What is the difference between the number of girls in school A and the number of girls in school C?

- (a) 25 (b) 30
(c) 35 (d) 20

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : According to the given graph

For school A,

$$B + G = 1800 \text{ ---(i)}$$

$$B - G = 350 \text{ ---(ii)}$$

Solving the equations (i) and (ii),

$$G = 725$$

Hence the number of girls in school A = 725

For school C,

$$B + G = 2000 \text{ ---(iii)}$$

$$B - G = 500 \text{ ---(iv)}$$

Solving the equations (iii) and (iv),

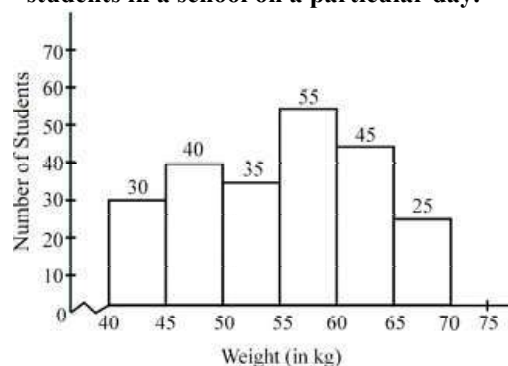
$$G = 750$$

Hence the number of girls in school C = 750

∴ Difference between the number of girls in school A and the number of girls in school C = $750 - 725 = 25$

Direction:

31. The given graph shows the weighing of students in a school on a particular day.



The number of students weighing less than 50 kg is what percent less than the number of students weighing 55 kg or more

- (a) 40 (b) 30
(c) 55 (d) 44

SSC CGL (Tier-II) 13-09-2019

Ans. (d) :

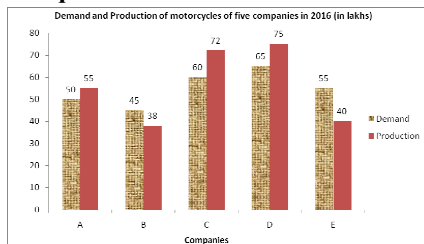
The number of students weighing less than 50 = 30 + 40 = 70

The number of students weighing 55kg or more = 55 + 45 + 25 = 125

$$\text{Required percentage} = \frac{55}{125} \times 100 = 44\%$$

Direction (Q.No. 32-34):

Study the following bar graph and answer the given question.



32. The total production of motorcycles of companies C, D and E is what Percent less than the total demand of motorcycles of all the companies during five years:

- (a) 47 (b) 43
(c) 38 (d) 32

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Total demand of motorcycles of all the companies during five years = 50 + 45 + 60 + 65 + 55 = 275 Lakhs

Total production of motorcycles of companies C, D and E = 72 + 75 + 40 = 187

$$\text{Required percentage \%} = \frac{88}{275} \times 100 = 32\%$$

33. The ratio of the total demand of motorcycles of companies A, C and E to the total production of motorcycles of B and C is :

- (a) 1 : 1 (b) 2 : 1
(c) 11 : 10 (d) 3 : 2

SSC CGL (Tier-II) 13-09-2019

Ans. (d) : Required ratio = (50 + 60 + 55) : (38 + 72)
= 165 : 110
= 3 : 2

34. The number of companies whose production of motorcycles is equal to or more than the average demand of motorcycles (per year) over five years is :

- (a) 1 (b) 2
(c) 4 (d) 3

SSC CGL (Tier-II) 13-09-2019

Ans. (d): Average demand of motorcycles over five years

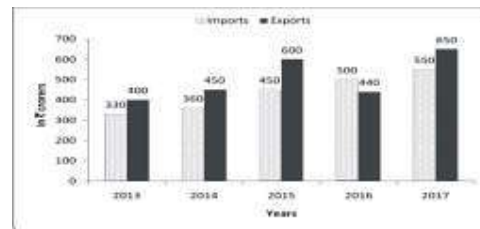
$$= \frac{50 + 45 + 60 + 65 + 55}{5}$$

$$= \frac{275}{5} = 55$$

Hence the productions of motorcycles of companies A, D and C are equal to or more than the average demand of motorcycles over five years.

Direction (Q.No. 35-36):

The given bar graph shows the imports and exports (in ₹ crores) of steel by a country from 2013 to 2017.



35. What is the ratio of the total imports in 2015 and 2017 to the total exports in 2013 and 2016?

- (a) 9 : 11
(b) 25 : 21
(c) 11 : 4
(d) 9 : 8

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : By the given graph

The total imports in 2015 and 2017 = 450 + 550 = 1000

Total exports in 2013 and 2016 = 400 + 440 = 840

$$\therefore \text{Required ratio} = 1000 : 840$$

$$= 100 : 84$$

$$= 25 : 21$$

36. The total imports of steel in 2014, 2016 and 2017 is what percent less than the total exports in 2013, 2015 and 2017 (correct to one decimal place) ?

- (a) 15.8
(b) 14.5
(c) 16.2
(d) 13.4

SSC CGL (Tier-II) 12-09-2019

Ans. (b) : The total imports of steel in 2014, 2016 and 2017 = 360 + 500 + 550 = 1410 (in crores)

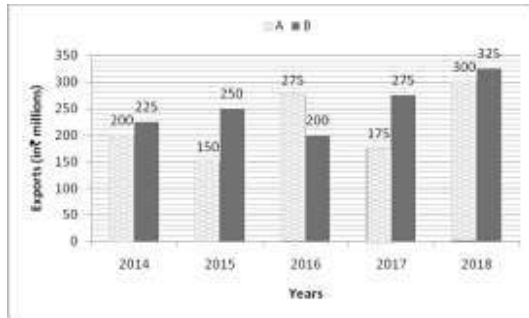
The total exports of steel in 2013, 2015 and 2017 = 400 + 600 + 650 = 1650 (in crores)

$$\therefore \text{Required Percentage} = \frac{1650 - 1410}{1650} \times 100$$

$$= \frac{240}{1650} \times 100 = 14.5$$

Direction (Q. No. 37-38):

The bar graph shows the exports of Cars of Type A and B (in ₹ millions).



37. The total exports of cars of type A in 2014 to 2017 is approximately what percentage less than the total exports of cars of type B in 2015 to 2018 ?
- (a) 23.8 (b) 30.4
(c) 14.3 (d) 31.3

SSC CGL (Tier-II) 11-9-2019

Ans. (a) : The total exports of cars of type A from 2014 to 2017 = 200 + 150 + 275 + 175 = 800
The total exports of cars of type B from 2015 to 2018 = 250 + 200 + 275 + 325 = 1050
Required percentage = $\frac{250}{1050} \times 100 = 23.8\%$

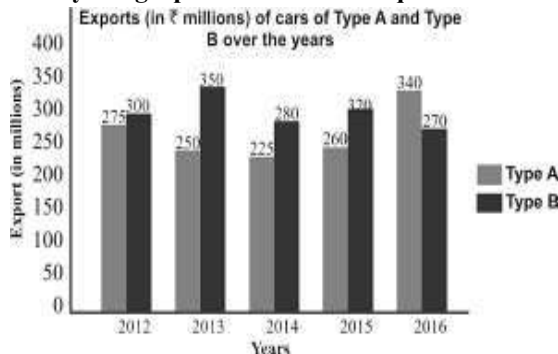
38. What is the ratio of the total exports of cars of type A in 2014 and 2018 to the total exports of cars of type B in 2015 and 2016 ?
- (a) 5 : 4 (b) 10 : 9
(c) 3 : 2 (d) 11 : 10

SSC CGL (Tier-II) 11-9-2019

Ans. (b) : Required ratio = (200 + 300) : (250 + 200)
= 500 : 450
= 10 : 9

Direction (Q. No. 39-40):

Study the graph and answer the question.



39. In how many years were the exports of type B cars more than the average exports of type A cars during 2012 to 2016?
- (a) 2 (b) 1
(c) 3 (d) 4

SSC CPO-SI 13/12/2019 (Shift-I)

Ans. (d) Average exports of cars of type A

$$= \frac{275 + 250 + 225 + 260 + 340}{5} = 270$$

Hence in 2012, 2013, 2014 and 2015 the total exports of type B cars were more than the average exports of type A cars.

40. The exports of type A cars in 2016 are what percentage less than the total exports of type B cars in 2014 and 2015?

- (a) 32 (b) $43\frac{1}{3}$
(c) $26\frac{2}{3}$ (d) 45

SSC CPO-SI 13/12/2019 (Shift-I)

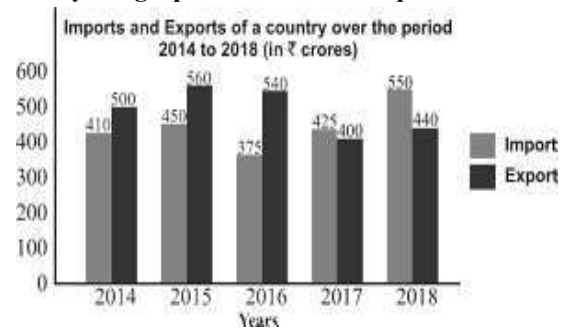
Ans. (b) The exports of type A cars in 2016 = 340

The total exports of type B cars in 2014 and 2015 = 280 + 320 = 600

$$\text{Percentage decrease} = \frac{600 - 340}{600} \times 100 = \frac{260}{6} = 43\frac{1}{3}\%$$

Direction (Q. No. 41-43):

Study the graph and answer the question.



41. In how many years were the exports of the country more than the average imports during the given years?

- (a) 2 (b) 3
(c) 4 (d) 1

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (b)

$$\begin{aligned} \text{Average imports} &= \frac{410 + 450 + 375 + 425 + 550}{5} \\ &= \frac{2210}{5} = 442 \text{ Crores} \end{aligned}$$

Hence there are 3 years in which the exports are more than the average imports.

42. The ratio of total imports in 2014, 2016 and 2017 of the country to the total exports in 2015 and 2016 is:

- (a) 8:11 (b) 12:11
(c) 10:11 (d) 11:10

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) Total imports of 2014, 2016 and 2017 = 410 + 375 + 425 = 1210
 Total exports of 2015 and 2016 = 560 + 540 = 1100
 Required ratio = 1210 : 1100
 = 11 : 10

43. By what percentage are the total imports of the country in 2016 and 2017 less than the total exports in 2014, 2015 and 2018 (Your answer should be correct to one decimal place)

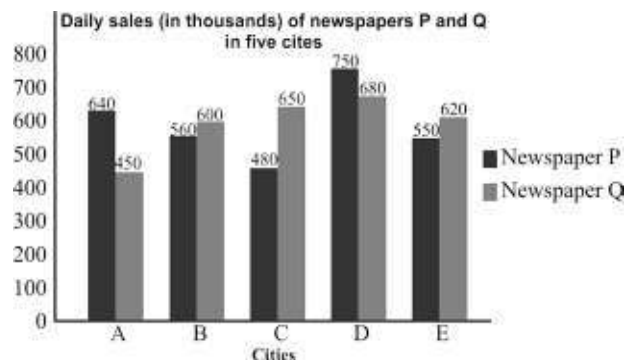
- (a) 46.7 (b) 48.4
 (c) 87.5 (d) 84.8

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) Total imports in year 2016 and 2017 = 375 + 425 = 800
 Total exports in year 2014, 2015 and 2018 = 500 + 560 + 440 = 1500
 Required decrease% = $\frac{(1500 - 800)}{1500} \times 100$
 = 46.7%

Direction (Q. No. 44-46):

Study the given graph and answer the question that follows.



44. The total daily sales of newspaper P in cities B, D and E is what percentage less than that of newspaper Q in cities A, C, D and E?

- (a) 22.5 (b) 20.8
 (c) 24.4 (d) 20.2

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (a) The total daily sales of newspaper P in cities B, D & E = 560 + 750 + 550 = 1860
 The total daily sales of newspaper Q in cities A, C, D and E = 450 + 650 + 680 + 620 = 2400
 \therefore Required percentage = $\frac{2400 - 1860}{2400} \times 100$
 = $\frac{540}{2400} \times 100$
 = 22.5%

45. What is the ratio of the total daily sales of newspaper P in cities A and C to the total daily sales of newspaper Q in cities B and D?

- (a) 15:16 (b) 16:17
 (c) 7:8 (d) 4:5

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) The total daily sales of newspaper P in cities A and C = 640 + 480 = 1120
 The total daily sales of newspaper Q in cities B and D = 600 + 680 = 1280
 \therefore Required ratio = 1120 : 1280 = 7 : 8

46. In which city the daily sales of newspaper P is 1.25 times the average daily sales of newspaper Q in cities A, B, C, D and E?

- (a) C (b) B
 (c) D (d) A

SSC CPO-SI – 12/12/2019 (Shift-I)

Ans. (c) The average sales of newspaper Q in cities A, B, C, D and E = $\frac{450 + 600 + 650 + 680 + 620}{5}$
 = $\frac{3000}{5} = 600$

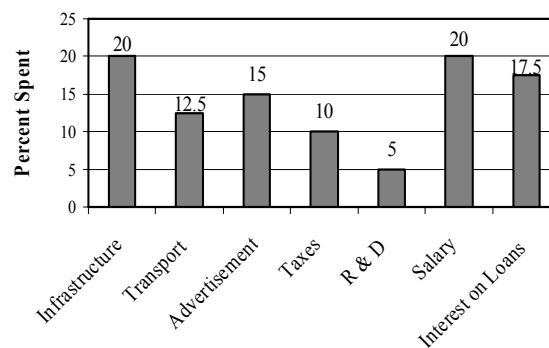
\therefore 1.25 times the average sales of newspaper Q in cities A, B, C, D and E = $600 \times 1.25 = 750$

Hence the daily sales of newspaper P in city D is 1.25 times the average sales of newspaper Q in cities A, B, C, D and E.

Direction (Q. No. 47-48):

Study the graph and answer the question.

Percentage distribution of total expenditure of a company in 2012.



47. If the total amount of expenditure of the company is x times the expenditure on transport, then the value of x is:

- (a) 5 (b) 8
 (c) 6 (d) 12

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b): The total expenditure of company
 $= 20 + 12.5 + 15 + 10 + 5 + 20 + 17.5$
 $= 100$

According to the question,
 Total amount of expenditure of the company
 $=$ The expenditure on transport $\times x$

$$100 = 12.5 \times x$$

$$x = \frac{100}{12.5}$$

$$x = 8$$

48. What is the ratio of the total expenditure on salary and interest on loans to the total expenditure on infrastructure and transport?

- (a) 13 : 12 (b) 14 : 11
 (c) 15 : 13 (d) 15 : 11

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c) : Total expenditure on salary and interest on loans $= 20 + 17.5 = 37.5$

Total expenditure on infrastructure and transport
 $= 20 + 12.5 = 32.5$

Required ratio $= 37.5 : 32.5$
 $= 15 : 13$

Direction (Q. No. 49-50):

Study the given graph and answer the question that follows.



49. In how many years was the revenue of the company more than 1.2 times the average expenditure over the given five years?

- (a) 2 (b) 4
 (c) 1 (d) 3

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (a) Total expenditure of the company in the given five years $= 150 + 210 + 350 + 275 + 325 = 1310$

Average expenditure $= \frac{1310}{5} = 262$

Average expenditure $\times 1.2 = 262 \times 1.2 = 314.4$

Therefore, it is clear that in 2016 and 2018, the total revenue of the company was 1.2 times the average expenditure.

50. Total expenditure of the company in 2016, 2017 and 2018 is what percentage less than the total revenue in the given five years (correct to one decimal place)?

- (a) 36.2% (b) 36.8%
 (c) 38.4% (d) 34.5%

SSC CPO-SI – 11/12/2019 (Shift-I)

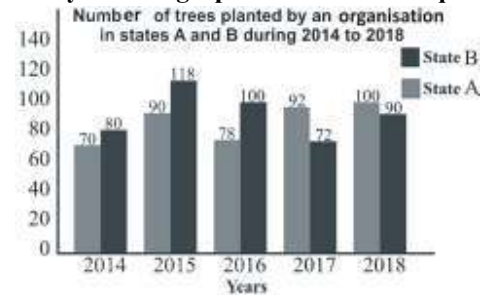
Ans. (d) Total revenue of five years
 $= 200 + 250 + 320 + 300 + 380 = 1450$

Total expenditure of company in years 2016, 2017 and 2018 $= 950$

Required decreased percentage $= \frac{500}{1450} \times 100 = 34.5\%$

Direction (Q. No. 51-52):

Study the bar graph and answer the question.



51. Percentage decrease in the number of trees planted in 2016 in state A as compared to that in 2015 in the same state was:

- (a) $15\frac{5}{13}$
 (b) $13\frac{1}{3}$
 (c) $13\frac{2}{3}$
 (d) $15\frac{2}{3}$

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b)

Required decreased percentage

$$= \frac{90 - 78}{90} \times 100$$

$$= \frac{12}{90} \times 100$$

$$= 13\frac{1}{3}\%$$

52. The total number of trees planted in state B in 2015 and 2017 was what percentage less than the total number of trees planted in state A in 2014, 2016 and 2017? (Your answer should be correct to one decimal place.)

- (a) 20.8 (b) 19.8
 (c) 20.1 (d) 21.4

SSC CPO-SI – 11/12/2019 (Shift-II)

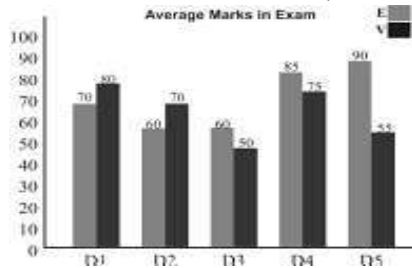
Ans. (a) The total number of trees planted in state B in 2015 and 2017 $= 118 + 72 = 190$

The total number of trees planted in state A in 2014, 2016 and 2017 $= 70 + 78 + 92 = 240$

Required percentage $= \frac{50}{240} \times 100 = 20.8\%$

Direction (Q. No. 53-54):

The given bar chart presents the average marks obtained in English (E) and Vernacular (V) by the students of five districts (D1, D2, D3, D4, D5) in a state at the secondary level examination of a particular year (marks secured out of a total of 100).



53. What is the difference between the average percentage of marks in vernacular of the districts (D1, D2, D4) and (D3, D5)?

- (a) 11.3% (b) 3.5%
(c) 1.7% (d) 22.5%

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (d) Average percentage of marks obtained in Vernacular by students in districts D1, D2, D4

$$= \frac{80 + 70 + 75}{3} = 75\%$$

Average percentage of marks obtained in Vernacular by students in districts D3, D5 = $\frac{50 + 55}{2} = 52.5\%$

Required difference = $75\% - 52.5\% = 22.5\%$

54. What is the average percentage of marks obtained in English of the five districts?

- (a) 68% (b) 75%
(c) 73% (d) 67%

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) Average marks obtained in English

$$= \frac{70 + 60 + 60 + 85 + 90}{5}$$

$$= \frac{365}{5} = 73\%$$

Direction (Q. No. 55-56):

Study the graph and answer the question.



55. The number of workers in the factory whose daily wages are 500 or more but less than 650 is what percentage more than the number of workers whose daily wages are 650 or more but less than 750? (Your answer should be correct to one decimal place)

- (a) 45.8 (b) 76.8
(c) 84.5 (d) 75.4

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c) The number of workers whose daily wages are ₹500 or more but less than ₹650 = $58 + 72 + 60 = 190$
The number of workers whose daily wages are ₹650 or more but less than ₹750 = $55 + 48 = 103$

Required percentage

$$= \frac{190 - 103}{103} \times 100 = \frac{87}{103} \times 100 = 84.466$$

$$\approx 84.5\%$$

56. The number of workers in the factory whose daily wages are ₹450 or more but less than ₹600 is _____.

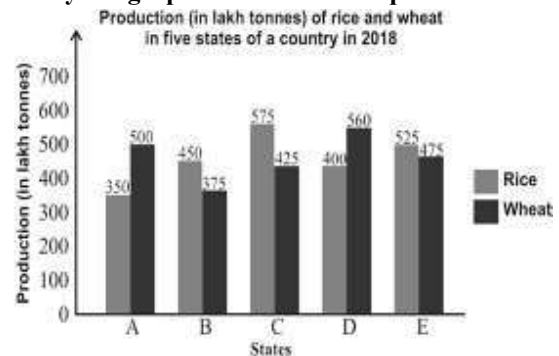
- (a) 190 (b) 170
(c) 148 (d) 180

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d) The number of workers whose daily wages are ₹450 or more but less than ₹600 = $50 + 58 + 72 = 180$

Direction (Q. No. 57-59):

Study the graph and answer the question.



57. The ratio of the total production of rice in states C and E to the total production of wheat in states B and D is _____.

- (a) 22 : 19 (b) 20 : 17
(c) 13 : 12 (d) 11 : 10

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) The total production of rice in states C and E = $575 + 525 = 1100$

The total production of wheat in states B and D = $375 + 560 = 935$

Required ratio = $1100 : 935$
= $20 : 17$

58. Total production of wheat in states A, B and E is what percentage less than the total production of rice in states C, D and E?
- (a) 11.1
(b) 12
(c) 12.2
(d) 10

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d) The total production of wheat in states A, B and E
 $= 500 + 375 + 475$
 $= 1350$

The total production of rice in states C, D and E
 $= 575 + 400 + 525 = 1500$

Required percentage $= \frac{1500 - 1350}{1500} \times 100 = 10\%$ less.

59. The number of states in which the production of wheat is more than 20% of the total production of rice in all five states is _____.
- (a) 1
(b) 2
(c) 4
(d) 3

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (d) 20% of the total production of rice in all 5 states
 $= (350 + 450 + 575 + 400 + 525) \times \frac{20}{100}$

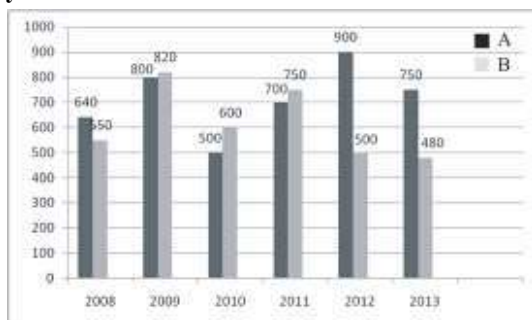
$$= 2300 \times \frac{20}{100}$$

$$= 460 \text{ lakh tonnes}$$

Hence, the number of states in which the production of wheat is more than 460 lakh tonnes = 3 states (A, D & E)

Direction (Q. No. 60-62):

The given bar graph shows the number of students of two schools over a period of six years :



60. In the bar graph, what is the ratio of the average of the total students from school A to the average of the total students from school B.
- (a) 370 : 429
(b) 429 : 799
(c) 799 : 429
(d) 429 : 370

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (d) : From the given bar graph

Total number of students in school A
 $= 640 + 800 + 500 + 700 + 900 + 750$
 $= 4,290$

Total number of students in school B
 $= 550 + 820 + 600 + 750 + 500 + 480$
 $= 3,700$

Hence, the ratio of the average number of students in school A and B $= 4290/6 : 3700/6$

Hence A : B = 429 : 370

61. In the bar graph, what is the ratio of the students taken for the years 2009, 2011, 2013 together from school A to the students taken for the years 2008, 2012, 2013 together from school B ?
- (a) 18 : 25
(b) 25 : 18
(c) 25 : 17
(d) 17 : 25

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : From the given bar graph,

Number of students of school B in the years 2009, 2011 and 2013 $= 800 + 700 + 750$
 $= 2250$

Number of students of school A in the years 2008, 2012 and 2013 $= 550 + 500 + 480 = 1530$

Required ratio $= 2250 : 1530$
 $= 25 : 17$

62. In the bar graph, in which year is the sum of the students from schools A and B taken together, the minimum ?
- (a) 2013
(b) 2012
(c) 2010
(d) 2011

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : From the given bar graph,

In year 2008,

Combined sum of students of school A and B
 $= 640 + 550 = 1190$

In year 2009,

Combined sum of students of school A and B
 $= 800 + 820 = 1620$

In year 2010,

Combined sum of students of school A and B
 $= 500 + 600 = 1100$

In year 2011,

Combined sum of students of school A and B
 $= 700 + 750 = 1450$

In year 2012,

Combined sum of students of school A and B
 $= 900 + 500 = 1400$

In year 2013,

Combined sum of students of school A and B
 $= 750 + 480 = 1230$

Hence in year 2010, the combined sum of students of school A and B is minimum.

(Direction)

63. Study the following bar graph and answer the question that follows.



In which of the following pairs of years, the average export of diamonds was closest to ₹12 crores?

- (a) 2012 and 2013 (b) 2011 and 2012
(c) 2013 and 2014 (d) 2010 and 2011

SSC CHSL –20/10/2020 (Shift-III)

Ans : (c)

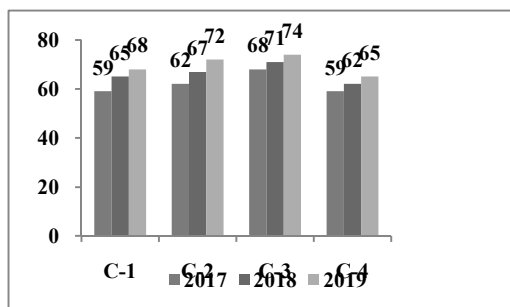
The average exports of diamonds in 2013 and 2014

$$= \frac{11.5 + 12.4}{2}$$

$$= \frac{23.9}{2} = 11.95 \text{ or } 12$$

Direction (Q. No. 64-67):

The given data shows the number of mobiles (in thousands) manufactured by companies C-1, C-2, C-3 and C-4 in 2017, 2018 and 2019.



64. What is the ratio of total products manufactured by C-1 to that of C-4?

- (a) 14 : 21 (b) 11 : 13
(c) 27 : 35 (d) 32 : 31

SSC CHSL –17/03/2020 (Shift-II)

Ans. (d) : Total number of mobiles manufactured by company C-1 = 59 + 65 + 68 = 192

Total number of mobiles manufactured by company C-4 = 59 + 62 + 65 = 186

Ratio of mobiles manufactured by company C-1 and company C-4 = $\frac{192}{186} = 32 : 31$

65. Which company manufactured the highest number of mobiles across all the years?

- (a) C-1 (b) C-3
(c) C-2 (d) C-4

SSC CHSL –17/03/2020 (Shift-II)

Ans. (b) : Total number of mobiles manufactured by company C-1 in all the years = (59 + 65 + 68) × 1000 = 192000

Total number of mobiles manufactured by company C-2 in all the years = (62 + 67 + 72) × 1000 = 201000

Total number of mobiles manufactured by company C-3 in all the years = (68 + 71 + 74) × 1000 = 213000

Total number of mobiles manufactured by company C-4 in all the years = (59 + 62 + 65) × 1000 = 186000

Hence it is clear that company C-3 manufactured the highest number of mobiles across all the years.

66. Which company witnessed the highest increase in manufacturing from 2017 to 2018?

- (a) C-1 (b) C-2
(c) C-3 (d) C-4

SSC CHSL –17/03/2020 (Shift-II)

Ans. (a) : During the year 2017 to 2018

Increase in manufacturing of company C-1 = (65 - 59) × 1000 = 6000

Increase in manufacturing of company C-2 = (67 - 62) × 1000 = 5000

Increase in manufacturing of company C-3 = (71 - 68) × 1000 = 3000

Increase in manufacturing of company C-4 = (62 - 59) × 1000 = 3000

Hence company C-1 witnessed the highest increase in manufacturing from 2017 to 2018.

67. Which company manufactured the least number of mobiles across all the years?

- (a) C-1 (b) C-4
(c) C-3 (d) C-2

SSC CHSL –17/03/2020 (Shift-II)

Ans. (b) : In all the years

Total number of mobiles manufactured by company C-1 = (59 + 65 + 68) × 1000 = 192000

Total number of mobiles manufactured by company C-2 = (62 + 67 + 72) × 1000 = 201000

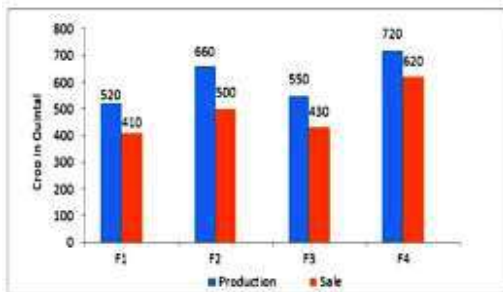
Total number of mobiles manufactured by company C-3 = (68 + 71 + 74) × 1000 = 213000

Total number of mobiles manufactured by company C-4 = (59 + 62 + 65) × 1000 = 186000

Hence company C-4 manufactured the least number of mobiles across all the years.

Direction (Q. No. 68-71):

The given bar graph represents the production and sales of a certain crop in quintals by the farmers F1, F2, F3 and F4.



68. What is the ratio between the total sales and total production by all farmers?

- (a) 3 : 4 (b) 6 : 7
(c) 4 : 5 (d) 5 : 6

SSC CHSL –19/03/2020 (Shift-I)

Ans. (c) : The sum of total production of crops by all the farmers = 520 + 660 + 550 + 720 = 2450

And the sum of total sales of crops by all farmers = 410 + 500 + 430 + 620 = 1960

$$\text{Required ratio} = \frac{1960}{2450} = \frac{4}{5}$$

69. What is the average of a crop in quintals, sold by the all farmers?

- (a) 490 (b) 530
(c) 470 (d) 510

SSC CHSL –19/03/2020 (Shift-I)

Ans. (a) : The sum of the crops sold by the all farmers. = 410 + 500 + 430 + 620 = 1960 quintals

$$\therefore \text{Average of the crops sold by the all farmers} = \frac{1960}{4} = 490 \text{ quintals}$$

70. What is the percentage less in the production by farmer F1 with respect to the production by farmer F2?

- (a) $24\frac{7}{33}\%$ (b) $21\frac{7}{33}\%$
(c) $22\frac{7}{33}\%$ (d) $23\frac{7}{33}\%$

SSC CHSL –19/03/2020 (Shift-I)

Ans. (b) : \because Production of crops by farmer F1 = 520 quintals

And production of crops by farmer F2 = 660 quintals

\therefore Difference between F1 and F2 = 660 – 520 = 140 quintals

$$\begin{aligned} \text{Required decreased percentage} &= \frac{140}{660} \times 100 \\ &= \frac{700}{33} = 21\frac{7}{33}\% \end{aligned}$$

71. Which farmer recorded the highest percentage of sales with respect to the production?

- (a) F1 (b) F3
(c) F2 (d) F4

SSC CHSL –19/03/2020 (Shift-I)

Ans. (d) Percentage of sales with respect to production

$$\text{by farmer F1} = \frac{410}{520} \times 100 = 78.84\%$$

Percentage of sales with respect to production by farmer F2 = $\frac{500}{660} \times 100 = 75.75\%$

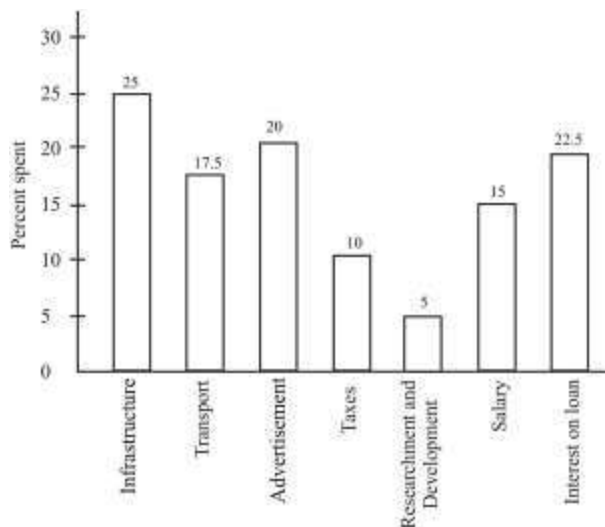
Percentage of sales with respect to production by farmer F3 = $\frac{430}{550} \times 100 = 78.18\%$

Percentage of sales with respect to production by farmer F4 = $\frac{620}{720} \times 100 = 86.11\%$

Hence farmer F4 recorded the highest percentage of sales with respect to production.

Direction (Q. No. 72-74):

The given graph represents the percentage distribution of the total expenditure of a company. Study the graph and answer the question that follows.



72. The expenditure on 'Interest on loans' is what percentage more than the expenditure on 'Transport'?

- (a) 4% (b) 5%
(c) 3% (d) 2%

SSC CHSL –12/10/2020 (Shift-II)

Ans. (b): From the given graph, the expenditure on Interest on loans = 22.5%

The expenditure on Transport = 17.5%

$$\text{Required difference} = 22.5 - 17.5 = 5\%$$

73. What is the ratio of the total expenditure on 'Infrastructure' and 'Transport' to the total expenditure on 'Taxes' and 'Interest on Loans'?

- (a) 14 : 13 (b) 15 : 13
(c) 16 : 13 (d) 17 : 13

SSC CHSL -12/10/2020 (Shift-II)

Ans. (d) : Total expenditure on Infrastructure and Transport = 25+17.5 = 42.5
Total expenditure on Taxes and Interest on Loans = 10 + 22.5 = 32.5
∴ Required ratio = 42.5 : 32.5 = 17 : 13

74. The total expenditure of the company is how many times the total expenditure on 'Research and Development' and 'Salary'?

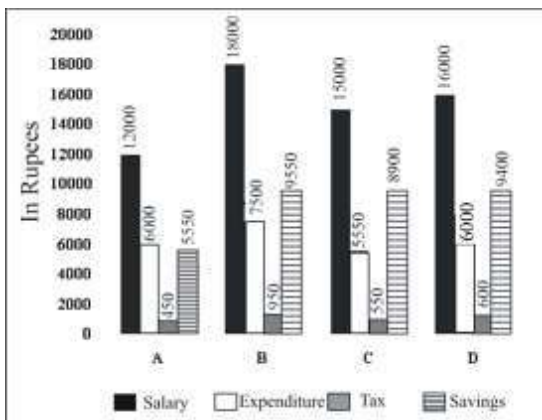
- (a) 6.75 (b) 5.75
(c) 8.75 (d) 7.75

SSC CHSL -12/10/2020 (Shift-II)

Ans. (b) : By the given graph, total expenditure of the company = 25 + 17.5 + 20 + 10 + 5 + 15 + 22.5 = 115
Total expenditure on Research and Development and Salary = 5+15 = 20
∴ Required number = $\frac{115}{20} = 5.75$

Direction (Q. No. 75-77):

The graph represents the salary, expenditure, tax and savings (in rupees) details of the persons A, B, C and D per month. Study the graph and answer the question.



75. Tax as the percentage of salary is least in case of.

- (a) A (b) D
(c) C (d) B

SSC CHSL -12/10/2020 (Shift-III)

Ans. (c) :

Person	Tax as a percentage of salary
A	$\frac{450}{12000} \times 100 = 3.75\%$
B	$\frac{950}{18000} \times 100 = 5.28\%$
C	$\frac{550}{15000} \times 100 = 3.66\%$
D	$\frac{600}{16000} \times 100 = 3.75\%$

Hence tax as a percentage of salary is least in case of C.

76. Savings as a percentage of salary is highest in case of :

- (a) D (b) B
(c) C (d) A

SSC CHSL -12/10/2020 (Shift-III)

Ans. (c) :

Person	Savings as a percentage of salary
A	$\frac{5550}{12000} \times 100 = 46.25\%$
B	$\frac{9550}{18000} \times 100 = 53.05\%$
C	$\frac{8900}{15000} \times 100 = 59.34\%$
D	$\frac{9400}{16000} \times 100 = 58.75\%$

Hence the savings as a percentage of salary is highest in case of C.

77. The expenditure as a percentage of salary is the least for:

- (a) A (b) C
(c) B (d) D

SSC CHSL -12/10/2020 (Shift-III)

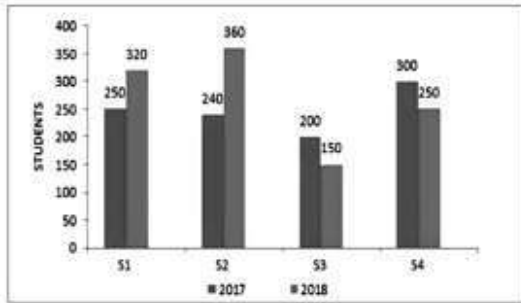
Ans. (b) :

Person	Expenditure as a percentage of salary
A	$\frac{6000}{12000} \times 100 = 50\%$
B	$\frac{7500}{18000} \times 100 = 41.67\%$
C	$\frac{5550}{15000} \times 100 = 37\%$
D	$\frac{6000}{16000} \times 100 = 37.5\%$

Hence expenditure as a percentage of salary is least for C.

Direction (Q. No. 78-81):

The given bar graph represents the number of students admitted in four schools (S1, S2, S3, S4) during two consecutive years 2017 and 2018.



78. What is the average number of students admitted to all school in 2018?
 (a) 290 (b) 270
 (c) 275 (d) 280

SSC CHSL –14/10/2020 (Shift-I)

Ans. (b) : The average number of students admitted to all school in 2018 = $\frac{320 + 360 + 150 + 250}{4}$
 $= \frac{1080}{4} = 270$

79. The ratio between total number of students admitted in the four schools in 2017 to the total number of students admitted in the four schools in 2018 is:
 (a) 12 : 11 (b) 11 : 12
 (c) 13 : 11 (d) 11 : 13

SSC CHSL –14/10/2020 (Shift-I)

Ans. (b): Total number of students admitted in the four schools in 2017 = 250 + 240 + 200 + 300 = 990
 Total number of students admitted in the four schools in 2018 = 320 + 360 + 150 + 250 = 1080
 Required ratio = 990 : 1080
 = 11 : 12

80. What percentage is the average admission of schools S3 and S4 in 2018 of the average admission of schools S1 and S2 in 2017?
 (a) 82.00% (b) 82.63%
 (c) 81.63% (d) 81.00%

SSC CHSL –14/10/2020 (Shift-I)

Ans. (c) : The average admission of schools S1 and S2 in 2017 = $\frac{250 + 240}{2} = 245$
 The average admission of schools S3 and S4 in 2018 = $\frac{150 + 250}{2} = 200$
 Required ratio = $\frac{200}{245} \times 100 = 81.63\%$

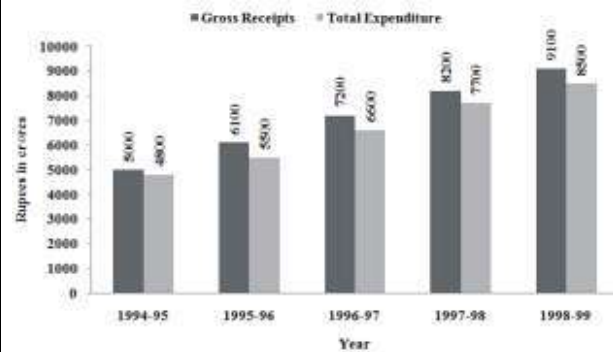
81. The total number of students admitted in school S3 for both years is approximately what percent of total student admitted in school S2 for both years?
 (a) 58.33% (b) 52.33%
 (c) 54.33% (d) 48.33%

SSC CHSL –14/10/2020 (Shift-I)

Ans. (a) : Required percentage = $\frac{(200 + 150)}{(240 + 360)} \times 100$
 $= \frac{350}{600} \times 100 = 58.33\%$

Direction (Q. No. 82-85):

Given bar graph shows, total expenditure and the gross receipts of a company (in ₹ crores). Study the graph and answer the question that follows.



82. What is the percentage increase in the gross receipts in 1996-97 as compared to 1994-95?
 (a) 44% (b) 41%
 (c) 42% (d) 43%

SSC CHSL –19/10/2020 (Shift-II)

Ans. (a): The percentage increase in the gross receipts = $\frac{7200 - 5000}{5000} \times 100$
 $= \frac{2200}{5000} \times 100 = 44\%$

83. The total expenditure of the company in 1998-99 exceeds that in 1994-95 by (in ₹ crore):
 (a) 3700 (b) 3800
 (c) 5500 (d) 4800

SSC CHSL –19/10/2020 (Shift-II)

Ans. (a) : The total expenditure of the company in 1998-99 = ₹8500
 The total expenditure of the company in 1994-95 = ₹4800
 \therefore Exceeds = 8500 - 4800 = ₹3700

84. If profit = gross receipts – total expenditure, then in 1997-98, what percentage of gross receipts is the profit made? (Correct to one decimal place)

- (a) 3.9% (b) 6.1%
(c) 5.4% (d) 4.8%

SSC CHSL –19/10/2020 (Shift-II)

Ans. (b) ∴ Profit = Gross receipts – Total expenditure

$$\begin{aligned} \therefore \text{Profit in } 1997-98 &= 8200 - 7700 \\ &= 500 \end{aligned}$$

According to the question,

$$\begin{aligned} \therefore \text{Percentage} &= \frac{500}{8200} \times 100 = \frac{500}{82} = 6.09 \\ &\approx 6.1\% \end{aligned}$$

85. In order to make a profit of 20%, what should have been the gross receipts (in crore ₹) in 1995-96, if the total expenditure remained the same?
- (a) 6875 (b) 6445
(c) 7565 (d) 5776

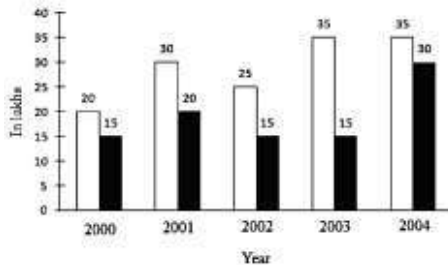
SSC CHSL –19/10/2020 (Shift-II)

Ans. (a) : Let the gross receipts be ₹x crores.

$$\begin{aligned} \therefore \frac{x - 5500}{x} \times 100 &= 20 \\ (x - 5500) \times 5 &= x \\ 4x &= 27500 \\ x &= 6875 \text{ crores.} \end{aligned}$$

Direction (Q. No. 86-87):

In the given bar graph, the white bar shows the income and the black bar shows the expenditure of a company. Study the graph and answer the question that follows.



86. The income in 2001 was equal to the expenditure in the year—
- (a) 2003 (b) 2004
(c) 2002 (d) 2000

SSC CHSL –15/10/2020 (Shift-III)

Ans. (b) : Income in 2001 = 30

Expenditure in 2004 = 30

Hence the income in 2001 was equal to the expenditure in the year 2004.

87. The percentage decrease in the income of the company in 2002 as compared to that in 2001 is:

- (a) $16\frac{2}{3}\%$ (b) 22%
(c) $24\frac{1}{3}\%$ (d) 18%

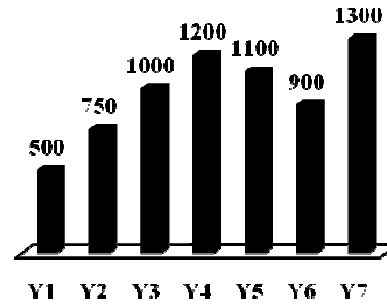
SSC CHSL –15/10/2020 (Shift-III)

Ans. (a) : The percentage decrease in the income of the Company in 2002 as compared to that in 2001 is

$$\begin{aligned} &= \frac{30-25}{30} \times 100 \\ &= \frac{1}{6} \times 100 \\ &= 16\frac{2}{3}\% \end{aligned}$$

Direction (Q. No. 88-89):

The bar chart given below shows the total exports (in ₹ 1000 crores) of a country for 7 consecutive years Y1, Y2, Y3, Y4, Y5, Y6 and Y7.



88. What is the average exports from years Y1 to Y7?
- (a) 931.45 (b) 886.19
(c) 964.28 (d) 847.87

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (c) : The average exports from years Y1 to Y7

$$\begin{aligned} &= \frac{500+750+1000+1200+1100+900+1300}{7} \\ &= \frac{6750}{7} \\ &= ₹964.28 \end{aligned}$$

89. What is the ratio of the exports of year with lowest exports and the year with second highest exports?
- (a) 9 : 12 (b) 5 : 12
(c) 9 : 13 (d) 5 : 11

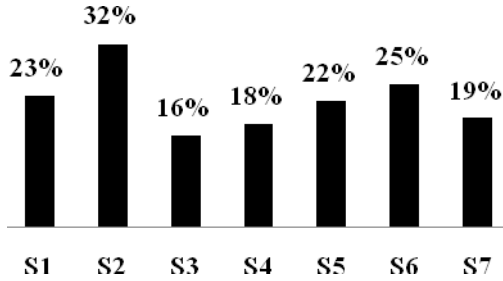
SSC GD Constable 13/02/2019 (Shift-I)

Ans. (b) : Y1 is the lowest export year, the total exports of Y1 = ₹500

Y4 is the second highest export year, the total exports of Y4 = ₹1200

$$\begin{aligned} \text{Hence the ratio} &= 500:1200 \\ &= 5:12 \end{aligned}$$

90. The bar chart given below shows the amount of sugar used in making 7 different varieties of sweets S1, S2, S3, S4, S5, S6 and S7 has been shown as a percentage of total weight of the sweet.



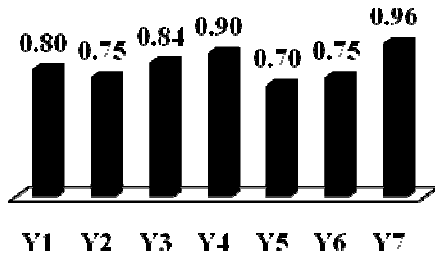
The combined weight of sweet S5 and S3 is 300 kg. What is the total amount of sugar used in these two sweets together?

- (a) Cannot be determined
- (b) 54 kg
- (c) 57 kg
- (d) 60 kg

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : The total amount of sugar used in S5 and S3 sweets cannot be determined because here the total amount of S5 and S3 sweets is stated while we must know the individual amounts of S5 and S3 sweets.

91. The bar chart given below shows the ratio of expenditure to revenue for seven consecutive years Y1, Y2, Y3, Y4, Y5, Y6 and Y7.



In which year is the profit highest?

- (a) Y5
- (b) Y6
- (c) Cannot be determined
- (d) Y2

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (a) : In year Y5,

$$\frac{\text{Expenditure}}{\text{Revenue}} = \frac{70}{100}$$

$$\text{Profit} = 100 - 70 = 30$$

In year Y2,

$$\frac{\text{Expenditure}}{\text{Revenue}} = \frac{75}{100}$$

$$\text{Profit} = 100 - 75 = 25$$

In year Y6,

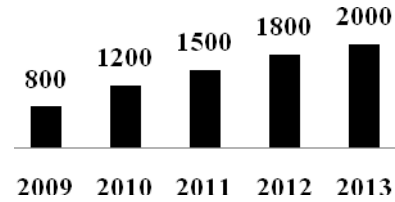
$$\frac{\text{Expenditure}}{\text{Revenue}} = \frac{75}{100}$$

$$\text{Profit} = 100 - 75 = 25$$

Hence from the given options it is clear that profit of year Y5 the is highest.

Direction (Q. No. 92-93):

The bar chart given below shows the annual production (in 1000 tonnes) of coffee of a country for years 2009 to 2013.



92. What is the average production (in 1000 tonnes) of coffee from year 2009 to 2011?

- (a) 1366.67
- (b) 1166.67
- (c) 1233.33
- (d) 1466.67

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (b) : Required average production

$$= \frac{800 + 1200 + 1500}{3}$$

$$= \frac{3500}{3} = 1166.67 \text{ (in 1000 tonnes)}$$

93. The production for the year 2011 is what percent of the production for the year 2009?

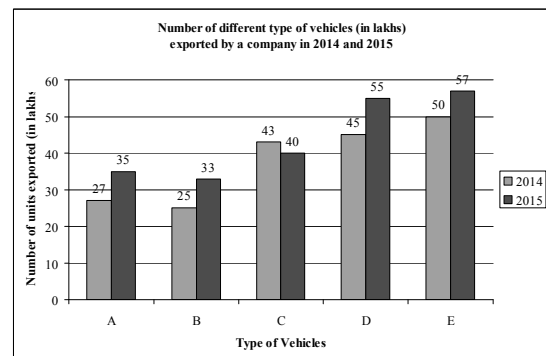
- (a) 157.5%
- (b) 175.25%
- (c) 187.5%
- (d) 205.25%

SSC GD Constable 14/02/2019 (Shift-II)

Ans. (c) : Required percentage

$$= \frac{1500}{800} \times 100 = 187.5\%$$

94. Study the given graph and answer the question that follows.



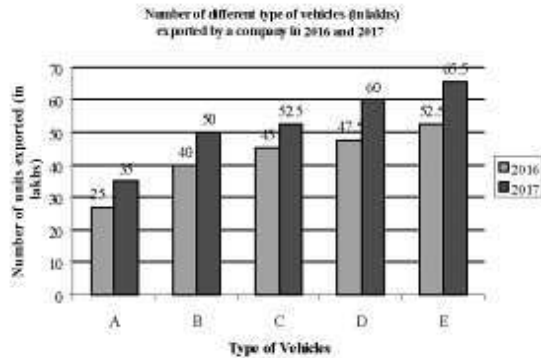
The total number of vehicles of types B, C and E exported in 2014 is what percentage of the total number of vehicles of types A, B, C, D and E exported in 2015 (correct to one decimal place)?

- (a) 53.6%
- (b) 63.8%
- (c) 61.6%
- (d) 62.4%

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (a) : Total number of vehicles of types B, C and E exported in 2014 = 25 + 43 + 50 = 118
 Total number of vehicles of types A, B, C, D and E exported in 2015 = 35 + 33 + 40 + 55 + 57 = 220
 \therefore Required percentage = $\frac{118}{220} \times 100 = 53.6\%$

95. Study the given graph and answer the question that follows :



The total number of vehicles of types C and D exported by the company in 2017 is by what percentage more than the total number of vehicles of types A, B and C exported in 2016 (correct to one decimal place?)

- (a) 3.5% (b) 2.3%
 (c) 2.1% (d) 1.9%

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (b) : Total number of vehicles of types C and D exported by the company in 2017 = 52.5 + 60 = 112.5
 Total number of vehicles of types A, B and C exported by the company in 2016 = 25 + 40 + 45 = 110
 \therefore Required percentage = $\frac{2.5}{110} \times 100$
 $= \frac{25}{11} = 2.3\%$

(II) Problems based on Tables

96. The table below gives the numbers (in thousand) of different types of geysers sold by a company in six consecutive years.

Year	Types				
	A	B	C	D	E
2007	75	122	103	98	95
2008	100	102	103	112	102
2009	105	108	112	109	108
2010	100	189	123	102	122
2011	95	123	102	124	124
2012	85	145	134	134	145

What is difference in the number of type B geysers sold in 2010 and 2012?

- (a) 44000 (b) 42000
 (c) 41000 (d) 45000

SSC CHSL 27/05/2022 (Shift- II)

Ans. (a) : According to the question:-

Required difference = Type of geysers B sold in 2010 –
 Type of geysers B sold in 2012

$$\Rightarrow 189000 - 145000$$

$$\Rightarrow \boxed{44000}$$

97. Study the given table and answer the question that follows.

The table shows quantity of various food items used by a restaurant during four months of a year (in kg).

Food Item	June	July	August	September
Rice	180	200	240	300
Wheat	420	400	380	350
Sugar	200	210	230	240
Pulses	250	310	320	280
Vegetables	300	320	390	370

The quantity of wheat used in the month of July is what percentage of the total quantity of food items used in June?

- (a) $29\frac{16}{27}\%$ (b) $29\frac{17}{27}\%$
 (c) $29\frac{18}{27}\%$ (d) $29\frac{15}{27}\%$

SSC CHSL 27/05/2022 (Shift- II)

Ans. (b) : According to the question:-

Required% = $\frac{\text{Wheat used in July}}{\text{Food item used in June}} \times 100$

$$\Rightarrow \frac{400}{180 + 420 + 200 + 250 + 300} \times 100 \Rightarrow \frac{400}{1350} \times 100$$

$$\Rightarrow 29\frac{17}{27}\%$$

98. Study the given table and answer the question that follow.

The following table gives the month-wise number of different types of scooters produced by a company during the first six month of 1992.

Types of scooters	Months					
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
X	25	25	15	40	20	15
Y	25	27	50	45	30	20
Z	25	27	15	25	30	20
T	25	26	25	0	30	35
TOTAL	100	105	105	110	110	90

In which month did the company produce the lowest aggregate number of scooters of all the four types taken.

- (a) June (b) March
 (c) March (d) January

SSC CHSL 07/06/2022 (Shift- II)

Ans. (a) : In January,

Number of scooters of all the four types taken together = 100

In February,

Number of scooters of all the four types taken together = 105

In March,
Number of scooters of all the four types taken together = 108
In April,
Number of scooters of all the four types together = 110
In May,
Number of scooters of all the four types taken together = 110
In June,
Number of scooters of all the four types taken together = 90
So, it is clear from above that the lowest aggregate number of all the four types taken together in month June.
Hence, option (a) is correct.

99. The table below shows the number of cakes sold by six different bakeries in a town on five different days of particular week.

Bakery	Days				
	Monday	Tuesday	Thursday	Saturday	Sunday
A	222	255	215	250	266
B	205	275	314	295	260
C	245	266	305	195	235
D	221	230	185	300	280
E	312	325	298	272	254
F	175	205	255	240	308

What is difference between the highest number of the cakes sold by bakery F in a single day and the lowest numbers of cake sold by bakery B in single day?

- (a) 139 (b) 125
(c) 103 (d) 100

SSC CHSL 27/05/2022 (Shift- III)

Ans. (c) : According to the question:-

Required difference = Highest number of cake sold by F in single day – Lowest number of cake sold by B in single day

$$\Rightarrow 308 - 205 = \boxed{103}$$

100. The following table shows day-wise number of seats occupied of different classes in a train. Numbers in bracket represent the total seats available in a particular class :

Day	2nd Class Non-AC (900)	Ist Class Non-AC (500)	AC III Tier (500)	AC II Tier (250)	AC Ist Class (150)
Monday	850	460	480	240	145
Tuesday	840	400	450	230	120
Wednesday	830	390	480	220	130
Thursday	790	480	490	250	125
Friday	840	470	500	210	130

How many seats remained vacant taking all the days together in Non-AC classes ?

- (a) 650 (b) 715
(c) 600 (d) 585

SSC CGL-(Tier-I) 13/08/2021 (Shift III)

Ans. (a) : Total number of seats in 2nd class Non-AC for all days

$$= 900 + 900 + 900 + 900 + 900 = 4500$$

Reserved seats in 2nd class Non-AC for all days

$$= 850 + 840 + 830 + 790 + 840$$

$$= 4150$$

∴ Vacant seats = 4500 – 4150

$$= 350$$

Total number of seats in 1st class Non-AC for all days

$$= 500 + 500 + 500 + 500 + 500$$

$$= 2500$$

Reserved seats in 1st class Non-AC for all days

$$= 460 + 400 + 390 + 480 + 470$$

$$= 2200$$

∴ Vacant seats = 2500 – 2200 = 300

Total vacant seats = 350 + 300 = 650

Hence, option (a) is correct.

101. Table shows income (in Rs) received by 4 employees of a company during the month of December, 2020 and the income sources.

Source	Amit	Suresh	Nitin	Varun
	Salary	35000	38500	29000
Arrears	6000	6300	5000	7500
Bonus	1000	1100	1000	1240
Overtime	1800	1950	1400	1500

Whose income from all sources except salary is more than 25% of his salary ?

- (a) Amit and Nitin
(b) Varun
(c) Amit
(d) None

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (a) :

	Total income from all sources other than salary	25% of salary
Amit	6000+1000+1800=8800	$35000 \times \frac{25}{100} = 8750$
Suresh	6300+1100+1950=9350	$38500 \times \frac{25}{100} = 9625$
Nitin	5000+1000+1400=7400	$29000 \times \frac{25}{100} = 7250$

Varun	$7500+1240+1500=10240$	$42000 \times \frac{25}{100} = 10500$
-------	------------------------	---------------------------------------

Hence income from all sources except salary of Amit and Nitin is more than 25% of his salary.

102. Study the following table and answer the question :

Percentage of marks obtained by six students in five subjects A, B, C, D & E

Students	Subjects				
	A (Out of 75)	B (Out of 80)	C (Out of 100)	D (Out of 50)	E (Out of 150)
Manju	68	85	86	72	92
Amit	64	65	80	96	80
Rekha	88	75	65	74	90
Anuj	80	55	68	66	84
Abhi	72	65	72	54	74
Vikram	60	70	73	84	86

Total marks obtained by Amit, Abhi and Anuj in subject E is what percent more than the total marks obtained by all the six students in subject B ? (correct to one decimal place)

- (a) 8.4 (b) 7.2
(c) 7.5 (d) 8.5

SSC CGL-(Tier-I) 23/08/2021 (Shift I)

Ans. (c) : Total marks obtained by Amit, Abhi and

$$\text{Anuj in subject E} = 150 \times \frac{80}{100} + 150 \times \frac{74}{100} + 150 \times \frac{84}{100}$$

$$= 120 + 111 + 126 = 357$$

Total marks obtained by all the six students in subject

$$B = 80 \times \frac{85}{100} + 80 \times \frac{65}{100} + 80 \times \frac{75}{100} + 80 \times \frac{55}{100}$$

$$+ 80 \times \frac{65}{100} + 80 \times \frac{70}{100}$$

$$= 68 + 52 + 60 + 44 + 52 + 56$$

$$= 332$$

$$\text{Required percentage} = \frac{25}{332} \times 100 = 7.5\%$$

103. Table shows income (in ₹) received by 4 employees of a company during the month of December 2020 and all their income sources.

Source	Amit	Suresh	Nitin	Varun
Salary	35000	38500	29000	42000
Arrears	6000	6300	5000	7500
Bonus	1000	1100	1000	1240
Overtime	1800	1950	1400	1500

What is the ratio of salary of Varun to his income other than salary ?

- (a) 128 : 653 (b) 653 : 128
(c) 128 : 525 (d) 525 : 128

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (d) : Ratio of salary of Varun to his income other than salary = $42000 : (7500 + 1240 + 1500)$

$$= 42000 : 10240$$

$$= 525 : 128$$

104. Study the following table and answer the questions.

Number of students Appeared (A) and Passed (P) in an annual examination from four schools Q, R, S & T in five years (2014 to 2018)

School Year	Q		R		S		T	
	A	P	A	P	A	P	A	P
2014	320	240	400	340	420	273	250	225
2015	400	320	380	285	350	280	300	228
2016	440	286	360	288	330	264	320	256
2017	350	252	420	294	380	247	350	315
2018	375	320	450	405	400	344	375	300

The difference between the average number of students passed from school R in 2015 to 2017 and the number of students passed from school Q in 2015 is x. The value of x lies between.

- (a) 20 and 25 (b) 35 and 40
(c) 30 and 35 (d) 25 and 30

SSC CGL-(Tier-I) 24/08/2021 (Shift I)

Ans. (c) : Average number of students passed from school R in 2015 to 2017

$$= \frac{285 + 288 + 294}{3}$$

$$= \frac{867}{3} = 289$$

The number of students passed from school Q in 2015 = 320

$$\text{Required difference} = 320 - 289 = 31$$

As per the question the value of 31 lies between 30 and 35 Hence, option (c) will be correct.

105. The data given in the table shows the number of students studying in four different disciplines in 5 institutes.

Study the table and answer the question:

Institutes	Arts	Science	Commerce	Computer Science
A	36	48	59	57
B	45	54	55	48
C	55	36	56	51
D	45	48	55	53
E	48	44	52	55

By what percentage is the number of students studying Computer Science in institutes A and B more than the number of students studying Arts in institutes B and C?

- (a) 5 (b) 14
(c) 2 (d) 24

SSC CGL-(Tier-I) 17/08/2021 (Shift I)

Ans. (a) : Number of Computer Science students in institutes A and B = $57 + 48$

$$= 105$$

Number of Arts students in institutes B and C = 45 + 55 = 100
 Number of students more in A & B = 105 – 100 = 5
 \therefore Required percentage = $\frac{5}{100} \times 100 = 5\%$

106. Study the following table and answer the question:

Number of students enrolled for Vocational Courses (VC) in institutes A, B, C, D, E & F.

Years \ Institutes	2014	2015	2016	2017	2018
A	110	150	165	180	205
B	120	180	176	200	220
C	140	220	180	175	225
D	125	210	175	180	230
E	150	200	160	200	240
F	165	230	200	220	210

The total number of students enrolled for VC in institutes B, C and E in 2015 is x% more than the total number of students enrolled in institutes A, D and F in 2016. The value of x is closest to:

- (a) 10.3 (b) 11.8
 (c) 10.8 (d) 11.1

SSC CGL–(Tier-I) 17/08/2021 (Shift I)

Ans. (d) : Total Number of students for VC in institutes B, C and E in 2015 = 180 + 220 + 200 = 600
 Total Number of students for VC in institutes A, D and F in 2016 = 165 + 175 + 200 = 540

As per the question,

$$\begin{aligned} \therefore x\% &= \frac{600 - 540}{540} \times 100 \\ &= \frac{60}{540} \times 100 \\ &= \frac{100}{9} = 11.1\% \end{aligned}$$

107. Study the following table and answer the question:

Number of students enrolled for Vocational Courses (VC) in institutes A, B, C, D, E & F.

Years \ Institutes	2014	2015	2016	2017	2018
A	110	150	165	180	205
B	120	180	176	200	220
C	140	220	180	175	225
D	125	210	175	180	230
E	150	200	160	200	240
F	165	230	200	220	210

The ratio of the total number of students enrolled for VC in institutes A, C and E in 2015 to the total number of students enrolled in institutes B and D in 2017, is:

- (a) 9 : 10 (b) 3 : 4
 (c) 3 : 2 (d) 10 : 11

SSC CGL–(Tier-I) 17/08/2021 (Shift I)

Ans. (c) : Number of students enrolled for VC in institutes A, C and E in 2015 = 150+220+200=570
 Number of students enrolled for VC in institutes B and D in 2017 = 200+180 = 380
 \therefore Required Ratio = 570 : 380
 = 3 : 2

108. The table shows the daily income (in ₹) of 50 persons.

Study the table and answer the question:

Income (Rs)	No. of persons
less than 200	12
less than 250	26
less than 300	34
less than 350	40
less than 400	60

How many persons earn ₹200 or more but less than ₹300?

- (a) 12 (b) 38
 (c) 22 (d) 8

SSC CGL–(Tier-I) 17/08/2021 (Shift I)

Ans. (c) : Number of required persons = Less than ₹300 – Less than ₹200
 = 34 persons – 12 persons
 = 22 persons

109. Study the following table and answer the question :

Number of students Appeared (A) and Passed (P) in an annual examination from four schools Q, R, S & T in five years (2014 to 2018) :

School \ Year	Q		R		S		T	
	A	P	A	P	A	P	A	P
2014	320	240	400	340	420	273	250	225
2015	400	320	380	285	350	280	300	228
2016	440	286	360	288	330	264	320	256
2017	350	252	420	294	380	247	350	315
2018	375	320	450	405	400	344	375	300

The ratio of the total number of students appeared from school Q in 2017 and from school S in 2018 to the total number of students passed from school R in 2018 and school T in 2014, is :

- (a) 16 : 9 (b) 25 : 21
 (c) 5 : 7 (d) 7 : 8

SSC CGL–(Tier-I) 18/08/2021 (Shift I)

Ans. (b) : Total number of students appeared from school Q in the year 2017 and from school S in the year 2018

$$= 350 + 400 = 750$$

Number of students passed from school R in the year 2018 and from school T in the year 2014 = 405 + 225 = 630

$$\begin{aligned} \text{Required Ratio} &= \frac{750}{630} \\ &= \frac{25}{21} \\ &= 25 : 21 \end{aligned}$$

110. Study the following table and answer the question.
Number of students Appeared (A) and Passed (P) in an annual examination from four schools Q, R, S & T in five years (2014 to 2018) :

School Year	Q		R		S		T	
	A	P	A	P	A	P	A	P
2014	320	240	400	340	420	273	250	225
2015	400	320	380	285	350	280	300	228
2016	440	286	360	288	330	264	320	256
2017	350	252	420	294	380	247	350	315
2018	375	320	450	405	400	344	375	300

The total number of students passed from school Q in 2014 and 2018 is what percent less than the total number of students appeared from schools R and S in 2017 ?

- (a) 42.9% (b) 30%
 (c) 25% (d) 35.4%

SSC CGL–(Tier-I) 18/08/2021 (Shift I)

Ans. (b) : Total number of students passed from school Q in the year 2014 and 2018 = 240 + 320 = 560
 Total number of students appeared from schools R and S in the year 2017 = 420 + 380 = 800
 Required percentage = $\frac{800 - 560}{800} \times 100 = \frac{240}{8} = 30\%$

111. Study the following table and answer the question :

Number of cars sold by dealers A, B, C, D & E during first six months of 2018.

Month Dealer	January	February	March	April	May	June
A	620	640	628	635	430	625
B	600	642	635	580	450	620
C	640	635	640	540	625	740
D	520	645	722	740	600	780
E	548	638	720	740	650	800

The average number of cars sold by the dealer C in February, April and May exceeds the number of cars sold by the dealer E in January by x. The value of x lies between :

- (a) 55 and 60 (b) 40 and 45
 (c) 45 and 50 (d) 50 and 55

SSC CGL–(Tier-I) 18/08/2021 (Shift II)

Ans. (d) : The average number of cars sold by the dealer C in February, April and May

$$\begin{aligned} &= \frac{635 + 540 + 625}{3} = \frac{1800}{3} = 600 \\ \text{Exceeds the number of cars sold by the dealer E in January} &= 548 + x \\ \text{According to the question,} \\ 548 + x &= 600 \\ x &= 600 - 548 \\ x &= 52 \\ \text{Hence the value of } x &\text{ lies between 50 and 55.} \end{aligned}$$

112. The data given in the table shows the number of boys and girls enrolled in three different streams in a school over 5 years.

Years	Arts		Science		Commerce	
	Boys	Girls	Boys	Girls	Boys	Girls
2012	48	36	40	35	35	45
2014	42	43	42	32	32	42
2016	45	42	38	30	36	38
2018	39	46	41	23	28	34
2020	36	43	39	30	39	41

By what percent is the total number of boys in Arts stream more than the total number of boys in Science stream in the years 2012 to 2020 ?

- (a) 5 (b) $4\frac{16}{21}$
 (c) 0 (d) $2\frac{18}{41}$

SSC CGL–(Tier-I) 16/08/2021 (Shift III)

Ans. (a) : Total number of boys in arts stream in the years 2012 to 2020 = 48 + 42 + 45 + 39 + 36 = 210
 Total number of boys in Science stream in the years 2012 to 2020 = 40 + 42 + 38 + 41 + 39 = 200
 Required percentage = $\frac{210 - 200}{200} \times 100 = 5\%$

113. Table shows District-wise data of number of primary school teachers posted in schools of a city.

Study the table and answer the question.

District	Male teachers	Female teachers
East	1650	2375
North	1075	2651
West	1280	1520
South	1170	1085
Central	690	859

In which district(s) is the number of female teachers exceed the number of male teachers by more than 500 ?

- (a) West and South (b) East and North
(c) North and South (d) East and West

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (b) :

(Male - Female)

$$\begin{aligned} \text{East} &\Rightarrow (1650 - 2375) = 725 \\ \text{North} &\Rightarrow (1075 - 2651) = 1576 \\ \text{West} &\Rightarrow (1280 - 1520) = 240 \\ \text{South} &\Rightarrow (1170 - 1085) = 85 \\ \text{Central} &\Rightarrow (690 - 859) = 169 \end{aligned}$$

} Female exceed by more than 500

Hence it is clear that in the East and North district the number of female teachers exceed the number of male teachers by more than 500.

114. In the table, production and sale (in 1000 tonnes) of a certain product of a company over 5 years is given.

years	Production (in 1000 tonnes)	Sale (in 1000 tonnes)
2015	1250	1000
2016	1400	1290
2017	1450	1100
2018	1500	1450
2019	1600	1390

In which year(s) sale is 80% or more but less than 90% of the production?

- (a) 2016, 2018 (b) 2019
(c) 2015, 2016 (d) 2015, 2019

SSC CGL-(Tier-I) 20/08/2021 (Shift III)

Ans. (d) :

$$\begin{aligned} \text{Sale percentage in 2015} &= \frac{1000}{1250} \times 100 = 80\% \\ \text{Sale percentage in 2016} &= \frac{1290}{1400} \times 100 = 92.14\% \\ \text{Sale percentage in 2017} &= \frac{1100}{1450} \times 100 = 75.86\% \\ \text{Sale percentage in 2018} &= \frac{1450}{1500} \times 100 = 96.66\% \\ \text{Sale percentage in 2019} &= \frac{1390}{1600} \times 100 = 86.87\% \end{aligned}$$

Hence, In the years 2015 and 2019 sale is 80% or more but less than 90% of the production.

115. In the table, production and sale (in 1000 tonnes) of a certain product of a company over 5 years is given.

Study the table and answer the question :

years	Production (in 1000 tonnes)	Sale (in 1000 tonnes)
2015	1250	1000
2016	1400	1290
2017	1450	1100
2018	1500	1450
2019	1600	1390

In which year(s) the sale increases by more than 25% of the previous year ?

- (a) 2018 (b) 2017 and 2019
(c) 2016 and 2018 (d) 2017

SSC CGL-(Tier-I) 17/08/2021 (Shift II)

Ans. (c) : There are only two years i.e. 2016 & 2018, in which sales have increased by more than 25% of the previous year.

2015 → 2016

$$\begin{array}{ccc} 1000 & : & 1290 \\ 100 & : & 129 \end{array}$$

} 29%

2017 → 2018

$$\begin{array}{ccc} 1100 & : & 1450 \\ 110 & : & 145 \end{array}$$

} ≈ 32%

Hence the required years are 2016 & 2018 respectively in which sales have increased more than 25% of the previous year sale.

116. Study the following table and answer the question:

Number of students enrolled for Vocational Courses (VC) in five institutes - A, B, C, D & E.

Institute \ Year	2013	2014	2015	2016	2017	2018
A	120	135	130	135	128	140
B	125	132	138	132	135	142
C	125	120	125	138	140	135
D	100	125	122	140	128	138
E	105	110	115	147	130	145

The ratio of the total number of students enrolled for VC in institutes A, C and E in 2016 to the total number of students enrolled in institutes B and D in 2018, is

- (a) 8:7 (b) 14:9
(c) 21:19 (d) 3:2

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (d) : Number of students enrolled for VC in institutes A,C and E in 2016 = 135 + 138 + 147
= 420
Number of students enrolled for VC in institutes B and D in 2018 = 142 + 138 = 280
∴ Required ratio = 420 : 280
= 3 : 2

117. Tables shows income (₹in) received by 4 employees of a company during the month of December 2020 and all their income sources.

Source	Amit	Suresh	Nitin	Varun
Salary	35000	38500	29000	42000
Arrears	6000	6300	5000	7500
Bonus	1000	1100	1000	1240
Overtime	1800	1950	1400	1500

By what percent are the Arrears of Amit and Suresh taken together less than the Arrears of Nitin and Varun taken together?

- (a) 1.4
(b) 1.2
(c) 1.5
(d) 1.6

SSC CGL (Tier-I) 16/08/2021 (Shift I)

Ans. (d) : Total Arrears of Amit and Suresh
= 6000+6300
= 12300
Total Arrears of both Nitin and Varun = 5000 + 7500
= 12500
∴ Decreased percentage = $\frac{200}{12500} \times 100$
 $\frac{8}{5} = 1.6\%$

118. Study the table and answer the question that follows:

In the given table, production of five different types of machines (A, B, C, D, E) in the years from 2016 to 2020 (in thousands) is given.

Machines	Years				
	2016	2017	2018	2019	2020
A	46	53	56	58	67
B	50	65	67	66	72
C	43	54	55	47	51
D	47	52	61	65	74
E	48	58	63	64	67

What is the ratio of the total production of type A machines in 2018 and type E machines in 2019 to the total production of type C and type D machines in 2016?

- (a) 2 : 5
(b) 5 : 2
(c) 4 : 3
(d) 3 : 4

SSC CHSL 11/08/2021 (Shift-I)

Ans. (c) : According to the question
Sum of total production = type A (2018) + type E (2019)
= 56 + 64 = 120
Sum of total production of type C and type D in 2016
= 43+47 = 90
Hence required ratio = 120 : 90
= 4 : 3

Direction (Q. No. 119-122):

The table shows the production of different types of cars (in thousands)

Cars \ Year	2012	2013	2014	2015	2016
A	30	35	48	45	56
B	42	48	40	38	56
C	48	36	38	35	44
D	51	24	30	46	54
E	20	42	40	35	43

119. The total production of type B cars in 2012, 2014 and 2015 taken together is approximately what percent more than the total production of type A cars in 2013 and 2016 taken together

- (a) 36.3%
(b) 34.4%
(c) 31.9%
(d) 33.2%

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (c) : Total production of type A cars in 2013 and 2016 = 35 + 56 = 91

Total production of type B cars in 2012, 2014 and 2015 = 42 + 40 + 38 = 120

Let the production of type B cars in 2012, 2014 and 2015 is approximately x percent more than the total production of type A cars in 2013 and 2016.

$$\text{Hence } x = \frac{120 - 91}{91} \times 100$$

$$= \frac{29}{91} \times 100$$

$$= 31.86$$

$$\approx 31.9$$

120. Find the number of years, in which the production of cars of type B is less than the average production of type D cars over the years.

- (a) 1
(b) 3
(c) 4
(d) 2

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d) : Average production of type D cars in all the years = $\frac{51 + 24 + 30 + 46 + 54}{5} = 41$

The production of type B cars in the years 2014 and 2015 is less than the average production of type D cars in all the years.

Hence the required answer will be 2.

121. If the data related to the production of cars of E is represented by a pie-chart, then the central angle of the sector representing the data of production of cars in 2013 will be:

- (a) 70° (b) 80°
(c) 102° (d) 84°

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d) : Total Production of type E cars from 2012 to 2016 = 180

Production of type E cars in 2013 = 42

Central angle of E type cars in 2013

$$= \frac{42}{180} \times 360^\circ = 42 \times 2^\circ = 84^\circ$$

122. What is the ratio of the total production of cars of type A in 2014 and type C in 2013 taken together to the total production of cars of type B in 2016 and type E in 2015 taken together?

- (a) 10 : 11 (b) 11 : 12
(c) 12 : 11 (d) 12 : 13

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-I)

Ans. (d) : Required ratio

$$= \frac{48+36}{56+35} = \frac{84}{91} = \frac{12}{13} = 12 : 13$$

Direction (Q. No. 123-126):

The table shows the production of different types of cars (in thousands):

Year Cars	2014	2015	2016	2017	2018
A	64	56	57	63	70
B	48	54	63	64	72
C	33	42	48	57	64
D	25	45	40	55	35
E	40	48	52	61	60

123. The total production of type C cars in 2015 and type E cars in 2018 taken together is what percent of the total production of cars in 2014 and 2017 taken together?

- (a) 20% (b) 22%
(c) 25% (d) 27%

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (a): Production of type C cars in year 2015 + Production of type E cars in year 2018 = 42 + 60 = 102

Total production of A, B, C, D and E cars in year 2014 = 210

Total production of A, B, C, D and E cars in year 2017 = 300

The total production of A, B, C, D and E cars in years 2014 and 2017 = 210 + 300 = 510

$$\text{Required percentage} = \frac{102}{510} \times 100 = 20\%$$

124. The total production of type D cars during 2015 to 2017 is what percent less than the total production of type E cars during 2014, 2015, 2016 and 2018 taken together?

- (a) 28 (b) 30
(c) 35 (d) 32

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (b) : Total production of type D cars from 2015 to 2017 = 45 + 40 + 55 = 140

Total production of type E cars in year 2014, 2015, 2016 and 2018 = 40 + 48 + 52 + 60 = 200

$$\text{Required percentage} = \frac{200-140}{200} \times 100\% = 30\%$$

125. In the data related to the production of type D cars is represented by a pie chart, then the central angle of the sector representing production of cars in 2015 will be:

- (a) 63° (b) 99°
(c) 81° (d) 72°

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (c) : Total production of type D cars from 2014 to 2018 = 25 + 45 + 40 + 55 + 35 = 200

$$200 = 360^\circ$$

$$1 \text{ unit} \rightarrow 1.8^\circ$$

The central angle of type D cars in year 2015 = 45 × 1.8° = 81°

126. The ratio of the total production of type A cars in 2015 and type B cars in 2014 taken together to the total production of type C cars in 2017 and type E cars in 2018 taken together is:

- (a) 34 : 39 (b) 16 : 19
(c) 4 : 5 (d) 8 : 9

SSC CGL (TIER-I)-2018 – 04.06.2019 (Shift-III)

Ans. (d) :

Total production of type A cars in year 2015 +

Total production of type B cars in year 2014

Total production of type C cars in year 2017 +

Total production of type E cars in year 2018

$$= \frac{56+48}{57+60}$$

$$= \frac{104}{117} = \frac{8}{9} = 8:9$$

Direction (Q. No. 127-130):

The table shows the production of different types of cars (in thousands).

Year Cars	2012	2013	2014	2015	2016
A	54	58	60	63	55
B	40	54	56	61	67
C	46	50	63	73	77
D	33	35	48	45	49
E	47	43	53	48	52

127. If the data related to the production of type D cars is represented by a pie-chart, then the central angle of the sector representing the production of cars in 2013 will be:

- (a) 60° (b) 77°
 (c) 84° (d) 75°

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : Total production of type D cars
 $= 33 + 35 + 48 + 45 + 49$
 $= 210$
 Total production of type D cars in 2013 = 35
 Central angle $= \frac{35}{210} \times 360^\circ = 60^\circ$

128. The total production of all types of cars, except type B, in 2012 is what percent less than the total productions of all types of cars in 2016?

- (a) 40 (b) 25.8
 (c) 26.7 (d) 42

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : The total production of all types of cars except type B, in 2012 $= 54 + 46 + 33 + 47 = 180$
 Total production of all types of cars in 2016
 $= 55 + 67 + 77 + 49 + 52 = 300$
 Required percentage $= \frac{120}{300} \times 100 = 40\%$

129. What is the ratio of the total production of type E cars in, 2014 and type C cars in 2016 taken together to the total production of type B cars in 2014 and type D cars in 2013 taken together?

- (a) 9 : 8 (b) 11 : 8
 (c) 11 : 5 (d) 10 : 7

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (d) : Total production of type E cars in 2014 and type C cars in 2016 $= 53 + 77 = 130$
 Production of type B cars in 2014 and type D cars in 2013 $= 56 + 35 = 91$
 \therefore Ratio $= \frac{130}{91} = \frac{10}{7} = 10 : 7$

130. The total production of type E cars in 2012 and 2013 is approximately what percent more than the average production of type A cars during the years 2012 to 2016?

- (a) 55.17% (b) 52.2%
 (c) 56.4% (d) 53.8 %

SSC CGL (TIER-I)-2018 – 06.06.2019 (Shift-II)

Ans. (a) : Total production of type E cars in 2012 and 2013
 $= 47 + 43 = 90$
 Average production of type A cars during the years 2012 to 2016
 $= \frac{54 + 58 + 60 + 63 + 55}{5} = \frac{290}{5} = 58$
 Required Percentage $= \frac{32}{58} \times 100 = 55.17$

Direction (Q. No. 131-134):

The table below shows the number of students enrolled in five colleges over the five years (2010 to 2014)

College \ Year	A	B	C	D	E
2010	400	270	350	430	470
2011	430	300	330	450	490
2012	370	250	360	470	410
2013	410	310	370	420	430
2014	420	290	340	480	480

131. In the year 2014, what percent of students were enrolled in college C 2014 ? (correct to one decimal place)

- (a) 17.3% (b) 16.9%
 (c) 16.7% (d) 17.1%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (b) : Total number of students enrolled in college C in year 2014 = 340
 Total number of students in year 2014 $= 420 + 290 + 340 + 480 + 480 = 2010$
 Required Percentage $= \frac{340}{2010} \times 100 = 16.9\%$

132. What is the ratio of the total students enrolled in colleges A and B in the year 2012 to the total students enrolled in colleges D and E in the year 2013?

- (a) 62 : 85 (b) 62 : 88
 (c) 58 : 63 (d) 63 : 86

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (a) : The total number of students enrolled in colleges A and B in the year 2012 $= 370 + 250 = 620$
 Number of students enrolled in colleges D and E in the year 2013 $= 420 + 430 = 850$
 Hence the ratio $= 620 : 850 = \boxed{62 : 85}$

133. What is the average number of students studying in college D over the given years?

- (a) 440 (b) 450
 (c) 430 (d) 420

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (b) : The total number of students studying in college 'D' $= 430 + 450 + 470 + 420 + 480 = 2250$
 Number of years = 5
 The average number of students studying in college D
 $= \frac{2250}{5} = 450$

134. The number of students studying in college E in the year 2013 is approximately what percent of the number of students studying in colleges B, C and D taken together in the year 2013 (nearest to one decimal place)?

- (a) 39.4% (b) 38.2%
(c) 39.1% (d) 38.6%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-II)

Ans. (c) : The number of students studying in college 'E' in the year 2013 = 430
Total number of students studying in colleges B, C and D in the year 2013 = 310 + 370 + 420 = 1100
Required percentage = $\frac{430}{1100} \times 100$
= 39.09%
≈ 39.1%

Direction (Q. No. 135-138):

The table below shows the percentage of students and the ratio of boys and girls in different colleges. Total students = 1800

College	% Students	Boys: Girls
A	20	4 : 5
B	18	1 : 2
C	14	4 : 3
D	22	6 : 5
E	10	2 : 3
F	16	9 : 7

135. If 10% of the girls from college A are transferred to college E, then what is the increase in the percentage of girls in college E?
(a) 4.6% (b) 4%
(c) 4.4% (d) 4.2%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) : Number of girls in college A
= $1800 \times \frac{20}{100} \times \frac{5}{9} = 200$
Number of students in college E = $1800 \times \frac{10}{100} = 180$
Number of girls in college E = $180 \times \frac{3}{5} = 108$
Percentage of girls in college E = $\frac{108}{180} \times 100 = 60\%$
On transferring 10% of girls from A to E,
∴ Total students in college E = $180 + 200 \times \frac{10}{100} = 200$
Now percentage of girls in college E
= $\frac{108 + 20}{200} \times 100 = 64\%$
∴ Percentage increase of girls in college E = 64 - 60
= 4%

136. What is the ratio of boys and girls in the colleges A and B taken together?
(a) 43 : 67 (b) 67 : 104
(c) 45 : 71 (d) 37 : 52

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) : ∴ Total students = 1800
Number of students in college A = $1800 \times \frac{20}{100} = 360$
Number of students in college B = $1800 \times \frac{18}{100} = 324$
Number of girls in college A and B
= $360 \times \frac{5}{9} + 324 \times \frac{2}{3}$
= 200 + 216 = 416
Number of boys in college A and B = $360 \times \frac{4}{9} + 324 \times \frac{1}{3}$
= 160 + 108 = 268
∴ Ratio of the girls and boys in colleges A and B =
268 : 416 = 67 : 104

137. In which college is the percentage difference between the number of boys and girls minimum.

- (a) A (b) C
(c) D (d) E

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (c) : The percentage difference between the number of boys and girls in the college is as follows:
A = $\frac{5-4}{9} \times 100 = 11.11\%$
C = $\frac{4-3}{7} \times 100 = 14.28\%$
D = $\frac{6-5}{11} \times 100 = 9.09\%$
E = $\frac{3-2}{5} \times 100 = 20\%$
Hence it is clear that the percentage difference between the number of boys and girls in college D is minimum.

138. What is the percentage of girls in colleges D, E and F taken together (nearest to one decimal place)?

- (a) 48.1% (b) 47.9%
(c) 48.3% (d) 48.5%

SSC CGL (TIER-I)-2018 – 10.06.2019 (Shift-III)

Ans. (b) : Total students = 1800
Number of total students in colleges (D + E + F)
= $1800 \times (22 + 10 + 16)\%$
= $1800 \times \frac{48}{100} = 18 \times 48 = 864$
Number of total girls in (D + E + F)
= $1800 \times \left(\frac{22}{100} \times \frac{5}{11} + \frac{10}{100} \times \frac{3}{5} + \frac{16}{100} \times \frac{7}{16} \right)$
= $1800 \times \left(\frac{1}{10} + \frac{3}{50} + \frac{7}{100} \right)$
= $1800 \times \frac{23}{100} = 414$

Hence percentage of total number of girls in D, E and F

$$= \frac{414}{864} \times 100$$
$$= 47.9\%$$

Direction (Q. No. 139-142):

The table below indicates the percentage of students and the ratio of boys and girls in the various streams of a college (Total students = 2600)

Streams	CE	CS	IT	ME	EC
Student%	20%	18%	21%	22%	19%
Boys & girls	3 : 2	4 : 5	3 : 4	6 : 5	9 : 10

139. In which stream is the difference in the percentage of boys and girls minimum?

- (a) IT (b) CS
(c) EC (d) ME

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (c) :

The percentage difference between boys and girls in various stream of colleges is as follows–

$$\text{IT Stream} = \frac{4-3}{7} \times 100 = 14.28\%$$

$$\text{CS Stream} = \frac{5-4}{9} \times 100 = 11.11\%$$

$$\text{EC Stream} = \frac{10-9}{19} \times 100 = 5.26\%$$

$$\text{ME Stream} = \frac{6-5}{11} \times 100 = 9.09 = 9.1\%$$

Hence the percentage difference between boys and girls in EC stream is minimum.

140. What is the ratio of students studying in CS and IT?

- (a) 6 : 7 (b) 12 : 13
(c) 11 : 13 (d) 9 : 11

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (a) : Total Students = 2600

$$\text{Total Students in CS} = 2600 \times 18\% = 468$$

$$\text{Total Students in IT} = 2600 \times 21\% = 546$$

∴ The ratio of students studying in CS and IT

$$= 468 : 546$$

$$= 234 : 273$$

$$= 78 : 91$$

$$= 6 : 7$$

141. What is the ratio of boys and girls in the college?

- (a) 6 : 7 (b) 7 : 8
(c) 5 : 6 (d) 1 : 1

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) : The ratio of boys and girls in the college

$$= 2600 \left(20 \times \frac{3}{5} + 18 \times \frac{4}{9} + 21 \times \frac{3}{7} + 22 \times \frac{6}{11} + 19 \times \frac{9}{19} \right) :$$

$$2600 \left(20 \times \frac{2}{5} + 18 \times \frac{5}{9} + 21 \times \frac{4}{7} + 22 \times \frac{5}{11} + 19 \times \frac{10}{19} \right)$$

$$= (12 + 8 + 9 + 12 + 9) : (8 + 10 + 12 + 10 + 10)$$

$$= 50 : 50$$

$$= 1 : 1$$

142. If the data about the number of girls enrolled in the various streams is represented by a pie-chart, what is the central angle of the sector representing the number of girls in the ME stream, to the nearest whole degree?

- (a) 74° (b) 68°
(c) 70° (d) 72°

SSC CGL (TIER-I)-2018 – 11.06.2019 (Shift-II)

Ans. (d) :

Number of girls in ME stream

$$= 2600 \times \frac{22}{100} \times \frac{5}{11} = 260$$

Total number of girls in all five streams

$$= 2600 \left(\frac{20}{100} \times \frac{2}{5} + \frac{18}{100} \times \frac{5}{9} + \frac{21}{100} \times \frac{4}{7} + \frac{22}{100} \times \frac{5}{11} + \frac{19}{100} \times \frac{10}{19} \right)$$

$$= \frac{2600}{100} (8 + 10 + 12 + 10 + 10)$$

$$= 26 \times (50) = 1300$$

∴ Central angle of required sector

$$= \frac{260}{1300} \times 360^\circ = 2 \times 36 = 72^\circ$$

Direction (Q. No. 143-146):

The following table shows the percentage distribution of students in various disciplines from five different colleges.

Subject	College				
	A	B	C	D	E
Science	25	35	45	28	35
Economics	35	40	20	42	25
Maths	40	25	35	30	40
Total Student	8,000	10,000	15,000	9,000	11,000

143. The number of students from the discipline of Economics from college B is approximate what percentage of the number of students from the discipline of Science from the college C?

- (a) 59 (b) 58
(c) 56 (d) 61

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (a) The number of students from the discipline of Economics of college B = $10000 \times \frac{40}{100} = 4000$
 The number of students from the discipline of science of college C = $15000 \times \frac{45}{100} = 6750$
 Required percentage = $\frac{4000}{6750} \times 100$
 = 59.25925
 $\approx 59\%$

144. If the data of the total students colleges wise, is represented by a pie-chart, what is the central angle of the sector representing college E (to the nearest whole number)?

- (a) 79° (b) 78°
 (c) 75° (d) 73°

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (c) : Total number of students of all colleges = $8,000 + 10,000 + 15,000 + 9,000 + 11,000 = 53,000$
 And total number of students of college E = 11,000
 \therefore Central angle of required sector = $\frac{11,000}{53,000} \times 360^\circ$
 = 74.71698
 $\approx 75^\circ$

145. What is the average number of students from the Science discipline of all the colleges taken together?

- (a) 3748 (b) 3724
 (c) 3762 (d) 3642

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (b) :
 Number of students from the Science discipline of college A = $8,000 \times \frac{25}{100} = 2,000$
 Number of students from the Science discipline of college B = $10,000 \times \frac{35}{100} = 35,000$
 Number of students from the Science discipline of college C = $15,000 \times \frac{45}{100} = 6,750$
 Number of students from the Science discipline of college D = $9,000 \times \frac{28}{100} = 2,520$
 Number of students from the Science discipline of college E = $11,000 \times \frac{35}{100} = 3,850$
 \therefore Required average
 = $\frac{(2000 + 3500 + 6750 + 2520 + 3850)}{5}$
 = $\frac{18620}{5} = 3724$

146. What is the percentage of students from the discipline of Mathematics for colleges A and C taken together (nearest to one decimal place)?

- (a) 36.7 (b) 37.5
 (c) 37.2 (d) 36.9

SSC CGL (TIER-I)-2018 – 12.06.2019 (Shift-I)

Ans. (a) :
 Number of students from the discipline of Mathematics for college A = $8000 \times \frac{40}{100} = 3200$
 Number of students from the discipline of Mathematics for college C = $15,000 \times \frac{35}{100} = 5250$
 \therefore Required Percentage = $\frac{(3200 + 5250)}{(8000 + 15000)} \times 100$
 = $\frac{8450}{23000} \times 100$
 = 36.7%

147. Table shows the percentage distribution of the expenditure incurred on different items for publishing book:

Item of expenditure	Percentage of expenditure
Paper	25
Printing	20
Binding	20
Royalty	15
Promotion	10
Transportation	10

Expenditure on royalty is less than that on Printing by:

- (a) 20% (b) 25%
 (c) 15% (d) 10%

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-III)

Ans. (b) : Required Percentage = $\frac{5}{20} \times 100 = 25\%$

Direction (Q. No. 148-151):

The table shows the number of cars sold by three showrooms over a period of six years.

Show rooms	year					
	2011	2012	2013	2014	2015	2016
A	500	480	520	620	650	630
B	450	420	530	480	520	400
C	400	450	460	520	540	430

148. By what percent did the total number of cars sold by all three showrooms decrease during the year 2016, as compared to that in the year 2015 (nearest to one decimal place)

- (a) 14.4% (b) 14.6%
 (c) 14.8% (d) 14.9%

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (b) : The total number of cars sold by all showrooms in 2015

$$= 650 + 520 + 540 = 1710$$

The total number of cars sold by all showrooms in 2016

$$= 630 + 400 + 430 = 1460$$

Decreased percentage in total cars in 2016 as compared to 2015

$$= \frac{1710 - 1460}{1710} \times 100$$

$$= \frac{250}{1710} \times 100$$

$$= 14.6\%$$

149. What is the ratio of the total cars sold by showroom B during the years 2014 and 2016 and the total cars sold by showroom C during the years 2015 and 2016?

- (a) 85 : 97 (b) 86 : 97
(c) 88 : 97 (d) 88 : 95

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c) : The total number of cars sold by showroom B in 2014 and 2016 = 480 + 400 = 880

Total number of cars sold by showroom C in 2015 and 2016

$$= 540 + 430 = 970$$

Hence required ratio = $\frac{880}{970} = 88 : 97$

150. What is the average number of cars sold by showroom A over the given six years (nearest to one decimal place)?

- (a) 594.7 (b) 592.7
(c) 566.7 (d) 586.7

SSC CGL (TIER-I)-2018 – 13.06.2019 (Shift-II)

Ans. (c) : The average number of cars sold by showroom A over the 6 years

$$= \frac{500 + 480 + 520 + 620 + 650 + 630}{6}$$

$$= \frac{3400}{6}$$

$$= 566.7$$

151. The number of students enrolled in different faculties in a school is as follows :

Science		Arts		Commerce		Vocational	
Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
35	18	25	47	45	40	10	30

The percentage of students studying in Science or Vocational subjects is :

- (a) 37.2% (b) 93%
(c) 50% (d) 25%

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-III)

Ans. (a) : Total number of students = 250
Students studying Science or Vocational subject = 35 + 18 + 10 + 30 = 93

Required percentage = $\frac{93}{250} \times 100 = 37.2\%$

Direction (Q. No. 152-154):

The given table shows the number (in thousands) of cars of five different models A, B, C, D and E produced during years 2012-2017. Study the table and answer the question that follows.

Years	A	B	C	D	E	Total
2012	18	26	22	23	31	120
2013	22	18	32	40	18	130
2014	32	43	26	35	34	170
2015	18	22	26	14	20	100
2016	36	12	44	38	50	180
2017	12	48	40	22	28	150

152. If 2013 and 2014 are put together, which type of cars constitute exactly 25% of the total number of cars produced in those 2 years?

- (a) D (b) B
(c) C (d) E

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (a) : Total number of cars produced in 2013 and 2014 = 130 + 170 = 300

For A, $\left(\frac{22 + 32}{300}\right) \times 100 = 18\%$

For B, $\left(\frac{18 + 43}{300}\right) \times 100 = 20.33\%$

For C, $\left(\frac{32 + 26}{300}\right) \times 100 = 19.33\%$

For D, $\left(\frac{40 + 35}{300}\right) \times 100 = 25\%$

For E, $\left(\frac{18 + 34}{300}\right) \times 100 = 17.33\%$

Hence it is clear that the number of type D cars is 25% of the total number of cars produced in those 2 years.

153. In the year 2015, which type of car constitutes exactly 20% of the total number of cars produced that years?

- (a) B (b) E
(c) D (d) A

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) : From the given table the total number of cars produced in the year 2015 = 100

20% of the 100 = $100 \times \frac{20}{100} = 20$

The number of type E cars is exactly 20% of the total number of cars produced in the year 2015.

154. The percentage decrease in the production of which type of car in 2017, with reference to 2016, was the maximum?

- (a) C (b) A
(c) E (d) D

SSC CGL (Tier-I)-2019 – 03/03/2020 (Shift-I)

Ans. (b) : In 2017 with reference to 2016
 For C, Required percentage = $\frac{4}{44} \times 100 = 9.09\%$
 For A, Required percentage = $\frac{24}{36} \times 100 = 66.67\%$
 For E, Required percentage = $\frac{22}{50} \times 100 = 44\%$
 For D, Required percentage = $\frac{16}{38} \times 100 = 42.1\%$
 Hence maximum reduction was recorded in type A car.

Direction (Q. No. 155-158):

The given table represents the revenue (in ₹ crores) of a company from the sale of four products A, B, C and D in 6 years. Study the table carefully and answer the question that follows.

Product \ Years	2012	2013	2014	2015	2016	2017
A	98	94	80	95	110	115
B	74	96	92	84	98	86
C	82	98	96	88	93	103
D	74	102	92	93	97	102

155. What is the ratio of the total revenue of the company in 2014 from the sale of all the four products to the total revenue from the sale of product C in 2014 to 2017?

- (a) 14 : 23 (b) 18 : 19
 (c) 7 : 10 (d) 7 : 9

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (b):
 Required ratio
 = $(80+92+96+92) : (96 + 88 + 93 + 103)$
 = $360 : 380 = 18 : 19$

156. The total revenue of the company from the sale of products B, C and D in 2014 is what percentage of the total revenue from the sale of products C and D in 6 years?

- (a) 18 (b) 20
 (c) 25 (d) 28

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (c) : The total revenue from the sale of products C and D in 6 years = $560 + 560 = 1120$
 The total revenue from the sale of products B, C and D in 2014 = $92 + 96 + 92 = 280$
 Required percentage = $\frac{280}{1120} \times 100 = 25\%$

157. By what percentage is the total revenue of the company from the sale of products A, B and D in 2012 and 2013 more than the total revenue from the sale of product B from 2013 to 2016? (Correct to one decimal place)

- (a) 31.2 (b) 43.6
 (c) 45.4 (d) 44.5

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (c) : The total revenue from the sale of products A, B and D in 2012 and 2013
 = $(98 + 74 + 74) + (94 + 96 + 102) = 538$
 The total revenue from the sale of product B from 2013 to 2016
 = $96 + 92 + 84 + 98 = 370$
 Required increase % = $\frac{168}{370} \times 100 = 45.4\%$

158. The number of years in which the revenue of the company from the sale of product D is more than the average revenue from the sale of product A over six years, is:

- (a) 4 (b) 2
 (c) 3 (d) 1

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-II)

Ans. (b) : Average revenue from the sale of product A over six years
 = $\frac{98+94+80+95+110+115}{6} = \frac{592}{6} = 98.66$
 Hence the sales of product D is more than the required average in the years 2013 and 2017.

(Direction)

159. During a medical check-up, the heights of 40 students in a class were recorded as shown in the following table.

Height (in cm)	Less than 175	Less than 170	Less than 165	Less than 160	Less than 155	Less than 150
Number of students	40	35	25	16	8	4

How many students have a height of 165 cm or more?

- (a) 15 (b) 25
 (c) 16 (d) 10

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) : Given,
 Total number of students in a class is 40,
 So, here the number of students row data given in cumulative frequency format.
 Student of height 170 -175 is $40 - 35 = 5$
 Student of height 165 -170 is $35 - 25 = 10$
 Number of students whose height 165 cm or more = $10 + 5 = 15$

160. The following table shows the daily earnings of 45 skilled workers.

Earnings (in Rs.)	700 - 800	800 - 900	900 - 1000	1000 - 1100	1100 - 1200	1200 - 1300
(No. of workers)	4	15	10	10	4	2

How many workers earn less than ₹1,100 in a day?

- (a) 43 (b) 29
 (c) 39 (d) 10

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (c) : The required number of workers = $4+15+10+10 = 39$

161. The number of students enrolled in different streams in a college is shown in the following table.

Science		Art		Commerce		Vocational	
Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
35	18	25	47	45	40	10	30

The ratio of the total number of boys to that of girls in the college is:

- (a) 27 : 23 (b) 23 : 27
(c) 13 : 12 (d) 1 : 1

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-II)

Ans. (a) : Required ratio = $(18 + 47 + 40 + 30) : (35 + 25 + 45 + 10)$
= 135 : 115
= 27 : 23

Direction (Q. No. 162-165):

The following table gives the details of Five commodities A, B, C, D and E with quantity required and their costs for a family in a month. Study the table and answer the questions that follows.

Item	Required amount (in kg)	Rate (in Rs)	
		Year 2016	Year 2019
A	15	₹60	₹80
B	20	₹50	₹60
C	12	₹35	₹40
D	40	₹75	₹85
E	8	₹64	₹72

162. The ratio of the total amount spent on A and D commodities in the year 2019 is:

- (a) 1 : 1 (b) 3 : 8
(c) 15 : 17 (d) 6 : 17

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (d) : Required ratio = $(15 \times 80) : (40 \times 85)$
= 6 : 17

163. The percentage of increase (per kg) in the rate of D commodities from 2016 to 2019 is:

- (a) 38.24% (b) 22.17%
(c) 13.33% (d) 5%

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (c) : Required increase percentage
= $\frac{10}{75} \times 100 = 13.33\%$

164. The total amount spent on the Five commodities by the family in the year 2019 is:

- (a) ₹6,856 (b) ₹5,400
(c) ₹7,248 (d) ₹8,122

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (a) : Total amount = $(15 \times 80) + (20 \times 60) + (12 \times 40) + (40 \times 85) + (8 \times 72)$
= 1200 + 1200 + 480 + 3400 + 576
= ₹6856.

165. The amount spent extra on commodities B and C in the year 2019 as compared to that in the year 2016, is:

- (a) ₹248 (b) ₹192
(c) ₹110 (d) ₹260

SSC CGL (Tier-I)-2019 – 06/03/2020 (Shift-III)

Ans. (d) : Extra amount = $20(60 - 50) + 12(40 - 35)$
= $20 \times 10 + 12 \times 5$
= $200 + 60 = ₹260$

166. The following table shows the age-wise brand ownership of mobile phone handsets.

Mobile Brand	1 year old	1 to 2 years old	2 to 5 years old	More than 5 years old
A	15%	45%	40%	
B	5%	15%	25%	55%
C	10%	10%	10%	70%
D	25%	55%	20%	
E	15%	50%	20%	15%

If a total of 5000 'C' mobile phone sets are sold till date, then how many are more than one year old?

- (a) 4350 (b) 4000
(c) 4200 (d) 4500

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (d) : Percentage of 'C' mobile phone sets more than one year old = $10 + 10 + 70 = 90\%$

Required number = $5000 \times \frac{90}{100} = 4500$

167. The following table shows the annual profit of a company (in ₹ lakh).

2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
625	690	725	775	815

The period which has the maximum percentage increase in profit over the previous year is:

- (a) 2016–2017 (b) 2017–2018
(c) 2018–2019 (d) 2015–2016

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (d) :

Required percentage increase for 2015-16

$$= \frac{65}{625} \times 100 = 10.4\%$$

Required percentage increase for 2016-17

$$= \frac{35}{690} \times 100 = 5.07\%$$

Required percentage increase for 2017-18

$$= \frac{50}{725} \times 100 = 6.89\%$$

Required percentage increase for 2018-19

$$= \frac{40}{775} \times 100 = 5.16\%$$

Hence the percentage increase in the year 2015-16 is maximum.

168. The following table shows the number of employees working in various departments of an organization from 2016 to 2019.

Years	Production	Marketing	Corporate	Research
2016	500	130	50	145
2017	940	146	60	140
2018	1000	160	70	146
2019	1010	150	75	150

In which year were the maximum number of employees working in the organization?

- (a) 2016 (b) 2019
(c) 2017 (d) 2018

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-II)

Ans. (b) :

Year	2016	2017	2018	2019
Total employee	825	1286	1376	1385

Hence the maximum number of employees was in the year 2019.

169. The following table showing the percentage of the total population of a state in different age groups.

Age group (in years)	Population (in percentage)
0–15	31
15–25	5.25
25–35	14.25
35–45	14.50
45–55	17.25
55 & above	17.75
Total	100

Out of every 50,000 people, find the approximate number of persons below the age of 35.

- (a) 25,230 (b) 25,250
(c) 26,250 (d) 26,260

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (b) : The number of persons below the age of 35 = $50000 \times (31 + 5.25 + 14.25) \%$
 $= 50000 \times \frac{50.5}{100} = 25250$

170. From the given table, what is the percentage of students scoring 40 or more, but less than 70.

Marks	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60	Less than 70	Less than 80
Number of students	12	19	22	31	38	46	50

- (a) 48% (b) 8%
(c) 96% (d) 56%

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (a)

Marks	Less than 20	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	12	7	3	9	7	8	4

Required percentage = $\left(\frac{9+7+8}{50}\right) \times 100$
 $= 48\%$

171. In a school, the distribution of teachers is as follows:

Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No of teachers	2	3	5	2	6	7	5

The total number of teachers of age less than 40 years is:

- (a) 12 (b) 10
(c) 39 (d) 18

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-I)

Ans. (a) : The total number of teachers of age less than 40 years = $2 + 3 + 5 + 2 = 12$

Direction (Q. No. 172-176):

The table given below shows the information about bats manufactured by 6 different companies. Each company manufactures only plastic and wooden bats. Each company labels these bats as Brand A or Brand B. The table shows the number of plastic bats as a percentage of total bats manufactured by each company. It also shows the ratio of wooden bats labeled A and B. Each company manufactured a total of 550000 bats.

Company	Plastic bats	Brand A : Brand B
R	55%	21 : 4
S	70%	8 : 7
T	45%	6 : 19
U	75%	41 : 14
V	60%	7 : 15
W	40%	5 : 6

172. What is the total number of wooden bats of brand A manufactured by company T ?

- (a) 23420 (b) 22990
(c) 68920 (d) 72600

SSC CGL (Tier-II) 20-02-2018

Ans. (d) : Total manufactured bats = 550000
 Wooden bats of brand A manufactured by company T = $550000 \times \frac{55}{100} \times \frac{6}{25}$
 $= 72600$

173. N = Wooden bats of Brand B manufactured by company U.

M = Total wooden bats manufactured by company R and W together.

What is the value of N/M ?

- (a) 0.043 (b) 0.061
(c) 0.125 (d) 0.087

SSC CGL (Tier-II) 20-02-2018

Ans. (b) : N = Wooden bats of Brand B manufactured by company U

$$= 550000 \times \frac{25}{100} \times \frac{14}{55}$$

$$= 35000$$

M = Total wooden bats manufactured by company R and W together

$$= 550000 \times \frac{45}{100} + 550000 \times \frac{60}{100}$$

$$= 247500 + 330000$$

$$= 577500$$

$$\frac{N}{M} = \frac{35000}{577500}$$

$$= 0.061$$

174. P = Sum of wooden bats of Brand B manufactured by S and wooden bats of Brand A manufactured by W.

Q = Difference of Brand B wooden bats and Brand A wooden bats manufactured by U.

What is the value of P-Q ?

- (a) 67500 (b) 177700
(c) 159500 (d) 123500

SSC CGL (Tier-II) 20-02-2018

Ans. (c) : $P = 550000 \times \frac{30}{100} \times \frac{7}{15} + 550000 \times \frac{60}{100} \times \frac{5}{11}$

$$= 77000 + 150000 = 227000$$

$$Q = 550000 \times \frac{25}{100} \times \left(\frac{41-14}{55} \right) = 67500$$

Hence the value of P - Q = 159500

175. Taking all 6 companies together, how many wooden bats of Brand A have been produced ?

- (a) 691000 (b) 724000
(c) 683000 (d) 716000

SSC CGL (Tier-II) 20-02-2018

Ans. (a) Wooden bats of Brand A manufactured by all the companies

$$= 550000 \left[\frac{45}{100} \times \frac{21}{25} + \frac{30}{100} \times \frac{8}{15} + \frac{55}{100} \times \frac{6}{25} + \frac{25}{100} \times \frac{41}{55} \right. \\ \left. + \frac{40}{100} \times \frac{7}{22} + \frac{60}{100} \times \frac{5}{11} \right]$$

$$= 207900 + 88000 + 72600 + 102500 + 70000 + 150000$$

$$= 691000$$

176. X = Average of plastic bats manufactured by V, U and T.

Y = Wooden bats of Brand A manufactured by V.

What is the value of X-Y ?

- (a) 197600 (b) 432890
(c) 260000 (d) 293300

SSC CGL (Tier-II) 20-02-2018

Ans. (c) :

$$X = \frac{550000 \times \frac{60}{100} + 550000 \times \frac{75}{100} + 550000 \times \frac{45}{100}}{3}$$

$$= \frac{330000 + 412500 + 247500}{3}$$

$$= 330000$$

$$Y = 550000 \times \frac{40}{100} \times \frac{7}{22} = 70000$$

Hence X-Y = 260000

Direction (Q. No. 177-179):

The table below shows the sales of milk in six different states as a percentage of total sales. In each state only two milkmen A and B sell the milk. The table below shows the sales of salesman A as percentage of total sale of milk in each state. The total sales of milk is 200000 litres.

State	Sales of milk	Sales by salesman A
P	24%	65%
Q	10%	80%
R	17%	50%
S	13%	70%
T	22%	60%
U	14%	80%

177. What are the average sales of milk (in liters) by the salesman A in all the given states ?

- (a) 21866.67 (b) 26466.6
(c) 19200 (d) 26000

SSC CGL (Tier-II) 18-02-2018

Ans. (a) : The average sales of milk by the salesman A in all the states

$$200000 \left[\frac{24}{100} \times \frac{65}{100} + \frac{10}{100} \times \frac{80}{100} + \frac{17}{100} \times \frac{50}{100} \right. \\ \left. + \frac{13}{100} \times \frac{70}{100} + \frac{22}{100} \times \frac{60}{100} + \frac{14}{100} \times \frac{80}{100} \right]$$

$$= \frac{20 [1560 + 800 + 850 + 910 + 1320 + 1120]}{6}$$

$$= \frac{20 \times 6560}{6}$$

$$= \frac{20 \times 6560}{6}$$

$$= 21866.67 \text{ liters.}$$

178. What is the respective ratio of sales of milk in state P and Q by salesman B and the sales of milk in state R and T by salesman A ?

- (a) 52 : 109 (b) 104 : 217
(c) 52 : 31 (d) 31 : 57

SSC CGL (Tier-II) 18-02-2018

Ans. (b) : Required Ratio

$$= 200000 \left[\frac{24}{100} \times \frac{35}{100} + \frac{10}{100} \times \frac{20}{100} \right] :$$

$$= 200000 \left[\frac{17}{100} \times \frac{50}{100} + \frac{22}{100} \times \frac{60}{100} \right]$$

$$= (840 + 200) : (850 + 1320)$$

$$= 1040 : 2170$$

$$= 104 : 217$$

179. What will be the central angle (in degrees) formed by the average sale of milk in state Q, T and S together?

- (a) 112.6 (b) 72
(c) 36 (d) 54

SSC CGL (Tier-II) 18-02-2018

Ans. (d) : The average sale of milk in state Q, T and S together =

$$\frac{10+22+13}{3} = \frac{45}{3} = 15\%$$

$$\therefore 100\% = 360^\circ$$

$$\therefore 15\% = 3.6 \times 15 = 54^\circ$$

Direction (Q. No. 180-184):

The given table shows the number (in percent) of employees working in different departments of an organization. The table also shows the ratio of males and females and the ratio of employees living in city Z and employees living in city Y. The total number of employees in the organization are 80000.

Department	Number of employees	Gender	City
		M:F	Z:Y
A	10%	7 : 3	1 : 9
B	22%	13 : 9	3 : 19
C	12%	1 : 2	5 : 1
D	20%	3 : 2	1 : 3
E	36%	8 : 1	5 : 13

180. Male employees of department E is what percent of the employees living in City Z from department A?

- (a) 1600 (b) 2400
(c) 3200 (d) 4200

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Number of employees in city Z of department A

$$= 80000 \times \frac{10}{100} \times \frac{1}{(1+9)}$$

$$= 800$$

Total number of male employees of department E

$$= 80000 \times \frac{36}{100} \times \frac{8}{8+1}$$

$$= 25600$$

$$\text{Required percentage} = \frac{25600}{800} \times 100$$

$$= 3200\%$$

181. What is the ratio of male employees working in department B and D together to female employees working in department A and E together?

- (a) 13 : 8 (b) 25 : 7
(c) 23 : 9 (d) 7 : 9

SSC CGL (Tier-II) 19-02-2018

Ans. (b) : Male employees working in department B =

$$80000 \times \frac{22}{100} \times \frac{13}{(13+9)} = 10400$$

Male employees working in department D

$$= 80000 \times \frac{20}{100} \times \frac{3}{(3+2)} = 9600$$

Female employees working in department

$$A = 80000 \times \frac{10}{100} \times \frac{3}{(7+3)} = 2400$$

Female employees working in department E

$$= 80000 \times \frac{36}{100} \times \frac{1}{(8+1)} = 3200$$

According to the question,

$$\text{Required ratio} = (10400+9600) : (2400+3200)$$

$$= 20000 : 5600$$

$$= 25 : 7$$

182. On an average how many residents of city Y are working in each department?

- (a) 11360 (b) 12420
(c) 9130 (d) 10940

SSC CGL (Tier-II) 19-02-2018

Ans. (a) : The employees residing in city Y of departments A, B, C, D and E =

$$80000 \left[\frac{10}{100} \times \frac{9}{10} + \frac{22}{100} \times \frac{19}{22} + \frac{12}{100} \times \frac{1}{6} + \frac{20}{100} \times \frac{3}{4} + \frac{36}{100} \times \frac{13}{18} \right]$$

$$= 800 [9 + 19 + 2 + 15 + 26]$$

$$= 800 \times 71 = 56800$$

$$\therefore \text{Average number of employees} = \frac{56800}{5} = 11360$$

183. What are the total number of employees in department A and E together?

- (a) 29400 (b) 17600
(c) 46400 (d) 36800

SSC CGL (Tier-II) 19-02-2018

Ans. (d) : Total number of employees working in

$$\text{department A} = 80000 \times \frac{10}{100} = 8000$$

Total number of employees working in department E

$$= 80000 \times \frac{36}{100} = 28800$$

Total number of employees in department A and E together = (8000+28800) = 36800

184. How many employees of department A and C together are living in city Z?

- (a) 9000 (b) 9200
(c) 8800 (d) 8200

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : Total number of employees in department A

$$= 80000 \times \frac{10}{100} = 8000$$

Employees in city Z of department A

$$= 8000 \times \frac{1}{(1+9)} = 800$$

Total number of employees in department C

$$= 80000 \times \frac{12}{100} = 9600$$

Total number of employees residing in city Z of

$$\text{department C} = 9600 \times \frac{5}{(5+1)} = 8000$$

Total number of employees residing in city Z of department A and C = 800+8000 = 8800

Direction (Q. No. 185-189):

The table given below shows the production of maize. Each state produces only maize and rice. There are three types of rice – R1, R2 and R3. The table also shows the R1 type of rice produced as a percentage of total rice production and the ratio of R2 and R3 type of rice. Total production by each state is 625000.

State	Maize	R1	R2 : R3
H	32%	60	6 : 11
R	62%	60	9 : 10
X	52%	60	3 : 5
S	52%	55	4 : 5
T	74%	80	3 : 10

185. What is the difference between the R1 type of rice produced by state X and the R2 type of rice produced by state H ?

- (a) 115000 (b) 120000
(c) 55000 (d) 65000

SSC CGL (Tier-II) 9-3-2018

Ans. (b) : The production of R1 type of rice produced by state X

$$= 625000 \times \frac{48}{100} \times \frac{60}{100}$$

The production of R2 type of rice produced by state H

$$= 625000 \times \frac{68}{100} \times \frac{40}{100} \times \frac{6}{17}$$

$$= 625000 \times \frac{24}{100} \times \frac{40}{100}$$

Required difference

$$= 625000 \left[\frac{48}{100} \times \frac{60}{100} - \frac{24}{100} \times \frac{40}{100} \right]$$

$$= 625000 \times \frac{1920}{10000}$$

$$= 120000$$

186. What is the sum of the total production of maize by state X and T and total production of R2 type of Rice by state S and R ?

- (a) 868500 (b) 1025000
(c) 925000 (d) 892500

SSC CGL (Tier-II) 9-3-2018

Ans. (d) : Total Production of maize by state X and T

$$= 625000 \left[\frac{52}{100} + \frac{74}{100} \right]$$

$$= 625000 \times \frac{126}{100}$$

Total Production of R2 type of rice by state S and R

$$= 625000 \left[\frac{48}{100} \times \frac{45}{100} \times \frac{4}{9} + \frac{38}{100} \times \frac{40}{100} \times \frac{9}{19} \right]$$

$$= 625000 \left[\frac{48}{100} \times \frac{20}{100} + \frac{18}{100} \times \frac{40}{100} \right]$$

Sum of the total production

$$= 625000 \left[\frac{126}{100} + \frac{960}{10000} + \frac{720}{10000} \right]$$

$$= 625000 \times \frac{14280}{10000} = 892500$$

187. Production of R3 type of rice by state X is what percentage of production of R1 type of rice by state S ?

- (a) 45.45 (b) 52.52
(c) 42.5 (d) 39.5

SSC CGL (Tier-II) 9-3-2018

Ans. (a) :

$$\text{Required Percentage} = \frac{625000 \times \frac{48}{100} \times \frac{40}{100} \times \frac{5}{8}}{625000 \times \frac{48}{100} \times \frac{55}{100}} \times 100$$

$$= \frac{200}{55 \times 8} \times 100 = 45.45\%$$

188. A = Average of the R3 type of rice produced by state H, R, S and X together

B = Difference between the R2 type of rice produced by state T and R1 type of rice produced by state R.

What is the value of B-A ?

- (a) 54750 (b) 56750
(c) 57500 (d) 57000

SSC CGL (Tier-II) 9-3-2018

Ans. (c) :

$$A = \frac{625000 \times \left[\frac{68}{100} \times \frac{40}{100} \times \frac{11}{17} + \frac{38}{100} \times \frac{40}{100} \times \frac{10}{19} + \frac{48}{100} \times \frac{45}{100} \times \frac{5}{9} + \frac{48}{100} \times \frac{40}{100} \times \frac{5}{8} \right]}{4}$$

$$A = \frac{625000 \left[\frac{44}{100} \times \frac{40}{100} + \frac{20}{100} \times \frac{40}{100} + \frac{48}{100} \times \frac{25}{100} + \frac{48}{100} \times \frac{25}{100} \right]}{4}$$

$$A = 625 \times [44 + 20 + 30 + 30] = 625 \times 124$$

$$B = 625000 \left[\frac{26}{100} \times \frac{20}{100} \times \frac{3}{13} - \frac{38}{100} \times \frac{60}{100} \right]$$

$$B = 625 \times 216$$

$$\therefore \text{Hence the value of } B - A = 625 \times 92 = 57500$$

189. F = Total production of R2 type of rice by all the states

K = Average of the total production of R1 type of rice by all the states

What is the value of K/F ?

- (a) 0.875 (b) 0.802
(c) 0.08 (d) 0.702

SSC CGL (Tier-II) 9-3-2018

Ans. (b) :

$$F = 625000 \left[\frac{68}{100} \times \frac{40}{100} \times \frac{6}{17} + \frac{38}{100} \times \frac{40}{100} \times \frac{9}{19} + \frac{48}{100} \times \frac{40}{100} \times \frac{3}{8} + \frac{48}{100} \times \frac{45}{100} \times \frac{4}{9} + \frac{26}{100} \times \frac{20}{100} \times \frac{3}{13} \right]$$

$$F = 625000 \left[\frac{24}{100} \times \frac{40}{100} + \frac{18}{100} \times \frac{40}{100} + \frac{18}{100} \times \frac{40}{100} + \frac{48}{100} \times \frac{20}{100} + \frac{6}{100} \times \frac{20}{100} \right]$$

$$F = 625 \times [96 + 72 + 72 + 96 + 12] = 625 \times 348$$

$$K = \frac{625000 \left[\frac{68}{100} \times \frac{60}{100} + \frac{38}{100} \times \frac{60}{100} + \frac{48}{100} \times \frac{60}{100} + \frac{48}{100} \times \frac{55}{100} + \frac{26}{100} \times \frac{80}{100} \right]}{5}$$

$$K = \frac{625 \times 1396}{5}$$

Hence the value of

$$\frac{K}{F} = \frac{625 \times 1396}{5} \times \frac{1}{625 \times 348} = 0.802$$

Direction (Q. No. 190-193):

The table given below shows the number of customers (in thousands) visiting 2 shopping complexes A and B from January 2017 to June 2017.

Month	Number of customers (in thousands)	
	Complex A	Complex B
January	20	22
February	25	24
March	15	20
April	25	28
May	14	20
June	20	15

190. What was the percentage change in number of customers of complex B from March to April?

- (a) 20 (b) 40
(c) 28 (d) 56

SSC MTS 9-10-2017 (Shift-I)

$$\text{Ans : (b) Required change} = \frac{28 - 20}{20} \times 100$$

$$= \frac{8}{20} \times 100 = 40\%$$

191. What is the maximum difference (in thousands) between the number of customers in the 2 complexes among the given months?

- (a) 5 (b) 6
(c) 8 (d) 4

SSC MTS 9-10-2017 (Shift-I)

$$\text{Ans : (b) Required difference in the month of January} = 22 - 20 = 2$$

$$\text{Required difference in the month of February} = 25 - 24 = 1$$

$$\text{Required difference in the month of March} = 20 - 15 = 5$$

$$\text{Required difference in the month of April} = 28 - 25 = 3$$

$$\text{Required difference in the month of May} = 20 - 14 = 6$$

$$\text{Required difference in the month of June} = 20 - 15 = 5$$

Hence the maximum difference of the number of customers in both the complexes = 6

192. What is the total number of customers (in thousands) in the 2 complexes in the month of April?

- (a) 52 (b) 53
(c) 50 (d) 56

SSC MTS 9-10-2017 (Shift-I)

$$\text{Ans : (b) The total number of customers in the 2 complexes in the month of April} = 25 + 28 = 53$$

193. What is the average number of customers (in thousands) in complex B from February to May?

- (a) 22 (b) 24
(c) 23 (d) 25

SSC MTS 9-10-2017 (Shift-I)

Ans : (c)

The average number of customers in complex B from February to May

$$= \frac{24 + 20 + 28 + 20}{4} = \frac{92}{4} = 23$$

Direction (Q. No. 194-197):

The table given below shows the number of students who have taken admission in school A and B from the years 2010 to 2015.

Year	School	
	A	B
2010	428	392
2011	442	410
2012	480	423
2013	436	428
2014	465	456
2015	452	450

194. What is the average difference of number of students in school A and B in the given period?

- (a) 24 (b) 27
(c) 96 (d) 144

SSC MTS 11-10-2017 (Shift-I)

Ans : (a)

Average number of students of school A

$$= \frac{428 + 442 + 480 + 436 + 465 + 452}{6} = \frac{2703}{6} = 450.5$$

Average number of students of school B

$$= \frac{392 + 410 + 423 + 428 + 456 + 450}{6} = \frac{2559}{6} = 426.5$$

$$\text{Required average difference} = 450.5 - 426.5 = 24$$

195. The difference between the number of students in both schools maximum in which year?

- (a) 2010 (b) 2012
(c) 2014 (d) 2015

SSC MTS 11-10-2017 (Shift-I)

Ans : (b) From the given options-

$$\text{Year 2010} \Rightarrow 428 - 392 = 36$$

$$2011 \Rightarrow 442 - 410 = 32$$

$$2012 \Rightarrow 480 - 423 = 57$$

$$2014 \Rightarrow 465 - 456 = 9$$

$$2015 \Rightarrow 452 - 450 = 2$$

Hence the difference is maximum in 2012.

196. If the total student intake capacity for school B was 500 then what percentage of seats remained vacant in school B in 2015?

- (a) 1% (b) 5%
(c) 10% (d) 20%

SSC MTS 11-10-2017 (Shift-I)

Ans : (c)

Percentage of vacant seats in school B in

$$2015 = \frac{500 - 450}{500} \times 100$$

$$= \frac{50}{500} \times 100 = 10\%$$

197. Across all the years, for how many years, the number of students in school A was less than the average number of students in school B?

- (a) 0 (b) 1
(c) 2 (d) 3

SSC MTS 11-10-2017 (Shift-I)

Ans : (a) Average of students of school B

$$= \frac{\text{Sum of total numbers}}{\text{Total numbers}}$$

$$= \frac{392 + 410 + 423 + 428 + 456 + 450}{6}$$

$$= \frac{2559}{6}$$

$$= 426.5$$

Hence, the number of students of each year in school A was not less than 426.5 in any year.

Direction (Q. No. 198-200):

The Table shows the number of candidates appearing for an interview for a post in six Banks (H, I, J, K, L, M) and percentage of qualifying candidates

Banks	Candidates Appearing	Percentage of Candidates Qualifying
H	1500	14
I	2200	26
J	3000	17
K	980	20
L	1200	28
M	2500	21

198. The number of candidates who did not qualify in bank K was approximately what percent (correct to nearest integer) of the candidates who did not qualify in bank I?

- (a) 42 (b) 48
(c) 44 (d) 51

SSC MTS 13/08/2019 (Shift-I)

Ans. (b): The number of candidates who did not qualify in bank K = $980 \times \frac{80}{100} = 784$

The number of candidates who did not qualify in bank

$$I = 2200 \times \frac{74}{100} = 1628$$

Required percentage

$$= \frac{\text{Non-qualified in bank K}}{\text{Non-qualified in bank I}} \times 100 = \frac{784}{1628} \times 100$$

$$= 48.15 \approx 48\%$$

199. What was the average number of candidates who appeared for the interview in bank H, J and L together?

- (a) 1900 (b) 1500
(c) 1800 (d) 2000

SSC MTS 13/08/2019 (Shift-I)

Ans. (a) : The average number of candidates who appeared for the interview in bank H, J and L together

$$= \frac{1500 + 3000 + 1200}{3}$$

$$= \frac{5700}{3}$$

$$= 1900$$

200. What was the respective ratio of the number of candidates who qualified in bank H to the number of candidates who qualified in bank L?

- (a) 2 : 5 (b) 3 : 7
(c) 5 : 8 (d) 5 : 6

SSC MTS 13/08/2019 (Shift-I)

Ans. (c) :

$$\frac{\text{Number of candidates who qualified in bank H}}{\text{Number of candidates who qualified in bank L}}$$

$$= \frac{\frac{1500 \times 14}{100}}{\frac{1200 \times 28}{100}} = \frac{15 \times 14}{12 \times 28} = \frac{5}{8} = 5 : 8$$

Direction (Q. No. 201-203):

The Table shows the number of T-20 matches played, runs scored, 50s and 100s scored by four Indian batsmen in a particular year.

Player	Matches Played	Runs Scored	50s	100s
Virat	16	900	4	3
Rohit	20	840	5	1
Shikhar	25	1050	6	2
Suresh	12	450	4	0

201. The difference between average runs per match scored by Shikhar and average runs per match scored by Rohit is:

- (a) 1 (b) 18
(c) 0 (d) 20

SSC MTS 09/08/2019 (Shift-I)

Ans. (c) : Required difference = $\frac{1050}{25} - \frac{840}{20}$

$$= 42 - 42$$

$$= 0$$

202. Total number of runs scored by all four batsmen is:

- (a) 3240 (b) 1620
(c) 1450 (d) 1500

SSC MTS 09/08/2019 (Shift-I)

Ans. (a) : Total number of runs scored by all batsmen

$$= 900 + 840 + 1050 + 450$$

$$= 3240$$

203. What is the average of the total number of runs scored by all four batsmen together?

- (a) 820 (b) 800
(c) 810 (d) 790

SSC MTS 09/08/2019 (Shift-I)

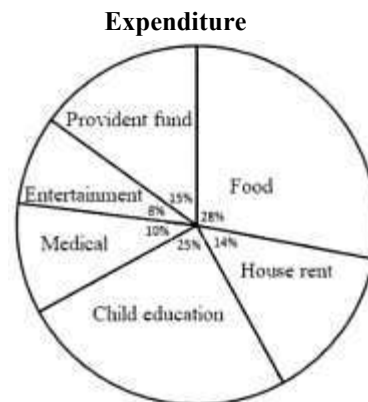
Ans. (c) : Required average = $\frac{900 + 840 + 1050 + 450}{4}$

$$= \frac{3240}{4}$$

$$= 810$$

(III) Problems based on Pie-Chart

204. The pie-chart given below shows the monthly expenditures made by a family under different heads as percentages of the total monthly income of the family. If the total monthly income of the family is ₹70,000, then what is the monthly expenditure incurred by the on house rent?



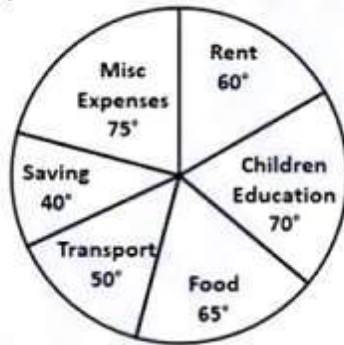
- (a) ₹9,600 (b) ₹9,500
(c) ₹9,700 (d) ₹9,800

SSC CHSL 26/05/2022 (Shift- III)

Ans. (d) : According to the question,
 Total monthly income of family = ₹70000
 \therefore 14% expenditure on house rent
 $= \frac{70000 \times 14}{100} = ₹9800$
 Hence, ₹9800 is the monthly expenditure on house rent.

205. Monthly expenditure of a family on different heads is shown in the following pie chart. The amount spent on Children Education, Transport and Rent is what percentage of the total earnings?

Expenditure on different Heads

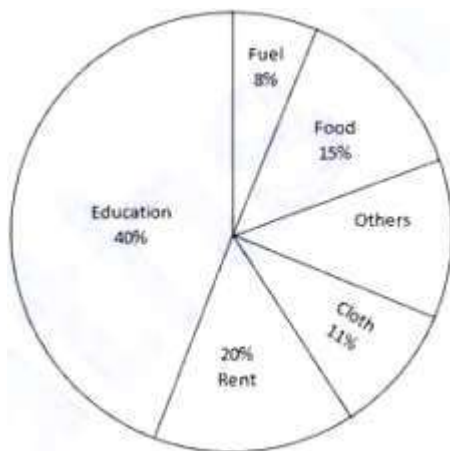


- (a) 45% (b) 55%
 (c) 40% (d) 50%

SSC CGL (Tier-I) 11/04/2022 (Shift-I)

Ans. (d) Required percentage = $\frac{70 + 50 + 60}{360} \times 100 = 50\%$

206. The following pie chart shows the expenditure incurred by a person during a period under different heads as percentage of the total expenditure incurred by the person during the same period.



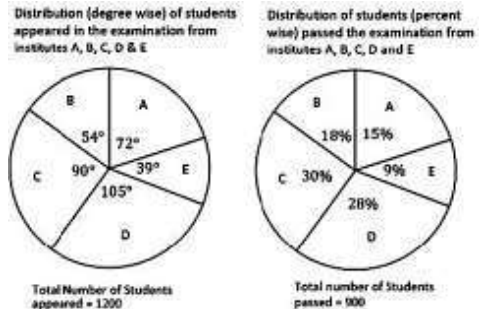
What is the ratio of the expenditure incurred by the person on food and on rent?

- (a) 4 : 3 (b) 8 : 3
 (c) 3 : 4 (d) 5 : 2

SSC CHSL 01/06/2022 (Shift- III)

Ans. (c) : According to the question,
 Required Ratio = Food : Rent
 $= 15 : 20$
 $= 3 : 4$

207. Study the given pie charts and answer the question that follows.



The number of students who passed the examination from institute D exceeds the number of students who appeared from institute A is x. The value of x lies between.

- (a) 11 and 14 (b) 5 and 8
 (c) 14 and 17 (d) 8 and 11

SSC CGL (Tier-II) 29/01/2022

Ans : (a) According to the Pie chart,
 Number of students who passed the examination from institute D
 $= 900 \times \frac{28}{100}$
 $= 252$
 Number of students who appeared from institute A
 $= \frac{1200}{360} \times 72$
 $= 240$
 Required difference = 252 - 240
 $= 12$
 Hence, value of x lies between 11 and 14.

208. The given pie chart shows a country's expenditure on various sports during a particular year. Study the pie chart and answer the question given below:



If the total amount spent on sports in the year was ₹4.2 crores, then the amount spent on football and hockey together was:

- (a) ₹2.47 crores (b) ₹1.47 crores
 (c) ₹1.45 crores (d) ₹1.35 crores

SSC MTS 18/10/2021 (Shift-I)

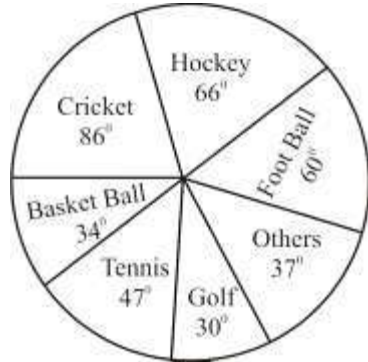
Ans. (b) : Total amount = 4.2 crores
 Amount spent on football and hockey

$$= \frac{4.2}{360^\circ} \times (60^\circ + 66^\circ)$$

$$= \frac{4.2}{360} \times 126$$

$$= ₹1.47 \text{ crore}$$

209. The given pie chart shows a country's expenditure on various sports during a particular year. Study the pie chart and answer the question given below.



If the total amount spent on sports was ₹3.6 crores, then the average amount on hockey, cricket and basketball was:

- (a) ₹56 lakhs (b) ₹62 lakhs
 (c) ₹60 lakhs (d) ₹65 lakhs

SSC MTS 18/10/2021 (Shift-I)

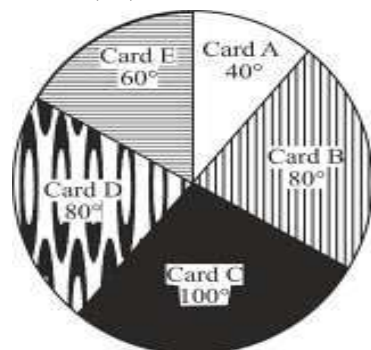
Ans. (b) : Total amount spent on sports = ₹3.6 crores or ₹36000000 -----[Given]
 Average amount spent on Hockey, Cricket and Basketball.

$$= \frac{36000000}{360 \times 3} \times (66 + 86 + 34)$$

$$= 100000 \times \frac{186}{3}$$

$$= 6200000 = ₹62 \text{ lakhs}$$

210. The pie chart shows the money spent by Aditya through credit cards of different banks. The total money spent by him through credit cards in year is ₹3,60,000



How much more money was spent through card C as compared to card D?

- (a) ₹ 2,000 (b) ₹ 40,000
 (c) ₹ 20,000 (d) ₹ 1,80,000

SSC CHSL 05/08/2021 (Shift-I)

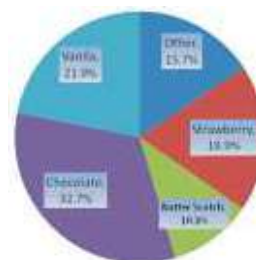
Ans. (c) : Required Amount = $360000 \times \frac{(100^\circ - 80^\circ)}{360^\circ}$
 = ₹20000

211. Study the given pie-charts and answer the question that follows:

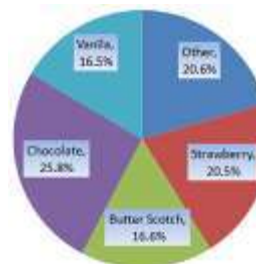
The pie-charts represent the popularity of ice-cream flavours among families in the years 2019 and 2020.

If 1% increase resulted in annual additional sales of ₹10,000, then how much (in ₹) did the combined Strawberry, Other and Butterscotch sales increase from 2019 to 2020?

2019



2020



- (a) 1,23,000 (b) 1,32,000
 (c) 3,12,000 (d) 2,13,000

SSC CHSL 05/08/2021 (Shift-I)

Ans. (a) : Total increase in required Strawberry, Other and Butterscotch sales.

$$= (20.5 - 18.9)\% + (20.6 - 15.7)\% + (16.6 - 10.8)\%$$

$$= (1.6 + 4.9 + 5.8)\% = 12.3\%$$

According to the question,

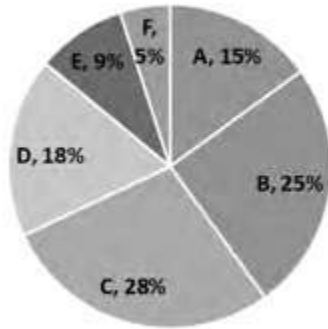
$$\therefore 1\% = 10000$$

$$\therefore 12.3\% = \frac{10000}{1} \times 12.3 = ₹123000$$

212. Study the given pie-chart and answer the question that follows.

The pie-chart represents the percentage distribution of candidates qualified in a bank examination from six different districts of a state in 2016. The total number of qualified candidates from the state is 68000.

The percentage distribution of candidates qualified for a bank examination from six districts A, B, C, D, E, and F of a State



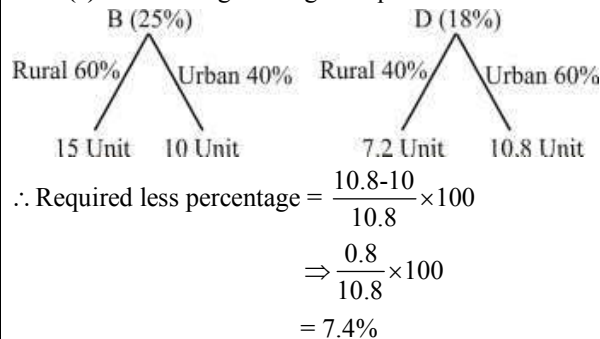
Districts = A = B = C = D = E = F

Out of the total selected candidates from Districts B and D, rural candidates are 60% and 40%, respectively. The number of selected urban candidates from B is what percent (up to one decimal place) more/less than the number of selected urban candidates from D?

- (a) More, 7.4 (b) More, 7.5
(c) less, 7.4 (d) less, 7.5

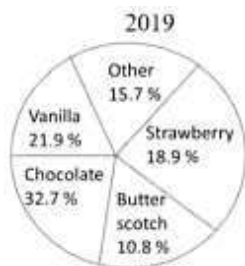
SSC CHSL 15/04/2021 (Shift-I)

Ans. (c) : According to the given question:-



213. Study the given pie chart and answer the question that follows.

The pie chart represents the popularity of ice-cream flavours among families in the year 2019.



In 2019, if 20% of the 'other' category was Anjeer flavour and 4082 people preferred Anjeer flavour, then how many people were surveyed?

- (a) 1,40,000 (b) 1,30,000
(c) 1,50,000 (d) 1,25,000

SSC CHSL 15/04/2021 (Shift-I)

Ans. (b) : According to the given question:

Other = 15.7%

↓ 20% Anjeer flavour

$$\therefore 15.7 \times \frac{20}{100} = 3.14\% \text{ people}$$

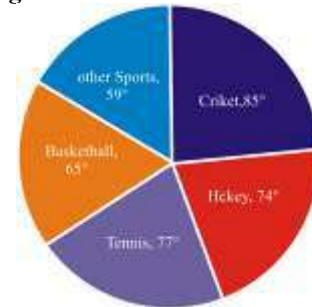
∴ Given 3.14% = 4082

$$1\% = 1300$$

$$\begin{aligned} \text{Total number of people surveyed} &= 100\% \\ &= 100 \times 1300 \\ &= 130000 \text{ people} \end{aligned}$$

214. The pie chart given below represents the expenditure of a country on various sports during 2015. Study the pie chart and answer the question that follows.

Note: the figure is not drawn to scale.



What percentage of the total expenditure is spent on cricket and tennis taken together, during 2015?

- (a) 50% (b) 23.6%
(c) 45% (d) 21.4%

SSC MTS 22/10/2021 (Shift-I)

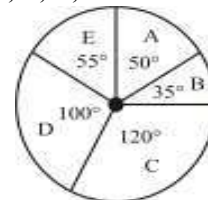
Ans. (c) : Total expenditure on cricket and tennis = $85^\circ + 77^\circ = 162^\circ$

$$\text{Intended percentage} = \frac{162^\circ \times 100}{360^\circ}$$

$$= 9 \times 5 = 45\%$$

215. Study the pie chart that shows the quantity wise sales distribution of given product (A, B, C, D and E) of a company in 2019 and answer the question that follows.

Quantity wise sales distribution of five products A, B, C, D and E.



If 2100 units of product were sold in 2019 and the total number of units sold by the company in 2020 was 28% more than in 2019, then how many units were sold by the company in 2020?

- (a) 8576 (b) 7428
(c) 6300 (d) 8064

SSC CHSL 19/04/2021 (Shift-I)

Ans. (d) : Total number of units of product were sold by C in 2019.

$$\therefore 120^\circ = 2100$$

$$1^\circ = \frac{2100}{120} = 17.5$$

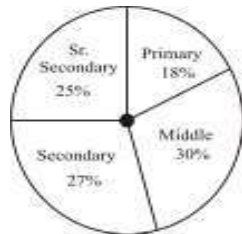
Total number of units of all product sold by company in 2019 = $360 \times 17.5 = 6300$

According to the question,

Total number of units of product sold by the company in 2020, 28% more than the number of units of product sold in 2019.

$$= 6300 \times \frac{128}{100} = 8064$$

- 216. Students of Primary, Middle, Secondary and Sr. Secondary classes collected donation for a Relief Fund as shown in the given pie chart. If the donation collected from Middle classes was ₹6,750, then how much more money was collected by Middle classes as compared to Secondary classes?**



- (a) ₹ 6,075 (b) ₹ 1,125
(c) ₹ 675 (d) ₹ 2,025

SSC CHSL 10/08/2021 (Shift-I)

Ans. (c) : $\therefore 30\% = ₹6750$

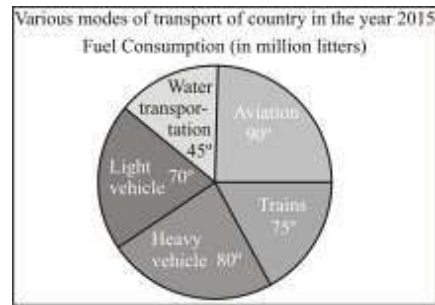
$$(30-27)\% = 3\% = \frac{6750}{30} \times 3 = ₹675$$

Hence, Required amount = ₹675

- 217. Study the given pie-chart and answer the question that follows.**

The pie-chart represents the consumption of fuel (in million litres) by various modes of transport of a country X in the year 2015. The total consumption of fuel by various modes of transport of the country in 800 million litres.

(The data shows here is only for mathematical exercise. They do not represent the actual figure of the country.)



To obtain fuel energy is required to run the machinery, which is to be produced by burning coal.

If 1 tonne of coal is burnt to produce 0.4 million litres of oil, then approximately what is the requirement of coal (in tonnes) for the Trains sector?

- (a) 417 (b) 415
(c) 418 (d) 420

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) : $360^\circ \rightarrow 800$ ml (million litres)

$$1^\circ \rightarrow \frac{200}{90} = \frac{20}{9} \text{ ml (million litres)}$$

$\therefore 1 \text{ tonne} = 0.4 \text{ ml (million litres)}$

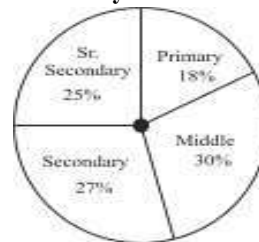
$$1 \text{ tonne} = \frac{2}{5} \text{ ml (million litres)}$$

So, $1^\circ = \frac{20}{9} \times \frac{5}{2} = \frac{50}{9} \text{ tonnes}$

According to the question,

$$75^\circ \rightarrow \frac{50}{9} \times 75^\circ = 416.6 \approx 417 \text{ tonnes}$$

- 218. Students of Primary, Middle, Secondary and Sr. Secondary classes collected donation for a Relief Fund as shown in the pie chart. If the donation collected from Middle classes was ₹ 6,750, then how much money was collected by the Primary Classes?**



- (a) ₹ 4,050 (b) ₹ 4,005
(c) ₹ 4,500 (d) ₹ 3,960

SSC CHSL 04/08/2021 (Shift-I)

Ans. (a) :

Donation collected by middle class students = ₹6750

Percentage of middle class students = 30%

$$30\% = 6750$$

$$1\% = 225$$

Percentage of primary class students = 18%

Money collected by primary classes $18 \times 225 = ₹4050$

219. Study the given pie-chart and answer the question that follows.

The pie-chart represents the consumption of fuel (in million litres) by various modes of transport of a country X in the year 2015. The total consumption of fuel by various modes of transport of the country is 800 million litres.

(The data shown here is only for mathematical exercise. They do not represent the actual figures of the country.)



The fuel consumed by light vehicles is approximately what percentage of the combined consumption of fuel for aviation and waterways?

- (a) 52 (b) 20
(c) 68 (d) 55

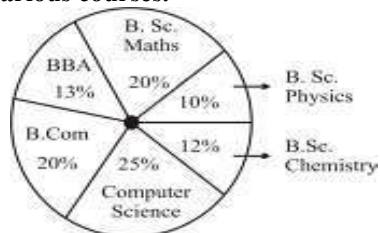
SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) : Required percentage = $\left(\frac{70}{90+45}\right) \times 100$
 $= \frac{70}{135} \times 100 = 51.85\% \approx 52\%$

220. Study the given pie chart and answer the question follows.

Total number of students admitted in a college = 700.

Distribution of the percentage of students in various courses.



Percentage-wise distribution of the number of boys.

Course	Number of boys
B.Sc. Maths	40%
B.Sc. Physics	68%
B.Sc. Chemistry	58%
B.Sc. Computer Science	80%
B. Com	75%
BBA	65%

The ratio of the total number of girls admitted in B.Sc. Maths to the total number of students admitted in B.Sc. Maths is:

- (a) 3 : 7 (b) 3 : 5
(c) 4 : 7 (d) 2 : 5

SSC CHSL 12/08/2021 (Shift-I)

Ans. (b) : Given,
 Total number of students = 700
 Total number of girls admitted in B.Sc maths =
 $= 700 \times \frac{20}{100} \times \frac{60}{100} = 84$
 Total number of student admitted in B.Sc Maths =
 $700 \times \frac{20}{100}$
 Required ratio = 84 : 140
 3 : 5

221. Study the given pie chart and answer the question that follows.

The pie chart shows the distribution (degree wise) of the number of computers sold by a shopkeeper during five months.

Total number of computers sold = 5400



If the difference between the number of computers sold in May and the number of computers sold in February is x, then the value of x will be:

- (a) 480 (b) 420
(c) 540 (d) 450

SSC CHSL 12/08/2021 (Shift-I)

Ans. (a) : Given,
 Total number of computers sold in May = 5400
 According to the question,
 Then,
 Difference = $5400 \times \frac{77}{360} - 5400 \times \frac{45}{360}$
 $x = 5400 \times \frac{32}{360} = 540 \times \frac{8}{9} = 480$

222. The given pie chart represents the percentage-wise distribution of 300 students of class X in a school in six different sections A, B, C, D, E and F.



The given table shows the number of boys of class X in six different sections A, B, C, D, E and F.

Section	A	B	C	D	E	F
No. of boys	36	26	34	28	---	20

If in section E, the ratio of boys and girls is 4 : 3, then the ratio of the number of girls in section B to that of the number of girls in section E is:

- (a) 15 : 8 (b) 13 : 8
(c) 13 : 9 (d) 14 : 9

SSC CHSL 13/04/2021 (Shift-I)

Ans. (d) :

$$\text{Number of students in section E} = \frac{300 \times 14}{100} = 42$$

$$\text{Number of girls in section E} = 42 \times \frac{3}{7} = 18$$

$$\begin{aligned} \text{Number of girls in section B} &= 300 \times \frac{18}{100} - 26 \\ &= 54 - 26 = 28 \end{aligned}$$

$$\text{Required ratio} = 28 : 18 = 14 : 9$$

223. The given pie charts represent the distribution of candidates who enrolled for a bank clerical examination and the candidates (out of those enrolled) who passed the examination, from five different institutes P, Q, R, S and T. Study the pie charts and answer the question that follows.

(i) Total number of candidates who enrolled for the examination from five institutes = 5500

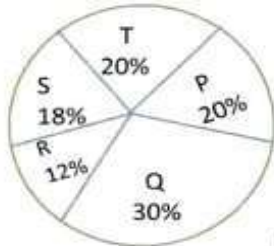


Fig. (I)

(ii) Total number of candidates who passed the examination from five institutes = 3300

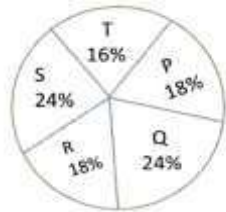


Fig. (II)

The average number of candidates passed from institutes P and Q together is what percentage of the total number of candidates enrolled from institutes P and Q together?

- (a) 24.6% (b) 25.8%
(c) 30% (d) 25.2%

SSC CHSL 12/04/2021 (Shift-II)

Ans : (d) Average number of candidates passed from institutes P and Q = $\frac{42 \times 3300}{2 \times 100}$
= 693

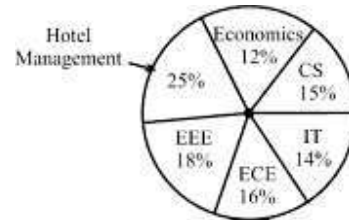
Total number of candidates enrolled from institutes P and Q = $50 \times \frac{5500}{100} = 2750$

Required percentage = $\frac{693}{2750} \times 100$
= 25.2%

Direction (Q. No. 224-226):

Study the following pie chart and answer the question. Total number of students admitted in a university in various fields = 5000

Distribution of the number of students into various fields :



Fields	No. of Boys
Economics	56%
CS	44%
IT	65%
ECE	72%
EEE	68%
Hotel Management	80%

224. The ratio of the number of boys in Economics to the number of students in Economics is:

- (a) 14 : 25
(b) 17 : 25
(c) 13 : 25
(d) 12 : 25

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (a) : Required ratio

$$= \frac{5000 \times \frac{12}{100} \times \frac{56}{100}}{5000 \times \frac{12}{100}} = \frac{56}{100} = \frac{14}{25}$$

225. What is average number of boys in CS, ECE and EEE fields ?

- (a) 514 (b) 516
(c) 406 (d) 506

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (d) : Number of students admitted in a university in various fields = 5000
100% = 5000
1% = 50.

$$\text{Number of Boys in CS} = 15 \times 50 \times \frac{44}{100} = 7.5 \times 44$$

$$\text{Number of boys in ECE} = 16 \times 50 \times \frac{72}{100} = 8 \times 72$$

$$\text{Number of boys in EEE} = 18 \times 50 \times \frac{68}{100} = 9 \times 68$$

$$\begin{aligned} \text{Average number of boys} \\ = \frac{7.5 \times 44 + 8 \times 72 + 9 \times 68}{3} = \frac{1518}{3} = 506 \end{aligned}$$

226. What is the difference between the number of girls in IT and number of girls in ECE?

- (a) 30 (b) 25
(c) 21 (d) 20

SSC CGL (Tier-II)-2019 – 18/11/2020

Ans. (c) :

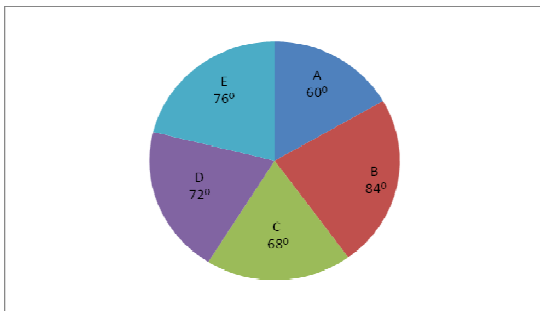
$$\text{Number of girls in IT} = 5000 \times \frac{14}{100} \times \frac{35}{100} = 245$$

$$\text{Number of girls in ECE} = 5000 \times \frac{16}{100} \times \frac{28}{100} = 224$$

$$\text{Hence Required difference} = 245 - 224 = 21$$

Direction (Q. No. 227-2229):

The given pie-chart shows the break-up of total marks obtained by a student in five subjects A, B, C, D and E. The maximum marks in each subject is 150 and he obtained a total of 600 marks.



227. In how many subjects did the student obtain more than his average score?

- (a) 4 (b) 3
(c) 1 (d) 2

SSC CGL (Tier-II) 13-09-2019

$$\text{Ans. (d) : Average marks} = \frac{600}{5} = 120$$

$$\begin{aligned} \text{Central angle of Average marks} &= \frac{120}{600} \times 360 \\ &= 72^\circ \end{aligned}$$

Hence students obtained more than the average marks in 2 subject (B and E).

228. The total marks obtained by the student in subjects C and E is approximately how much percent more than what he obtained in A and D together?

- (a) 10.25% (b) 9.09%
(c) 8.33% (d) 7.26%

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$$\text{Central angle of total marks obtained in subject C and E} = 68^\circ + 76^\circ = 144^\circ$$

$$\text{Central angle of total marks obtained in subject A and D} = 60^\circ + 72^\circ = 132^\circ$$

$$\text{Required percentage} = \frac{12^\circ}{132^\circ} \times 100 = 9.09\%$$

229. What is the difference between the marks obtained by the student in the subject B and D.

- (a) 27 (b) 20
(c) 30 (d) 12

SSC CGL (Tier-II) 13-09-2019

$$\text{Ans. (b) : } \because 360^\circ = 600$$

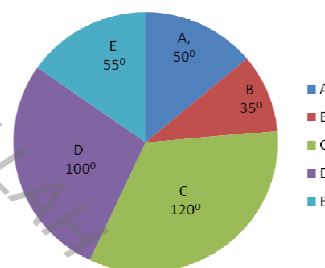
$$(84^\circ - 72^\circ) = 12^\circ = \frac{600}{360} \times 12 = 20$$

The difference between the marks obtained by the students in the subjects B and D is 20.

Direction (Q. No. 230-232):

The given pie chart shows the quantity wise sales distribution of five products (A, B, C, D and E) of a company in 2016.

Quantity wise sales distribution of five products (A, B, C, D and E)



230. In 2016, if a total of 14616 units were sold, then the number of units of products D sold was :

- (a) 4872 (b) 4060
(c) 4263 (d) 4096

SSC CGL (Tier-II) 12-09-2019

$$\text{Ans. (b) : } 360^\circ = 14616$$

$$1^\circ = \frac{14616}{360}$$

$$\therefore 100^\circ = \frac{14616}{360} \times 100 = 4060$$

$$\therefore \text{Hence number of units of product D sold} = 4060$$

231. If 1500 units of product D were sold in 2016 and the total number of units sold by the company in 2017 was 18% more than that sold in 2016, then the total units sold by the company in 2017 is :

- (a) 6372 (b) 6390
(c) 6336 (d) 6354

SSC CGL (Tier-II) 12-09-2019

Ans. (a) : Total units of product D were sold in 2016 = 1500 units
 $\therefore 100^0 = 1500$
 $1^0 = 15$ units
 Total units of product sold in 2016 = $15 \times 360 = 5400$ units
 \therefore According to the question, units of product sold in 2017 = $5400 \times \frac{118}{100} = 54 \times 118 = 6372$ units

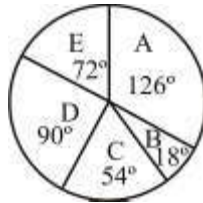
- 232. If 320 units of product A were sold by the company, then how many units of products B and E together were sold by the company ?**
 (a) 567 (b) 640
 (c) 512 (d) 576

SSC CGL (Tier-II) 12-09-2019

Ans. (d) : \therefore Central angle of B and E = 90^0
 $\therefore 50^0 = 320$ units
 $90^0 = \frac{320}{50^0} \times 90^0 = 576$ units

Direction (Q. No. 233-234):

The given pie chart shows the breakup of total number of the employees of a company working in different offices (A, B, C, D, and E).
 Total No. of employees = 2400



- 233. What is the number of offices in which the number of employees of the company is between 350 and 650?**
 (a) 2 (b) 3
 (c) 4 (d) 1

SSC CGL (Tier-II) 11-9-2019

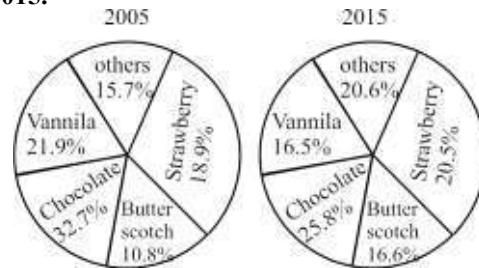
Ans. (b) : Total number of employees in office A = $\frac{126^0}{360^0} \times 2400 = 840$
 Total number of employees in office B = $\frac{18^0}{360^0} \times 2400 = 120$
 Total number of employees in office C = $\frac{54^0}{360^0} \times 2400 = 360$
 Total number of employees in office D = $\frac{90^0}{360^0} \times 2400 = 600$
 Total number of employees in office E = $\frac{72^0}{360^0} \times 2400 = 480$
 Hence required number = 3

- 234. If 40% of the number of employees in office A are shifted equally to office B and E, then what is the difference between the number of employees in B and C ?**
 (a) 130 (b) 72
 (c) 120 (d) 82

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :
 Central angle of 40% employees in office A = $126 \times 40\% = 126 \times \frac{2}{5} = \frac{252}{5} = 50.4^0$
 Central angle of employees in office B after transferring = $18 + 25.2^0 = 43.2^0$
 Difference (in central angle) = $54^0 - 43.2^0 = 10.8^0$
 Required difference = $2400 \times \frac{10.8}{360} = 72$

- 235. The given pie charts represent the popularity of ice-cream flavours in the years 2005 and 2015.**



If a percentage point shift results in annual additional sales of ₹5,000, how much (in ₹), did the combined annual Strawberry and Butterscotch sales increase from 2005 to 2015?

- (a) 37,000 (b) 10,000
 (c) 74,000 (d) 65,000

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (a) : The total percentage of Strawberry and Butterscotch in the year 2005 = $(18.9 + 10.8)\% = 29.7\%$
 The total percentage of Strawberry and Butterscotch in year 2015 = $(20.5 + 16.6)\% = 37.1\%$
 Total percentage increase from year 2005 to 2015 = $(37.1 - 29.7)\% = 7.4\%$
 $\therefore 1\% = 5000$
 $\therefore 7.4\% = 5000 \times 7.4 = ₹37000$

- 236. The given pie chart represents the popularity of ice-cream flavours in the year 2015.**



In 2015, if the total sale of Chocolate flavour is for ₹5,160, then the total sale (in ₹) for Vanilla flavour is:

- (a) 4,120 (b) 3,300
(c) 4,100 (d) 5,160

SSC CPO-SI 25/11/2020 (Shift-I)

Ans. (b) : Total sale of Chocolate flavour in year 2015 = 5160

$$\therefore 25.8\% = 5160$$

$$\therefore 16.5\% = \frac{5160}{25.8} \times 16.5 = 3300$$

Hence the total sale for vanilla flavour is ₹3300.

Direction (Q. No. 237-239):

The following pie chart shows percentage expenditure of a country on different heads. The total expenditure is ₹1,680 (in billions). Study the chart and answer the question:



237. The total amount of expenditure for Education and Health (in billions ₹) is:

- (a) 84 (b) 126
(c) 186 (d) 168

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (d) : The total amount of expenditure for Education and Health

$$= \left(\frac{6+4}{100} \right) \times 1680$$

$$= 168 \text{ (in billions)}$$

238. The central angle of the sector representing expenditure on Subsidy is :

- (a) 108.3° (b) 75.6°
(c) 54.9° (d) 90°

SSC CPO-SI 24/11/2020 (Shift-II)

Ans. (b) : Central angle of the sector representing

$$\text{expenditure on subsidy} = \frac{21}{100} \times 360^\circ = 75.6^\circ$$

239. The amount of expenditure of Defence is what percentage more than the expenditure on Education?

- (a) 50% (b) 150%
(c) 125% (d) 100%

SSC CPO-SI 24/11/2020 (Shift-II)

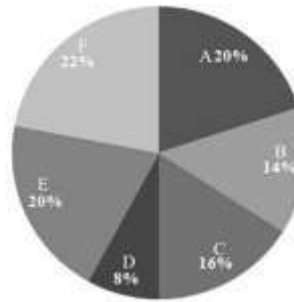
Ans. (d):

$$\text{Required percentage} = \frac{12-6}{6} \times 100 = 100\%$$

Direction (Q. No. 240-245):

The given pie chart shows the percentage distribution of 450 employees in an organisation. Read the pie chart and answer the question that follows.

Percentage of Employees in different Departments (Total 450 Employees)



240. If 75% of the employees in department D are males, how many female employees are there in that department??

- (a) 18 (b) 27
(c) 9 (d) 36

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (c): Total employees in department D =

$$450 \times \frac{8}{100} = 36$$

$$\therefore \text{Female employees in department D} = 36 \times \frac{25}{100} = 9$$

241. What is the number of employees working in department F?

- (a) 36 (b) 99
(c) 72 (d) 63

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (b) : The number of employees working in department F

$$= 450 \times \frac{22}{100} = 99$$

242. What is the central angle of the sector representing the number of employees in department E?

- (a) 72° (b) 108°
(c) 90° (d) 36°

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) : $\therefore 100\% = 360^\circ$

\therefore The central angle of the sector representing the number of employees in department E

$$(20\%) = \frac{360}{100} \times 20$$

$$= 72^\circ$$

243. What is the central angle of the sector representing the number of employees in department A?
- (a) 72° (b) 108°
(c) 36° (d) 90°

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (a) : Percentage of number of employees in department A = 20%

$$\text{Central angle of the sector of } 20\% = \frac{360^\circ}{100} \times 20 = 72^\circ$$

244. What is the number of employees working in department B?

- (a) 72 (b) 36
(c) 90 (d) 63

SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (d) : Percentage of employees in department B = 14%

$$\text{Required number of employees} = 450 \times \frac{14}{100} = 63$$

245. If 60% of the employees in department E are females, how many male employees are there in that department?

- (a) 54 (b) 36
(c) 72 (d) 18

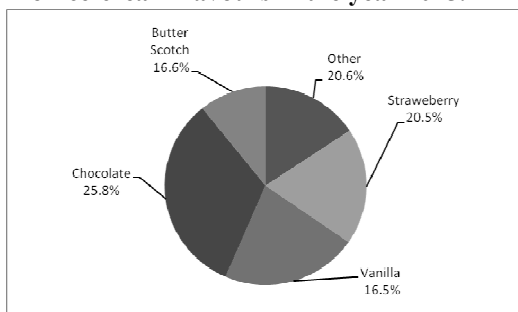
SSC CPO-SI 23/11/2020 (Shift-II)

Ans. (b) : Total employees in department E = $450 \times \frac{20}{100} = 90$

$$\text{Then the number of male employees} = 90 \times \frac{40}{100} = 36$$

Direction (Q. No. 246-247):

The given pie chart represents the popularity of ice-cream flavours in the year 2015.



246. In 2015, if the total sale of vanilla flavour is for ₹3,300, then the total sale (in ₹) for chocolate flavour is :
- (a) 3,320 (b) 4,100
(c) 4,120 (d) 5,160

SSC CPO-SI 23/11/2020 (Shift-I)

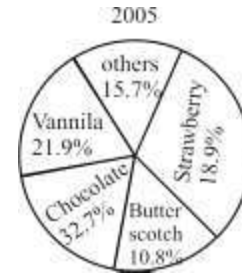
Ans. (d) : Percentage of total sale of vanilla flavour in the year 2015 = 16.5% = ₹3,300

$$1\% = \frac{3300}{16.5} = 200$$

$$1\% = 200$$

$$\begin{aligned} \text{Hence the sale of chocolate flavour} \\ &= 25.8 \times 200 \\ &= 5160 \end{aligned}$$

247. The given pie chart represents the popularity of ice-cream flavours in the year 2005.



In 2005, if 10% of the 'other' category is mix fruit flavour and 1570 people surveyed preferred mix fruit flavour, then how many people were surveyed ?

- (a) 1,50,000 (b) 1,75,000
(c) 1,00,000 (d) 4,00,000

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (c) : In year 2005,

$$\begin{aligned} \text{Mix fruit flavour} &= 15.7 \times \frac{10}{100} \\ &= 1.57\% \end{aligned}$$

$$\therefore 1.57\% = 1570$$

$$1\% = 1000$$

$$100\% = 1,00,000$$

Hence, survey was conducted on 100,000 people.

Direction (Q. No. 248-250):

Study the pie-chart and answer the question.

Distribution (degree-wise) of the number of employees of a company working in 5 departments A, B, C, D and E.



248. The number of employees working in department C is what percentage more than the total number of employees working in D and E? (Your answer should be correct to one decimal place)

- (a) 23.2% (b) 21.4%
(c) 22.8% (d) 20.6%

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) The number of employees working in department C = $\frac{122.4^{\circ}}{360^{\circ}} \times 3200 = 1088$

The number of employees working in department D and

$$E = \frac{(64.8^{\circ} + 36^{\circ})}{360^{\circ}} \times 3200 = 896$$

$$\text{Required percentage} = \frac{1088 - 896}{896} \times 100$$

$$= \frac{19200}{896} = 21.4\%$$

249. If the ratio of male employees and female employees working in department D is 4:5 and that in department E is 9:11, then what is the ratio of the total male employees in D and E to the number of employees in B?

- (a) 31 : 32 (b) 25 : 32
(c) 15 : 16 (d) 7 : 8

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (b) Central angle of all male employees working

$$\text{in department D and E} = 64.8^{\circ} \times \frac{4}{9} + 36^{\circ} \times \frac{9}{20}$$

$$= 28.8^{\circ} + 16.2^{\circ} = 45^{\circ}$$

Total number of employees in department B = 57.6

Required ratio = $45 : 57.6 = 25:32$

250. If the total number employees working in departments A and B exceeds the number of employees in department C by x, then x lies between:

- (a) 80 & 100 (b) 100 & 120
(c) 120 & 140 (d) 140 & 160

SSC CPO-SI – 09/12/2019 (Shift-II)

Ans. (c) The total number of employees of company = 3200

$$\therefore 360^{\circ} = 3200$$

$$1^{\circ} = \frac{3200}{360} = \frac{80}{9}$$

$$\text{Required difference} = \frac{(79.2 + 57.6 - 122.4) \times 80}{9}$$

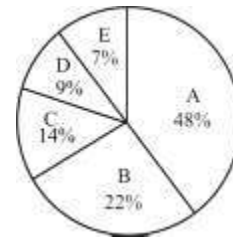
$$x = 14.4 \times \frac{80}{9}$$

$$x = 128$$

Hence the value of x lies between 120 and 140.

Direction (Q. No. 251-252):

The given pie-chart represents the distribution of the percentage of sales of a particular brand of car from five showrooms A, B, C, D and E during 2018. The total number of cars sold during that year from the five showrooms is 5000.



251. What is the central angle (nearest to 0.1 degree) of the sector corresponding to the sales from the showrooms C?

- (a) 60.5° (b) 50.4°
(c) 56.7° (d) 48.6°

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b) The central angle of the sector corresponding to the sales from the showroom C

$$= \frac{360^{\circ}}{100} \times 14 = 50.4^{\circ}$$

252. What is the total number of cars from the showrooms B and D?

- (a) 1650 (b) 1550
(c) 1450 (d) 1750

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (b) The total number of cars from the showrooms

$$B \text{ and } D = 5000 \times \frac{(22+9)}{100} = 1550$$

Direction (Q. No. 253-255):

Study the pie chart and answer the question.

Distribution (degree wise) of the number of computers sold by a shopkeeper during five months

Total Number of Computers Sold = 5400



253. If the difference between the number of computers sold in March and the number of computers sold in January is x, then x lies between:

- (a) 300 & 350 (b) 150 & 200
(c) 250 & 300 (d) 200 & 250

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (d) $\therefore 360^{\circ} = 5400$

$$1^{\circ} = \frac{5400}{360} = 15$$

The difference between central angle of computers sold in March and January = $99^{\circ} - 85^{\circ} = 14^{\circ}$

$$\therefore x = 15 \times 14 = 210$$

Hence the value of x lies between 200 & 250.

254. The number of months, in which the number of computers sold was above 20% of the total number of computers sold in 5 months, was:

- (a) 1 (b) 3
(c) 4 (d) 2

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (b) 20% of 5400 = 1080

Number of computers sold in January

$$= \frac{85^\circ}{360^\circ} \times 5400 = 1275$$

Number of computers sold in February

$$= \frac{45^\circ}{360^\circ} \times 5400 = 675$$

Number of computers sold in March

$$= \frac{99^\circ}{360^\circ} \times 5400 = 1485$$

Number of computers sold in April

$$= \frac{54^\circ}{360^\circ} \times 5400 = 810$$

Number of computers sold in May

$$= \frac{77^\circ}{360^\circ} \times 5400 = 1155$$

Therefore, the number of computers sold in January, March and May was more than 20% of the total number of computers sold.

255. The total number of computers sold in February and April is what percentage more than the number of computers sold in May? (Your answer should be correct to one decimal place.)

- (a) 25.8 (b) 26.4
(c) 28.6 (d) 30.2

SSC CPO-SI – 11/12/2019 (Shift-II)

Ans. (c) Central angle of number of computers sold in February and April = $45^\circ + 54^\circ = 99^\circ$

Central angle of numbers of computer sold in May = 77°

$$\text{Required Percentage} = \frac{22}{77} \times 100 = 28.57\% \approx 28.6$$

Direction (Q. No. 256-257):

Study the given pie chart and answer the question that follows.



Total = 5200

256. If the total number of students in schools D and E exceeds the number of students in school A by x, then x lies between:

- (a) 525 & 550 (b) 475 & 500
(c) 550 & 575 (d) 500 & 525

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (d) Central angle of the total number of students in school D and E = $64.8 + 57.6 = 122.4$

The central angle of number of students in school A = 86.4°

$$x = \left(\frac{122.4 - 86.4}{360^\circ} \right) \times 5200$$

$$x = 520$$

Hence the value of x lies between 500 & 525.

257. If the ratio of the number of boys to that of girls in school B is 7:6 and the ratio of the number of boys to that of girls in school D is 4:5, then what is the ratio of the number of boys in B to that of girls in D?

- (a) 13 : 14 (b) 14 : 13
(c) 12 : 13 (d) 13 : 12

SSC CPO-SI – 11/12/2019 (Shift-I)

Ans. (b)

Central angle of the number of boys in School B

$$= \frac{7}{13} \times 72^\circ$$

Central angle of the number of girls in School D

$$= \frac{5}{9} \times 64.8^\circ = 5 \times 7.2$$

$$\text{Required ratio} = \left(\frac{7}{13} \times 72^\circ \right) : (5 \times 7.2)$$

$$= 14 : 13$$

Direction (Q. No. 258-260):

Study the pie-chart and answer the question.

Distribution (degree wise) of the number of employees of a company working in five departments



Total Number of Employees = 1400

258. If 80% of the number of employees working in the IT department and 40% of the number of employees working in both the HR and Accounts departments are females, then total number of female employees working in these three departments is _____.

- (a) 364 (b) 332
(c) 312 (d) 344

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (a) The number of female employees working in

$$\text{IT department} = \frac{72^{\circ}}{360^{\circ}} \times 1400 \times \frac{80}{100} = 224$$

The number of female employees working in HR and Accounts departments

$$= \frac{32.4^{\circ} + 57.6^{\circ}}{360^{\circ}} \times 1400 \times \frac{40}{100} = 140$$

$$\text{Required number of female employees} = 224 + 140 = 364$$

259. The total number of employees of the company working in production and IT department exceeds the total number of employees working in the Marketing and Accounts departments by _____.

- (a) 164 (b) 158
(c) 154 (d) 143

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (c) The total number of employees working in production of the company + IT department

$$= \frac{111.6^{\circ} + 72^{\circ}}{360^{\circ}} \times 1400 = \frac{183.6}{360} \times 1400 = 714$$

The number of employees working in Marketing and

$$\text{Accounts departments} = \frac{86.4^{\circ} + 57.6^{\circ}}{360^{\circ}} \times 1400 = 560$$

$$\text{Required number} = 714 - 560 = 154$$

260. The number of employees working in Marketing department is what percent more than the number of employees working in IT department?

- (a) 16.67 (b) 18.33
(c) 22 (d) 20

SSC CPO-SI 13/12/2019 (Shift-II)

Ans. (d) The number of employees working in

$$\text{Marketing department} = \frac{86.4^{\circ}}{360^{\circ}} \times 1400$$

$$= 24 \times 14 = 336$$

Number of employees working in IT department

$$= \frac{72^{\circ}}{360^{\circ}} \times 1400 = 280$$

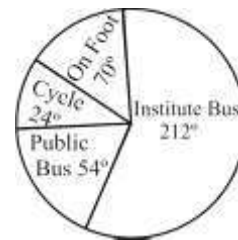
$$\text{Required percentage} = \frac{336 - 280}{280} \times 100 = \frac{56}{280} \times 100 =$$

20%

Direction (Q. No. 261-262):

Study the pie-chart and answer the question.

In an institute, there are 900 students who use different modes of transport to and from travel. The given pie diagram represents the requisite data.



261. The number of students who do NOT use the institute bus is:

- (a) 420 (b) 370
(c) 360 (d) 350

SSC CHSL -26/10/2020 (Shift-III)

Ans. (b) : Number of institute bus = $\frac{900}{360} \times 212 = 530$

∴ The number of students who do not use the institute bus = $900 - 530 = 370$

262. The number of students who travel on foot is:

- (a) 175 (b) 150
(c) 225 (d) 180

SSC CHSL -26/10/2020 (Shift-III)

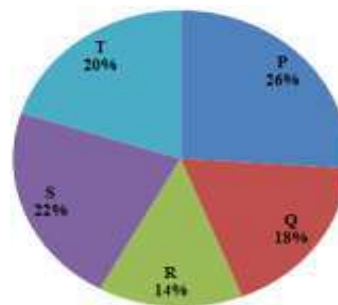
Ans. (a) : The total number of students = 900

The number of students who travel on foot

$$900 \times \frac{70}{360} = 175$$

Direction (Q. No. 263-264):

The following pie-chart shows the percentage-wise distribution of the number of students in five different schools P, Q, R, S and T. The total number of students in all five schools together is 8400.



263. Find the average number of students in schools R and S together:

- (a) 1510 (b) 1612
(c) 1512 (d) 1620

SSC CHSL -26/10/2020 (Shift-II)

Ans. (c) : Average number of the students of school R

$$\text{and S} = \frac{14 + 22}{2} = 18\%$$

Average number of required students =

$$8400 \times \frac{18}{100} = 1512$$

264. The number of students in school T is what percentage of the total number of students in schools Q and S together?

- (a) 40% (b) 50%
(c) 45% (d) 55%

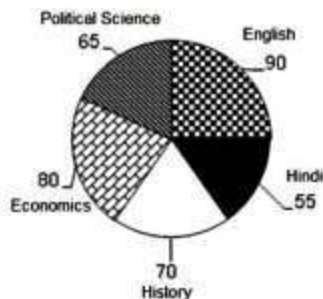
SSC CHSL –16/10/2020 (Shift-I)

Ans. (b):

$$\begin{aligned} \text{Required percentage} &= \frac{20}{(18+22)} \times 100 \\ &= \frac{20}{40} \times 100 = 50\% \end{aligned}$$

(Direction)

265. The following Pie chart shows the marks (in degrees) scored by a student in different subjects – English, Hindi, History, Economics and Political Science – in an examination. Total marks obtained in the examination are 600. Observe the chart and answer the question



What is the difference between marks scored in History and marks scored in Hindi?

- (a) 30 (b) 40
(c) 15 (d) 25

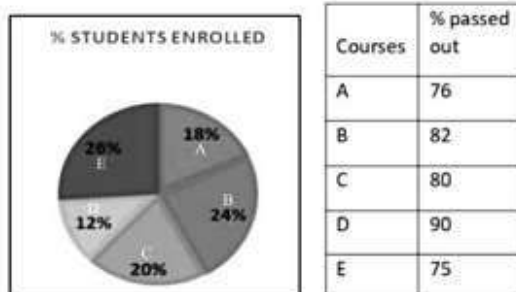
SSC CHSL –16/10/2020 (Shift-I)

Ans. (d) : $360^\circ = 600$

$$70^\circ - 55^\circ = 15^\circ = \frac{600}{360} \times 15 = 25$$

Hence required difference = 25

266. The given pie chart shows the percentage of students enrolled for the courses A, B, C, D and E in a university and the table shows the percentage of students that passed, out of the enrolled students.



If the total number of student is 60000, then the total number of students who did not pass in the courses A, C is:

- (a) 7628 (b) 7852
(c) 4992 (d) 8254

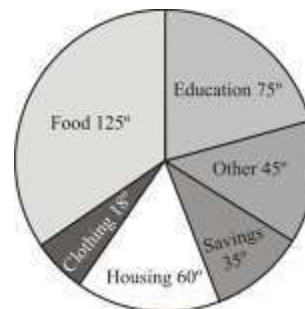
SSC CHSL –14/10/2020 (Shift-II)

Ans. (c) : The total number of students who did not pass in the courses A, C

$$\begin{aligned} &= 60000 \times \frac{18}{100} \times \frac{24}{100} + 60000 \times \frac{20}{100} \times \frac{20}{100} \\ &= 2592 + 2400 = 4992 \end{aligned}$$

Direction (Q. No. 267-268):

The following pie-chart shows the monthly expenditure incurred by a family on various items, and their savings. Study the chart and answer the question that follows.



267. If the monthly income is ₹64,800, then the yearly savings are:

- (a) ₹70,500 (b) ₹75,000
(c) ₹72,500 (d) ₹75,600

SSC CHSL –26/10/2020 (Shift-I)

Ans. (d) : $\therefore 360^\circ = 64800$

$$\therefore 35^\circ = \frac{64800}{360} \times 35 = 6,300$$

Yearly savings = $6300 \times 12 = ₹75,600$

268. If the expenditure on Education is 2,700 more than that on Housing, then the total expenditure on Food and Clothing is:

- (a) ₹27,540 (b) ₹27,450
(c) ₹25,740 (d) ₹25,400

SSC CHSL –26/10/2020 (Shift-I)

Ans. (c) : Expenditure on Education = 75°

Expenditure on Housing = 60°

Difference = $75^\circ - 60^\circ = 2700$

$$1^\circ = 2700$$

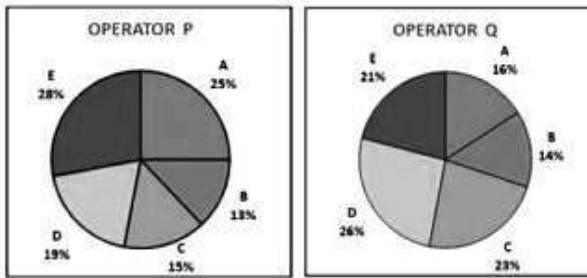
$$1^\circ = 180$$

Total expenditure on Food and Clothing = $125^\circ + 18^\circ = 143^\circ$

$$= 143 \times 180$$

Total expenditure = ₹25,740

269. The percentage of customers of two network operators P and Q across the cities A, B, C, D, E is shown in the given pie charts



Based on the information in the given pie charts, if the customers of operator P are 3.6 lakhs, and the customers of operator Q are 4.2 lakhs, then in the city C, the positive difference between the customers of the operators is :

- (a) 44,500 (b) 42,600
(c) 52,000 (d) 48,000

SSC CHSL –13/10/2020 (Shift-I)

Ans. (b) : Number of customers of operator P = 360000

Then number of customers of operator in the city C = $360000 \times \frac{15}{100} = 54,000$

Number of customers of operator Q = 420000

Then the number of customer of operator Q in the city C

$$= 420000 \times \frac{23}{100} = 96,600$$

The positive difference between the customers of the operators in the city C = $96,600 - 54,000 = 42,600$

270. The following pie chart shows the ratio of the amount of imports by a company to the amount of exports from that company from 2013 to 2019.



If the imports in 2016 were ₹250 million and the total exports in the years 2016 and 2017 together were ₹500 million, then the imports in 2017 were :

- (a) ₹420 million (b) ₹520 million
(c) ₹320 million (d) ₹620 million

SSC CHSL –13/10/2020 (Shift-II)

Ans. (a) : The ratio of imports and exports in 2016 = $1.25 = \frac{5}{4}$

Exports in the year 2016 = $\frac{250}{5} \times 4 = 200$ million

Total exports in the year 2017 = $500 - 200 = 300$ million

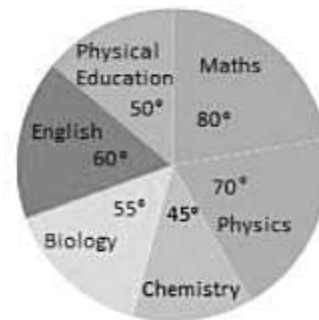
Ratio of imports and exports in the year 2017 = $1.4 = \frac{7}{5}$

Total imports in the year 2017 = $\frac{300}{5} \times 7$ million = 420 million

Direction (Q. No. 271-274):

The given pie chart shows the marks obtained in an examination by a student (in degrees). Observe the pie chart and answer the question that follows.

Mark obtained in examination



271. If the total marks are 720, then the marks obtained in Mathematics are:

- (a) 120 (b) 140
(c) 80 (d) 160

SSC CHSL –19/03/2020 (Shift-III)

Ans. (d) : \therefore Sum of all subjects = 360°

$\therefore 360^\circ = 720$

$\therefore 1^\circ = \frac{720}{360} = 2$

\therefore The marks obtained in Mathematics $80^\circ = 80 \times 2 = 160$

272. If total marks are 720, then the marks obtained in Chemistry, Biology and Maths together is what percentage of the total marks?

- (a) 40% (b) 30%
(c) 60% (d) 50%

SSC CHSL –19/03/2020 (Shift-III)

Ans. (d) : Sum of the marks obtained in Chemistry, Biology and Maths = $45^\circ + 55^\circ + 80^\circ = 180^\circ$
 \therefore Hence, Required percentage = $\frac{180^\circ}{360^\circ} \times 100 = 50\%$

273. If the total marks are 720, then the difference between the total marks obtained in Physics, Maths and Physical education and the total marks in Chemistry, Biology and English out of the total marks is:

- (a) 110 (b) 90
 (c) 80 (d) 100

SSC CHSL –19/03/2020 (Shift-III)

Ans. (c) : Sum of the marks obtained in Physics, Maths and Physical education = $70^\circ + 80^\circ + 50^\circ = 200^\circ$
 Again the sum of the marks obtained in Chemistry, Biology and English = $45^\circ + 55^\circ + 60^\circ = 160^\circ$
 Hence the difference between the total marks obtained in these two groups

$$= 200^\circ - 160^\circ = 40^\circ \left[\begin{array}{l} \because 360^\circ = 720 \\ 1^\circ = 2 \end{array} \right]$$

$$= 40 \times 2 = 80$$

274. If the total marks are 720, then the marks obtained in English is what percentage of the marks obtained in Maths?

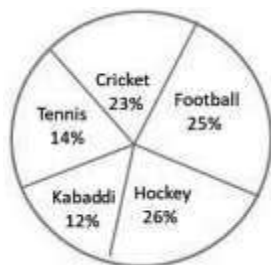
- (a) 60% (b) 75%
 (c) 55% (d) 50%

SSC CHSL –19/03/2020 (Shift-III)

Ans. (b) : \therefore Required Percentage = $\frac{60}{80} \times 100 = 75\%$

Direction (Q. No. 275-276):

The given pie-chart represents the percentage of students enrolled in five different sports. The total number of students is 2800.



275. What is the average number of students enrolled in Hockey and Tennis together?

- (a) 560 (b) 540
 (c) 460 (d) 580

SSC CHSL –20/10/2020 (Shift-I)

Ans: (a) Required average percentage = $\frac{26+14}{2} = 20\%$
 Required number of students = $2800 \times \frac{20}{100} = 560$

276. If 24 students playing Cricket are shifted to Kabaddi, then find the new ratio of the number of students in Cricket to those in Kabaddi.

- (a) 31 : 16
 (b) 31 : 18
 (c) 30 : 17
 (d) 30 : 13

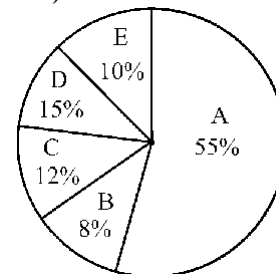
SSC CHSL –20/10/2020 (Shift-I)

Ans : (b) Total number of students playing Cricket = $2800 \times \frac{23}{100} = 644$
 Total number of students playing Kabaddi = $2800 \times \frac{12}{100} = 336$
 According to the question,
 Required ratio = $(644-24) : (336+24)$
 $= 620 : 360$
 $= 31 : 18$

Direction (Q. No. 277-278):

Study the following pie-chart and answer the given question.

The pie-chart shows Budget Expenditure of a company in the year 2018 (percentage distribution) on different heads A, B, C, D & E.



277. If ₹165 crore were spent in year 2018 on A, what would have been the total expenditure for that year (in ₹crores)?

- (a) ₹320 (b) ₹400
 (c) ₹350 (d) ₹300

SSC CHSL –20/10/2020 (Shift-II)

Ans: (d) $55\% = ₹165$ (in crores)
 $100\% = \frac{165}{55} \times 100 = ₹300$ crore
 Total expenditure (in crores) = ₹300

278. The central angle of the sector representing expenditure on head D is:

- (a) 52° (b) 54°
 (c) 56° (d) 45°

SSC CHSL –20/10/2020 (Shift-II)

Ans : (b) $100\% = 360^\circ$

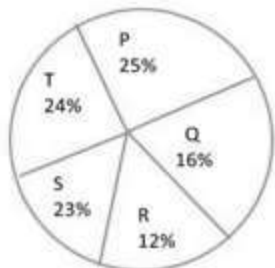
$$15\% = \frac{360^\circ}{100} \times 15 = 54^\circ$$

Central angle of sector on D = 54°

Direction (Q. No. 279-280):

The pie-chart shows the percentage-wise distribution of the number of students in five different schools P, Q, R, S and T. The total number of students in all five schools together is 10,500.

Study the pie-chart and answer the question.



279. The difference between the central angles corresponding to schools T and R is:

- (a) 43.2° (b) 34.5°
 (c) 42.8° (d) 44°

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a) Percentage of students in school T = 24%

Percentage of students in school R = 12%

Difference = $(24 - 12)\% = 12\%$

$$= \frac{360 \times 12}{100} = \frac{4320}{100} = 43.2^\circ$$

Difference between the central angles.

280. The number of students in school R is what percentage of the total number of students in schools Q and T together?

- (a) 30% (b) 35%
 (c) 40% (d) 25%

SSC CHSL -21/10/2020 (Shift-II)

Ans. (a) Percentage of students in school R = 12%

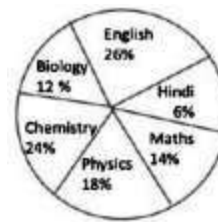
Total number of students in schools Q and T together = $16 + 24$

$$= 40\%$$

$$\text{Total percentage} = \frac{12}{40} \times 100 = 30\%$$

Direction (Q. No. 281-282):

The pie-chart shows percentage-wise distribution of teacher who teach six different subjects. Study the pie chart and answer the question.



Total number of teachers = 1650

281. What is the difference between the total number of teachers who teach Physics and Maths and the total number of teachers who teach Chemistry and Biology?

- (a) 76 (b) 66
 (c) 60 (d) 68

SSC CHSL -21/10/2020 (Shift-I)

Ans. (b) The total number of teachers who teach Physics and Maths = 1650 of $(18 + 14)\%$

$$= 1650 \text{ of } 32\%$$

The total number of teachers who teach Chemistry and Biology = 1650 of 36%

Hence the required difference = 1650 of $(36 - 32)\%$

$$= 1650 \times \frac{4}{100} = 66$$

282. What is the total number of teachers teaching English, Maths and Physics?

- (a) 957 (b) 857
 (c) 975 (d) 950

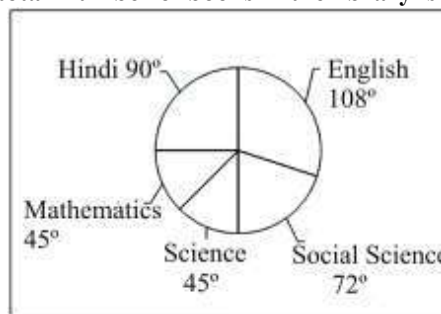
SSC CHSL -21/10/2020 (Shift-I)

Ans. (a) The total number of teachers teaching English, Maths and Physics = $1650 \times \frac{(26 + 14 + 18)}{100}$

$$= 1650 \times \frac{58}{100} = 957$$

Direction (Q. No. 283-286):

The pie chart given below shows the number of books of 5 different subjects in a library. The total number of books in the library is 360.



283. How many books of English are there in the library?

- (a) 75 (b) 180
 (c) 108 (d) 1080

SSC MTS 9-10-2017 (Shift-III)

Ans : (c) Total number of books in the library = 360
 $\therefore 360^\circ = 360$
 $\therefore 108^\circ = 108$
 \therefore Number of books of English = 108

284. Which 2 subject's books are present in equal number in the library?

- (a) English and Social Science
- (b) Hindi and Mathematics
- (c) English and Hindi
- (d) Mathematics and Science

SSC MTS 9-10-2017 (Shift-III)

Ans : (d) The central angle for Mathematics and Science books is 45° .
Hence, there are equal number of books of Mathematics and Science in the library.

285. What is the difference between the number of books of English and that of Social Science?

- (a) 72
- (b) 36
- (c) 108
- (d) 90

SSC MTS 9-10-2017 (Shift-III)

Ans : (b) $\therefore 360^\circ = 360$ (Total books)
 $1^\circ = 1$
 $\therefore 108^\circ - 72^\circ = 36^\circ = 36$ books
 \therefore Required difference = 36

286. What is the total number of books of Hindi and Social Science?

- (a) 198
- (b) 135
- (c) 160
- (d) 162

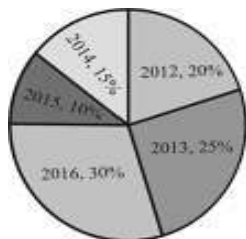
SSC MTS 9-10-2017 (Shift-III)

Ans : (d) $\therefore 360^\circ = 360$
 $\therefore 90^\circ + 72^\circ = 162^\circ = 162$ books
 \therefore The total number of books of Hindi and Social Science = 162

Direction (Q. No. 287-289):

The following pie chart shows the percent of selected candidates in an examination conducted from 2012-2016

Total number of selected candidates = 720



287. What is the total number of selected candidates in year 2012 and 2014?

- (a) 250
- (b) 180
- (c) 252
- (d) 144

SSC MTS 21/08/2019 (Shift-I)

Ans. (c) : The total number of selected candidates = 720

Selected candidates in year 2012 and 2014 = $20 + 15 = 35\%$

$$\text{Required total number} = \frac{720 \times 35}{100} = 252$$

288. In which year the number of selected candidates is equal to taken together the total number of selected candidates for year 2012 and 2015?

- (a) 2014
- (b) 2016
- (c) 2013
- (d) 2012

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : The total number of selected candidates = 720

Selected candidates in year 2012 = 20%

Selected candidates in year 2015 = 10%

Selected candidates in both the year 2012 and 2015 = 30%

Which is equal to the selected candidates in the year 2016.

289. The selected candidates in 2015 is what percent less than the selected candidates in 2013?

- (a) 45%
- (b) 60%
- (c) 50%
- (d) 40%

SSC MTS 21/08/2019 (Shift-I)

Ans. (b) : Selected candidates in year 2015 = 10%

Selected candidates in year 2013 = 25%

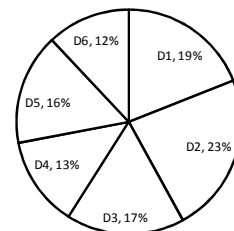
$$\text{Required Percentage} = \frac{25-10}{25} \times 100\%$$

$$= \frac{15}{25} \times 100\% = 60\%$$

Direction (Q. No. 290-292):

The Pie chart given below represents the expenses incurred by different departments of a company. Each expense is shown as a percentage of total expenditure of the company.

The central angles shown in Pie chart are not as per any chosen scale



290. The expenses incurred by department D1 is approximate what percent of the expenses incurred by department D6?

- (a) 148.33% (b) 168.33%
 (c) 138.33% (d) 158.33%

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) :
 $D1 = 19\%$, $D6 = 12\%$
 Required percentage = $\frac{19}{12} \times 100 = 158.33\%$

291. If the total expenses of the company is ₹20 lakhs, then what is the total expenses on departments D2, D4 and D5?

- (a) ₹ 12,60,000 (b) ₹ 9,00,000
 (c) ₹ 10,60,000 (d) ₹ 10,40,000

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) : Total expenses on departments D2, D4 and D5 = $2000000 \times (23+13+16)\%$
 $= 2000000 \times \frac{52}{100}$
 $= ₹1040000$

292. What is the difference between the central angles (nearest to 0.1 degree) subtended by sectors D2 and D3?

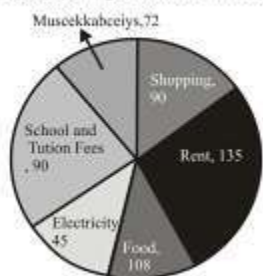
- (a) 15.3° (b) 24.2°
 (c) 18.6° (d) 21.6°

SSC MTS 19/08/2019 (Shift-II)

Ans. (d) :
 $\therefore 100\% = 360^{\circ}$
 $1\% = 3.6^{\circ}$
 $6\% = 3.6^{\circ} \times 6$
 $= 21.6^{\circ}$
 Difference of central angles by the sector D2 and D3 =
 $D2 - D3 = 23\% - 17\% = 6\%$

293. The following pie chart shows specially the different type of monthly expenses of a family. The amount spent on educational fee in a month is ₹18000. What is monthly expenses? In the following pie diagram different components of expenses are shown while they do not reflect central angle.

Expenses of a particular family



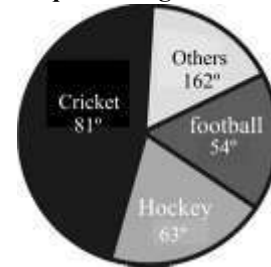
- (a) ₹1,08,000 (b) ₹72,000
 (c) ₹90,000 (d) ₹36,000

SSC MTS 14/08/2019 (Shift-I)

Ans. (a) : Total expenses of a family = $72 + 90 + 135 + 108 + 45 + 90 = 540$ units
 $\therefore 90$ units = ₹18000 1 unit = 200
 540 unit = ₹108000

Direction (Q. No. 294-296):

The pie chart given here shows the spendings of a country on various sports during a particular year. Study the graph carefully and answer the questions given below it.



294. If the total amount spent on sports during the year be ₹18000, the amount spent on cricket exceeds that on football by (in ₹)

- (a) 2800 (b) 1350
 (c) 3000 (d) 2550

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (b) : The amount spent on all sports in one year = ₹18000
 Difference of central angles of cricket and football =
 $81^{\circ} - 54^{\circ} = 27^{\circ}$
 $360^{\circ} = ₹18000$
 $1^{\circ} = 50$
 $27^{\circ} = 27 \times 50 = ₹1350$
 $\therefore ₹1350$ more was spent on cricket than football.

295. How much percent less is spent on football than that on cricket?

- (a) $33\frac{1}{3}\%$ (b) $12\frac{1}{2}\%$
 (c) $20\frac{1}{2}\%$ (d) 25%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (a) : Central angle of football = 54°
 Central angle of cricket = 81°
 \therefore Required percentage = $\frac{81^{\circ} - 54^{\circ}}{81^{\circ}} \times 100$
 $= \frac{27^{\circ}}{81^{\circ}} \times 100$
 $= 33\frac{1}{3}\%$

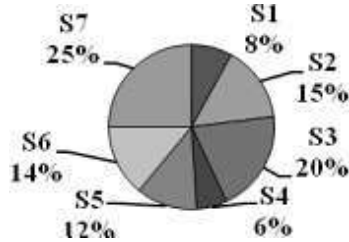
296. What percent of the total spendings is spent on others?

- (a) 12.5% (b) 45%
 (c) 25% (d) 22.5%

SSC GD Constable 05/03/2019 (Shift-II)

Ans. (b) : Total spendings = $(162^0 + 63^0 + 54^0 + 81^0) = 360^0$
 Spent on others = 162^0
 Required percentage = $\frac{162^0}{360^0} \times 100$
 $= 45\%$

297. The pie chart given below shows the annual snowfall received by 7 states of a country. The snowfall is shown as a percentage of total annual snowfall of the country.



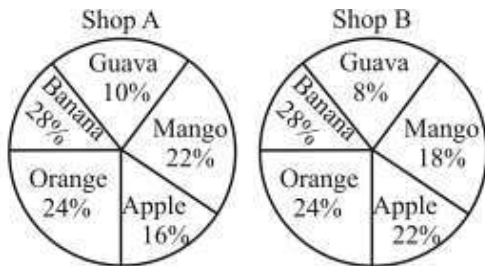
If the annual snowfall received by the country is 700 cm. What is the difference in the annual snowfalls of S3 and S2?

- (a) 42 cm (b) 7 cm
 (c) Cannot be determined (d) 35 cm

SSC GD Constable 13/02/2019 (Shift-I)

Ans. (d) :
 Difference in the annual snowfalls of S3 and S2 =
 $= 700 \times \frac{(20-15)}{100}$
 $= 700 \times \frac{5}{100} = 35\text{cm.}$

298. The following pie diagram shows the percentage quantity of fruits at two fruit shop A and B



Total Quantity = 1400 kg Total Quantity = 1200 kg

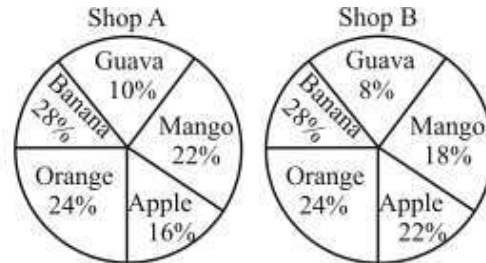
If the price of guava is Rs. 12 per kg, that of mango is Rs. 30 per kg, that of apple is Rs. 40 per kg, that of orange is Rs. 20 per kg and that of banana is Rs. 15 per kg, then what is the total cost of all fruits at shop B?

- (a) ₹ 28,992 (b) ₹ 27,990
 (c) ₹ 28,880 (d) ₹ 28,990

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (a) : Total price of shop B
 $= 1200 \frac{(8 \times 12 + 18 \times 30 + 22 \times 40 + 24 \times 20 + 28 \times 15)}{100}$
 $= 12 \times (96 + 540 + 880 + 480 + 420)$
 $= 12 \times 2416 = ₹ 28992$

299. The following pie diagram shows the percentage quantity of fruits at two fruit shop A and B



Total Quantity = 1400 kg Total Quantity = 1200 kg

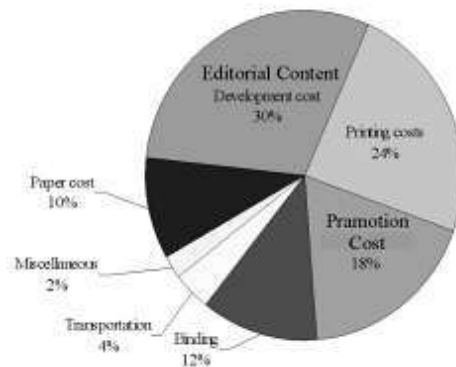
What is the difference between the quantity of mangoes at these two fruit shops A and B?

- (a) 85kg (b) 84kg
 (c) 90kg (d) 92kg

SSC Sel. Post Phase VIII (G.L.) 09.11.20 (Shift-2)

Ans. (d) : Required difference in quantity of mangoes
 $= 1400 \times \frac{22}{100} - 1200 \times \frac{18}{100}$
 $= 308 - 216 = 92\text{kg}$

300. The following pie chart represents the expenditure incurred in printing a magazine :



If the editorial content development cost of the magazine is ₹ 48,000 then the cost (in ₹) of binding is:

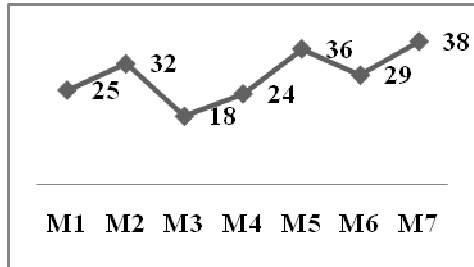
- (a) 36,000 (b) 18,000
 (c) 38,400 (d) 19,200

SSC Sel. Post Phase VIII (H.L.) 09.11.20 (Shift-I)

Ans. (d) : Editorial content development cost of the magazine = ₹ 48000
 $\therefore 30\% = ₹ 48000$
 $1\% = ₹ 1600$
 then cost of binding = 12×1600
 $= ₹ 19200$

(IV) Problems based on Line Diagram

301. The line chart given below shows the production (in 10000) of cars in 7 different months.



Production of cars in month M4 is what percent of the production of cars in month M2?

- (a) 125% (b) 75%
 (c) 66.66% (d) 83.33%

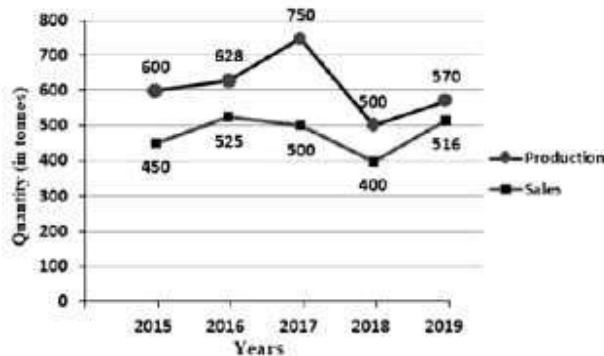
SSC GD Constable 14/02/2019 (Shift-II)

Ans. (b) : We know that;

$$\begin{aligned} \text{Required percentage} &= \frac{\text{M4}}{\text{M2}} \times 100 = \frac{24}{32} \times 100 \\ &= 75\% \end{aligned}$$

302. The given line graph shows the production (in tonnes) and the sales (in tonnes) of a company.

How much more is the production in 2015 and 2017 taken together then the sales in 2016 and 2018 taken together (in tonnes)?



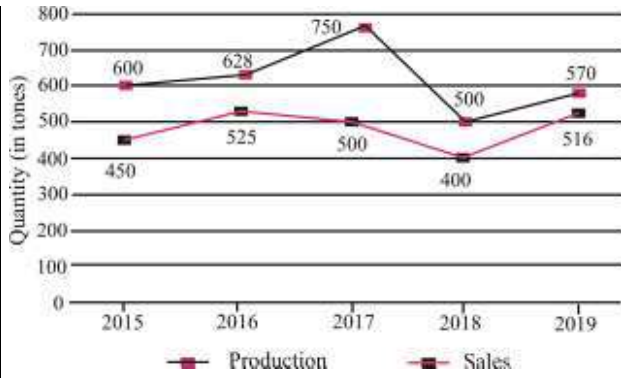
- (a) 425 (b) 328
 (c) 434 (d) 178

SSC CHSL 06/08/2021 (Shift-I)

Ans. (a) ∴ Total production in 2015 and 2017
 $= 600 + 750 = 1350$
 Total sales in 2016 and 2018 $= 525 + 400 = 925$
 Required increase $= 1350 - 925 = 425$

303. The line graph shows the production (in tonnes) and the sales (in tonnes) of a company.

What is the ratio of the production of the company in 2015 and 2016 taken together to the sales in 2017 and 2019 taken together?



- (a) 307 : 254
 (b) 307 : 330
 (c) 195 : 214
 (d) 307 : 229

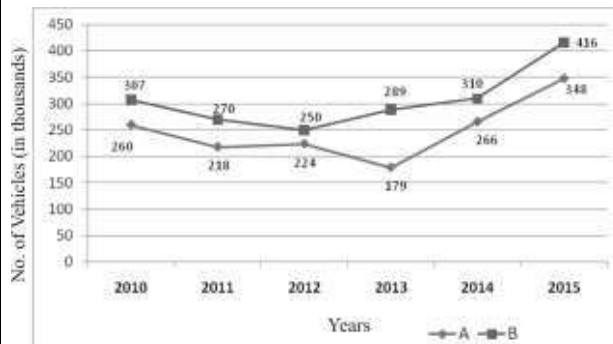
SSC CHSL 12/08/2021 (Shift-II)

Ans. (a) : Required ratio $= 600 + 628 : 500 + 516$
 $1228 : 1016$
 $307 : 254$

304. Study the line graph and answer the question that follows.

The line graph represents the number of vehicles (in thousands) manufactured by two automobile companies A and B over the years from 2010 to 2015. The X-axis represents the years and the Y-axis represents number of vehicles in thousands.

(The data shown here is only for mathematical exercise. They do not represent the actual figures of the country.)



The average value of the vehicles manufactured by Company A is what percent of the average value of the vehicles manufactured by Company B during 2010 to 2015?

- (a) 81.2 (b) 83.1
 (c) 67.8 (d) 78.5

SSC CHSL 16/04/2021 (Shift-I)

Ans. (a) : The average value of the vehicles manufactured by company A

$$= \frac{260 + 218 + 224 + 179 + 266 + 348}{6} = \frac{1495}{6} = 249.16$$

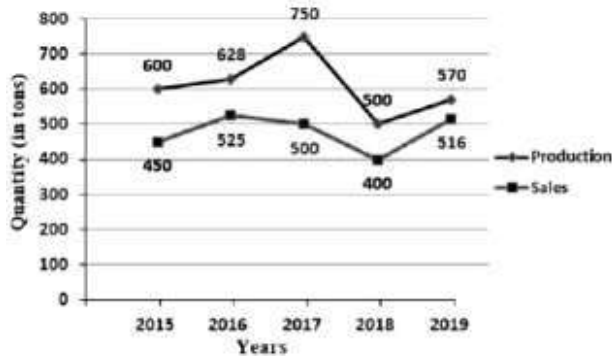
The average value of vehicles manufactured by

$$\text{company B} = \frac{307 + 270 + 250 + 289 + 310 + 416}{6}$$

$$= \frac{1842}{6} = 307$$

$$\text{Required percentage} = \frac{249.16}{307} \times 100 = 81.159 \approx 81.2\%$$

305. The line graph shows the production (in tonnes) and the sales (in tonnes) of a company. What percentage (approximately) of the total production of the company is the total sales of the company in all the years together? (correct to 2 decimal places)



- (a) 75 (b) 72.55
(c) 68.12 (d) 78.44

SSC CHSL 12/04/2021 (Shift-I)

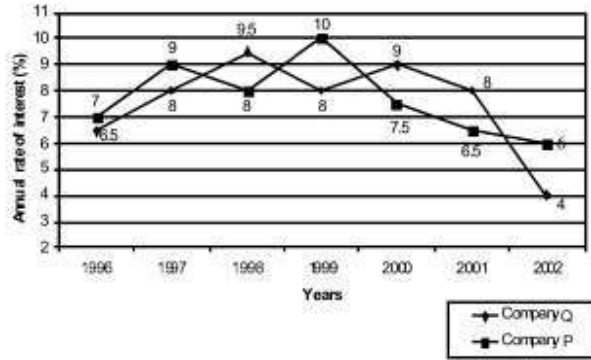
Ans : (d) Total sale of the company in all the years
 $= 450 + 525 + 500 + 400 + 516 = 2391$ tonnes
 Total production of the company in the all years
 $= 600 + 628 + 750 + 500 + 570 = 3048$ tonnes
 Required % = $\frac{2391}{3048} \times 100 = 78.44\%$

Direction (Q. No. 306-308):

Two different finance companies declare a fixed annual rate of interest on the amount invested by investors with them. The interest rate declared by these companies can vary from year to year depending on the variation in the country's economy and the interest rate of the banks. The annual rate of interest offered by the two companies P and Q is shown in the graph below.

Study the graph and answer the question.

Annual percentage rate of interest offered by two finance companies P and Q over the years.



306. A sum of ₹3.5 lakhs was invested in company Q in the year 2000 for one year. How much more simple interest will accrue if the amount was invested in company P?
 (a) ₹ 5,500 (b) ₹ 5,000
 (c) ₹ 5,250 (d) ₹ 5,200

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (c) : The Simple Interest received for investing 3.5 lakhs in company Q in the year 2000 = $350000 \times \frac{9}{100} = ₹ 31500$

Simple Interest received for investing 3.5 lakhs in company P in the year 2000 = $350000 \times \frac{7.5}{100} = ₹ 26250$

Required difference = $31500 - 26250 = ₹ 5250$

307. If two sums in the ratio 9:10 are invested in companies P and Q respectively in 1999, then what is the ratio of the simple interests received from companies P and Q respectively after one year?
 (a) 9 : 8 (b) 8 : 7
 (c) 8 : 9 (d) 7 : 8

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (a) : Ratio of amount invested in companies P and Q in the year 1999 = 9 : 10

Let the amount of P and Q is $9x$ and $10x$ respectively.

The ratio of the simple interest received from companies P and Q after one year =

$$9x \times \frac{10}{100} : 10x \times \frac{8}{100}$$

$$= 90 : 80$$

$$= 9 : 8$$

308. An investor invested a sum of ₹4 lakhs in company Q in the year 2000. After one year, the entire amount was transferred to company P in 2001 as an investment for one year. What amount will the investor receive from company P?
 (a) ₹ 4,54,420 (b) ₹ 4,64,340
 (c) ₹ 4,56,320 (d) ₹ 4,64,430

SSC CPO-SI – 12/12/2019 (Shift-II)

Ans. (b)

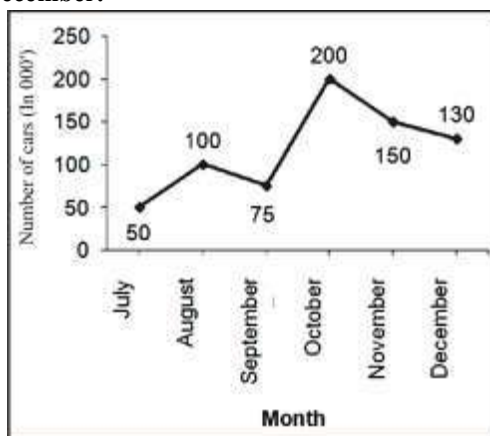
The total amount including the simple interest of company Q after 1 year of 2000 = $400000 \times \frac{(100+9)}{100}$
= ₹ 436000

The total amount including the simple interest of company P after 1 year of 2000

$$= 436000 \times \frac{(100+6.5)}{100}$$
$$= 436000 \times \frac{106.5}{100}$$
$$= ₹ 464340$$

Direction (Q. No. 309-312):

The line chart given below shows the number of cars manufactured (in 000') by company X in year 2015 from the month of July to December.



309. What is the percentage change in the number of cars manufactured in December to that in July?

- (a) 130% (b) 80 %
(c) 160% (d) 140%

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : Number of cars manufactured in July = 50
Number of cars manufactured in December = 130

$$\text{Required percentage} = \frac{(130-50)}{50} \times 100\%$$
$$= 80 \times 2 = 160\%$$

310. What is the difference between the maximum and minimum number of cars manufactured among the given months as a percentage of the cars manufactured in September?

- (a) 250 (b) 300
(c) 150 (d) 200

SSC MTS 10-10-2017 (Shift-III)

Ans. (d) : Maximum number of cars manufactured in the given months = 200
and minimum number of cars manufactured in the given months = 50
difference = $200 - 50 = 150$

Number of cars manufactured in September = 75

$$\text{Required percentage} = \frac{150}{75} \times 100 = 200\%$$

311. What is the average number of cars manufactured (in 000') by the company X from July to November?

- (a) 105 (b) 100
(c) 115 (d) 141

SSC MTS 10-10-2017 (Shift-III)

Ans. (c) : The average number of cars manufactured by the company from July to November =
$$= \frac{50+100+75+200+150}{5} = 115$$

312. In how many months was the number of cars manufactured a multiple of 10,000?

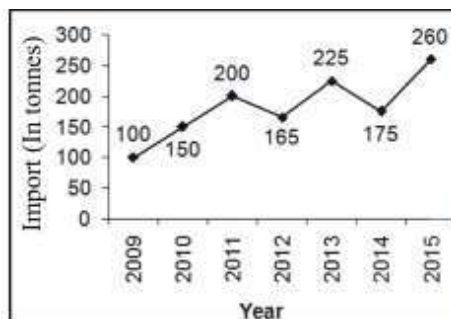
- (a) 6 (b) 5
(c) 4 (d) 7

SSC MTS 10-10-2017 (Shift-III)

Ans. (b) : The numbers of cars manufactured in the 5 months of July, August, October, November and December are in the multiple of 10000.

Direction (Q. No. 313-316):

The line chart given below shows the wheat imported (in tonnes) by the flour manufacturing company A from years 2009 to 2015.



313. What is the percentage change in import of wheat from year 2010 to 2014?

- (a) 75 (b) 175
(c) 16.67 (d) 25

SSC MTS 11-10-2017 (Shift-III)

Ans. (c) : The Percentage change in import of wheat from year 2010 to 2014

$$= \frac{25}{150} \times 100$$
$$= 16.67$$

314. What is the average wheat import (in tones) from year 2009 to 2013?

- (a) 170 (b) 168
(c) 180 (d) 165

SSC MTS 11-10-2017 (Shift-III)

Ans. (b) : Average = $\frac{100 + 150 + 200 + 165 + 225}{5}$
 $= \frac{840}{5} = 168$

315. In how many years, the import was more than the import in 2012?

- (a) 2 (b) 3
 (c) 4 (d) 5

SSC MTS 11-10-2017 (Shift-III)

Ans. (c) : In 4 years, the import was more than the import in 2012.

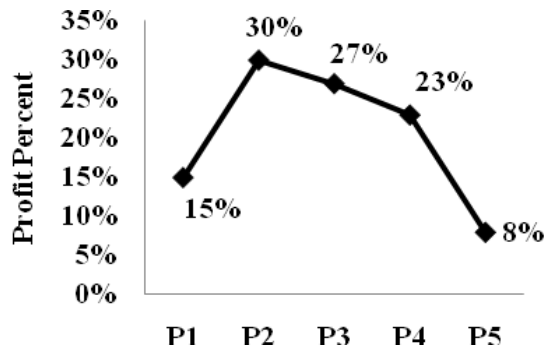
316. What is the percentage change in the wheat imported from year 2009 to 2013?

- (a) 225 (b) 150
 (c) 100 (d) 125

SSC MTS 11-10-2017 (Shift-III)

Ans. (d) : The percentage change in wheat imported from year 2009 to 2013 = $\frac{225 - 100}{100} \times 100 = 125$

317. The line chart given below shows the profit percentage of a company on 5 different products P1, P2, P3, P4 and P5.



The expenditure of product P5 is ₹46000. What is revenue of product P5?

- (a) ₹ 52780
 (b) ₹ 49680
 (c) ₹ 47360
 (d) ₹ 4600

SSC GD Constable 11/02/2019 (Shift-II)

Ans. (b) : Profit = $46000 \times \frac{8}{100} = ₹3680$

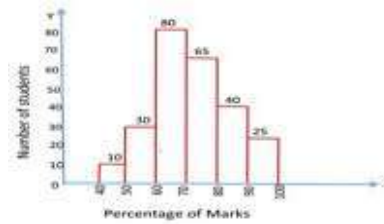
Total revenue of product 5 = $46000 + 3680 = ₹49680$

(V) Problems based on Histogram

318. Study the histogram and answer the question given below.

The given graph represents the percentage of marks scored by students in class X Board Examination in 2018 in a school.

Total number of students = 250



The number of students who scored less than 60% marks is approximately what percentage less than the number of students who scored 70% and above?

- (a) 68.35% (b) 68%
 (c) 69.23% (d) 67.23%

SSC MTS 06/10/2021 (Shift-I)

Ans. (c) : Number of students who scored less than 60% marks

$$= 10 + 30 = 40$$

Number of students who scored 70% marks and above

$$= 65 + 40 + 25 = 130$$

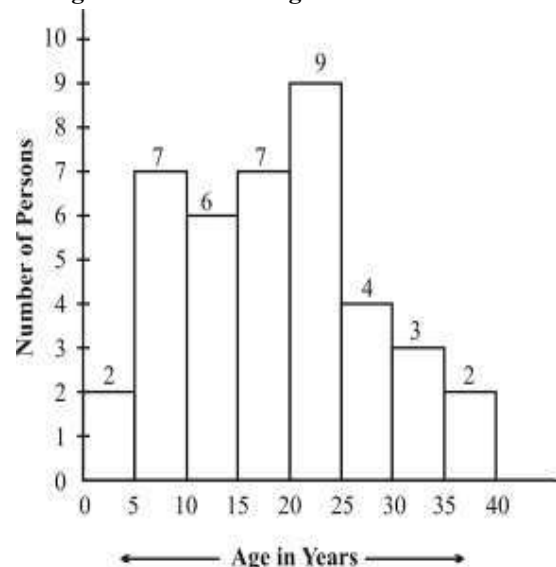
Now, according to the question,

$$\% \text{ decrease} = \frac{130 - 40}{130} \times 100$$

$$= \frac{90}{130} \times 100$$

$$= \frac{900}{13} = 69.23\%$$

319. Some persons went on an outstation tour. The histogram shows their ages.



How many persons are less than 20 years of age?

- (a) 18 (b) 22
 (c) 31 (d) 25

SSC CHSL 12/08/2021 (Shift-I)

Ans. (b) : Number of persons less than 20 years
 $= 2 + 7 + 6 + 7 = 22$