ENGLISH MEDIUM

SSC MATHEMATICS

CHAPTER, TOPIC & TYPE WISE

SOLVED PAPERS

Youth Competition Times

SSC 2025

Useful for ■ CGL Tier-I&II ■ CHSL (10+2) Tier I&II ■ CPO-SI ■ Stenographer ■ JE ■ MTS ■ Selection Post ■ GD ■ Delhi Police ■ Other SSC EXAMS

MATHEMATICS

23950+ NEW TCS PYQ

TCS Pattern Questions asked in all SSC Exams till Date

WITH TREND ANALYSIS CHART

Chapter, Topic & Type Wise

Best solution of questions with initial short trick

904 PAPERS

SOLVED PAPERS

Answers with Detail Analytical Explanation & Based on Revised ANSWER-KEY

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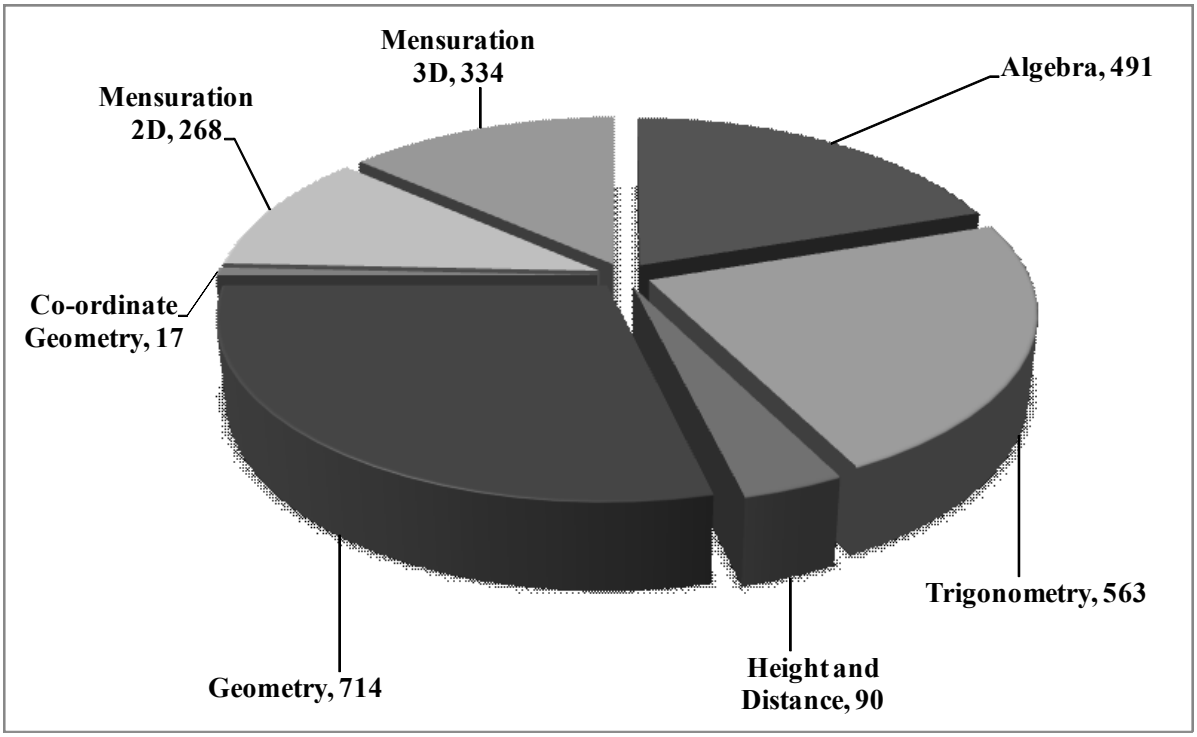
ANALYSIS CHART OF QUESTION PAPERS OF VARIOUS PREVIOUS EXAM OF SSC

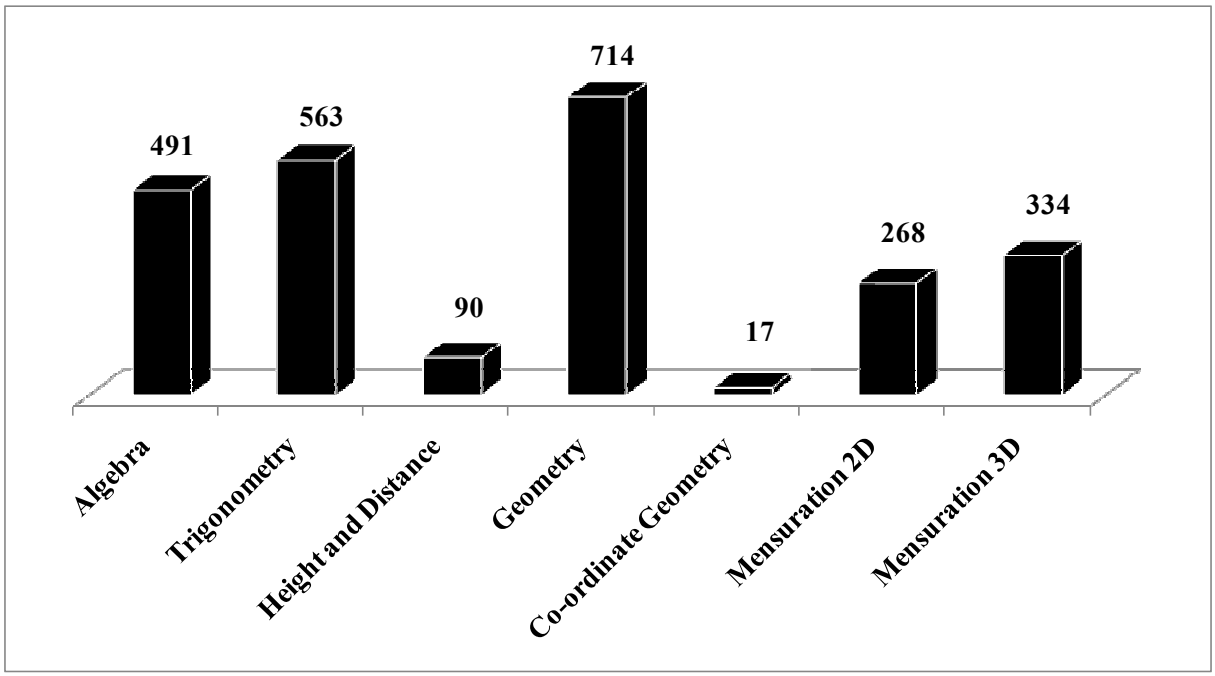
Sr. No.	Exam	Exam Year	Total Question	Total Question of Maths
1.	SSC CGL (Tier-II) (October)	2023	1	1 × 30 = 30
2.	SSC CGL (Tier-I)	2023	39	39 × 25 = 975
3.	SSC CGL (Tier-II) (March)	2023	4	4 × 30 = 120
4.	SSC CHSL (Tier-I) (March)	2023	36	36 × 25 = 900
5.	SSC CHSL (Tier-II)	2023	1	1 × 30 = 30
6.	SSC CHSL (Tier-I) (August)	2023	40	40 × 25 = 1000
7.	SSC MTS (September)	2023	27	27 × 25 = 600
8.	SSC MTS	2023	57	57 × 25 = 1425
9.	SSC Selection Post Phase-XI (Graduate Level)	2023	12	12 × 25 = 300
10.	SSC GD (Constable)	2023	76	76 × 20 = 1520
11.	SSC CGL (Tier-I)	2022	40	40 × 25 = 1000
12.	SSC CPO (Tier-I)	2022	9	9 × 50 = 450
13.	SSC CGL (Tier-II)	2022	3	3 × 100 = 300
14.	SSC CGL (Tier-I)	2022	21	21 × 25 = 525
15.	SSC CHSL	2022	42	42 × 25 = 1050
16.	SSC MTS	2022	48	48 × 25 = 1200
17.	SSC CGL (Tier-I)	2021	21	21 × 25 = 525
18.	SSC CHSL	2021	36	36 × 25 = 900
19.	SSC MTS	2021	42	42 × 25 = 1050
20.	SSC GD	2021	62	62 × 25 = 1550
21.	SSC MTS	2019	39	39 × 25 = 975
22.	SSC CPO-SI	2020	6	6 × 50 = 300
23.	SSC Selection Post Phase VIII (Graduate Level)	2020	4	4 × 25 = 100
24.	SSC Selection Post Phase VIII (H.S. Level)	2020	3	3 × 25 = 75
25.	SSC Selection Post Phase VIII (Matriculation Level)	2020	5	5 × 25=125
26.	SSC CGL (Tier-II)	2020	3	3 × 100 = 300
27.	SSC CHSL	2020	36	36 × 25 = 900
28.	SSC CGL (Tier-I)	2020	18	18 × 25 = 450
29.	SSC CPO-SI	2019	8	8 × 50 = 400
30.	SSC Selection Post Phase VII (Graduate Level)	2019	4	4 × 25 = 100
31.	SSC Selection Post Phase VII (H.S. Level)	2019	4	4 × 25 = 100
32.	SSC Selection Post Phase VII (Matriculation Level)	2019	4	4 × 25 = 100
33.	SSC CGL (Tier-II)	2019	3	3 × 100 = 300
34.	SSC CGL (Tier-I)	2019	22	22 × 25 = 550
35.	SSC MTS	2019	39	39 × 25 = 975
36.	SSC CHSL	2019	25	25 × 25 = 625
37.	SSC GD	2019	40	40 × 25 = 1000
38.	SSC CGL (Tier-II)	2017	7	7 × 100 = 700
39.	SSC MTS	2017	17	17 × 25 = 425
	Total		**904**	**23950**

Note– After Detailed Analysis of the above **904** Question papers of SSC Exams related to Mathematics **23,950** questions have been presented chapterwise, Topicwise & Typewise.
Questions of repetitive and similar nature have been included so that the technique of asking question can benefit the competitors.

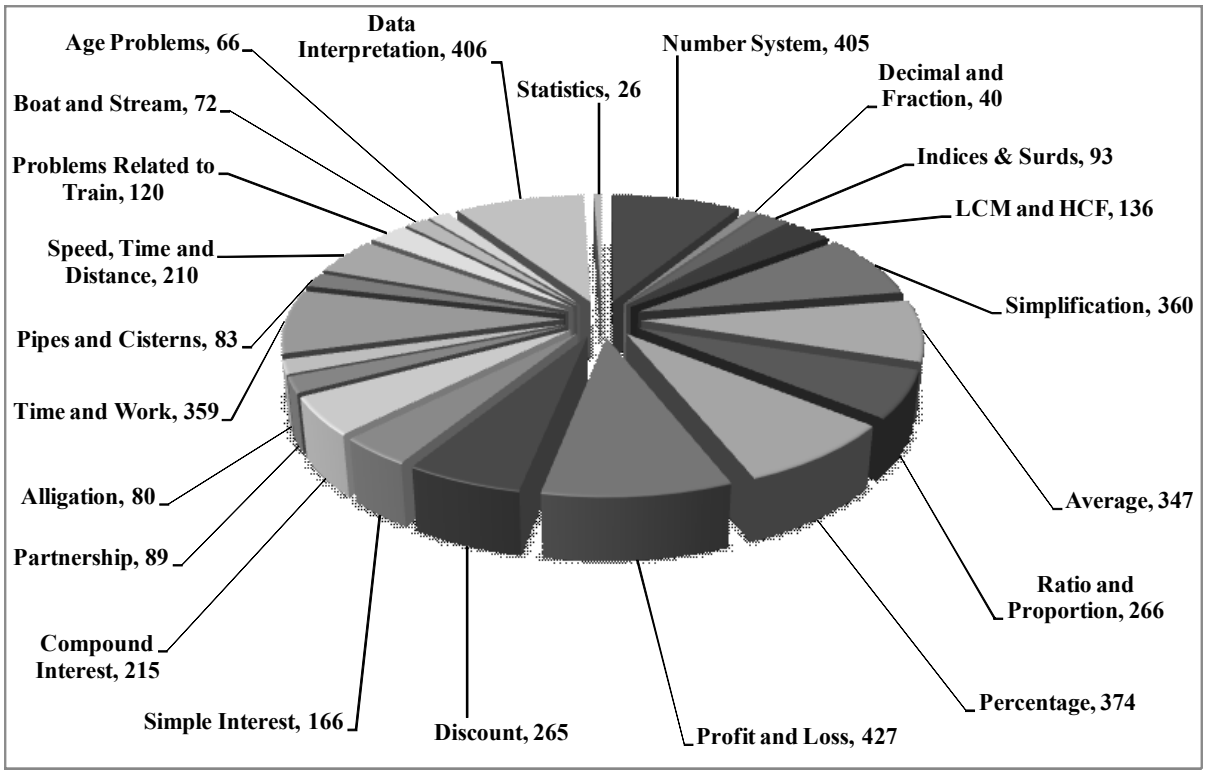
Trend Analysis of Previous Year SSC Exams Papers
Through Pie Chart and Bar Graph

SECTION-1





SECTION-2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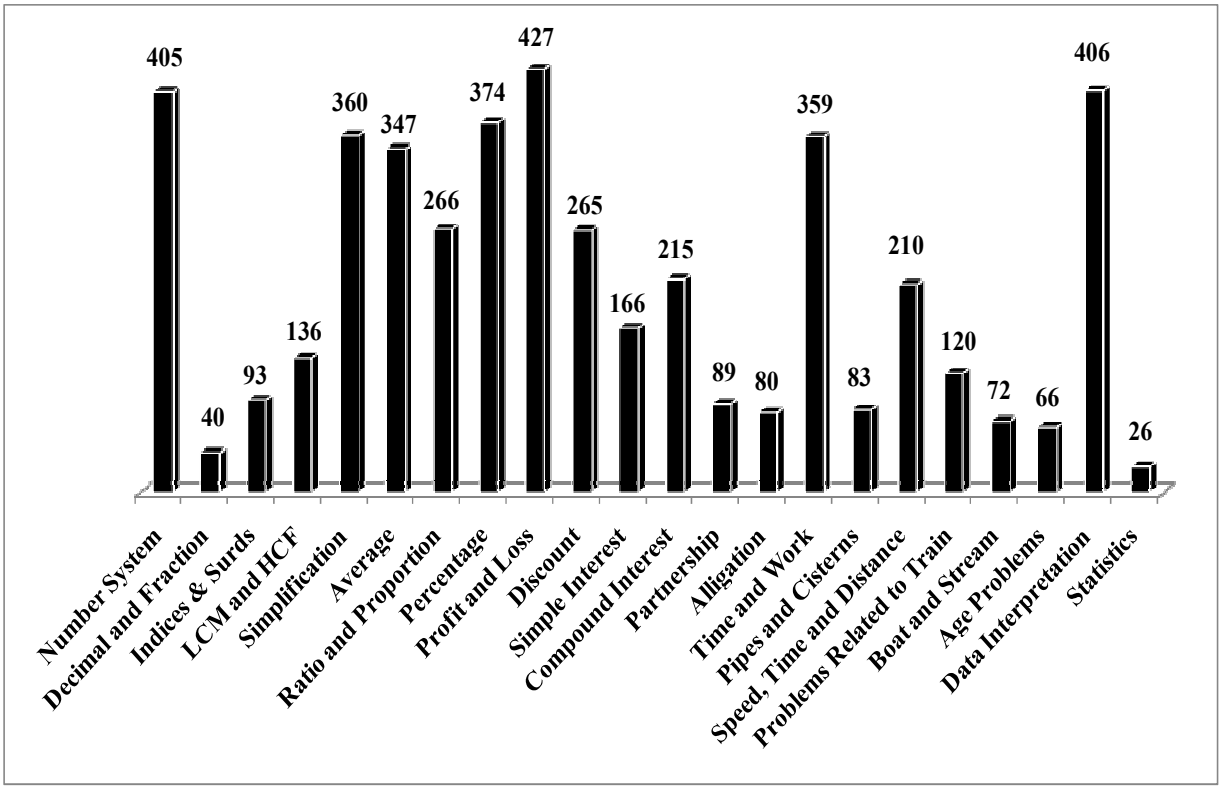
405
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210
120
72
66
406
26
Number System
Decimal and Fraction
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Partnership
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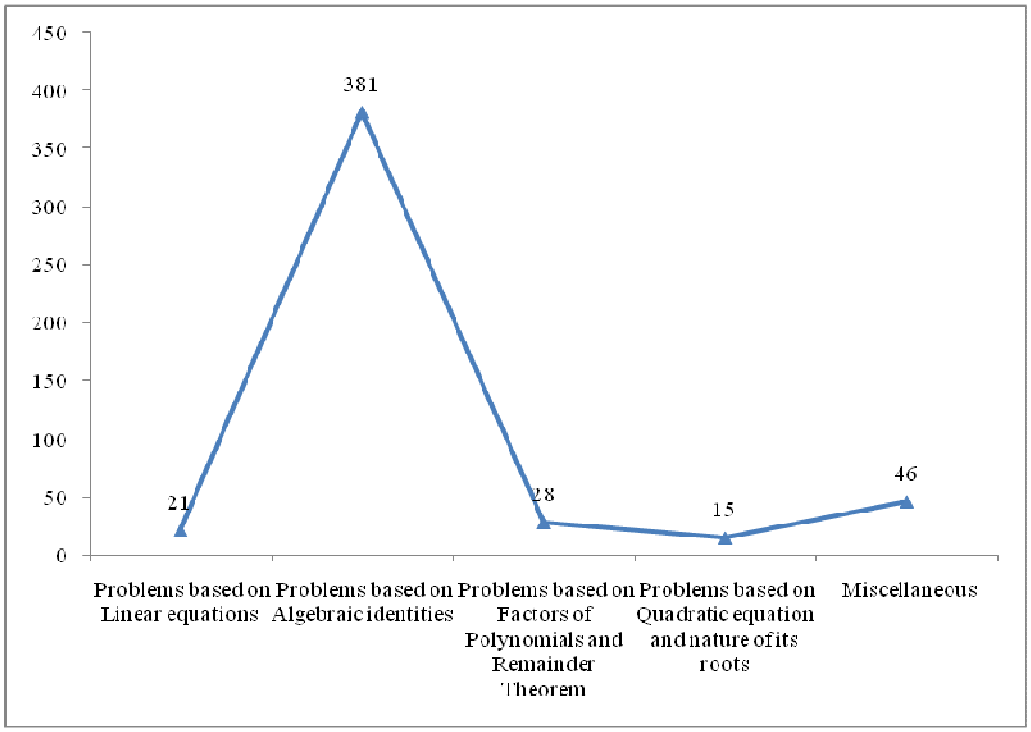
Time and Work
Pipes and Cisterns
Speed, Time and Distance
Problems Related to Train
Boat and Stream
Age Problems
Data Interpretation
Statistics

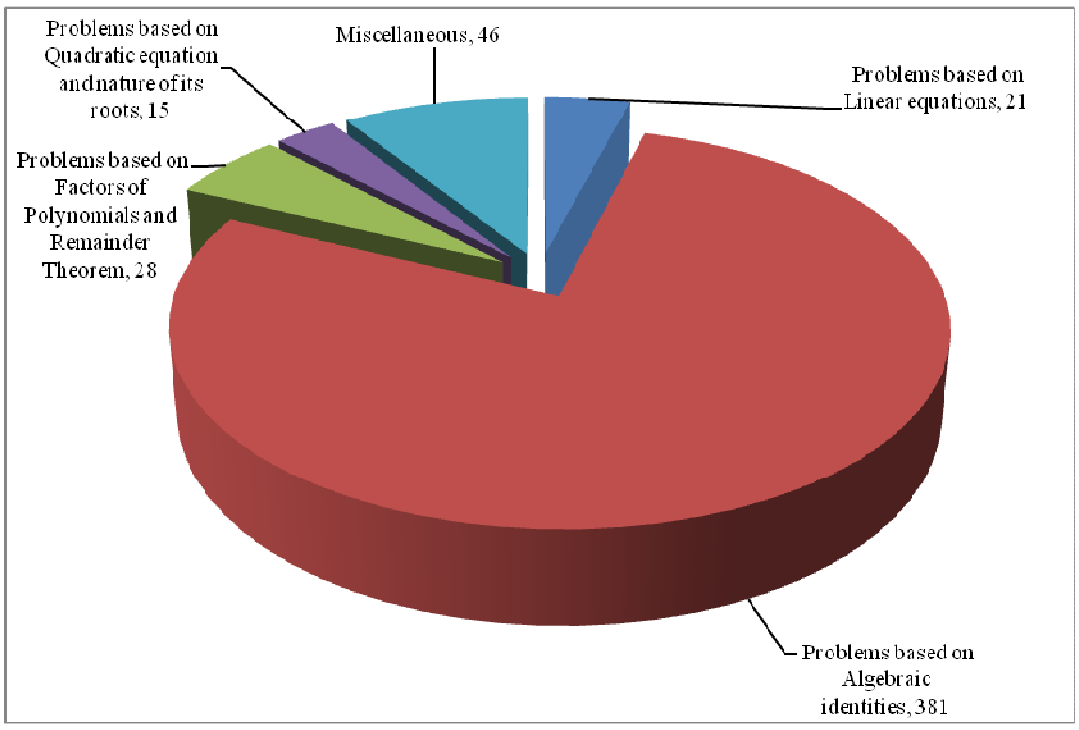
SECTION -1

01. Algebra

Based On TCS Pattern			
Typewise	**Exam**	**Question No.**	**Years**
Type-I **Problems based on Linear equations**	**CGL (Tier-1)**	**6**	**(2017–2023)**
	CGL (Tier-2)	**5**	
	CHSL (Tier-1)	**3**	
	CHSL (Tier-2)	**–**	
	Selection Post VII, VIII, XI	**3**	
	SSC MTS	**2**	
	SSC GD	**2**	
	SSC CPO SI	**–**	
Type-II **Problems based on Algebraic identities**	**CGL (Tier-1)**	**74**	**(2017–2023)**
	CGL (Tier-2)	**30**	
	CHSL (Tier-1)	**58**	
	CHSL (Tier-2)	**60**	
	Selection Post VII, VIII, XI	**49**	
	SSC MTS	**47**	
	SSC GD	**40**	
	SSC CPO SI	**–**	
Type-III **Problems based on Factors of Polynomials and Remainder Theorem**	**CGL (Tier-1)**	**7**	**(2017–2023)**
	CGL (Tier-2)	**3**	
	CHSL (Tier-1)	**6**	
	CHSL (Tier-2)	**3**	
	Selection Post VII, VIII, XI	**1**	
	SSC MTS	**3**	
	SSC GD	**5**	
	SSC CPO SI	**–**	
Type-IV **Problems based on Quadratic equation and nature of its roots**	**CGL (Tier-1)**	**4**	**(2017–2023)**
	CGL (Tier-2)	**3**	
	CHSL (Tier-1)	**1**	
	CHSL (Tier-2)	**1**	
	Selection Post VII, VIII, XI	**–**	
	SSC MTS	**2**	
	SSC GD	**4**	
	SSC CPO SI	**–**	
Type-V **Miscellaneous**	**CGL (Tier-1)**	**16**	**(2017–2023)**
	CGL (Tier-2)	**–**	
	CHSL (Tier-1)	**11**	
	CHSL (Tier-2)	**–**	
	Selection Post VII, VIII, XI	**–**	
	SSC MTS	**10**	
	SSC GD	**10**	
	SSC CPO SI	**–**	

Trend Analysis of Questions topicwise from CGL (Pre & Mains) CHSL (Pre & Mains) Selection Post VII, VIII, XI, SSC MTS, SSC GD & Other Exams (2017-2023)





01.

ALGEBRA

(I) Problems based on Linear Equations

1. If $5x + 3y = 15$ and $2xy = 6$ then the value of $5x - 3y$ will be :

(a) $3\sqrt{5}$ (b) $3\sqrt{4}$

(c) $3\sqrt{3}$ (d) $3\sqrt{2}$

SSC CHSL (Tier-I) 02/08/2023 (Shift-I)

Ans. (a) : Given that-

$5x + 3y = 15$,

$2xy = 6$

$xy = 3$

$\because$ Formula-

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

$(5x - 3y)^2 = (5x + 3y)^2 - 60xy$

$= (15)^2 - 60 \times 3$

$= 225 - 180$

$(5x - 3y) = \sqrt{45}$

$\therefore 5x - 3y = 3\sqrt{5}$

2. If $4x^2 + y^2 = 40$ and $xy = 6$ then find the value of $2x+y$

(a) 4 (b) 8

(c) 6 (d) 5

SSC CGL (Mains) 06/03/2023

Ans. (b) : According to the question,

$\Rightarrow (2x + y)^2 = 4x^2 + y^2 + 2 \times 2x \times y$

$= 40 + 4 \times 6$

$\Rightarrow (2x + y)^2 = 64$

$\Rightarrow 2x + y = 8$

3. For what value of m will the system of equation $18x - 72y + 13 = 0$ and $7x - my - 17 = 0$ have no solutions ?

(a) 24 (b) 12

(c) 9 (d) 28

SSC CGL (Mains) 06/03/2023

Ans. (d) : According to the question,

$18x - 72y + 13 = 0$

and,

$7x - my - 17 = 0$

So, the given system of equation will have no solution, if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\frac{18}{7} = \frac{72}{m}$$

$\therefore$ $\boxed{m = 28}$

4. Simplify the problem $(3x + 2y)^2 - (3x - 2y)^2$.

(a) $9x^2 - 4y^2$ (b) 12xy

(c) $18x^2 - 8y^2$ (d) 24xy

SSC CHSL (Tier-I) 10/08/2023 (Shift-I)

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

$(3x + 2y + 3x - 2y)(3x + 2y - 3x + 2y)$ $[\because a^2 - b^2 = (a + b)(a - b)]$

$= 6x \times 4y$

$= 24xy$

5. For what value of m will the system of equation $17x + my + 102 = 0$ and $23x + 299y + 138 = 0$ have infinite number of solutions ?

(a) 221 (b) 223

(c) 220 (d) 219

SSC CGL (Mains) 02/03/2023

Ans. (a) : According to the question,

$17x + my + 102 = 0$ and $23x + 299y + 138 = 0$

For infinite solutions,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\Rightarrow \frac{17}{23} = \frac{m}{299} = \frac{102}{138}$$

$$\Rightarrow m = 17 \times \frac{299}{23}$$

$\Rightarrow m = 17 \times 13$

$\therefore m = 221$

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

(a) 18 (b) –36

(c) 36 (d) –18

SSC MTS 01/09/2023 (Shift Ist)

Ans. (d) : Given,

$x + y + 3 = 0$

$x + y = -3$ ..... (i)

taking cube of both sides,

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

$x^3 + y^3 + 3xy(-3) = -27$ {From Equation (i)}

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

On adding 9 in both sides–

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

$\boxed{x^3 + y^3 - 9xy + 9 = -18}$

7. If $\frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{3+\sqrt{5}}} = a+\sqrt{5}b$ where a, b > 0 then what is the value of (ab) : (a+b) ?

(a) 7 : 8 (b) 4 : 7
(c) 7 : 4 (d) 8 : 7

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

Ans. (a) : $\frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{3+\sqrt{5}}} = a+\sqrt{5}\ b$

On multiplying and dividing by 2 in $\sqrt{(3+\sqrt{5})}$

$$= \frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{\frac{2(3+\sqrt{5})}{2}}}$$

$$= \frac{22\sqrt{2}}{4\sqrt{2}-\sqrt{\frac{6+2\sqrt{5}}{2}}} \qquad \left(\because (a+b)^2 = a^2+b^2+2ab\right)$$

$\therefore\ (\sqrt{5}+1)^2 = 6+2\sqrt{5}$

$$= \frac{22\sqrt{2}}{4\sqrt{2}-\left(\frac{(\sqrt{5}+1)^0}{\sqrt{2}}\right)} = \frac{22\sqrt{2}\times\sqrt{2}}{8-\sqrt{5}-1}$$

$= \frac{44}{7-\sqrt{5}}$ (On Rationalizing, we get)

$$= \frac{44}{(7-\sqrt{5})}\times\frac{(7+\sqrt{5})}{(7+\sqrt{5})} = 7+\sqrt{5}$$

Comparing with $a+\sqrt{5}b$
a = 7, b = 1
Putting the value of a and b in ab : (a + b)
(7 × 1) : (7 + 1)
= 7 : 8

8. What will be the solution of following system of linear equations?

$3x-9y+4z=5$
$2x+7y+z=12$
$3x-z=0$

(a) $x=\frac{143}{150}, y=\frac{31}{30}, z=\frac{143}{51}$
(b) $x=\frac{143}{150}, y=\frac{31}{37}, z=\frac{143}{50}$
(c) $x=\frac{143}{150}, y=\frac{31}{30}, z=\frac{143}{50}$
(d) $x=\frac{137}{150}, y=\frac{31}{30}, z=\frac{143}{50}$

SSC Selection Posts XI-28/06/2023 (Shift-III)

Ans. (c) : According to the question,

$3x-9y+4z=5$ .....(i)
$2x+7y+z=12$ .....(ii)
$3x-z=0$.....(iii)

$x=\frac{z}{3}$

Putting the value of $x=\frac{z}{3}$ in eq^n (i) and (ii)

$3\times\frac{z}{3}-9y+4z=5$
$5z-9y=5$……(iv)
$2\times\frac{z}{3}+7y+z=12$
$5z+21y\pm 36$……(v)
eq^n (iv) - eq^n (v), we get
30y = 31
$\boxed{y=\frac{31}{30}}$

Putting the value of $y=\frac{31}{30}$ in eq^n 5

$5z-9\times\frac{31}{30}=5$
$z=\frac{143}{50}$

Puitting the value of $z=\frac{143}{50}$ in eq^n iii, we get

$3x-\frac{143}{50}=0 \Rightarrow x=\frac{143}{50}$

Hence, $x=\frac{143}{50}$, $y=\frac{31}{30}$, $z=\frac{143}{50}$
So, option (c) is correct.

9. If 2a + b = 10 and 2ab = 9 then, the value of (2a – b) will be :

(a) 10 (b) 4
(c) 8 (d) 6

SSC Selection Posts XI-28/06/2023 (Shift-III)

Ans. (c) : Given that, 2a + b = 10 and 2 ab = 9
According to the question,

$\because\ (a-b)=\sqrt{(a+b)^2-4ab}$

$\therefore (2a-b)=\sqrt{(2a+b)^2-8ab}$
$=\sqrt{100-36}$
$=\sqrt{64}$
$=8$

10. 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,

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

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

$x + y + 3z = 17$ ..... (iii)

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

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

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

$17x + 13y = 163$ ..... (iv)

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

$8x + 5y = 70$ ..... (v)

By solving the equation (iv) and (v)

$x = 5, \quad y = 6$

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

$15 + 12 + z = 29$

$\Rightarrow z = 2$

$\therefore xy + yz + zx = (5\times6) + (6\times2) + (2\times5)$

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

11. 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) : $a - b = 3$

$a^3 - b^3 = 999$

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

$3[9 + 3ab] = 999$

$3ab = 333 - 9$

$ab = 108$

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

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

$(a + b)^2 = 441$

$a + b = 21$

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

$= 3 \times 21 = 63$

12. 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, $x + y = 8$ ..... (1)

$y + z = 13$ ..... (2)

$z + x = 17$ ..... (3)

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

$2(x+y+z) = 38$-------(iv)

$x + y + z = 19$

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

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

13. 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 $75x + 113y$?

(a) 163/3 (b) 143/6

(c) 218/9 (d) 311/3

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

Ans. (a) :

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

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

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

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

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

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

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

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

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

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

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

Multiply by 5 eq^n (4) and multiplying by 2 in eq^n (5), respectively then subtracting equation (4) from equation (5).

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

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

$- \quad - \quad -$

$3y = 1$

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

From equation (4),

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

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

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

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

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

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

14. 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

16. 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

16. 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

4x – 3y = –3 ———— (ii)

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

x = 3, y = 5

$\therefore 5x-3y-9=15-15-9=-9$

17. 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)

On 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),

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

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

Now, $a+c=\frac{1}{3}+\frac{1}{12}=\frac{4+1}{12}=\frac{5}{12}$

18. 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
∴ x = 16
As per question,

$$\frac{2x+3y}{2x-3y}=\frac{32+12}{32-12}=\frac{44}{20}=\frac{11}{5}$$

19. 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

20. 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.....(i)
4x + 5y = 67 .....(ii)
By solving the equation (i) and (ii),

$$\begin{array}{rcrcl} 4x & + & 6y & = & 74 \\ 4x & + & 5y & = & 67 \\ - & & - & & - \\ \hline & & y & = & 7 \\ \hline \end{array}$$

{multiplying by 2 in equation (i)}

From equation (i)–
2x + 3 × 7 = 37
2x = 16
x = 8
Hence, the cost price of an apple and a kiwi = 8 + 7 = ₹15

21. 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), we get
2u = 88
u = 44
∴ v = 40
u : v = 44 : 40
= 11 : 10

(II) Problems based on Algebraic Identities

22. 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

23. 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 ---------- (i)
$x^2 - y^2 = 203$
(x + y)(x – y) = 203
7(x + y) = 203
x + y = 29 .....(ii)
By solving the equation (i) and (ii), we get-
x = 18, y = 11

24. If $x+\frac{1}{x}=1$ then what is the value of $\frac{x^2+7x+1}{x^2+11x+1}$?

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

SSC CGL (Tier-I) 26/07/2023 (Shift-II)

Ans. (b) : According to the question,

$$\frac{x^2+7x+1}{x^2+11x+1}=\frac{x\left(x+7+\frac{1}{x}\right)}{x\left(x+11+\frac{1}{x}\right)}=\frac{\left(x+\frac{1}{x}+7\right)}{\left(x+\frac{1}{x}+11\right)}$$

$$=\frac{1+7}{1+11}=\frac{8}{12}=\frac{2}{3}$$

25. If $(a^3 + b^3 + c^3 - 3abc) = 405$ and $(a-b)^2 + (b-c)^2 + (c-a)^2 = 54$, then find the value of $(a + b + c)$

(a) 27 (b) 9
(c) 15 (d) 45

SSC CGL (Tier-I) 26/07/2023 (Shift-II)

Ans. (c) : $a^3 + b^3 + c^3 - 3abc = 405$

$(a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca) = 405$ (By Formula)

OR, $(a + b + c) \times \frac{1}{2}\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right] = 405$

$(a+b+c) \times \frac{1}{2} \times 54 = 405$

$(a + b + c) = \frac{405}{27} = 15$

26. If $(a + b + c) = 13$ and $(ab + bc + ca) = 54$ then find the value of $(a^2 + b^2 + c^2)$.

(a) 61 (b) 63
(c) 65 (d) 59

SSC CGL (Tier-I) 26/07/2023 (Shift-II)

Ans. (a) : $a + b + c = 13$, $ab + bc + ca = 54$ Then

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

(By formula) :- $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$(13)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$169 = a^2 + b^2 + c^2 + 2 \times 54$

$169 - 108 = a^2 + b^2 + c^2$

$a^2 + b^2 + c^2 = 61$

27. If $A = \frac{58^2 - 25^2}{46^2 - 37^2}, B = \frac{26^2 - 15^2}{56^2 - 15^2}$ then the value of $\frac{1}{B} - \frac{20}{A}$ is :

(a) 1 (b) –1
(c) 0 (d) 2

SSC CGL Mains 26/10/2023

Ans. (a) : According to the question,

$A = \frac{(58+25)(58-25)}{(46-37)(46+37)} \quad \{\because a^2 - b^2 = (a+b)(a-b)\}$

$= \frac{(83) \times (33)}{9 \times 83}$

we get, $= \frac{11}{3}$

Now, $B = \frac{(26+15)(26-15)}{(56+15)(56-15)}$

$= \frac{41 \times 11}{71 \times 41} = \frac{11}{71}$

Now, $\frac{1}{B} - \frac{20}{A} = \frac{1}{\frac{11}{71}} - \frac{20}{\frac{11}{3}}$

$= \frac{71}{11} - \frac{60}{11} = \frac{11}{11} = 1$

28. If $a^2 + b^2 + c^2 = 160$ and $a + b + c = 16$ then find the value of $ab + bc + ca$.

(a) 84 (b) 48
(c) 96 (d) 42

SSC CHSL (Tier-I) 14/08/2023 (Shift-IV)

Ans. (b) : $a^2 + b^2 + c^2 = 160$; $a + b + c = 16$; $(ab + bc + ca) = ?$

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

$\Rightarrow (16)^2 = 160 + 2(ab + bc + ca)$

$\Rightarrow (ab + bc + ca) = \frac{256 - 160}{2} = \frac{96}{2}$

$\Rightarrow ab + bc + ca = 48$

29. If $\left(z + \frac{1}{z}\right) = 4$, then find the value of $\frac{1}{2}\left(z^2 + \frac{1}{z^2}\right)$

(a) 8 (b) 14
(c) 16 (d) 7

SSC CHSL (Tier-I) 03/08/2023 (Shift-II)

Ans. (d) : $\left(z + \frac{1}{z}\right) = 4$, $\frac{1}{2}\left(z^2 + \frac{1}{z^2}\right) = ?$

$\because \left(z + \frac{1}{z}\right)^2 = z^2 + \frac{1}{z^2} + 2$

$\Rightarrow (4)^2 = z^2 + \frac{1}{z^2} + 2$

$\Rightarrow \left(z^2 + \frac{1}{z^2}\right) = 14$

on dividing by both side

$\Rightarrow \frac{1}{2}\left(z^2 + \frac{1}{z^2}\right) = \frac{14}{2}$

$\Rightarrow \frac{1}{2}\left(z^2 + \frac{1}{z^2}\right) = 7$

30. If $a - b = 5$ and $ab = 24$ then find the value of $(a^3 - b^3)$:

(a) 360 (b) 455
(c) 485 (d) 385

SSC CHSL (Tier-I) 14/08/2023 (Shift-IV)

Ans. (c) : $(a - b) = 5$; $ab = 24$, $a^3 - b^3 = ?$

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

$\Rightarrow (5)^2 = a^2 + b^2 - 2 \times 24$

$a^2 + b^2 = 25 + 48$

$\Rightarrow a^2 + b^2 = 73$

Now,

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

$\Rightarrow (a^3 - b^3) = 5 \times (73 + 24)$

$\Rightarrow (a^3 - b^3) = 5 \times 97$

$\Rightarrow a^3 - b^3 = 485$

Trick -
$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$
$5^3 = a^3 - b^3 - 3 \times 24(5)$
$a^3 - b^3 = 125 + 360 = 485$

31. Simplify the given expression:-
$(5p + 3q)(5p - 3q)$
(a) $25p^2 - 9q^2 + 30pq$ (b) $25p^2 + 9q^2 - 30pq$
(c) $25p^2 - 9q^2$ (d) $25p^2 + 9q^2$

SSC CHSL (Tier-I) 17/08/2023 (Shift-II)

Ans. (c) : Given that–
$(5p + 3q)(5p - 3q)$
$\Rightarrow 25p^2 - 9q^2$
$[\because (a+b)(a-b) = a^2 - b^2]$
Hence option (c) is right

32. If $\left(x + \frac{1}{x}\right) = 7$ and $x > 1$ then find the value of $\left(x^3 - \frac{1}{x^3}\right)$.
(a) $174\sqrt{5}$ (b) $144\sqrt{5}$
(c) $164\sqrt{5}$ (d) $154\sqrt{5}$

SSC CHSL (Tier-I) 04/08/2023 (Shift-III)

Ans. (b) : Given that : $x + \frac{1}{x} = 7$

$\because \left(x - \frac{1}{x}\right)^2 = \left(x + \frac{1}{x}\right)^2 - 4$
$= 7^2 - 4$
$\left(x - \frac{1}{x}\right) = \sqrt{45} = 3\sqrt{5}$
$\left(x^3 - \frac{1}{x^3}\right) = \left(x - \frac{1}{x}\right)^3 + 3x.\frac{1}{x}\left(x - \frac{1}{x}\right)$
$= \left(3\sqrt{5}\right)^3 + 3\left(3\sqrt{5}\right)$
$= 135\sqrt{5} + 9\sqrt{5}$
$= 144\sqrt{5}$

33. If $\left(y - \frac{1}{y}\right) = 9$, then find the value of $\left(y^3 - \frac{1}{y^3}\right)$
(a) 729 (b) 756 (c) 702 (d) 766

SSC CHSL (Tier-I) 04/08/2023 (Shift-III)

Ans. (b) : $\left(y - \frac{1}{y}\right) = 9$, $\left(y^3 - \frac{1}{y^3}\right) = ?$

$\left(y - \frac{1}{y}\right)^2 = y^2 + \frac{1}{y^2} - 2$
$\Rightarrow (9)^2 = y^2 + \frac{1}{y^2} - 2$
$\Rightarrow \left(y^2 + \frac{1}{y^2}\right) = 83$
$\therefore \left(y^3 - \frac{1}{y^3}\right) = \left(y - \frac{1}{y}\right)\left(y^2 + \frac{1}{y^2} + y\frac{1}{y}\right)$
$= 9 \times (83 + 1)$
$= 756$
$\left(y^3 - \frac{1}{y^3}\right) = 756$

Trick-
$\left(y - \frac{1}{y}\right)^3 = y^3 - \frac{1}{y^3} - 3y \times \frac{1}{y}\left(y - \frac{1}{y}\right)$
$(9)^3 = y^3 - \frac{1}{y^3} - 3(9)$
$y^3 - \frac{1}{y^3} = 756$

34. If $2x + \frac{2}{x} = 5$, then, the value of $\left(x^3 + \frac{1}{x^3} + 2\right)$ will be :
(a) $\frac{71}{8}$ (b) $\frac{91}{11}$
(c) $\frac{81}{7}$ (d) $\frac{81}{8}$

SSC CHSL (Tier-I) 02/08/2023 (Shift-I)

Ans. (d) : $2x + \frac{2}{x} = 5$
$2x^2 - 5x + 2 = 0$
$2x^2 - 4x - x + 2 = 0$
$x = 2, 1/2$
Putting the value (x=2) in Equ $\left(x^3 + \frac{1}{x^3} + 2\right)$
$= (2)^3 + \frac{1}{(2)^3} + 2$
$= 8 + \frac{1}{8} + 2 = \frac{81}{8}$

35. If $x > 1$ and $x^2 + \frac{1}{x^2} = 2\sqrt{5}$ then the value of $x^4 - \frac{1}{x^4}$ will be :
(a) $8\sqrt{6}$ (b) $8\sqrt{5}$
(c) $4\sqrt{30}$ (d) $4\sqrt{5}$

SSC Selection Posts XI-28/06/2023 (Shift-III)

Ans. (b) : Given that
$x > 1$ and $x^2 + \frac{1}{x^2} = 2\sqrt{5}$
then, $\left(x + \frac{1}{x}\right)^2 = 2\sqrt{5} + 2 = 2(\sqrt{5} + 1)$

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

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

$$x-\frac{1}{x}=\sqrt{2(\sqrt{5}-1)}$$

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

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

$$=2\sqrt{5}\times\sqrt{2\left(\sqrt{5}+1\right)}\times\sqrt{2\left(\sqrt{5}-1\right)}$$

$$=2\sqrt{5}\times\sqrt{4\times(5-1)}$$

$$=8\sqrt{5}$$

36. Find the value of $(a^3 + b^3 + c^3 - 3abc)$, where, a = 335, b = 215 and c = 180.

(a) 15452630 (b) 14502230
(c) 14472250 (d) 15421320

SSC CHSL (Tier-I) 04/08/2023 (Shift-III)

Ans. (c) : Given that,
a = 335
b = 215
c = 180

$\therefore a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)\,[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$$=\frac{1}{2}(335+215+180)\left[(335-215)^2+(215-180)^2+(180-335)^2\right]$$

$$=\frac{1}{2}(730)\left[(120)^2+(35)^2+(-155)^2\right]$$

$$=\frac{1}{2}\times730\left[14400+1225+24025\right]$$

= 365 × 39650
= 14472250

37. If $x+\frac{1}{x}=7$ then find the value of $x^2+\frac{1}{x^2}$:

(a) 49 (b) 51
(c) 5 (d) 47

SSC CHSL (Tier-I) 02/08/2023 (Shift-I)

Ans. (d): $x+\frac{1}{x}=7$
On squaring both sides–

$$\left(x+\frac{1}{x}\right)^2=49$$

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

$$\therefore\quad x^2+\frac{1}{x^2}=47$$

38. If $x^2 - 5\sqrt{5}x + 1 = 0$, and $x > 0$ then the value of $\left(x^3 - \frac{1}{x^3}\right)$ will be :

(a) 1331 (b) 1296
(c) 1244 (d) 1364

SSC CHSL (Tier-I) 08/08/2023 (Shift-II)

Ans. (d) : $x^2 - 5\sqrt{5}x + 1 = 0$
On dividing both sides by x,

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

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

$$\left(x-\frac{1}{x}\right)^2=125-4$$

$$x-\frac{1}{x}=\sqrt{121}$$

$$x-\frac{1}{x}=11$$

Taking cube of both sides,

$$\Rightarrow\left(x-\frac{1}{x}\right)^3=(11)^3$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=1331$$

$$\Rightarrow x^3-\frac{1}{x^3}=1331+3\times11$$

$$\therefore\ \left(x^3-\frac{1}{x^3}\right)=1364$$

39. If $a^2 + b^2 + c^2 = ab + bc + ca$ then the value of $\frac{11a^4+13b^4+15c^4}{16a^2b^2+19b^2c^2+17c^2a^2}$ is

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

SSC CHSL (Tier-I) 09/08/2023 (Shift-III)

Ans. (b): $a^2 + b^2 + c^2 = ab + bc + ca$
On putting,
a = b = c = 1
1 + 1 + 1 = 1 × 1 + 1 × 1 + 1 × 1
3 = 3
From question-

$$=\frac{11a^4+13b^4+15c^4}{16a^2b^2+19b^2c^2+17c^2a^2}$$

$$=\frac{11+13+15}{16+19+17}$$

$$=\frac{39}{52}$$

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

40. Simplify the following expression $(c + d)^2 - (c - d)^2$.

(a) $2(c^2 + d^2)$ (b) $(c^2 + d^2)$

(c) 4cd (d) 2cd

SSC CHSL (Tier-I) 09/08/2023 (Shift-III)

Ans. (c) : $(c + d)^2 - (c - d)^2$

$= c^2 + d^2 + 2cd - c^2 - d^2 + 2cd$

$= 4cd$

41. If $a + b + c = 13$ and $ab + bc + ca = 45$ then find the value of $a^2 + b^2 + c^2$

(a) 65 (b) 79

(c) 85 (d) 57

SSC CHSL (Tier-I) 09/08/2023 (Shift-III)

Ans. (b) : $a + b + c = 13$

$ab + bc + ca = 45$

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

$(13)^2 = a^2 + b^2 + c^2 + 2(45)$

$\therefore a^2 + b^2 + c^2 = 169 - 90$

$= 79$

42. If $x^2 + \frac{1}{x^2} = 29$ then find the value of $x - \frac{1}{x}$

(a) ± 3 (b) $\pm 4\sqrt{3}$

(c) ± 4 (d) $\pm 3\sqrt{3}$

SSC CHSL (Tier-I) 10/08/2023 (Shift-I)

Ans. (d) : Given that,

$$x^2 + \frac{1}{x^2} = 29$$

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

$$= \pm\sqrt{29 - 2}$$

$$= \pm\sqrt{27}$$

$$= \pm 3\sqrt{3}$$

43. Simplify the expression $\frac{36a^2 - 49b^2}{6a + 7b}$.

(a) $\frac{1}{6a - 7b}$ (b) $6a - 7b$

(c) $7b - 6a$ (d) $6a + 7b$

SSC CHSL (Tier-I) 11/08/2023 (Shift-I)

Ans. (b) : $\frac{36a^2 - 49b^2}{6a + 7b} = \frac{(6a)^2 - (7b)^2}{6a + 7b}$

$$= \frac{(6a + 7b)(6a - 7b)}{(6a + 7b)}$$

$= 6a - 7b$

44. If $\left(3y + \frac{3}{y} = 8\right)$ then find the value of $y^2 + \frac{1}{y^2}$

(a) $9\frac{1}{9}$ (b) $4\frac{5}{6}$ (c) $7\frac{1}{9}$ (d) $5\frac{1}{9}$

SSC CHSL (Tier-I) 11/08/2023 (Shift-I)

Ans. (d) : $3y + \frac{3}{y} = 8$

On dividing both the sides by 3,

$$y + \frac{1}{y} = \frac{8}{3}$$

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

$$\frac{64}{9} - 2 = y^2 + \frac{1}{y^2}$$

$$y^2 + \frac{1}{y^2} = \frac{46}{9}$$

$$= 5\frac{1}{9}$$

45. If $a^2 + b^2 + c^2 = ab + bc + ac$, then find the value of $\frac{11a^4 + 13b^4 + 17c^4}{17a^2b^2 + 9b^2c^2 + 15c^2a^2}$

(a) 4 (b) 11

(c) 2 (d) 1

SSC CGL (Tier-I) 18/07/2023 (Shift-III)

Ans. (d) : $a^2 + b^2 + c^2 = ab + bc + ca$

on putting, $a = b = c = 1$

$1 + 1 + 1 = 1 + 1 + 1$

$3 = 3$

On putting the value in the required expression,

$$= \frac{11a^4 + 13b^4 + 17c^4}{17a^2b^2 + 9b^2c^2 + 15c^2a^2}$$

$$= \frac{11 + 13 + 17}{17 + 9 + 15} = \frac{41}{41} = 1$$

46. If $x = 2$ and $y = 3$ then solve the expression $\frac{\sqrt{x} - \sqrt{y}}{\sqrt{x} + \sqrt{y}}$

(a) $2\sqrt{6} - 6$ (b) $5 - 2\sqrt{6}$

(c) $2\sqrt{6} - 5$ (d) $\sqrt{6} - 5$

SSC CGL (Tier-I) 25/07/2023 (Shift-IV)

Ans. (c) : $x = 2$ and $y = 3$, $\therefore \frac{\sqrt{x} - \sqrt{y}}{\sqrt{x} + \sqrt{y}} = ?$

On putting the value of x and y,

$$\Rightarrow \frac{\sqrt{2} - \sqrt{3}}{\sqrt{2} + \sqrt{3}} \times \frac{\sqrt{2} - \sqrt{3}}{\sqrt{2} - \sqrt{3}} \quad \text{(On rationalization)}$$

$$\Rightarrow \frac{\left(\sqrt{2} - \sqrt{3}\right)^2}{\left(\sqrt{2}\right)^2 - \left(\sqrt{3}\right)^2} = \frac{2 + 3 - 2\sqrt{2 \times 3}}{2 - 3}$$

$$\Rightarrow \frac{5 - 2\sqrt{6}}{-1} = 2\sqrt{6} - 5$$

47. If (a + b – c) = 20 and $a^2 + b^2 + c^2 = 152$ then find the value of $a^3 + b^3 – c^3 + 3abc$:

(a) 560 (b) 640
(c) 480 (d) 720

SSC CGL (Tier-I) 25/07/2023 (Shift-IV)
SSC CGL (Tier-I) 19/07/2023 (Shift-IV)

Ans. (a): Given, (a + b – c) = 20
and $a^2 + b^2 + c^2 = 152$
$(a + b – c)^2 = a^2 + b^2 + c^2 + 2ab – 2bc – 2ca$
$400 – 152 = 2(ab – bc – ca)$
$248 = 2(ab – bc – ca)$
$ab – bc – ca = 124$
$\therefore a^3 + b^3 – c^3 + 3abc = (a + b – c)\ [a^2 + b^2 + c^2 – (ab – bc – ca)]$
$= 20(152 – 124)$
$= 20 \times 28 = 560$

48. What is the value of $\left(\frac{1}{a}-\frac{1}{b}-\frac{1}{c}\right)$, if $\frac{2a-5}{a}-\frac{4b-5}{b}+\frac{6c+5}{c}=0$

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$ (c) $-\frac{12}{5}$ (d) $-\frac{8}{5}$

SSC CGL (Tier-I) 21/07/2023 (Shift-II)

Ans. (b) : $\frac{2a-5}{a}-\frac{4b-5}{b}+\frac{6c+5}{c}=0$

$2-\frac{5}{a}-4+\frac{5}{b}+6+\frac{5}{c}=0$

$\frac{1}{a}-\frac{1}{b}-\frac{1}{c}=\frac{4}{5}$

49. If $\left(x-\frac{1}{x}\right)=2\sqrt{2}$ then the value of $\left(x^6+\frac{1}{x^6}\right)$ is:

(a) 960 (b) 970
(c) 1030 (d) 1000

SSC CGL (Tier-I) 21/07/2023 (Shift-II)

Ans. (b) : $x-\frac{1}{x}=2\sqrt{2}$

Suppose, $x-\frac{1}{x}=a$

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

$=\left(2\sqrt{2}\right)^3+3\left(2\sqrt{2}\right)$

$=16\sqrt{2}+6\sqrt{2}$

$=22\sqrt{2}$

On squaring both side,

$\left(x^3-\frac{1}{x^3}\right)^2=\left(22\sqrt{2}\right)^2$

$x^6+\frac{1}{x^6}-2=968$

$\therefore\ x^6+\frac{1}{x^6}=970$

50. If $\left(x+\frac{1}{x}\right)=2$, then the value of $x^7+\frac{1}{x^{117}}$ will be :

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

SSC CGL (Tier-I) 19/07/2023 (Shift-IV)

Ans. (d) : $x+\frac{1}{x}=2$

$x^2 – 2x + 1 = 0$

$(x – 1)^2 = 0$

$x = 1$

$x^7+\frac{1}{x^{117}}=1+1=2$

51. If $\left(x+\frac{1}{x}\right)=6$ and x >1 then find the value of $\left(x^2-\frac{1}{x^2}\right)$.

(a) $12\sqrt{10}$ (b) $24\sqrt{2}$
(c) $18\sqrt{2}$ (d) $30\sqrt{2}$

SSC CGL (Tier-I) 27/07/2023 (Shift-III)

Ans. (b) : $x+\frac{1}{x}=6$

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

$=36-4$

$x-\frac{1}{x}=\sqrt{32}=4\sqrt{2}$

[$\because$ Fomula $(a + b)(a – b) = a^2 – b^2$]

$\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)=4\sqrt{2}\times6$

$\therefore\left(x^2-\frac{1}{x^2}\right)=24\sqrt{2}$

52. If $(a^3+b^3+c^3–3abc) = 405$ and $(a+b+c) = 15$ then find the value of $(a-b)^2+(b-c)^2+(c-a)^2$

(a) 18 (b) 45
(c) 54 (d) 27

SSC CGL (Tier-I) 20/07/2023 (Shift-I)

Ans. (c) : Given that $(a^3 + b^3 + c^3 - 3abc) = 405$,

$a + b + c = 15$

$(a – b)^2 + (b – c)^2 + (c – a)^2 = ?$

By Formula,

$a^3+b^3+c^3-3abc=\frac{1}{2}(a+b+c)\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

$405=\frac{1}{2}\times15\times\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

$27\times2=(a-b)^2+(b-c)^2+(c-a)^2$

$\therefore\ (a-b)^2+(b-c)^2+(c-a)^2=54$

53. If $\left(x-\frac{1}{x}\right)=\sqrt{6}$ and x > 1 then the value of $\left(x^8-\frac{1}{x^8}\right)$ will be :

(a) $992\sqrt{15}$ (b) $1024\sqrt{15}$

(c) $1012\sqrt{15}$ (d) $998\sqrt{15}$

SSC CGL (Tier-I) 17/07/2023 (Shift-II)

Ans. (a) : Given that,

$$\left(x-\frac{1}{x}\right)=\left(\sqrt{6}\right)$$

On squaring both sides,

$$\Rightarrow\left(x-\frac{1}{x}\right)^2=\left(\sqrt{6}\right)^2$$

$$\Rightarrow x^2+\frac{1}{x^2}-2=6$$

$$\Rightarrow\left(x^2+\frac{1}{x^2}\right)=8$$

Again on squaring both the sides

$$\Rightarrow\left(x^2+\frac{1}{x^2}\right)^2=(8)^2$$

$$\Rightarrow\left(x^4+\frac{1}{x^4}\right)=64-2$$

$$\Rightarrow\left(x^4+\frac{1}{x^4}\right)=62$$

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

$$=8^2-4$$

$$=64-4$$

$$=\sqrt{60}$$

$$\left(x^2-\frac{1}{x^2}\right)=2\sqrt{15}$$

$$\therefore\left(x^8-\frac{1}{x^8}\right)$$

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

$$=2\sqrt{15}\times8\times62$$

$$=992\sqrt{15}$$

54. Simplify the problem $\frac{x^4-2x^2+1}{x^2-2x+1}$

(a) x^2+2x+2 (b) x^2+x+1

(c) x^2+2x+1 (d) x^2-2x+1

SSC CGL (Tier-I) 17/07/2023 (Shift-II)

Ans. (c): $\frac{x^4-2x^2+1}{x^2-2x+1}$

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

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

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

$$\Rightarrow(x+1)^2$$

$$\Rightarrow x^2+2x+1$$

55. If $7b-\frac{1}{4b}=7$ then find the value of $16b^2+\frac{1}{49b^2}$.

(a) $\frac{120}{7}$ (b) $\frac{104}{7}$ (c) $\frac{80}{49}$ (d) $\frac{7}{2}$

SSC CGL (Tier-I) 14/07/2023 (Shift-I)

Ans. (a) : $7b-\frac{1}{4b}=7$

Multiplying by 4/7 in both the sides

$$4b-\frac{1}{7b}=4$$

On squaring both sides-

$$16b^2+\frac{1}{49b^2}-2\times4\times\frac{1}{7}=16$$

$$16b^2+\frac{1}{49b^2}=\frac{120}{7}$$

56. If (a + b + c) = 16 and ($a^2 + b^2 + c^2$) = 90 then find the value of (ab + bc + ca) :

(a) 82 (b) 84

(c) 83 (d) 81

SSC CGL (Tier-I) 14/07/2023 (Shift-I)

Ans. (c) : (a + b + c) = 16

$a^2 + b^2 + c^2 = 90$

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

$256 = 90 + 2(ab + bc + ca)$

$$\frac{166}{2}=ab+bc+ca$$

$ab + bc + ca = 83$

57. If $\sqrt{a}=3b$, then $\frac{a}{b^2}$ is equals to :

(a) $\frac{1}{9}$ (b) 6

(c) 9 (d) $\frac{1}{6}$

SSC CHSL (Tier-I) 08/08/2023 (Shift-II)

Ans. (c) : $\sqrt{a} = 3b$

On squaring both sides –

$a = 9b^2$

$\frac{a}{b^2} = 9$

58. If $x^4 + \frac{16}{x^4} = 15617, x > 0$ then the value $x + \frac{2}{x}$ is:

(a) $\sqrt{129}$ (b) $\sqrt{123}$

(c) $\sqrt{127}$ (d) $\sqrt{121}$

SSC CGL 12/12/2022 (Shift-III)

Ans. (a): $x^4 + \frac{16}{x^4} = 15617$ then $x + \frac{2}{x} = ?$

$$x^2 + \frac{4}{x^2} = \sqrt{15617 + 2 \times 4}$$

$$= \sqrt{15625}$$

$$= \sqrt{25^2 \times 25}$$

$$= 25 \times 5$$

$$= 125$$

$$x^2 + \frac{4}{x^2} = 125$$

then $x + \frac{2}{x} = \sqrt{125 + 2 \times 2}$

$$x + \frac{2}{x} = \sqrt{129}$$

59. If $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$ then find the value of $x^3 - 6x^2 + 18x$:

(a) 45 (b) 40

(c) 22 (d) 33

SSC CGL 13/12/2022 (Shift-IV)

Ans. (c) : Given,

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

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

On cubing both sides,

$x^3 - 8 - 6x(x - 2) = 4 - 2 - 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}}\left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)$

$\Rightarrow x^3 - 8 - 6x^2 + 12x = 2 - 6(x - 2)$

$\Rightarrow x^3 - 8 - 6x^2 + 12x = 2 - 6x + 12$

$\Rightarrow x^3 - 6x^2 + 12x + 6x = 14 + 8$

$\therefore \boxed{x^3 - 6x^2 + 18x = 22}$

60. If $x + y + z = 25$, $x^3 + y^3 + z^3 = 85$ and $xyz = 20$ then find the value of $x^2 + y^2 + z^2 - xy - yz - zx$

(a) 4 (b) 3

(c) 1 (d) 2

SSC CHSL –01/06/2022 (Shift-III)

Ans. (c) : Given that, $x + y + z = 25$

$x^3 + y^3 + z^3 = 85$

and $xyz = 20$

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

$\Rightarrow 85 - 60 = 25[x^2 + y^2 + z^2 - xy - yz - zx]$

$\Rightarrow x^2 + y^2 + z^2 - xy - yz - zx = 1$

61. If $8x^3 + 27y^3 + 64z^3 = 72xyz$ then the relation between x, y and z can be.

(a) $2x + 3y = 4z$ (b) $2x + y + z = 0$

(c) $2x + 3y = -4z$ (d) $2x - 3y + 4z = 0$

SSC CHSL –30/05/2022 (Shift-I)

Ans. (c) : $8x^3 + 27y^3 + 64z^3 = 72\,xyz$

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

If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

According to the condition

$\Rightarrow 2x + 3y + 4z = 0$

$\Rightarrow 2x + 3y = -4z$

62. If $a + 2b = 27$ and $a^3 + 8b^3 = 5427$ then get the value of 2ab.

(a) 176 (b) 156

(c) 149 (d) 172

SSC CHSL –24/05/2022 (Shift-III)

Ans. (a) : Given that,

$a + 2b = 27$

and $a^3 + 8b^3 = 5427$

$\Rightarrow a^3 + (2b)^3 = (a + 2b)(a^2 + 4b^2 - 2ab) = 5427$

$\Rightarrow a^2 + 4b^2 - 2ab = \frac{5427}{27}$

$\Rightarrow a^2 + 4b^2 - 2ab = 201$ ...(1)

Again,

$(a + 2b) = 27$

$(a + 2b)^2 = (27)^2$

$a^2 + 4b^2 + 4ab = 729$ ...(2)

By solving the eq^n (1) and (2)–

$$a^2 + 4b^2 - 2ab = 201$$

$$a^2 + 4b^2 + 4ab = 729$$

$$- \quad - \quad -$$

$$-6ab = -528$$

$$2ab = \frac{528}{3}$$

$\therefore \boxed{2ab = 176}$

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

(a) 4 (b) 2

(c) 8 (d) 1

SSC MTS 11/09/2023 (Shift IIst)

Ans. (a) : $x + y + z = 7$, $x^2 + y^2 + z^2 = 85$

$x^3 + y^3 + z^3 = 913$ $\sqrt[3]{xyz} = ?$

Formula-

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

$49 - 85 = 2(xy + yz + zx)$

$xy + yz + zx = -18$

Formula-

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

$913 - 3xyz = 7(85+18)$

$913 - 721 = 3xyz \Rightarrow xyz = 64$

$\sqrt[3]{xyz} = (64)^{1/3} = (4^3)^{1/3} = \boxed{4}$

64. If x = 32, y = 33 and z = 35 then find the value for expression $(x^3 + y^3 + z^3 - 3xyz)$:

(a) 1000 (b) 1120

(c) 700 (d) 900

SSC CHSL –01/06/2022 (Shift-III)

Ans. (c) : Given that,

$x = 32, y = 33$ and $z = 35$

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

$=(32 + 33 + 35)[(32)^2 + (33)^2 + (35)^2 - 32 \times 33 - 33 \times 35 - 35 \times 32]$

$= 100[1024 + 1089 + 1225 - 1056 - 1155 - 1120]$

$= 100[3338 - 3331] = 100 \times 7 = 700$

65. If $\frac{x^2}{y^2} + \frac{y^2}{x^2} = 7$ then $\frac{x^3}{y^3} + \frac{y^3}{x^3}$ equals to :

(a) 17 (b) 15

(c) 18 (d) 16

SSC CHSL –26/05/2022 (Shift-I)

Ans. (c) : From the question,

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

By adding 2 in both sides–

$$\frac{x^2}{y^2} + \frac{y^2}{x^2} + 2 \times \frac{x}{y} \times \frac{y}{x} = 7 + \frac{2xy}{yx}$$

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

$$\frac{x}{y} + \frac{y}{x} = \sqrt{9} = 3$$

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

$= 3(7 - 1) = 3 \times 6 = 18$

66. If $a^2 + b^2 + c^2 = 6.25$ and $(ab + bc + ca) = 0.52$ where $(a+b+c) < 0$ then find the value of $(a + b + c)$:

(a) –2.7 (b) –2.8

(c) ± 2.7 (d) ±2.8

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

Ans. (a): $a^2 + b^2 + c^2 = 6.25$

$ab + bc + ca = 0.52$

$(a+b+c) < 0$

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

$= 6.25 + 2 \times 0.52$

$= 6.25 + 1.04$

$(a+b+c)^2 = 7.29$

$a + b + c = \pm 2.7$

$\because (a+b+c) < 0$

$\therefore \boxed{a + b + c = -2.7}$

67. If $xy = -6$ and $x^3 + y^3 = 19$ (Where x and y are integers) then the value of $\frac{1}{x^{-1}} + \frac{1}{y^{-1}}$ is :

(a) 2 (b) 1

(c) –2 (d) –1

SSC CGL (Tier-II) 08/08/2022 (Shift-I)

Ans. (b) : $xy = -6$

$x^3 + y^3 = 19$

Suppose $x = 3$ and $y = -2$

$xy = 3 \times (-2) = -6$

$x^3 + y^3 = (3)^3 + (-2)^3 = 27 - 8 = 19$

$\therefore \frac{1}{x^{-1}} + \frac{1}{y^{-1}} = x + y = 3 + (-2) = 1$

68. If $x + y = 1$ then, the value of $(x^3 + 3xy + y^3)$ will be :

(a) –1 (b) 1

(c) 0 (d) 2

SSC CGL (Tier-II) 08/08/2022 (Shift-I)

Ans. (b) : $x + y = 1$ ..... (1)

Taking cube of both the sides–

$(x+y)^3 = 1^3$

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

$x^3 + y^3 + 3xy(x+y) = 1$

$x^3 + y^3 + 3xy(1) = 1$ (From Eq^n (1))

$\boxed{x^3 + y^3 + 3xy = 1}$

69. What will be the simplified value of $\frac{(x+y+z)(xy+yz+zx) - xyz}{(x+y)(y+z)(z+x)}$.

(a) y (b) x

(c) 1 (d) z

SSC GD Constable 07/02/2023 (Shift Ist)

Ans. (c) : $\frac{(x+y+z)(xy+yz+zx) - xyz}{(x+y)(y+z)(z+x)}$

putting $x = 0$

$$= \frac{(y+z)(0.y + yz + z.0) - 0.yz}{(0+y)(y+z)(z+0)} = \frac{(y+z)(yz)}{(y+z)yz} = 1$$

70. If $\left(x + \frac{1}{x}\right)^2 = 3$ then the value of $(x^6 + x^{-6})$ is:

(a) –2 (b) 2

(c) –6 (d) 6

SSC CGL (Tier-II) 08/08/2022 (Shift-I)

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

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

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

$$x^2+\frac{1}{x^2}=1.....(1)$$

On cubing both sides,

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

$$x^6+\frac{1}{x^6}+3.x^2.\frac{1}{x^2}\left(x^2+\frac{1}{x^2}\right)=1$$

$$x^6+\frac{1}{x^6}+3.1.(1)=1$$

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

$$x^6+\frac{1}{x^6}=-2$$

$$\boxed{x^6+x^{-6}=-2}$$

71. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 32$, $a^3 + b^3 + c^3 = 189$ and then find the value of $(abc - 3)$.

(a) 1 (b) 3 (c) 2 (d) 0

SSC CGL 12/04/2022 (Shift-II)

Ans. (d) : $a + b + c = 6$ ..... (i)

$a^2 + b^2 + c^2 = 32$..... (ii)

$a^3 + b^3 + c^3 = 189$ ..... (iii)

On squaring both the sides of eq^n (i)−

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

$a^2 + b^2 + c^2 + 2 (ab + bc + ca) = 36$

$32 + 2 (ab + bc + ca) = 36$ (By eq^n (ii))

$2 (ab + bc + ca) = 36 - 32$

$ab + bc + ca = 2$

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

$189 - 3abc = 6 (32-2)$

$189 - 3abc = 180$

$3abc = 9$

$\boxed{abc = 3}$

$abc - 3 = 3 - 3$

$\therefore \boxed{abc - 3 = 0}$

72. If $x + y + z = 18$, $xyz = 81$ and $xy+yz+zx = 90$ then the value of $(x^3 + y^3 + z^3 + xyz)$ will be :

(a) 1225 (b) 1250

(c) 1321 (d) 1296

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

Ans. (d) : Given that−

$x + y + z = 18$ ..... (i)

$xy + yz + zx = 90$ ..... (ii)

$xyz = 81$ ..... (iii)

On squaring both sides of eq^n (i)−

$(x+y+z)^2 = (18)^2$

$x^2 + y^2 + z^2 + 2 (xy + yz + zx) = 324$

$x^2 + y^2 + z^2 + 2 (90) = 324$ (By eq^n (ii))

$x^2 + y^2 + z^2 = 144$

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

$x^3 + y^3 + z^3 - 3 \times 81 = 18 \times [144 - 90]$

[By eq^n (ii) and (i)]

$x^3 + y^3 + z^3 = 18 \times 54 + 3 \times 81$

$x^3 + y^3 + z^3 = 972 + 243$

$x^3 + y^3 + z^3 = 1215$

$x^3 + y^3 + z^3 + xyz = 1215 + xyz$

$x^3 + y^3 + z^3 + xyz = 1215+81$

$\boxed{x^3 + y^3 + z^3 + xyz = 1296}$

73. If $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$ then the value of $x^4 + \frac{1}{x^4}$ will be:

(a) 531 (b) 623

(c) 527 (d) 7

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

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

Ans. (c) :

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

On squaring both the sides−

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

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

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

Again Squaring both the sides −

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

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

Again Squaring both the sides−

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

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

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

74. Simplify $(a^{-1} + b^{-1}) \div (a^{-3} + b^{-3})$

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

(c) $\frac{ab}{(a^2-ab+b^2)}$ (d) $\frac{a^2b^2}{(a^2-ab+b^2)}$

SSC CHSL –09/06/2022 (Shift-III)

Ans. (d): $\frac{a^{-1}+b^{-1}}{a^{-3}+b^{-3}}$

$= \frac{\frac{1}{a}+\frac{1}{b}}{\frac{1}{a^3}+\frac{1}{b^3}} = \frac{\frac{b+a}{ab}}{\frac{b^3+a^3}{a^3b^3}}$

$= \frac{b+a}{ab} \times \frac{a^3b^3}{b^3+a^3}$

$\frac{b+a}{ab} \times \frac{a^3b^3}{(b+a)(b^2-ab+a^2)}$

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

75. If $x - \frac{1}{x} = 11$ and $x > 0$ then find the value of $\left(x^2 - \frac{1}{x^2}\right)$

(a) $55\sqrt{5}$ (b) $11\sqrt{123}$

(c) $-55\sqrt{5}$ (d) $-11\sqrt{123}$

SSC CHSL –08/06/2022 (Shift-II)

Ans. (a) : Given that,

$x - \frac{1}{x} = 11$ .....(i)

$x^2 + \frac{1}{x^2} - 2 = 121$

$x^2 + \frac{1}{x^2} = 123$

$x^2 + \frac{1}{x^2} + 2 = 125$ .....(ii)

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

Multiplying the equation (i) and (ii)

$\left(x^2 - \frac{1}{x^2}\right) = 5\sqrt{5} \times 11 = 55\sqrt{5}$

76. What will be the value of following expression

$2^2\left(\frac{x^a}{x^b}\right)^{(a+b)} \times 3^2\left(\frac{x^b}{x^c}\right)^{(b+c)} \times 6^{-2}\left(\frac{x^c}{x^a}\right)^{(a+c)}$

(a) 1 (b) 0 (c) 9 (d) 4

SSC CHSL –08/06/2022 (Shift-II)

Ans. (a) : $2^2\left(\frac{x^a}{x^b}\right)^{(a+b)} \times 3^2\left(\frac{x^b}{x^c}\right)^{(b+c)} \times 6^{-2}\left(\frac{x^c}{x^a}\right)^{(a+c)}$

$= 4 \times \frac{x^{a^2+ab}}{x^{ab+b^2}} \times 9 \times \frac{x^{b^2+bc}}{x^{bc+c^2}} \times \frac{1}{36} \times \frac{x^{ac+c^2}}{x^{a^2+ac}}$

$= 4 \times 9 \times \frac{1}{36} \times \frac{x^{a^2+b^2+c^2+ab+bc+ac}}{x^{a^2+b^2+c^2+ab+bc+ac}}$

$= 1$

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

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

SSC CHSL –03/06/2022 (Shift-II)

Ans. (b): Given that,

$a - b = 3$

$a - 3 = b$ ...(1)

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

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

$a^2 + ab + b^2 = \frac{999}{3}$

$a^2 + ab + b^2 = 333$

$a^2 + a(a - 3) + (a - 3)^2 = 333$ (By Eq^n (i))

$3a^2 - 9a - 324 = 0$

$a^2 - 3a - 108 = 0$

$a^2 - 12a + 9a - 108 = 0$

$a(a - 12) + 9(a - 12) = 0$

$(a - 12)(a + 9)$

$\Rightarrow a = 12$ or -9

$a = 12$

$b = 9$ Form Eq^n (1)

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

$= (12 + 9)(12 - 9)$

$= 21 \times 3 = 63$

78. If $a + b + c = 0$, then find the value of $\frac{a^2+b^2+c^2}{a^2-bc}$:

(a) –1 (b) 1 (c) –2 (d) 2

SSC CHSL –03/06/2022 (Shift-II)

Ans. (d) : Given that,

$a + b + c = 0$

$a = - b - c$

$a = [-(b + c)]$

On squaring both the sides,

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

$a^2 = b^2 + c^2 + 2bc$ ...(1)

Hence, $\frac{a^2+b^2+c^2}{a^2-bc} = \frac{b^2+c^2+2bc+b^2+c^2}{b^2+c^2+2bc-bc}$

On putting the value of (a^2) form Eq^n (i)

$= \frac{2b^2+2c^2+2bc}{b^2+c^2+bc}$

$\frac{2(b^2+c^2+bc)}{b^2+c^2+bc} = 2$

79. If $r + \frac{64}{r} = 16$ then find the value of $r^4 + \frac{1}{r^3}$.

(a) 512 (b) $4096\frac{1}{512}$

(c) $512\frac{1}{4096}$ (d) 4096

SSC CHSL –25/05/2022 (Shift-III)

Ans. (b) : $r+\frac{64}{r}=16$, $r^4+\frac{1}{r^3}=?$

On putting r = 8

$\Rightarrow 8+\frac{64}{8}=16$

$\Rightarrow \frac{64+64}{8}=16$

$\Rightarrow 16=16$

Hence,

$\Rightarrow 8^4+\frac{1}{8^3}$

$\Rightarrow 4096+\frac{1}{512}$

or $4096\frac{1}{512}$

80. 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 02/05/2023 (Shift I[st])

Ans. (c) : Suppose 0.4 = a

0.6 = b

Since $\frac{a^3+b^3}{a^2+b^2-ab}=\frac{\left(a^2+b^2-ab\right)(a+b)}{\left(a^2+b^2-ab\right)}$

$=a+b=0.4+0.6=1.0$

81. What is the value of 296 × 304

(a) 89974 (b) 89874

(c) 79984 (d) 89984

SSC MTS 03/05/2023 (Shift II[nd])

Ans. (d) : 296 × 304 = ?

$=(300-4)\times(300+4)$

$=(300)^2-(4)^2$

$=90000-16=89984$

82. If $a^3+3a^2+9a=1$ then the value of $\left(a^3+\frac{3}{a}\right)$ is:

(a) 31 (b) 26

(c) 28 (d) 24

SSC CPO SI 11/11/2022 (Shift III[rd])

Ans. (c) : $a^3+3a^2+9a=1$

$a^2+3a+9=\frac{1}{a}$

Multiplying by (a-3) in both sides

$(a-3)(a^2+a\times3+3^2)=\frac{1}{a}\times(a-3)$

$a^3-3^3=\frac{a}{a}-\frac{3}{a}$

$a^3+\frac{3}{a}=1+27=28$

83. If $x^4+x^{-4}=194$, x > 0 then the value of $(x-2)^2$ will be:

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

SSC CPO SI 10/11/2022 (Shift II[nd])

Ans. (b) :

$x^4+\frac{1}{x^4}=194$ (Adding 2 in both sides)

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

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

$x^2+\frac{1}{x^2}=14$ (Adding 2 in both sides)

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

$\left(x+\frac{1}{x}\right)^2=16$, $\Rightarrow x+\frac{1}{x}=4$

$x^2+1=4x$

$x^2-4x+1=0$ (Adding 3 in both sides)

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

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

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

84. Find the value of expression $(a+b-c)^3+(a-b+c)^3-8a^3$

(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 CPO SI 9/11/2022 (Shift I[st])

Ans. (a) : $(a+b-c)^3+(a-b+c)^3-8a^3$

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

$\because A+B+C=a+b-c+a-b+c-2a=0$

$\therefore A^3+B^3+C^3=3ABC$

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

$=6a(a-b+c)(c-a-b)$

Trick :

taking a = b = c = 1

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

By option (a)

6a (a–b+c) (c–a–b) = – 6 which satisfy the equation.

85. If $(x^2-4x+1)=0$ then value of $x^9+x^7-194x^5-194x^3$ is :

(a) 4 (b) –4 (c) 1 (d) –1

SSC CPO SI 9/11/2022 (Shift I[st])

Ans. (b) : $x^2-4x+1=0$

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

On squaring both the sides-

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

$x^4+\frac{1}{x^4}=196-2$

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

$$x^4 - 194 = \frac{-1}{x^4} \quad \text{.....(i)}$$

$\therefore \quad x^9 + x^7 - 194x^5 - 194x^3$

$\Rightarrow \quad x^5(x^4 - 194) + x^3(x^4 - 194)$

$$x^5 \times \left(\frac{-1}{x^4}\right) + x^3 \times \left(\frac{-1}{x^4}\right) = -\left(x + \frac{1}{x}\right) = -4$$

86. 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 eq^n, (i)

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

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

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

87. 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)

$\because \quad x^2 - 8x + 16 = 0$

$(x - 4)^2 = 0$

$x = 4$

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

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

$= 16 + 2 = 18$

Trick:

Put, $x = 4$

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

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

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

(a) 10 (b) 15

(c) 9 (d) 12

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

Ans. (d) :

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

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

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

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

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

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

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

$$= 57 - 45 = 12$$

89. 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 -

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

$$(x + 2y)^2 - (x - 2y)^2$$

$$x^2 + 4y^2 + 4xy - x^2 - 4y^2 + 4xy$$

$$= 8xy$$

Now,

$$(x + 2y)^2 - (x - 2y)^2 = 8xy$$

$$(10)^2 - (x - 2y)^2 = 8 \times \frac{9}{2}$$

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

$$(x - 2y) = 8$$

Hence, option (a) is correct.

90. If $4x - 3y = 12$ and $xy = 5$, then find the value of $\frac{16x^2 + 9y^2}{8}$

(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

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

$16x^2 + 9y^2 = 144 - 120$

$16x^2 + 9y^2 = 24$ (divide by 8 on both side)

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

91. 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 : -

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

$\because$ a = 11/5

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

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

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

92. 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,

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

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

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

$$x^3+\frac{1}{x^3}+3.x.\frac{1}{x}\left(x+\frac{1}{x}\right)=-8\times3\sqrt{3}$$

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

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

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

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

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

$\because$ 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-

$x^5+\frac{1}{x^5}=\left(-18\sqrt{3}\right)(10)-\left(-2\sqrt{3}\right)$

$=-180\sqrt{3}+2\sqrt{3}$

$=-178\sqrt{3}$

$\Rightarrow\; x^5+\frac{1}{x^5}=-178\sqrt{3}$

93. 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)

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

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

On squaring both sides

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

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

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

94. 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 ,

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

Put , a= 8, b= 1

$a^2 - b^2 = 8^2 - 1^2$

$= 64-1 = 63$

95. 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)

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

On adding 2 in both side

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

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

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

On adding 2 in both sides

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

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

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

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

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

On adding 3 in both sides

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

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

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

96. 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) : $(a+b-c)^3+(a-b+c)^3-8a^3$

$=(a+b-c)^3+(a-b+c)^3+(-2a)^3=0$

$\because A+B+C=a+b-c+a-b+c-2a=0$

$\therefore A^3+B^3+C^3=3ABC$

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

$=6a(a-b+c)(c-a-b)$

97. 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 both sides

$$x^2-79+\frac{1}{x^2}=0,\ x^2+\frac{1}{x^2}=79$$

Add 2 on both sides,

$$x^2+\frac{1}{x^2}+2=79+2$$

$$\left(x+\frac{1}{x}\right)^2=81,\ x+\frac{1}{x}=9$$

98. 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

$$(a-3)(a^2+a\times3+3^2)=\frac{1}{a}\times(a-3)$$

$$a^3-3^3=\frac{a}{a}-\frac{3}{a}$$

$$a^3+\frac{3}{a}=1+27=28$$

99. 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–

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

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

$$\therefore\left(5x+\frac{1}{4x}\right)^2=\left(5x-\frac{1}{4x}\right)^2+4\times5x\times\frac{1}{4x}$$

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

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

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

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

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

100. 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,

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

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

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

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

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

101. 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)

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

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

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

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

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

$=4+6+9$

$=19$

102. 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) $a + b + c = 11$, $ab + bc + ca = 28$

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

$a^3 + b^3 + c^3 - 3abc = 11(121 - 84)$

$a^3 + b^3 + c^3 - 3abc = 11 \times 37$

$a^3 + b^3 + c^3 - 3abc = 407$

103. 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,

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

$a^2 + b^2 + 49c^2 + 18 = 2b + 56c - 2a$

$(a^2 + 2a + 1) + (b^2 - 2b + 1) + (49c^2 - 56c + 16) = 0$

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

$a + 1 = 0,\ b - 1 = 0,\ 7c - 4 = 0$

$a = -1,\ b = 1,\ c = \frac{4}{7}$

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

104. 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,

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

$= 7[49 - 3 \times 8]$

$= 7 \times 25$

$= 175$

105. 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,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

On comparing,

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

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

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

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

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

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

108. 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

$x^3+\frac{1}{x^3}+3\times5=125$

$\therefore x^3+\frac{1}{x^3}=(5)^3-3\times5=125-15=110$

109. 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,

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

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

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

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

$= 972 + 324$

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

110. 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

Let a + b + c = y

On squaring on both sides,

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

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

$6.25 + 1.04 = y^2$

$y^2 = 7.29$

$y = \pm \sqrt{7.29}$

If a + b + c < 0

Then, a + b + c = –2.7

111. 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

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

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

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

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

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

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

(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 B = 6

Then,

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

113. 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

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

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

114. 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

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

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

$= (18)(47) - 3$

$= 846 - 3 = 843$

115. If $x^2 - 3x + 1 = 0$, then the value of $\frac{\left(x^4+\frac{1}{x^2}\right)}{\left(x^2+5x+1\right)}$ 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,

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

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

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

$\frac{x\left(x^3+\frac{1}{x^3}\right)}{x\left[\left\{x+\frac{1}{x}\right\}+5\right]}$

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

116. 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,

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

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

$= 8[64 - 30]$

$= 8 \times 34 = 272$

117. 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,

$a + b + c = 1$

$ab + bc + ca = -22$

$abc = -40$

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

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

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

$= 1 \times 67$

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

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

118. 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) : Given,

$27x^3 - 64y^3 = (Ax+By)(Cx^2+Dy^2-Exy)$

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

On comparing both sides, we get,

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

Hence

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

$= 16 - 16 - 12$

$= -12$

119. 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) : $(3x + 2y)^3 + (3x - 2y)^3 = 3kx(3x^2 + 4y^2)$

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

So,

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

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

$6x[(9x^2+4y^2)\times 2-(9x^2-4y^2)] = 3kx(3x^2+4y^2)$
$6x[18x^2+8y^2-9x^2+4y^2] = 3kx(3x^2+4y^2)$
$6x[9x^2+12y^2] = 3kx(3x^2+4y^2)$
$3\times 6x(3x^2+4y^2) = 3kx(3x^2+4y^2)$
$6x = kx$
$k = 6$

120. 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),
$361 + 6xy(19) = 6859$
$6xy \times 19 = 6859-361 = 6498$
$xy = \frac{6498}{114} = 57$

121. 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,
$x^2+4y^2+3z^2+\frac{19}{4}=2\sqrt{3}(x+y+z)$
$x^2-2\sqrt{3}x+3+4y^2-2\sqrt{3}y+\frac{3}{4}+3z^2-2\sqrt{3}z+1=0$
$\left(x-\sqrt{3}\right)^2+\left(2y-\frac{\sqrt{3}}{2}\right)^2+\left(\sqrt{3}z-1\right)^2=0$
$x=\sqrt{3}$, $2y=\frac{\sqrt{3}}{2}$, $\sqrt{3}z=1, \Rightarrow y=\frac{\sqrt{3}}{4}$, $z=\frac{1}{\sqrt{3}}$
Hence,
$x - 4y + 3z$
$= \sqrt{3}-4\times\frac{\sqrt{3}}{4}+3\times\frac{1}{\sqrt{3}}$
$= \sqrt{3}-\sqrt{3}+\sqrt{3}$
$= \sqrt{3}$

122. 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,
$x + y + z = 13$ $x^2 + y^2 + z^2 = 91$ and $xz = y^2$
$x + y + z = 13$
On squaring both sides,
$x^2 + y^2 + z^2 + 2(xy + yz + zx) = 169$
$91 + 2(xy + yz + y^2) = 169$
$2(x+y+z)y = 169-91$
$y = \frac{39}{13} = 3$.....(i)
$x + z = 13-3$
$x + z = 10$
$xz = y^2$
$xz = (3)^2$
$xz = 9$
$z = \frac{9}{x}$
$x + \frac{9}{x} = 10$
$x(10-x) = 9$
$x = 1$
Hence, $z \sim x = 9 - 1 = 8$

123. 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)
$\frac{1}{x}+\frac{1}{y}=\frac{20}{9}$
$\frac{x+y}{xy}=\frac{20}{9}$
$\frac{5}{xy}=\frac{20}{9}$ [On putting the value of $x + y = 5$]
$xy = \frac{9}{4}$
$(x+y)^3 = x^3+y^3+3xy(x+y)$
$(5)^3 = x^3+y^3+3\times\frac{9}{4}\times 5$
$125-\frac{135}{4} = x^3+y^3$
$x^3+y^3 = \frac{500-135}{4} = \frac{365}{4}$

124. 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,

$x+y+z = 5,\ \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 0$, $xyz = 12$

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

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

$yz+zx+xy = 0$

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

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

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

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

125. 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,

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

$(7a)^2+(5b)^2 + 2\times7\times5ab = 30+70ab$ $(\because ab = 1)$

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

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

126. 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.

127. 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,

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

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

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

128. 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,

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

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

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

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

129. 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 $a + b + c = 0$
$\therefore a^3 + b^3 + c^3 - 3abc = 0$
$\because 2x + 3y + 1 = 0$
$\therefore 8x^3 + 27y^3 + (1)^3 - 3 \times 2x \times 3y \times 1 = 0$
$8x^3 + 27y^3 + 1 - 18xy = 0$ (adding +7 to Both sides)
$8x^3 + 27y^3 + 8 - 18xy = 7$

130. 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) : $\because (a^2 + b^2 + ab)(a^2 + b^2 - ab) = a^4 + b^4 + a^2b^2$

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

Given $a^2 + b^2 - ab = 21$ .....(2)

From eq^n (1) – (2),
$2ab = -8$
From eq^n (1) + (2),
$2(a^2 + b^2) = 34$
$a^2 + b^2 = 17$
$\therefore (a+b)^2 = 17-8 = 9$
$a + b = 3$

$$\therefore \frac{1}{a}+\frac{1}{b} = \frac{b+a}{ab} = \frac{3}{-4} = \frac{-3}{4}$$

131. If $\left(54\sqrt{2}x^3 + 24\sqrt{3}y^3\right) \div \left(\sqrt{18}x + \sqrt{12}y\right) = Ax^2 + By^2 + Cxy$, 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) :

$$\left[\left(3\sqrt{2}x\right)^3 + \left(2\sqrt{3}y\right)^3\right] \div \left(3\sqrt{2}x + 2\sqrt{3}y\right)$$

$= Ax^2 + By^2 + Cxy$
$\because a^3 + b^3 = (a+b)(a^2 + b^2 - ab)$

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

On comparing:
$Ax^2+By^2+Cxy = 18x^2 + 12y^2 - 6\sqrt{6}\,xy$
$A = 18, B = 12, C = -6\sqrt{6}$
$\therefore A^2-(B^2+C^2) = 18^2 - (144+216)$
$= 324 - 360$
$= -36$

132. 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,
$x + y + z = 7$, $x^2 + y^2 + z^2 = 85$, $x^3 + y^3 + z^3 = 913$
$\therefore x^3+y^3+z^3-3xyz = (x+y+z)[x^2+y^2+z^2-xy-yz-zx]$
$\because (x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz+zx)$
$\because x^2+y^2+z^2+2(xy+yz+zx) = 49$
$2(xy+yz+zx) = -36$
$(xy+yz+zx) = -18$
$x^3+y^3+z^3-3xyz = 7 \times [85 + 18]$
$3xyz = 913 - 721 = 192$
$xyz = 64$
$\sqrt[3]{xyz} = \sqrt[3]{64} = 4$

133. 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),
$x^2 + y^2 + xy = 3$
$\underline{x^2 + y^2 - xy = 7}$
$2(x^2+y^2) = 10$
$x^2 + y^2 = 5$
$x^2 + y^2 + xy = 3$
$xy = -2$

$$\frac{x}{y}+\frac{y}{x} = \frac{x^2+y^2}{xy} = \frac{-5}{2}$$

134. 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,

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

$xy = -1 \times 24$

$xy = -24$

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

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

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

$= 11 \times 49 + 576$

$= 539 + 576 = 1115$

135. If $\left(16\sqrt{2}x^3 + 81\sqrt{3}y^3\right) \div \left(2\sqrt{2x} + 3\sqrt{3}y\right) = Ax^2 + By^2 + Cxy$, 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,

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

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

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

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

On comparing both sides,

$A = 8$

$B = 27$

$C = -6\sqrt{6}$

Then,

$2A - 3B - 2\sqrt{6}C = 2 \times 8 - 3 \times 27 - 2\sqrt{6} \times \left(-6\sqrt{6}\right)$

$= 16 - 81 + 12 \times 6$

$= 16 - 81 + 72$

$= 88 - 81$

$= 7$

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

136. 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 $x = 3$,

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

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

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

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

137. 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,

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

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

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

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

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

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

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

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

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

138. 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)

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

$xy = \frac{2\times5}{18} = \frac{5}{9}$ ------ (ii)

On cubing of equation (i) ,

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

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

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

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

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

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

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

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

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

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

On cubing both side of equation (ii),

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

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

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

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

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

140. 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,

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

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

141. 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 on both side

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

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

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

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

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

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

$\{\because x > 0\}$

142. 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,

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

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

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

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

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

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

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

After comparing LHS with RHS,

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

A = 4, B = 7 & C = –16

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

143. 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,

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

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

144. 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) : $x + y + z = 2$

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

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

$$\therefore x^3+y^3+z^3-3xyz=(x+y+z)\,[x^2+y^2+z^2-(xy+yz+zx)]$$
$$=2\times[26+11]$$
$$=2\times37=74$$

145. 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,

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

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

$= 14 \times 52 – 4$

$= 728 – 4 = 724$

146. 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) :

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

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

$$\frac{4}{xy}=\frac{16}{15} \qquad \text{....(Given, } x+y=4)$$

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

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

$$=4^3-3\times\frac{15}{4}\times4 \quad = 64 – 45 = 19$$

147. 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,

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

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

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

$2(xy+yz+zx) = –36$

$xy+yz+zx = –18$

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

$69–3xyz = 3\times[45– (–18)]$

$–3xyz = 63\times3–69$

$$xyz = \frac{189-69}{-3} = –40$$

148. 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,

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

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

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

On dividing by x,

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

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

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

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

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

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

On comparing both sides,

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

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

$= 6 - 6 + 36 = 36$

150. 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

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

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

151. 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) : $x - y = 4$, $xy = 3$

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

$= 4 \times [(x-y)^2 + 2xy + xy]$

$= 4 \times [4^2 + 3 \times 3]$

$= 4 \times [16 + 9]$

$= 4 \times 25 = 100$

152. 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,

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

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

$= 630\sqrt{3}$

153. 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–

$a + b = p$, $ab = q$ $[a^4 + b^4 = ?]$

$(a + b) = p$ (On squaring both sides)

$a^2 + b^2 + 2ab = p^2$

$a^2 + b^2 = p^2 - 2q$ (On squaring both sides)

$a^4 + b^4 + 2q^2 = p^4 + 4q^2 - 2p^2 \times 2q$

$a^4 + b^4 = p^4 - 4p^2q + 2q^2$

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

$x^4 + y^4 + x^2y^2 = (x^2 + y^2 + xy)(x^2 + y^2 - xy)$

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

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

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

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

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

From eq^n (i) and eq^n (ii),

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

$x^2 + y^2 = 12$

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

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

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

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

156. 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,

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

157. If $x-3=\frac{1}{2x}$, then what is the value of $\left(x^4+\frac{1}{16x^4}\right)$?

(a) 11 (b) 99½
(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,

$$x^4+\frac{1}{16x^4}+2\times x^2\times\frac{1}{4x^2}=100$$

$$x^4+\frac{1}{16x^4}=100-\frac{1}{2}=\frac{199}{2}=99\frac{1}{2}$$

158. Given that $3\sqrt{3}x^3 - 8y^3 = \left(\sqrt{3}x+Ay\right)(3x^2+By^2+Cxy)$, 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) : $3\sqrt{3}x^3 - 8y^3 = (\sqrt{3}x + Ay)(3x^2+By^2+Cxy)$

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

$= (\sqrt{3}x+Ay)(3x^2+By^2+Cxy)$

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

$\therefore$ On comparing both sides,

$A=-2, B=4, C=2\sqrt{3}$

So, $A^2+B^2-C^2=(-2)^2+(4)^2-(2\sqrt{3})^2$

$= 4+16-12=8$

159. 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, $3x-2y+3=3\times1-2\times3+3=0$ L.H.S =R.H.S.

On putting $x=1$ and $y=3$,

$27x^3+54xy+30-8y^3 = 27+54\times1\times3+30-8\times27$

$= 27+162+30-216$

$= 219-216=3$

160. 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,

$$x^4+\frac{1}{x^4}=(98)^2-2=9604-2=9602$$

161. If 3u+2v = 7 and uv = 2, then the value of (3u–2v) is:

(a) 2 (b) 0

(c) 1 (d) 5

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

$(3u-2v)^2=(3u+2v)^2-4\times3u\times2v$

$=49-24\times2=1$

$3u-2v=1$

162. 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,

$$\left(x-\frac{1}{2x}\right)^2=9$$

$$x^2+\frac{1}{4x^2}-2\times x\times\frac{1}{2x}=9$$

$$x^2+\frac{1}{4x^2}=10$$

163. 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) :

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

$185=5[25-3(ab+bc+ca)]$

$37-25=-3(ab+bc+ca)$

$ab+bc+ca=-4$

$\because -4$ lies between –7 and – 3.

Hence option (a) will be right.

164. 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,

$(3x+5y)^2=142$

$9x^2+25y^2+30xy=196$ ($\because$ xy = 6)

So, $9x^2+25y^2=196-30\times6=196-180=16$

165. 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) : $a^2+b^2+c^2+48=8(a+b+c)$

$a^2-8a+16+b^2-8b+16+c^2-8c+16=0$

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

$\therefore$ $(a-4)^2=0$, $a=4$

$(b-4)^2=0$, $b=4$

$(c-4)^2=0$, $c=4$

So, $\sqrt[3]{a^3-b^3+c^3}=\sqrt[3]{4^3-4^3+4^3}=4$

166. 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,

$4x^2-12x+4+5=5$

$4x^2-12x+9=5$

$(2x-3)^2=5$

167. 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) : $x-\frac{2}{x}=4$

$$x^2+\frac{4}{x^2}-2\times x\times\frac{2}{x}=16 \text{ (on squaring both sides)}$$

$$x^2+\frac{4}{x^2}=16+4=20$$

168. 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,

$$x^6+\frac{1}{x^6}=(14)^3-3\times14$$

$$=2744-42=2702$$

169. 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, $x+\frac{1}{x}=8$

170. 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 10/082021 (Shift-II)

Ans. (d) : Given

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

On multiplying by 3 of both side

$$3x+\frac{1}{x}=5\times3=15$$

On cubing both sides,

$$\left(3x+\frac{1}{x}\right)^3=(15)^3$$

$$27x^3+\frac{1}{x^3}+3\times3x\times\frac{1}{x}\left(3x+\frac{1}{x}\right)=3375$$

$$27x^3+\frac{1}{x^3}+9(15)=3375$$

$$27x^3+\frac{1}{x^3}=3375-135$$

$$27x^3+\frac{1}{x^3}=3240$$

171. 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 :-

$1+4x^2+16x^4=512$ -------(i)

And $1-2x+4x^2=64$ ------- (ii)

On dividing equation (i) by equation (ii)

$$\frac{1+4x^2+16x^4}{1-2x+4x^2}=\frac{512}{64}$$

$$\frac{(1+2x+4x^2)(1-2x+4x^2)}{1-2x+4x^2}=8$$

$$1+2x+4x^2=8$$

172. 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

$$\left(x^2+\frac{1}{x^2}\right)^2=(12)^2$$

$$x^4+\frac{1}{x^4}+2=144$$

$$x^4+\frac{1}{x^4}=144-2$$

$$\boxed{x^4+\frac{1}{x^4}=142}$$

173. 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,

$x+\frac{81}{x}=18$

$\Rightarrow x^2+81=81x$

$\Rightarrow x^2-18x+81=0$

$\Rightarrow x^2-(9+9)x+81=0$

$\Rightarrow x^2-9x-9x+81=0$

$\Rightarrow x(x-9)-9(x-9)=0$

$\Rightarrow (x-9)(x-9)=0$

$\therefore \boxed{x=9}$

So, $x^2+\frac{162}{x^2}=9^2+\frac{162}{92}$

$=81+\frac{162}{81}$

$=81+2$

$=83$

174. 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 :- $x^3+y^3=468$

$(x+y)(x^2+y^2-xy)=468$

$x^2+y^2-xy=\frac{468}{12}$ ----- [$\because$on putting the value of $(x+y)=12$]

$x^2+y^2-xy=39$ -------(i)

And $x+y=12$

On squaring both sides

$x^2+y^2+2xy=144$ ----(ii)

On subtracting equation (i) from equation (ii)

$xy=144-39=\frac{105}{3}=35$ -----(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, $\boxed{x^4+y^4=3026}$

175. 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,

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=54\sqrt{2}$

$x^3+\frac{1}{x^3}+3\times 3\sqrt{2}=54\sqrt{2}$

$x^3+\frac{1}{x^3}=54\sqrt{2}-9\sqrt{2}$

$x^3+\frac{1}{x^3}=45\sqrt{2}$

176. If $x^2+1-2x=0$, $x>0$, then $x^2(x^2-2)=$ .....

(a) 1 (b) $\sqrt{2}$

(c) –1 (d) 0

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

Ans. (c) : $x^2+1-2x=0$ $(x>0)$

$(x-1)^2=0$

$x=1$

$x^2(x^2-2)=1(1-2)=-1$

177. 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,

$a^2+b^2+2ab=576$

$2ab=576-(a^2+b^2)$

$2ab==576-306=270$

$ab=\frac{270}{2}=135$

$ab=135$.....(ii)

From equations (i) and (ii)

$a=15, b=9$

Then, $4a-5b=4\times 15-5\times 9=15$, $\boxed{4a-5b=15}$

178. 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, $x^3-y^3=316$

$(x-y)(x^2+y^2+xy)=316$

$x^2+y^2+xy=\frac{316}{4}=79$ --------(i)

From, $x-y=4$

On squaring both sides,

$x^2+y^2-2xy=16$ ------- (ii)

From equation (i) and (ii),

$xy = 21 = 7 \times 3$

On taking x = 7 and y = 3,

Now, $x^4 + y^4 = (7)^4 + (3)^4 = 2401 + 81$

$x^4 + y^4 = 2482$

179. 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:

(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

$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 25$

$2(ab + bc + ca) = 25 - 27 = -2$

$ab + bc + ca = \frac{-2}{2} = -1$ ----- (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,

$\frac{abc}{5} = \frac{-5}{5} = -1$

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

180. 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, $a^3+b^3+c^3 - 3abc = 836$

181. 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

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

Ans. (b) :

$(x-1.5)^3 + (x-4)^3 + (x-3.5)^3 = 3(x-1.5)(x-4)(x-3.5)$

Now from formula

When, $a^3+b^3+c^3 = 3abc$

Then, a + b + c = 0

Hence $x-1.5 + x-4 + x-3.5 = 0$

$3x - 9 = 0$

$3x = 9$

$x = \frac{9}{3} = 3$

182. 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 :- $a^3+b^3+c^3 - 3abc = 250$

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

$\frac{1}{5}(ab+bc+ca) = \frac{1}{5} \times 25 = 5$

183. 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 $x^2+y^2 = 45$

$2xy = 45 - 25 = 20$

$xy = \frac{20}{2} = 10$

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

$= 5(45+10)$

$= 5 \times 55 = 275$

$\therefore x^3 - y^3 = 275$

184. 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,

$\boxed{a + 7b - c = 4}$

185. 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, $(x^2 + y^2 + z^2) \div (y^2 + xz)$

$[(2)^2 + (1)^2 + (1)^2 \div [(1)^2 + 2 \times 1]$

$6 \div 3 = 2$

$(x^2 + y^2 + z^2) \div (y^2 + xy) = 2$

186. 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,

$x^2 + \frac{1}{x^2} - 2 = 83 - 2 = 81$

$\left(x - \frac{1}{x}\right)^2 = (9)^2$

$x - \frac{1}{x} = 9$

187. If $x^2 - 3x + 1 = 0$, then the value of $2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right)$ 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,

$x^2 + \frac{1}{x^2} = 9 - 2 = 7$ -------(ii)

Again, on squaring both sides,

$x^4 + \frac{1}{x^4} = 49 - 2 = 47$

Again, on squaring both sides,

$x^8 + \frac{1}{x^8} = 2209 - 2 = 2207$ ------(iii)

From equation (ii) and (iii),

$2\left(x^8 + \frac{1}{x^8}\right) - 5\left(x^2 + \frac{1}{x^2}\right)$

$4414 - 35 = 4379$

188. 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

When $a^3+b^3+c^3 = 3abc$

Then $a+b+c = 0$

Hence, $4x - 5 + x - 2 + 3(2x - 5) = 0$

$4x - 5 + x - 2 + 6x - 15 = 0$

$11x - 22 = 0$

$11x = 22$

$x = \frac{22}{11} = 2$

$\left(x + \frac{3}{2}\right) = 2 + \frac{3}{2} = \frac{7}{2}$

189. If $x^2 - 5\sqrt{2x} - 1 = 0$, 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,

$$x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=250\sqrt{2}$$

$$x^3-\frac{1}{x^3}-3\times5\sqrt{2}=250\sqrt{2}$$

$$x^3-\frac{1}{x^3}-15\sqrt{2}=250\sqrt{2}$$

$$x^3-\frac{1}{x^3}=265\sqrt{2}$$

190. 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

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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:-

$133=19(a^2+b^2+ab)$

$a^2+b^2+ab=\frac{133}{19}=7$ -------(i)

and $a^2+b^2-ab=19$ ------ (ii) -----(Given)

On solving equation (i) and (ii),

$2ab=-12$

$ab=\frac{-12}{2}=-6$

191. 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) $\frac{433}{32}$

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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, $x^3-y^3=\frac{217}{64}$

192. 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

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Ans. (c) : From formula

$$x^3+y^3+z^3-3xyz=\frac{1}{2}(x+y+z)\left[(x-y)^2+(y-z)^2+(z-x)^2\right]$$

$$x^3+y^3+z^3-3xyz=\frac{1}{2}(555+556+557)\left[(555-556)^2+(556-557)^2+(557-555)^2\right]$$

$$=\frac{1}{2}\times1668\times(1+1+4)$$

$$=\frac{1}{2}\times1668\times6=5004$$

Hence $\boxed{x^3+y^3+z^3-3xyz=5004}$

193. If a + 5b = 25 and ab = 20, then one of the values of (a – 5b) is:

(a) 14 (b) 13

(c) 15 (d) 16

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Ans. (c) : From formula:-

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

$(a+5b)^2-4\times a\times5b=(a-5b)^2$

$(25)^2-20\times ab=(a-5b)^2$

$625-20\times20=(a-5b)^2$

$(a-5b)^2=225$

$a-5b=\sqrt{225}=15$

$a-5b=15$

194. If $3a-b=1$ and $ab=4$, then the value of $(9a^2-b^2)$ is:

(a) 7 (b) 8

(c) 5 (d) 6

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Ans. (a) : From formula,

$(x-y)^2+4xy=(x+y)^2$

$(3a-b)^2+4\times3a\times b=(3a+b)^2$

$(1)^2+12\times4=(3a+b)^2$

$3a+b=\sqrt{49}=7$ ------- (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, $9a^2 - b^2 = 7$

195. If $3x + y = 12$ and $xy = 9$, then the value of $(3x - y)$ is:

(a) 4 (b) 5

(c) 6 (d) 3

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Ans. (c) : Given

$3x+y = 12$ 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, $\boxed{3x-y = 6}$

196. 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

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Ans. (c) : From formula,

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

$(a+b+c)^2 = 576+2\times 50$

$\begin{bmatrix} \text{Given } a^2 + b^2 + c^2 = 576 \\ (ab + bc + ca) = 50 \end{bmatrix}$

$(a+b+c)^2 = 676$

$a+b+c = \sqrt{676} = \pm 26$

$\because$ $a+b+c < 0$

Hence, $a+b+c = -26$

197. 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

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Ans. (a) : Given :- $2x + \frac{1}{2x} = 5$

On cubing both sides,

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

$$8x^3 + \frac{1}{8x^3} + 3 \times 2x \times \frac{1}{2x}\left(2x + \frac{1}{2x}\right) = 125$$

$$8x^3 + \frac{1}{8x^3} + 3(5) = 125$$

$$8x^3 + \frac{1}{8x^3} = 125 - 15$$

$$8x^3 + \frac{1}{8x^3} = 110$$

198. 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 09/082021 (Shift-II)

Ans. (c) : Given:- $x+y = 27$ and $x^2+y^2 = 425$

On squaring both side of $x+y = 27$,

$(x+y)^2 = (27)^2$

$x^2+y^2 + 2xy = 729$

$2xy = 729 - 425 = 304$ -----(i)

Now, $(x-y)^2 = x^2 + y^2 - 2xy$

$= 425-304$

$(x-y)^2 = 121$

199. If $\left(40\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(2\sqrt{5}x - \sqrt{2y}\right) = Ax^2+By^2 - Cxy$, then find the value of $A + 3B - \sqrt{10}C$

(a) 34 (b) 46

(c) 6 (d) 28

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Ans. (b) :

$$\left(40\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(2\sqrt{5}x - \sqrt{2y}\right) = Ax^2+By^2-Cxy$$

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

$$\frac{\left(2\sqrt{5}x - \sqrt{2}y\right)\left(20x^2 + 2y^2 + 2\sqrt{10}xy\right)}{\left(2\sqrt{5}x - \sqrt{2}y\right)} = Ax^2 + By^2 - Cxy$$

$20x^2 + 2y^2 + 2\sqrt{10}xy = Ax^2+By^2-Cxy$

On comparing both sides,

$A = 20$, $B = 2$ and $C = -2\sqrt{10}$

Now $A + 3B - \sqrt{10}C$

$= 20 + 3 \times 2 - \sqrt{10} \times \left(-2\sqrt{10}\right)$

$= 20 + 6 + 2 \times 10$

$= 26 + 20 = 46$

200. 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

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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,

$$x^2+\frac{1}{x^2}+2=34+2$$

$$\left(x+\frac{1}{x}\right)^2=36$$

$$x+\frac{1}{x}=\sqrt{36}=6$$

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

201. 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

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Ans. (d) : From the formula :-

$$a^3+b^3+c^3-3abc=\frac{(a+b+c)}{2}\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$$

$$=\left(\frac{125+127+129}{2}\right)\left[(125-127)^2+(127-129)^2+(129-125)^2\right]$$

$= 190.5 \times (4+4+16)$

$= 190.5 \times 24$

$= 4572$

202. 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

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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, $5x+3=5\times1+3=8$

$5x+3=8$

203. If (3p – 5m) = 5 and pm = 6, then what is the value of $(9p^2-25m^2)$?

(a) $\pm30\sqrt{10}$ (b) $30\sqrt{10}$

(c) $\pm5\sqrt{385}$ (d) $5\sqrt{385}$

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

Ans : (d) Given:- (3p – 5m) = 5, pm = 6

$(3p-5m)^2+4\times3p\times5m=(3p+5m)^2$

$(5)^2+60\times pm=(3p+5m)^2$

$(3p+5m)^2=25+360=385$

$3p+5m=\sqrt{385}$ -------(i)

Now, $9p^2-25m^2=(3p)^2-(5m)^2$

$=(3p+5m)(3p-5m)$

$=\sqrt{365}\times5$

Hence, $9p^2-25m^2=5\sqrt{385}$

204. 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 06/082021 (Shift-II)

Ans. (a) : Given,

$a+b+c=2\rightarrow a^2+b^2+c^2+2(ab+bc+ca)=4$

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

$=2\times[4-(ab+bc+ca)\times2-(ab+bc+ca)]$

$=2\times[4-3(ab+bc+ca)]$

$=2\times[4+3]$

$=14$

205. 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) : $x^2+\frac{1}{49x^2}=15\frac{5}{7}$

$$\left(x+\frac{1}{7x}\right)^2=x^2+\frac{1}{49x^2}+\frac{2}{7}=\frac{110}{7}+\frac{2}{7}$$

$$=\frac{112}{7}=16$$

$$\therefore\ \left(x+\frac{1}{7x}\right)=\pm4$$

206. 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 :-

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

$$\left(x-\frac{1}{x}\right)^2=\left(\sqrt{13}\right)^2-4$$

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

On cubing both sides,

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

$$x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=27$$

$$x^3-\frac{1}{x^3}-3\times3=27$$

$$x^3-\frac{1}{x^3}=27+9=36$$

$$x^3-\frac{1}{x^3}=36$$

207. 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 $x+\frac{2}{x}=13$

208. 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

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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 $\boxed{16a^2 + b^4 = 32}$

209. 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

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Ans.(d) : Given that– $x-\frac{1}{2x}=4$

On multiplying by 2 in both sides,

$$2x-\frac{1}{x}=8 \quad \text{____(i)}$$

On cubing both sides,

$$8x^3-\frac{1}{x^3}-3\times2x\times\frac{1}{x}\left(2x-\frac{1}{x}\right)=512$$

$$\Rightarrow 8x^3-\frac{1}{x^3}-6\times8=512 \qquad \left[\text{From eq}^{n}\text{(i)}\right]$$

$$\Rightarrow 8x^3-\frac{1}{x^3}=512+48$$

$$\boxed{8x^3-\frac{1}{x^3}=560}$$

210. 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

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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,

$$x^3-\frac{1}{x^3}=729+27=756$$

211. If $x^2+\left(4-\sqrt{3}\right)x-1=0$ 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) $9-8\sqrt{3}$

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Ans. (c) : Given

$$x^2 + \left(4-\sqrt{3}\right)x - 1 = 0$$

On multiplying by $\frac{1}{x}$ both sides,

$$x - \frac{1}{x} = 4 - \sqrt{3}$$

On squaring both sides,

$$x^2 + \frac{1}{x^2} - 2 = \left(4-\sqrt{3}\right)^2 = 16 + 3 - 8\sqrt{3}$$

$$x^2 + \frac{1}{x^2} = 19 - 8\sqrt{3} + 2 = 21 - 8\sqrt{3}$$

Hence, $\boxed{x^2 + \frac{1}{x^2} = 21 - 8\sqrt{3}}$

212. 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,

$$A = 7 \text{ and } B = 13$$

Now $2A - B = 2 \times 7 - 13$

$= 14 - 13 = 1$

Hence, $2A - B = 1$

213. 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,

$$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 1728$$

$$x^3 + \frac{1}{x^3} + 3 \times 12 = 1728$$

$$x^3 + \frac{1}{x^3} = 1728 - 36$$

$$\boxed{x^3 + \frac{1}{x^3} = 1692}$$

214. 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

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Ans. (d) : Given, $x^8 - 2599\,x^4 + 1 = 0$

$$x^8 + 1 = 2599\,x^4$$

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,

$$x^2 + \frac{1}{x^2} - 2 = 51 - 2 = 49$$

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

$$x - \frac{1}{x} = 7$$

215. 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) : $x^2 + \frac{1}{x^2} = 7, \quad x > 0$

$$x^2 + \frac{1}{x^2} + 2 = 9 \qquad \text{(adding 2 both side)}$$

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

$$x^3 + \frac{1}{x^3} = 3^3 - 3 \times 3 = 27 - 9$$

$\therefore \quad x^3 + \frac{1}{x^3} = 18$

216. 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,

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

$=\frac{8}{27}+2=\frac{62}{27}$

217. 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, $\sqrt{x}+\frac{1}{\sqrt{x}}=3=K$

$\because \quad x+\frac{1}{x}=K^2-2$

$x+\frac{1}{x}=3^2-2=7$

$\therefore \quad x^3+\frac{1}{x^3}=K^3-3K$

$=7^3-3\times7$

$=343-21=322$

218. If $x-\frac{3}{x}=6$, $x\neq0$, then the value of $\frac{x^4-\frac{27}{x^2}}{x^2-3x-3}$ is?

(a) 90 (b) 80

(c) 270 (d) 54

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Ans. (a) : $x-\frac{3}{x}=6$, $x\neq0$

$\left(x-\frac{3}{x}\right)^3=6^3$ (On cubing both sides)

$x^3-\frac{27}{x^3}-3\times x\times\frac{3}{x}\times\left(x-\frac{3}{x}\right)=216$

$x^3-\frac{27}{x^3}-9\times6=216$

$x^3-\frac{27}{x^3}=270$

$\frac{x^4-\frac{27}{x^2}}{x^2-3x-3}$

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

$=\frac{270}{6-3}=90$

219. If $\frac{3\left(x^2+1\right)-7x}{3x}=6$, $x\neq0$, 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) $\sqrt{\frac{25}{3}}$

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Ans. (b) :

$\frac{3\left(x^2+1\right)-7x}{3x}=6$

$x+\frac{1}{x}-\frac{7}{3}=6$

$x+\frac{1}{x}=\frac{25}{3}$

$x+\frac{1}{x}+2=\frac{25}{3}+2$

$\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=\frac{31}{3}$

$\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{\frac{31}{3}}$

220. 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,
$x^3 + y^3 + 9xy = (0)^3 + (3)^3 + 9 \times 0 \times 3 = 27$

221. If $a^4 + 1 = [a^2/b^2]\ (4b^2 - b^4 - 1)$, 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)

$$a^4 + 1 = \frac{a^2}{b^2}\left(4b^2 - b^4 - 1\right)$$

$$a^2 + \frac{1}{a^2} = 4 - b^2 - \frac{1}{b^2}$$

$$a^2 + \frac{1}{a^2} - 2 + b^2 + \frac{1}{b^2} - 2 = 0$$

$$\left(a - \frac{1}{a}\right)^2 + \left(b - \frac{1}{b}\right)^2 = 0$$

$$\left(a - \frac{1}{a}\right) = 0, \qquad \left(b - \frac{1}{b}\right) = 0$$

$a^2 - 1 = 0$, $b^2 - 1 = 0$
$a = 1$, $b = 1$
According to the question
$a^4 + b^4$
$= 1 + 1 = 2$

Trick:
Put, $a = 1, b = 1$

$$a^4 + 1 = \left[\frac{a^2}{b^2}\right]\left[4b^2 - b^2 - 1\right]$$

$1 + 1 = 1\ (4 - 2)$
$2 = 2$
(equation satisfies)
$\therefore\ a^4 + b^4 = 1$
$\therefore\ a^4 + b^4 = 1 + 1 = 2$

222. If $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7$ Cyx, then the value of $(4A - B + 5C)$ is:

(a) 3 (b) 1
(c) 0 (d) 2

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Ans. (d) : $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7$ Cyx

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

$$\frac{(3x - 7y)(9x^2 + 49y^2 + 21xy)}{(3x - 7y)} = Ax^2 + By^2 + 7Cyx$$

$9x^2 + 49y^2 + 21xy = Ax^2 + By^2 + 7Cyx$
On comparing equation

$$A = 9,\ B = 49,\ C = \frac{21}{7} = 3$$

$4A - B + 5C = 4 \times 9 - 49 + 5 \times 3$
$= 51 - 49$
$= 2$

223. 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) $4\frac{7}{8}$

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Ans. (b) : $a^2 + b^2 + 64c^2 + 16c + 1 + 1 + 1 - 2a - 2b = 0$
$a^2 - 2a + 1 + b^2 - 2b + 1 + 64c^2 + 16c + 1 = 0$
$(a-1)^2 + (b-1)^2 + (8c+1)^2 = 0$

$(a-1)^2 = 0$	$(b-1)^2 = 0$	$(8c+1)^2 = 0$
$a = 1$	$b = 1$	$8c = -1$
		$c = -\frac{1}{8}$

$$\Rightarrow \quad 4a^7 + b^7 + 8c^2 = 4 \times 1 + 1 + 8 \times \frac{1}{64}$$

$$= 4 + 1 + \frac{1}{8} = 5\frac{1}{8}$$

224. 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
$x^4 + y^4 + 2x^2y^2 = 1 + 4x^2y^2 - 4xy$
$x^4 + y^4 = 1 + 2xy\ (xy - 2)$ $[\because xy(xy-2) = 12]$
$= 1 + 2 \times 12$
$= 25$

225. 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

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Ans. (a) : $(a+b+c)^2 = \underbrace{a^2 + b^2 + c^2} + 2(\underbrace{ab + bc + ca})$

$49 = 21 + 2(ab + bc + ca)$

$$\frac{28}{2} = (ab + bc + ca)$$

$(ab + bc + ca) = 14$

226. 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,

$16x^2 + 9y^2 + 4z^2 = 24 (x - y + z) - 61$

$[xy + 2z = ?]$

$16x^2 + 9y^2 + 4z^2 - 24x + 24y - 24z + 61 = 0$

$(16x^2-24x+9)+(9y^2+24y+16)+(4z^2-24z+36)=0$

$(4x - 3)^2 + (3y + 4)^2 + (2z - 6)^2 = 0$

$4x - 3 = 0 \quad |3y + 4 = 0| \quad 2z - 6 = 0$

$x = 3/4 \quad |y = -4/3| \quad z = 3$

$$\Rightarrow xy + 2z = \frac{3}{4} \times \left(-\frac{4}{3}\right) + 2 \times 3$$

$= -1 + 6 = 5$

227. 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

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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

$A = 19$

$B = -10$

$C = 7$

$\Rightarrow A + B + C = 19 + 7 - 10 = 16$

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

$361 = x^2 + y^2 + z^2 + 2 \times 114$

$361 - 228 = x^2 + y^2 + z^2$

$x^2 + y^2 + z^2 = 133$

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

$= 19 \times (133-114)$

$$\sqrt{x^3 + y^3 + z^3 - 3xyz} = \sqrt{19 \times 19}$$

$$\sqrt{x^3 + y^3 + z^3 - 3xyz} = 19$$

229. 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)

$x^2 + y^2 + z^2 + 2xy + 2yz + 2xz = 361$

$133 + 2 (xy + yz + zx) = 361$

$2(xy + yz + zx) = 361 - 133$

$xy + yz + xz = 114$

$xz = y^2$ (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 $x = 4$, $y = 6$, $z = 9$

$x + y + z = 19$

$4 + 6 + 9 = 19$

$19 = 19$

$\therefore z - x = 9 - 4 = 5$

230. If $3\sqrt{3}x^3 - 2\sqrt{2}y^3 = \left(\sqrt{3}x - \sqrt{2}y\right)\left(Ax^2 + By^2 + Cxy\right)$, 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) :

$$3\sqrt{3}x^3 - 2\sqrt{2}y^3 = \left(\sqrt{3}x - \sqrt{2}y\right)\left(Ax^2 + By^2 + Cxy\right)$$

$$\left(\sqrt{3}x\right)^3 - \left(\sqrt{2}y\right)^3 = \left(\sqrt{3}x - \sqrt{2}y\right)\left(Ax^2 + By^2 + Cxy\right)$$

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

$$3x^2 + 2y^2 + \sqrt{6}xy = Ax^2 + By^2 + Cxy$$

By comparing

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

Hence $(A \times B) \div C = (3 \times 2) \div \sqrt{6} = \sqrt{6}$

231. 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): $\because (a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$4 = 26 + 2(ab + bc + ca)$$

$$ab + bc + ca = -11$$

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

$$= 2(26 + 11)$$

$$= 2 \times 37 = 74$$

232. 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) : $a + \frac{1}{a} = 3$

$$\left(a + \frac{1}{a}\right)^2 = 9 \text{ (On squaring both sides)}$$

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

$$a^2 + \frac{1}{a^2} = 7 \quad \text{(Again, on squaring both side)}$$

$$\left(a^2 + \frac{1}{a^2}\right)^2 = 49$$

$$a^4 + \frac{1}{a^4} + 2 = 49$$

$$a^4 + \frac{1}{a^4} = 47$$

233. 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) : $\sqrt{x^4 + y^4 - 2x^2y^2}$

$$= \sqrt{\left(x^2 - y^2\right)^2}$$

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

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

$$= 2a \times \frac{2}{a} = 4$$

234. 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) : $\because (a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$= 20 + 2 \times 8 = 36$$

$$a + b + c = 6$$

$$\therefore \quad \frac{1}{2}(a+b+c)\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$$

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

$$= 6 \times [20 - 8]$$

$$= 6 \times 12 = 72$$

235. 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, $\frac{6x}{(2x^2 + 5x - 2)} = 1$

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

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

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

$$= \sqrt{\left(\frac{1}{2}\right)^2 + 4} = \frac{\sqrt{17}}{2}$$

$$\therefore \quad x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)\left[x^2 + \frac{1}{x^2} - 1\right]$$

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

$$= \left(\frac{\sqrt{17}}{2}\right)\left[\left(\frac{\sqrt{17}}{2}\right)^2 - 3\right]$$

$$= \frac{\sqrt{17}}{2}\left[\frac{17-12}{4}\right]$$

$$= \frac{5\sqrt{17}}{8}$$

236. 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)

$$\left(x^2 + 8x - 1\right)\left(\frac{x^4 + 1}{x}\right)^{-1}$$

From question,

$$(11x)\left(\frac{11x^2}{x}\right)^{-1} \qquad \left[\because\ x^2 - 1 = 3x\right]$$

$$(11x) \times \left(\frac{1}{11x}\right) = 1$$

237. If $\left(135\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(3\sqrt{5}x - \sqrt{2}y\right) = Ax^2 + By^2 + \sqrt{10}Cxy$, then the value of (A + B – 9 C) is?

(a) 18 (b) 12

(c) 10 (d) 20

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-II)

Ans. (d) : $\left(135\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(3\sqrt{5}x - \sqrt{2}y\right)$

$= Ax^2 + By^2 + \sqrt{10}Cxy$

$\left[\left(3\sqrt{5}x\right)^3 - \left(\sqrt{2}y\right)^3 \div \left(3\sqrt{5}x - \sqrt{2}y\right)\right]$

$= Ax^2 + By^2 + \sqrt{10}Cxy$

$\because \quad \boxed{a^3 - b^3 = (a-b)(a^2 + b^2 + ab)}$

$\left(3\sqrt{5}x - \sqrt{2}y\right)\left(45x^2 + 2y^2 + 3\sqrt{10}xy\right) \div \left(3\sqrt{5}x - \sqrt{2}y\right)$

$= Ax^2 + By^2 + \sqrt{10}Cxy$

$45x^2 + 2y^2 + 3\sqrt{10}xy = Ax^2 + By^2 + \sqrt{10}Cxy$

By comparing

$A = 45, \quad B = 2, \quad C = 3$

$(A + B - 9C) = 45 + 2 - 27$

$= 47 - 27$

$= 20$

238. 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): $9a^2 + 4b^2 + c^2 + 21 = 4(3a + b - 2c)$

$(9a^2 - 12a + 4) + (4b^2 - 4b + 1) + (c^2 + 8c + 16) = 0$

$(3a - 2)^2 + (2b - 1)^2 + (c + 4)^2 = 0$

$3a - 2 = 0 \qquad 2b - 1 = 0 \qquad c + 4 = 0$

$\Rightarrow \quad a = 2/3 \quad \Rightarrow b = 1/2 \quad \Rightarrow c = -4$

$9a + 4b - c$

$= 9 \times \frac{2}{3} + 4 \times \frac{1}{2} - (-4)$

$= 6 + 2 + 4 = 12$

239. 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

$(x + p)^3 = (2)^3$

$x^3 + p^3 + 3xp(x + p) = 8$

$x^3 + p^3 + 3xp(2) = 8$

$\boxed{x^3 + p^3 + 6xp = 8}$

240. If $x^4 - 6x^2 - 1 = 0$, then the value of $x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5$ is?

(a) 239 (b) 204

(c) 209 (d) 219

SSC CGL (TIER-I)-2018 – 07.06.2019 (Shift-I)

Ans. (c) :

$$x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5$$

$$x^6 - \frac{1}{x^6} - 5\left(x^2 - \frac{1}{x^2}\right) + 5 \quad \text{.....(A)}$$

$\because \quad x^4 - 6x^2 - 1 = 0$

$$x^4 - 1 = 6x^2$$

$$x^2 - \frac{1}{x^2} = 6 \quad \text{.....(B)}$$

$$\left(x^2 - \frac{1}{x^2}\right)^3 = (6)^3$$

$$x^6 - \frac{1}{x^6} - 3\left(x^2 - \frac{1}{x^2}\right) = 216$$

$$x^6 - \frac{1}{x^6} - 3(6) = 216$$

$$x^6 - \frac{1}{x^6} = 216 + 18$$

$$\boxed{x^6 - \frac{1}{x^6} = 234} \quad \text{.....(C)}$$

By putting the value of equation B and equation (C) in equation (A)

$= 234 - 5(6) + 5$

$= 234 - 30 + 5$

$= \boxed{209}$

241. 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) : $a + b + c = 11$ ..... (i)

Given

$\therefore ab + bc + ca = 38$

From equation (i)

$(a + b + c)^2 = (11)^2 = 121$

$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 121$

$a^2 + b^2 + c^2 = 121 - 2 \times 38 = 121 - 76 = 45$

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

$\therefore a^3 + b^3 + c^3 - 3abc = 11 \times (45 - 38)$

$= 11 \times 7$

$= 77$

242. 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

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

$$x + \frac{1}{x} - 2 = 16$$

$$\left(x + \frac{1}{x}\right) = 18 \quad \text{.....(i)}$$

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

$$x^2 + \frac{1}{x^2} = (18)^2 - 2 \quad \text{(From equation (i))}$$

$$x^2 + \frac{1}{x^2} = 324 - 2$$

$$x^2 + \frac{1}{x^2} = 322$$

243. 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) : $4x^2 - 6x + 1 = 0$

$$4x^2 + 1 = 6x$$

$$\frac{4x^2 + 1}{2x} = \frac{6x}{2x} \quad (\because \text{ on dividing by } 2x)$$

$$2x + \frac{1}{2x} = 3 \quad \text{.....(i)}$$

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, $\quad 8x^3 + \left(8x^3\right)^{-1} = 18$

244. 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) $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$

$$x + \frac{1}{x} + 2 = 7 \quad \text{(By squaring both sides)}$$

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

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

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

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

$$x^3+\frac{1}{x^3}+3(5)=125, \qquad \boxed{x^3+\frac{1}{x^3}=110}$$

245. 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

$$(8)^3 = a^3 + b^3 + 3 \times \frac{32}{3}(8)$$

$$512 = a^3 + b^3 + 256$$

$$a^3 + b^3 = 256$$

246. 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:–

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

$(4)^2 = a^2 + b^2 + c^2 + 2\,(2)$

$a^2 + b^2 + c^2 = 12$

$a^3 + b^3 + c^3 - 3abc = (a+b+c)\,[a^2+b^2+c^2 - (ab + bc + ca)] = 4\,[12 - 2]$

$a^3 + b^3 + c^3 - 3abc = 4 \times 10 = 40$

247. 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,

$a + b = 6$ .....(i)

$ab = \frac{16}{3}$

$\because$ $a^3+b^3 = (a + b)\,(a^2 + b^2 - ab)$ ....(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)

$$a^3 + b^3 = 6 \times \left(\frac{76}{3} - \frac{16}{3}\right) = 6 \times \frac{60}{3} = 120$$

248. 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

$a^2+b^2+c^2+2(ab+bc+ca) = 64$

$a^2+b^2+c^2 = 64-2\,(ab + bc + ca)$ .....(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)

$a^3+b^3+c^3 - 3abc = (a+b+c)\,[64-3\,(ab+bc+ca)]$

$= 8 \times [64 - 3 \times 12] = 8 \times [64 - 36]$

$= 8 \times 28$

$= 224$

249. 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

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

$a^3 - b^3 = (5)^3 + 3 \times 2 \times (5)$

$= 125 + 30$

$= 155$

250. 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) :

$$\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2} \qquad \text{.....(i)}$$

On squaring equation (i)

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

$$x + \frac{1}{x} - 2 = 8$$

$$x + \frac{1}{x} = 10 \qquad \text{.....(ii)}$$

On squaring equation (ii)

$$\left(x + \frac{1}{x}\right)^2 = (10)^2$$

$$x^2 + \frac{1}{x^2} = 98$$

251. 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

$(a+b)^3 = (6)^3$

$\Rightarrow a^3 + b^3 + 3ab\,(a+b) = 216$

$\Rightarrow a^3 + b^3 + 3 \times 8 \times 6 = 216$ $[\because ab = 8]$

$\Rightarrow a^3 + b^3 = 216–144$

$\Rightarrow \boxed{a^3 + b^3 = 72}$

252. 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–

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

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

$$= 125 - 15 = 110$$

253. 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)

Ans. (b) : $(x-5)^3 + (x-6)^3 + (x-7)^3$

$= 3(x-5)\,(x-6)\,(x-7)$

$a = x - 5,\ b = x - 6,\ c = x - 7$

$\because \quad a^3 + b^3 + c^3 = 3abc$

$\therefore \quad a + b + c = 0$

$x - 5 + x - 6 + x - 7 = 0$

$3x - 18 = 0$

$x = 6$

254. 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)

Ans. (c) : $a^3 - b^3 = 208$

$(a - b)\,(a^2 + b^2 + ab) = 208$

$4(a^2+b^2+ab) = 208$

$a^2 + b^2 + ab = 52$

$\therefore \quad (a + b)^2 - ab = 52$

255. 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 $ab = 6$

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

$a^3 - b^3 = 5^3 + 3 \times 6 \times 5$

$a^3 - b^3 = 125 + 90$

$a^3 - b^3 = 215$

256. If $a - \frac{1}{a} = 3$, then $a^6 + \frac{1}{a^6}$ equal to :

(a) 996 (b) 729

(c) 1298 (d) 1331

SSC CGL (TIER-I)-2018 – 19.06.2019 (Shift-III)

Ans. (c) : $a - \frac{1}{a} = 3$.....(i)

By squaring the equation (i)

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

$$a^2 + \frac{1}{a^2} = 11 \text{.....(ii)}$$

By cubing the equation (ii)

$$a^6 + \frac{1}{a^6} + 3\left(a^2 + \frac{1}{a^2}\right) = 1331$$

$$a^6 + \frac{1}{a^6} = 1331 - 33 = 1298$$

257. 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)

Ans. (a) : $x + \frac{1}{x} = 4$ $\boxed{x^3 + \frac{1}{x^3} = a^3 - 3a}$

On cubing both sides

$$x^3 + \frac{1}{x^3} = (4)^3 - 3 \times 4 = 64 - 12$$

$$\therefore \quad x^3 + \frac{1}{x^3} = 52$$

258. 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)

Ans. (b) $\therefore a^3 - b^3 = 210,\ a - b = 5$

$(a–b)\,(a^2 + b^2 + ab) = 210$

$\therefore a - b = 5$ Given

$\therefore \quad 5 \times (a^2 + b^2 + ab) = 210$

$(a^2 + b^2 + 2ab) - ab = 42$

$(a + b)^2 - ab = 42$

259. 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

$a + b + c = 0$

$x–4 + x – 5 + x – 3 = 0$

$3x – 12 = 0$

$3x = 12$

$x = 4$

II[nd] method

$(x-4)^3 + (x-5)^3 + (x-3)^3 = 3(x-4)(x-5)(x-3)$

$\because$ By option (b)

$\therefore x = 4$ By taking the value of $x = 4$

$(4-4)^3 + (4-5)^3 + (4-3)^3 = 3(4-4)(4-5)(4-3)$

$0 + (-1) + 1 = 3(0) \times (-1)(1)$

$0 = 0$

L.H.S. = R.H.S.

$\therefore x = 4$

260. 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

$$\left(x^3 + \frac{1}{x^3}\right)^2 = (-18)^2$$

$$x^6 + \frac{1}{x^6} + 2 = 324$$

$$x^6 + \frac{1}{x^6} = 324 - 2 = 322$$

261. The value of $27a^3 - 2\sqrt{2}b^3$ is equal to?

(a) $\left(3a - \sqrt{2}b\right)\left(9a^2 + 2b^2 + 6\sqrt{2}ab\right)$

(b) $\left(3a - \sqrt{2}b\right)\left(9a^2 - 2b^2 - 3\sqrt{2}ab\right)$

(c) $\left(3a - \sqrt{2}b\right)\left(9a^2 + 2b^2 + 3\sqrt{2}ab\right)$

(d) $\left(3a - \sqrt{2}b\right)\left(9a^2 - 2b^2 + 6\sqrt{2}ab\right)$

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

Ans. (c) : $\because A^3 - B^3 = (A - B)(A^2 + B^2 + AB)$

$$27a^3 - 2\sqrt{2}b^3 = \left(3a\right)^3 - \left(\sqrt{2}b\right)^3$$

$$= \left(3a - \sqrt{2}b\right)\left(9a^2 + 2b^2 + 3\sqrt{2}ab\right)$$

262. 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) $\frac{7}{4}$ (b) $\frac{5}{4}$

(c) $\frac{7}{3}$ (d) $\frac{5}{2}$

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

Ans. (b) : $x^2 + xy + y^2 = 7$ ..... (1)

$\because (x^2 - xy + y^2)(x^2 + xy + y^2) = x^4 + x^2y^2 + y^4$

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

$$= \frac{21}{7} = 3 \text{.....(2)}$$

For equation (1) + (2),

$2(x^2 + y^2) = 10$

$x^2 + y^2 = 5$

For equation (1) – (2),

$2xy = 4$

$xy = 2$

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

263. 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) : $\because x^3 - y^3 = (x-y)^3 + 3xy(x-y)$

$= 64 + 3 \times 45 \times 4$

$= 64 + 540 = 604$

264. 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

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-III)

Ans. (d) :

$$2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = \left(Ax + y + Bz\right)^2$$

$$\left(-\sqrt{2}x + y + 2\sqrt{2}z\right)^2 = \left(Ax + y + Bz\right)^2$$

On comparing the coefficients,

$A = -\sqrt{2}$, $B = 2\sqrt{2}$

$\therefore A^2 + B^2 - AB = 2 + 8 + 4 = 14$

265. 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,

$$9x^2 + \frac{1}{16x^2} + 2 \times 3x \times \frac{1}{4x} = \frac{441}{16}$$

$$9x^2 + \left(16x^2\right)^{-1} = \frac{441}{16} - \frac{3}{2} = \frac{417}{16}$$

266. 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,

$$25x^2 + \frac{1}{36x^2} + 2 \times 5x \times \frac{1}{6x} = \frac{25}{4}$$

$$25x^2 + \frac{1}{36x^2} = \frac{25}{4} - \frac{5}{3} = \frac{55}{12}$$

267. 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) : $a^2 + b^2 + c^2 = (a+b+c)^2 - 2(ab+bc+ca)$

$= 49 + 12 = 61$

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

$= 7(61+6)$

$= 7 \times 67 = 469$

268. 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) :

$$P = \frac{x^4 - 8x}{x^3 - x^2 - 2x} = \frac{x^3 - 8}{x^2 - x - 2} = \frac{(x-2)(x^2 + 2x + 4)}{(x-2)(x+1)}$$

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

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

$$R = \frac{2(x^2 + 2x + 4)}{x - 5}$$

$$(P \times Q) \div R = \frac{x^2 + 2x + 4}{x+1} \times \frac{x+1}{x-5} \times \frac{x-5}{2(x^2 + 2x + 4)}$$

$$= \frac{1}{2}$$

269. 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) $\frac{114}{25}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (d) :

$$5x + \frac{1}{3x} = 4$$

On multiplying by $\frac{3}{5}$

$$3x + \frac{1}{5x} = \frac{12}{5}$$

On squaring both sides

$$9x^2 + \frac{1}{25x^2} + 2 \times 3x \times \frac{1}{5x} = \frac{144}{25}$$

$$9x^2 + \frac{1}{25x^2} = \frac{144}{25} - \frac{6}{5} = \frac{114}{25}$$

270. 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

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (a) : $\because a^3 + b^3 + c^3 - 3abc = (a+b+c)[(a+b+c)^2 - 3(ab + bc + ca)]$

$a^3 + b^3 + c^3 + 405 = 11\ [121 - 9]$

$a^3 + b^3 + c^3 = 1232 - 405 = 827$

271. 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) $\frac{1}{2}$

SSC CGL (Tier-I)-2019 – 04/03/2020 (Shift-I)

Ans. (c) :

$$\frac{x^3-y^3}{x\left[(x+y)^2-3xy\right]}\div\frac{y\left[(x-y)^2+3xy\right]}{x^3+y^3}\times\frac{(x+y)^2-(x-y)^2}{x^2-y^2}$$

$$=\frac{(x-y)\left(x^2+xy+y^2\right)}{x\left(x^2+y^2-xy\right)}\times\frac{(x+y)\left(x^2-xy+y^2\right)}{y\left(x^2+y^2+xy\right)}\times\frac{4xy}{(x+y)(x-y)}$$

$= 4$

272. 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) : $x^2 + xy + y^2 = \frac{x^4+x^2y^2+y^4}{x^2-xy+y^2}$

$$x^2 + xy + y^2 = \frac{273}{13}$$

$x^2 + xy + y^2 = 21$ .....(i)

$x^2 - xy + y^2 = 13$ .....(ii)

From equation (i) and equation (ii),

$2xy = 8$

$xy = 4$

273. 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) $53\frac{3}{4}$

SSC CGL (Tier-I)-2019 – 05/03/2020 (Shift-II)

Ans. (d) : $20x^2 - 30x + 1 = 0$

$$20x + \frac{1}{x} = 30$$

$$5x + \frac{1}{4x} = \frac{15}{2}$$

On squaring both sides,

$$25x^2 + \frac{1}{16x^2} + 2\times5x\times\frac{1}{4x} = \frac{225}{4}$$

$$25x^2 + \frac{1}{16x^2} = \frac{225}{4} - \frac{5}{2} = \frac{215}{4} = 53\frac{3}{4}$$

274. 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) :

$16a^4 + 36a^2b^2 + 81b^4 = (4a^2 + 9b^2 - 6ab)\ (4a^2 + 9b^2 + 6ab)$ From formula

$4a^2 + 9b^2 + 6ab = \frac{91}{13} = 7$ .....(i)

$4a^2 + 9b^2 - 6ab = 13$ .....(ii)

From equation (i) – equation (ii)

$12ab = -6$

$3ab = \frac{-6}{4} = \frac{-3}{2}$

275. 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) : $x^2 - 2\sqrt{5}x + 1 = 0$

$$x + \frac{1}{x} = 2\sqrt{5}$$

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

then, $x^2 + \frac{1}{x^2} = (2\sqrt{5})^2 - 2 = 18$

$$x^3 + \frac{1}{x^3} = (2\sqrt{5})^3 - 3\times2\sqrt{5} = 34\sqrt{5}$$

$$\therefore \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) = 18\times34\sqrt{5}$$

$$\therefore\ x^5 + \frac{1}{x^5} = 612\sqrt{5} - 2\sqrt{5} = 610\sqrt{5}$$

276. 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) $a^3 + b^3 + 6c^3 - 6abc$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (a) : $(a+b+2c)\ (a^2+b^2+4c^2 - ab - 2bc - 2ca)$

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

$\therefore\ a^3 + b^3 + (2c)^3 - 3 \times a \times b \times (2c)$

$= a^3 + b^3 + 8c^3 - 6abc$

277. If $a^4 + \frac{1}{a^4} = 50$, a > 0, then find the value of $a^3 + \frac{1}{a^3}$.

(a) $\sqrt{2\left(1-\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$

(b) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1-2\sqrt{13}\right)$

(c) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$

(d) $\sqrt{2\left(1+\sqrt{13}\right)}+\left(-1+2\sqrt{13}\right)$

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (c) : $a^4 + \frac{1}{a^4} = 50$

$a^2 + \frac{1}{a^2} = \sqrt{52}$

$\left(a + \frac{1}{a}\right)^2 = 2\sqrt{13} + 2$

$a + \frac{1}{a} = \sqrt{2\left(1+\sqrt{13}\right)}$

if $a + \frac{1}{a} = k$ and $a^3 + \frac{1}{a^3} = k^3 - 3k$

$\therefore a^3 + \frac{1}{a^3} = 2\left(1+\sqrt{13}\right)\sqrt{2\left(1+\sqrt{13}\right)} - 3\sqrt{2\left(1+\sqrt{13}\right)}$

$= \sqrt{2\left(1+\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$

278. 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) : $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
$= 300 + 100 = 400$
$a + b + c = 20$

279. 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,
$p = 48$

280. 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.

281. 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:–
$\because (a + b + c)^2 = (a^2 + b^2 + c^2 + 2ab + 2bc + 2ca)$
$(4a + 3b + 2c)^2$
$= 16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca$

282. 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)
$x^4 + y^4 = [(10)^2 - 2 \times 4]^2 - 2 \times (4)^2$
$= (92)^2 - 2 \times 16$
$= 8464 - 32$
$= \boxed{8432}$

283. 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

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Ans. (b) : $a^3 + b^3 = 91$ ----------(i)
$b^3 + c^3 = 72$ ----------(ii)
$c^3 + a^3 = 35$ ----------(iii)
By adding
$2(a^3 + b^3 + c^3) = 198$
$a^3 + b^3 + c^3 = 99$
$\because a^3+b^3+c^3-3abc = (a+b+c)[(a+b+c)^2 - 3(ab+bc+ca)]$
$99 - 3abc = 9(81-78)$
$3abc = 99 - 27 = 72$
$abc = 24$

284. If $x^3 - 4x^2 + 19 = 6(x-1)$, then what is the value of $[x^2 + (1/x - 4)]$?

(a) 3 (b) 5
(c) 6 (d) 8

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

Ans. (c) : Given–

$x^3 - 4x^2 + 19 = 6(x-1)$

$\Rightarrow x^3 - 4x^2 = 6x - 6 - 19$

$\Rightarrow x^3 - 4x^2 = 6x - 25$ ..... (i)

$\therefore x^2 + \dfrac{1}{(x-4)} = \dfrac{x^3 - 4x^2 + 1}{x-4}$

$= \dfrac{6x - 25 + 1}{x-4}$ (From equation (i))

$= \dfrac{6(x-4)}{(x-4)}$

$= \boxed{6}$

285. 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) $(x-y)^2 + (y-z)^2 + (z-x)^2$

$= [x^2+y^2-2xy+y^2+z^2-2yz+z^2+x^2-2zx]$

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

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

$= 2[(22)^2 - 3 \times 35]$

$= 2[484 - 105]$

$= 2 \times 379$

$= 758$

286. If $x + (1/x) = (\sqrt{3}+1)/2$, then what is the value of $x^4+(1/x^4)$?

(a) $\left(4\sqrt{3}-1\right)/4$ (b) $\left(4\sqrt{3}+1\right)/2$

(c) $\left(-4\sqrt{3}-1\right)/4$ (d) $\left(-4\sqrt{3}-1\right)/2$

SSC CGL (Tier-II) 19-02-2018

Ans. (c) : $x + \dfrac{1}{x} = \dfrac{\sqrt{3}+1}{2}$ (Squaring in both sides)

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

$= \dfrac{4+2\sqrt{3}}{4} - 2 = \dfrac{2\sqrt{3}-4}{4} = \dfrac{\sqrt{3}-2}{2}$

$x^4 + \dfrac{1}{x^4} = \left(\dfrac{\sqrt{3}-2}{2}\right)^2 - 2$

$= \dfrac{7-4\sqrt{3}}{4} - 2 = \dfrac{\left(-4\sqrt{3}-1\right)}{4}$

287. $A = (x^8-1)/(x^4+1)$ and $B = (y^4-1)/(y^2+1)$. If x = 2 and y = 9, the what is the value of $A^2 + 2AB + AB^2$?

(a) 96475 (b) 98625

(c) 92425 (d) 89125

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

Ans. (b) : Given–

$A = \dfrac{x^8-1}{x^4+1}$ & $B = \dfrac{y^4-1}{y^2+1}$

From formula

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

By solving the equation A and B

$A = \dfrac{\left(x^4-1\right)\left(x^4+1\right)}{\left(x^4+1\right)}$ & $B = \dfrac{\left(y^2-1\right)\left(y^2+1\right)}{\left(y^2+1\right)}$

$A = (x^4-1)$ & $B = (y^2-1)$

If x = 2, & y = 9

Then–

$A = 2^4 - 1 = 15$

$B = 9^2 - 1 = 80$

By putting the value of A and B

$\Rightarrow A^2 + AB^2 + 2AB$

$\Rightarrow (15)^2 + 15 \times (80)^2 + 2 \times 15 \times 80$

$= 225 + 96000 + 2400 = 98625$

288. If $x = \left(\sqrt{5}\right)+1$ and $y = \left(\sqrt{5}\right)-1$ then what is the value of $(x^2/y^2) + (y^2/x^2) + 4\left(\dfrac{x}{y} + \dfrac{y}{x}\right) + 6$?

(a) 31 (b) $23\sqrt{5}$

(c) $27\sqrt{5}$ (d) 25

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

Ans. (d) : Given,

$x = \sqrt{5} + 1$.....(1)

$y = \sqrt{5} - 1$.....(2)

From equation (1) and (2)

$x + y = 2\sqrt{5}$ & $xy = 4$

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

$= 20 - 2 \times 4$

$x^2+y^2 = 12$

$= \dfrac{x^2}{y^2} + \dfrac{y^2}{x^2} + 4\left[\left(\dfrac{x}{y}\right) + \left(\dfrac{y}{x}\right)\right] + 6$

$= \dfrac{x^4+y^4}{x^2y^2} + 4\left[\dfrac{x^2+y^2}{xy}\right] + 6$

$= \dfrac{\left(x^2+y^2\right)^2 - 2x^2y^2}{x^2y^2} + 4\dfrac{\left[(x+y)^2 - 2xy\right]}{xy} + 6$-------(3)

By putting the value in equation (3)

$\Rightarrow \dfrac{(12)^2 - 2 \times 16}{16} + \dfrac{4 \times (12)}{4} + 6$

$= 7 + 18 = 25$

289. 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

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

Ans. (a) : Given–

$x = 2+\sqrt{3},\ y = 2-\sqrt{3},\ z = 1$

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

$x + y + z = 2+\sqrt{3}+2-\sqrt{3}+1 = 5$

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

$7 + 4\sqrt{3} + 7 - 4\sqrt{3} + 1$

$= 7 + 7 + 1$

$= 15$

We know that

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

$5^2 = 15 + 2\,(xy + yz + zx)$

$xy + yz + zx = \dfrac{10}{2} = 5$

$\dfrac{x}{yz} + \dfrac{y}{xz} + \dfrac{z}{xy} + 2\left[\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}\right]$

$\Rightarrow \dfrac{x^2 + y^2 + z^2}{xyz} + 2\left[\dfrac{xy + yz + zx}{xyz}\right]$ (Putting the value)

$\dfrac{15}{1} + 2\left[\dfrac{5}{1}\right] \Rightarrow 15 + 10 = 25$

290. 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

$(3-2)(9 + 3P + 4) = 0$

$3P = -13 \Rightarrow P = \dfrac{-13}{3}$

291. 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) :

$x - \dfrac{1}{x} = 2$ (On squaring both sides)

$x^3 - \dfrac{1}{x^3} = (2)^3 + 3\times 2 = 14$.....(1)

Again $x + \dfrac{1}{x} = \sqrt{(2)^2 + 4} = \sqrt{8}$

$x^3 + \dfrac{1}{x^3} = \left(\sqrt{8}\right)^3 - 3\sqrt{8} = 5\sqrt{8}$.....(2)

By multiplying the equation (i) and (ii)

$x^6 - \dfrac{1}{x^6} = 70\sqrt{8} = 140\sqrt{2}$

292. 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)

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

$13 - 3 \times 1 = 1\left((x+y+z)^2 - 3(xy + yz + zx)\right)$

$10 = 1^2 - 3(xy + yz + zx)$

$3(xy + yz + zx) = 1 - 10 = -9$

$xy + yz + zx = -3$

293. 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,

$y = z = 0$

$x^3 + 0 = 3(1+0)$

$x^3 = 3$

$P = 0 + 0 - x = -x$

$Q = 0 + x - 0 = x$

$R = x + 0 - 0 = x$

$P^3 + Q^3 + R^3 - 3PQR = (-x)^3 + x^3 + x^3 - 3\times(-x)\times x\times x$

$= x^3 + 3x^3$

$= 4x^3$

$= 4 \times 3 = 12$

294. The value of $\dfrac{(4.6)^4 + (5.4)^4 + (24.84)^2}{(4.6)^2 + (5.4)^2 + 24.84}$ is :

(a) 24.42 (b) 25.48
(c) 24.24 (d) 25.42

SSC CGL (Tier-II) 13-09-2019

Ans. (b) :

$\dfrac{(4.6)^4 + (5.4)^4 + (24.84)^2}{(4.6)^2 + (5.4)^2 + 24.84}$

Hence x = 4.6, y = 5.4

$x^4 + y^4 + x^2y^2 = (x^2+y^2+xy)(x^2+y^2-xy)$

$= \dfrac{\left[(4.6)^2 + (5.4)^2 + 4.6\times 5.4\right]\left[(4.6)^2 + (5.4)^2 - 4.6\times 5.4\right]}{(4.6)^2 + (5.4)^2 + 24.84}$

$= (4.6 + 5.4)^2 - 3 \times 4.6 \times 5.4$

$= 100 - 74.52 = 25.48$

295. 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) :

$x = \sqrt[6]{27} - \sqrt{6\frac{3}{4}}$

$= \left(3^3\right)^{\frac{1}{6}} - \sqrt{\frac{27}{4}}$

$= \sqrt{3} - \frac{3\sqrt{3}}{2} = \frac{-\sqrt{3}}{2}$

$y = \frac{\sqrt{45}+\sqrt{605}+\sqrt{245}}{\sqrt{80}+\sqrt{125}} = \frac{3\sqrt{5}+11\sqrt{5}+7\sqrt{5}}{4\sqrt{5}+5\sqrt{5}} = \frac{7}{3}$

$x^2 + y^2 = \frac{3}{4} + \frac{49}{9} = \frac{27+196}{36} = \frac{223}{36}$

296. 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,

$A = 2,\ C = 4$

$B = -3,\ D = -9$

$\therefore (A+B+C-D) = 2 - 3 + 4 + 9$

$= 12$

297. 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) :

$\therefore xy = 1$

$x + y = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} + \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$= \frac{5+3-2\sqrt{15}+5+3+2\sqrt{15}}{2} = 8$

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

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

$= 8[64-3]$

$= 8 \times 61 = 488$

298. 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,

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

$\therefore x^3 - x^{-3} = 756$

299. 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

SSC CGL (Tier-II) 12-09-2019

Ans. (c) : Value putting,

$\because xyz = -12 = 1 \times (-3) \times 4$

Taking the value $x = 1, y = -3, z = 4$

$x + y + z = 1 - 3 + 4 = 2$

$xy + yz + zx = -3 - 12 + 4 = -11$

$\therefore \sqrt{x^3 + y^3 + z^3 - 2} = \sqrt{1^3 + (-3)^3 + (4)^3 - 2} = \sqrt{1 - 27 + 64 - 2}$

$= \sqrt{63 - 27} = \sqrt{36} = 6$

300. 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,

$16x^3 + \frac{1}{256x^3} = 16 \times \frac{423}{16} = 423$

301. 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

$a-4 = 0$, $b-4 = 0$, $c+8 = 0$

$a = 4$, $b = 4$, $c = -8$

$\sqrt{ab - bc + ca} = \sqrt{16 + 32 - 32} = 4$

302. 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

SSC CGL (Tier-II) 11-9-2019

Ans. (b) :

$$\frac{(253)^3 + (247)^3}{25.3 \times 25.3 - 624.91 + 24.7 \times 24.7} = 50 \times 10^k$$

$$\frac{10^3 \times \left[(25.3)^3 + (24.7)^3\right]}{(25.3)^2 - 25.3 + 24.7 \times (24.7)^2} = 50 \times 10^k$$

$$\frac{10^3 \times (25.3 + 24.7)\left[(25.3)^2 - 25.3 \times 24.7 + (24.7)^2\right]}{(25.3)^2 - 25.3 \times 24.7 + (24.7)^2} = 50 \times 10^k$$

$10^3 \times 50 = 50 \times 10^k$

$10^3 = 10^k$

$k = 3$

303. 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

$x^2 - 16x + 59 = 0$

$\Rightarrow x^2 - 16x + 64 - 5 = 0$

$\Rightarrow x^2 - 16x + 64 = 5$

$\Rightarrow (x-8)^2 = 5$

$\Rightarrow x - 8 = \sqrt{5}$

$\Rightarrow (x-6) = \sqrt{5} + 2$

$$\frac{1}{(x-6)} = \sqrt{5} - 2$$

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

$= 5 + 4 + 4\sqrt{5} + 5 + 4 - 4\sqrt{5}$

$= 18$

304. 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)

$$\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3}{abc} + \frac{b^3}{abc} + \frac{c^3}{abc}$$

$$= \frac{a^3 + b^3 + c^3}{abc}$$

$$= \frac{3abc}{abc} \quad \text{(From equation (i))}$$

$= 3$

305. 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

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Ans. (c) : $\frac{427 \times 427 \times 427 + 325 \times 325 \times 325}{42.7 \times 42.7 + 32.5 \times 32.5 - 42.7 \times 32.5}$

$$= \frac{(427)^3 + (325)^3}{(42.7)^2 + (32.5)^2 - 42.7 \times 32.5}$$

$$= \frac{(427 + 325)\left[(427)^2 + (325)^2 - 427 \times 325\right]}{\frac{1}{100}\left[(427)^2 + (325)^2 - 427 \times 325\right]}$$

$= 752 \times 100 = \boxed{75200}$

306. 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

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Ans. (d) :

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

$x^3 + y^3 + z^3 - 3 \times 216 = 19\left[361 - 3 \times 114\right]$

$x^3 + y^3 + z^3 = 361 + 648 = 1009$

$\sqrt{x^3 + y^3 + z^3 + xyz}$

$\sqrt{1009 + 216}$

$= \sqrt{1225}$

$= 35$

307. If $\left(5\sqrt{5}x^3 - 3\sqrt{3}y^3\right) \div \left(\sqrt{5}x - \sqrt{3}y\right) = \left(Ax^2 + By^2 + Cxy\right)$, then what is the value of $(3A - B - \sqrt{15}C)$?

(a) –3 (b) –5
(c) 12 (d) 8

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Ans. (a) : $\dfrac{\left(\sqrt{5}x\right)^3 - \left(\sqrt{3}y\right)^3}{\left(\sqrt{5}x - \sqrt{3}y\right)} = Ax^2 + By^2 + Cxy$

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

On comparing

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

$\therefore \left(3A - B - \sqrt{15}C\right) = 3 \times 5 - 3 - \sqrt{15} \times \sqrt{15}$

$= 15 - 3 - 15$

$= \boxed{-3}$

308. If $x^4 + x^{-4} = 194$, $x > 0$ then what is the value of $x + \dfrac{1}{x} + 2$?

(a) 14 (b) 8
(c) 4 (d) 6

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Ans. (d) : Given– $x^4 + x^{-4} = 194$

$\Rightarrow x^4 + \dfrac{1}{x^4} = 194$

$\Rightarrow x^4 + \dfrac{1}{x^4} + 2 = 196$

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

$\Rightarrow x^2 + \dfrac{1}{x^2} + 2 = 16$

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

$\therefore x + \dfrac{1}{x} + 2 = 4 + 2$

$= 6$

309. 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) $\sqrt{10}$

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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

$a - 2 = 0, \quad b + 4 = 0 \quad \text{or } c - 8 = 0$

$\therefore a = 2, \quad b = -4 \quad \text{or } c = 8$

$\sqrt{ab - bc + ca} = \sqrt{-8 + 32 + 16} = \sqrt{40} = 2\sqrt{10}$

310. 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

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Ans. (d) : $xy + yz + zx = \dfrac{(x + y + z)^2 - \left(x^2 + y^2 + z^2\right)}{2}$

$= \dfrac{169 - 133}{2} = \dfrac{36}{2} = 18$

$\because x^3 + y^3 + z^3 - 3xyz =$

$(x+y+z)\left[x^2 + y^2 + z^2 - (xy + yz + zx)\right]$

$847 - 3xyz = 13\,[133 - 18]$

$847 - 3xyz = 13 \times 115$

$3xyz = 847 - 1495 = -648$

$xyz = -216$

$\sqrt[3]{xyz} = -6$

311. If $a^3 + b^3 = 217$ and $a + b = 7$, then the value of ab is:

(a) –1 (b) 7
(c) 6 (d) –6

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Ans. (c) : $\because (a+b)^3 = a^3 + b^3 + 3ab(a+b)$

$(7)^3 = 217 + 3ab \times 7$

$343 - 217 = 21ab$

$126 = 21ab$

$ab = 6$

312. If $x^2 - 3x + 1 = 0$, then the value of $\left(x^4 + \dfrac{1}{x^2}\right) \div \left(x^2 + 1\right)$ is:

(a) 9 (b) 5
(c) 7 (d) 6

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Ans. (d) : $x^2 - 3x + 1 = 0,$

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

$x^3 + \dfrac{1}{x^3} = (3)^3 - 3 \times 3 = 18$

$\dfrac{\left(x^4 + \dfrac{1}{x^2}\right)}{x^2 + 1}$

$= \dfrac{x^3 + \dfrac{1}{x^3}}{x + \dfrac{1}{x}} = \dfrac{18}{3} = 6$

313. 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, $7x + 8y = 7(-3) + 8\times\left(\frac{-3}{2}\right)$

$= -21 - 12 = -33$

314. The value of

$$\frac{0.325\times0.325+0.175\times0.175+25\times0.00455}{5\times0.0065\times3.25-7\times0.175\times0.025}+\frac{0.5}{1.5}$$

is:

(a) $\frac{11}{3}$ (b) $\frac{7}{3}$
(c) 3 (d) 0

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Ans. (a) :

$$\frac{0.325\times0.325+0.175\times0.175+25\times0.00455}{5\times0.0065\times3.25-7\times0.175\times0.025}+\frac{0.5}{1.5}$$

$$=\frac{0.325\times0.325+0.175\times0.175+2\times0.325\times0.175}{0.325\times0.325-0.175\times0.175}+\frac{0.5}{1.5}$$

$$=\frac{(0.325+0.175)^2}{(0.325)^2-(0.175)^2}+\frac{1}{3}\ [\text{Formula } a^2+b^2+2ab=(a+b)^2]$$

$$=\frac{0.325+0.175}{0.325-0.175}+\frac{1}{3}$$

$$=\frac{0.500}{0.150}+\frac{1}{3}$$

$$=\frac{10}{3}+\frac{1}{3}=\frac{11}{3}$$

315. If $x + y + z = 17$, $xyz = 171$ and $xy + yz + zx = 111$, then the value of $\sqrt[3]{\left(x^3+y^3+z^3+xyz\right)}$ is:

(a) –4 (b) –64
(c) 4 (d) 0

SSC CPO-SI 24/11/2020 (Shift-I)

Ans. (a) :

$$=\sqrt[3]{\left(x^3+y^3+z^3+xyz\right)}$$

$$=\sqrt{4xyz+x^3+y^3+z^3-3xyz}$$

$$=\sqrt[3]{4xyz+(x+y+z)\left[(x+y+z)^2-3(xy+yz+zx)\right]}$$

$$=\sqrt[3]{4\times171+17[289-333]}$$

$$=\sqrt[3]{684-748}=\sqrt[3]{-64}=-4$$

316. If $x^2 - 5x + 1 = 0$, then the value of $\left(x^4+\frac{1}{x^2}\right)\div\left(x^2+1\right)$ 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, $\frac{x^4+\frac{1}{x^2}}{x^2+1}=\frac{x^3+\frac{1}{x^3}}{x+\frac{1}{x}}$

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

$\therefore\ x^3+\frac{1}{x^3}=5^3-3\times5=125-15=110$

Hence $\frac{x^3+\frac{1}{x^3}}{x+\frac{1}{x}}=\frac{110}{5}=22$

317. 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) : $\because\ x^3 + y^3 + z^3 - 3xyz$

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

$= 19[(19)^2 - 3(114)]$

$= 19(361-342)$

$x^3 + y^3 + z^3 - 3xyz = 19\times19 = 361$

Now, $x^3 + y^3 + z^3 + xyz = 361 + 4xyz$

$= 361 + 4\times216 = 361 + 864 = 1225$

Hence $x^3 + y^3 + z^3 + xyz = 1225$

318. The value of $\frac{6.35\times6.35\times6.35+3.65\times3.65\times3.65}{63.5\times63.5+36.5\times36.5-63.5\times36.5}$ is equal to?

(a) 0.1 (b) 1
(c) 0.01 (d) 10

SSC CPO-SI 23/11/2020 (Shift-I)

Ans. (a) : $\frac{6.35\times6.35\times6.35+3.65\times3.65\times3.65}{63.5\times63.5+36.5\times36.5-63.5\times36.5}$

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

$\therefore\ \frac{(6.35)^3+(3.65)^3}{(6.35)^2+(3.65)^2-6.35\times3.65}$

$=\frac{[(6.35)+(3.65)]\left[(6.35)^2+(3.65)^2-6.35\times3.65\right]}{100[(6.35)^2+(3.6)^2-6.35\times3.65]}$

$=\frac{10}{100}=0.1$

319. 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 $\sqrt{ab - bc + ca} = \sqrt{6\times6 - 6\times(-12) - 12\times6}$

$= \sqrt{36 + 72 - 72} = \sqrt{36} = 6$

320. 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) $3\sqrt{7}$

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Ans. (a) $x^2 - \sqrt{7}\,x + 1 = 0$

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

On cubing both sides,

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

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

$$x^3 + \frac{1}{x^3} + 3\sqrt{7} = 7\sqrt{7}$$

$$x^3 + x^{-3} = 4\sqrt{7}$$

321. The value of

$$\frac{0.325\times0.325 + 0.175\times0.175 - 25\times0.00455}{5\times0.0065\times3.25 - 7\times0.175\times0.025}$$

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) $\dfrac{0.325\times0.325 + 0.175\times0.175 - 25\times0.00455}{5\times0.0065\times3.25 - 7\times0.175\times0.025}$

$$= \frac{(0.325)^2 + (0.175)^2 - 2\times0.325\times0.175}{(0.325)^2 - (0.175)^2}$$

$$= \frac{(0.325 - 0.175)^2}{(0.325 - 0.175)(0.325 + 0.175)}$$

$$= \frac{0.325 - 0.175}{0.325 + 0.175}$$

$$= \frac{150}{500} = 0.30$$

322. 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

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Ans. (d)

$x + y + z = 10$

On squaring both sides,

$(x + y + z)^2 = 10^2$

$x^2 + y^2 + z^2 + 2\ (xy + yz + zx) = 100$

$x^2 + y^2 + z^2 + 2 \times 25 = 100$

$x^2 + y^2 + z^2 = 50$

$\because\quad x^3 + y^3 + z^3 - 3xyz = (x + y + z)$

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

$x^3 + y^3 + z^3 - 3 \times 100 = 10 \times (50 - 25)$

$x^3 + y^3 + z^3 = 250 + 300$

$= 550$

323. 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) $\dfrac{37}{216}$ (b) $\dfrac{35}{432}$

(c) $\dfrac{19}{108}$ (d) $\dfrac{19}{108}$

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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, $ax^2 + by^2 + 2hxy + 2gx + 2fy + c$

$a = 4, b = 9, h = 6, g = -1, f = -\dfrac{3}{2}, c = -20$

$$\left\{\frac{(g + f - c)}{abh}\right\} = \left\{\frac{\left(-1 + \left(-\frac{3}{2}\right) - (-20)\right)}{4\times9\times6}\right\} = \frac{-\frac{5}{2} + 20}{216}$$

$$= \frac{35}{432}$$

324. 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

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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

325. If $\sqrt{x}+\frac{1}{\sqrt{x}}=3, x>0$, then $x^2(x^2-47)$ = ?

(a) –1 (b) –2
(c) 2 (d) 0

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Ans. (a)

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

$x+\frac{1}{x}=(3)^2-2=7$

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

$x^4+1=47x^2$

$x^4-47x^2=-1$

$x^2(x^2-47)=-1$

326. $\frac{0.74\times1.23\times0.13}{(0.37)^3+(0.41)^3-8(0.39)^3}$ What is the value of

(a) –1 (b) 1
(c) 1/3 (d) –1/3

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Ans. (d)

$\frac{0.74\times1.23\times0.13}{(0.37)^3+(0.41)^3-8(0.39)^3}$

$=\frac{0.37\times0.41\times0.78}{(0.37)^3+(0.41)^3+(-0.78)^3}$

$\because$ $a+b+c=0.37+0.41-0.78=0$

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

$=\frac{0.37\times0.41\times0.78}{-3\times0.37\times0.41\times0.78}=\frac{-1}{3}$

327. 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– $a^3-b^3=(a-b)(a^2+b^2+ab)$

$(2x-5y-2x-5y)[(2x-5y)^2+(2x+5y)^2+(2x-5y)(2x+5y)]=y[Ax^2+By^2]$

$-10y[12x^2+25y^2]=y[Ax^2+By^2]$

$A=-120, \quad B=-250$

$\therefore$ $2A-B=2\times(-120)+250=10$

328. 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

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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, $a(b^2+c^2)+b(c^2+a^2)+c(a^2+b^2)+3abc$

$=a(38-a^2)+b(38-b^2)+c(38-c^2)+3abc$

$=38(a+b+c)-(a^3+b^3+c^3-3abc)$

$=38\times6-[6(38+1)]$

$=6\times(38-39)=-6$

329. 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

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Ans. (a)

$\because$ $x^3+y^3+z^3-3xyz$

$=\frac{1}{2}(x+y+z)[(x-y)^2+(y-z)^2+(z-x)^2]$

$=\frac{1}{2}(5.51+5.52+5.57)[(-0.01)^2+(-0.05)^2+(0.06)^2]$

$=\frac{1}{2}\times16.60\times[0.0001+0.0025+0.0036]$

$=8.3\times0.0062=0.05146$

330. The value of $\frac{4.669\times4.669-9\times(0.777)^2}{(4.669)^2+(2.331)^2+14(0.667)(2.331)}$ is (1–k), where k = ?

(a) 0.666 (b) 0.768
(c) 0.467 (d) 0.647

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Ans. (a)

$\frac{4.669\times4.669-9\times(0.777)^2}{(4.669)^2+(2.331)^2+14(0.667)(2.331)}=1-k$

$\frac{(4.669)^2-(2.331)^2}{(4.669)^2+(2.331)^2+2\times4.669\times2.331}=1-k$

$\frac{(4.669+2.331)(4.669-2.331)}{(4.669+2.331)^2}=1-k$

$\frac{2.338}{7}=1-k$

$0.334=1-k$

$k=0.666$

331. 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) $x^6 - 512y^6 = (x^2 + Ay^2)(x^4 - Bx^2y^2 + Cy^4)$

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

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

$\Rightarrow \left(x^2 - 8y^2\right)(x^4 + 8x^2y^2 + 64y^2)$

$= \left(x^2 + Ay^2\right)(x^4 - Bx^2y^2 + Cy^2)$

By comparing

$A = -8,\ B = -8,\ C = 64$

$\therefore\ A + B - C = -8 - 8 - 64$

$= -80$

332. 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, $x^6 + \frac{1}{x^6} = (14)^3 - 3 \times 14$

$= 2744 - 42$

$x^6 + x^{-6} = 2702$

333. 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,

$x^3 + \frac{1}{x^3} = k$ And $x + \frac{1}{x} = p$

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

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

$= p^2 - 2 - 1 = p^2 - 3$

334. 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) $a^3 + b^3 + c^3 - 3abc$

$= \frac{1}{2}(a + b + c)\left[(a - b)^2 + (b - c)^2 + (c - a)^2\right]$

$= \frac{1}{2}(500 + 502 + 504)\left[(-2)^2 + (-2)^2 + 4^2\right]$

$= \frac{1}{2} \times 1506 \times 24 = 18072$

335. 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) $\frac{8x}{2x^2 + 7x - 2} = 1$

$8x = 2x^2 + 7x - 2$

$2x^2 - x - 2 = 0$

$2x - \frac{2}{x} = 1$

$x - \frac{1}{x} = \frac{1}{2}$

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

$x + \frac{1}{x} = \sqrt{\frac{17}{4}}$

$x^3 + \frac{1}{x^3} = \left(\sqrt{\frac{17}{4}}\right)^3 - 3\sqrt{\frac{17}{4}}$

$= \frac{5}{4}\sqrt{\frac{17}{4}} = \frac{5\sqrt{17}}{8}$

336. 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

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

Then the value of a + b + c will be zero

$x + 3y + 4z = 0$

337. 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) $\frac{4}{3}\left(x^2+\frac{1}{x^2}\right)=110\frac{2}{3}$

$\left(x^2+\frac{1}{x^2}\right)=\frac{332}{3}\times\frac{3}{4}$

$\left(x^2+\frac{1}{x^2}\right)=83$

$\left(x-\frac{1}{x}\right)=9$

$\left(x^3-\frac{1}{x^3}\right)=9^3+3\times9=729+27=756$

$\therefore \quad \frac{1}{9}\left(x^3-\frac{1}{x^3}\right)=\frac{756}{9}=84$

338. 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

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

$=\frac{(x+y)^3-3xy(x+y)}{(xy)^3}$

$=\frac{7^3-3\times10\times7}{10^3}$

$=\frac{343-210}{1000}$

$=\frac{133}{1000}=0.133$

339. 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) : $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$(4)^2 = a^2 + b^2 + c^2 + 2 \times 1$

$16 - 2 = a^2 + b^2 + c^2$

$14 = a^2 + b^2 + c^2$

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

$= 4(14 - 1)$

$= 4 \times 13 = 52$

340. If $40\sqrt{5}x^3-3\sqrt{3}y^3=\left(2\sqrt{5}x-\sqrt{3}y\right)\times\left(Ax^2+Bxy+Cy^2\right)$, 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) :

$40\sqrt{5}x^3-3\sqrt{3}y^3=\left(2\sqrt{5}x-\sqrt{3}y\right)\times\left(Ax^2+Bxy+Cy^2\right)$

$\left(2\sqrt{5}x\right)^3-\left(\sqrt{3}y\right)^3=\left(2\sqrt{5}x-\sqrt{3}y\right)\times\left(Ax^2+Bxy+Cy^2\right)$

$\left(2\sqrt{5}x-\sqrt{3}y\right)\left(20x^2+3y^2+2\sqrt{5}x\times\sqrt{3}y\right)$

$=\left(Ax^2+Bxy+Cy^2\right)\left(2\sqrt{5}x-\sqrt{3}y\right)$

$\left[20x^2+3y^2+2\sqrt{5}x\times\sqrt{3}y\right]=\left(Ax^2+Bxy+Cy^2\right)$

On comparing both sides,

$A = 20, \quad B = 2\sqrt{15}, \quad C = 3$

$\sqrt{B^2+C^2-A}=\sqrt{\left(2\sqrt{15}\right)^2+(3)^2-20}$

On putting the value

$=\sqrt{60+9-20}$

$=\sqrt{49}=7$

341. If $x^2 + 1 = 3x$, then the value of $\frac{\left(x^4+x^{-2}\right)}{\left(x^2+5x+1\right)}$ 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) : $x^2+1=3x$

On dividing by x both sides

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

On cubing both sides,

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

$x^3+\frac{1}{x^3}=27-9$

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

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

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

$=\frac{18}{3+5}=\frac{18}{8}=\frac{9}{4}$

$=\boxed{2\frac{1}{4}}$

342. 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,

$$a^2 + 4b^2 + 49c^2 + 18 = 2(2b + 28c - a)$$

$$\Rightarrow a^2 + 2a + 1 + 4b^2 - 4b + 1 + 49c^2 - 56c + 16 = 0$$

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

$$\Rightarrow (a+1) = 0,\ 2b-1 = 0,\ 7c-4 = 0$$

$$a = -1,\quad b = \frac{1}{2},\quad c = \frac{4}{7}$$

$$3a + 2b + 7c$$

$$= 3\times(-1) + 2\times\frac{1}{2} + 7\times\frac{4}{7}$$

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

343. If $250\sqrt{2}x^3 - 5\sqrt{5}y^3 = \left(5\sqrt{2}x - \sqrt{5}y\right)\times(Ax^2 + Bxy + Cy^2)$, then the value of $\left(A + C - \sqrt{10}B\right)$ is?

(a) 5 (b) $5\sqrt{2}$
(c) 10 (d) $2\sqrt{5}$

SSC CHSL 03/07/2019 (Shift-II)

Ans. (a) : $250\sqrt{2}x^3 - 5\sqrt{5}y^3 = \left(5\sqrt{2}x - \sqrt{5}y\right)\left(Ax^2 + Bxy + Cy^2\right)$

$$\Rightarrow \left(5\sqrt{2}x\right)^3 - \left(\sqrt{5}y\right)^3 = \left(5\sqrt{2}x - \sqrt{5}y\right)\left(Ax^2 + Bxy + Cy^2\right)$$

$$\Rightarrow \left(5\sqrt{2}x - \sqrt{5}y\right)\left(50x^2 + 5\sqrt{10}xy + 5y^2\right) = \left(5\sqrt{2}x - \sqrt{5}y\right)\left(Ax^2 + Bxy + Cy^2\right)$$

$$\Rightarrow 50x^2 + 5\sqrt{10}xy + 5y^2 = Ax^2 + Bxy + Cy^2$$

On comparing both sides-

$$A = 50,\qquad B = 5\sqrt{10},\qquad C = 5$$

Hence $A + C - \sqrt{10}B = 50 + 5 - \sqrt{10}\left(5\sqrt{10}\right)$

$$= 55 - 50$$

$$= 5$$

344. 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 $c = 0$

Hence $3a + 4b + c = 4 + 3 + 0 = 7$

345. If $x \neq -1$, 2 and 5, then the value of $\left\{\frac{2(x^3-8)}{x^2-x-2}\times\frac{x^2+2x+1}{x^2-4x-5}\div\frac{x^2+2x+4}{3x-15}\right\}$ 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:–

$$\left\{\frac{2(x^3-8)}{x^2-x-2}\times\frac{x^2+2x+1}{x^2-4x-5}\div\frac{x^2+2x+4}{3x-15}\right\}$$

$$= \left\{\frac{2(x^3-2^3)}{x^2-x-2}\times\frac{x^2+2x+1}{x^2-4x-5}\times\frac{3x-15}{x^2+2x+4}\right\}$$

$$= \frac{2(x-2)(x^2+2x+4)}{(x-2)(x+1)}\times\frac{(x+1)(x+1)}{(x+1)(x-5)}\times\frac{3(x-5)}{(x^2+2x+4)}$$

$$= 2\times 3 = 6$$

346. 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 $x^6 - 3x^2 + \frac{3}{x^2} - \frac{1}{x^6} + 1$

$$x^6 - \frac{1}{x^6} - 3\left(x^2 - \frac{1}{x^2}\right) + 1$$

$$140 - 3(5) + 1$$

$$140 - 15 + 1 = 126$$

347. 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 substracting 2 in both sides)

$$x^2+\frac{1}{x^2}-2=38-2$$

$$\left(x-\frac{1}{x}\right)^2=36,\quad x-\frac{1}{x}=6$$

348. 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) : $\because (a+b)^2 = a^2+b^2+2ab$

$(a+b)^2 = 99+2\times 11 = 121$

$a+b = 11$

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

$11^3 = a^3+b^3+3\times 11\times 11$

$a^3+b^3 = 1331-363$

$a^3+b^3 = 968$

349. 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

SSC CHSL 04/07/2019 (Shift-III)

Ans. (b) : $(3x-7)^3+(3x-8)^3+(3x+6)^3 = 3(3x-7)(3x-8)(3x+6)$

$\because a^3+b^3+c^3 = 3abc$

$\therefore \quad a+b+c = 0$

if $\quad a = 3x-7,\quad b = 3x-8,\quad c = 3x+6$

$3x-7+3x-8+3x+6 = 0$

$9x = 7+8-6$

$9x = 9$

$x = 1$

350. If $x^2 - 6x + 1 = 0$, then the value of $\left(x^4+\frac{1}{x^2}\right)\div\left(x^2+1\right)$ 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 $\left(x^4+\frac{1}{x^2}\right)\div\left(x^2+1\right)$

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

$$=\frac{x^3+\frac{1}{x^3}}{x+\frac{1}{x}}=\frac{198}{6}=33$$

351. 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) $(a-b)^3 = a^3-b^3-3ab(a-b)$

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

$29(a-b)^2 = 899-3ab\times 29$

$29[(a-b)^2+3ab] = 899$

$$(a-b)^2+3ab = \frac{899}{29}=31$$

352. 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) : $x^4+\frac{1}{x^4}=1154$

On adding 2 in both sides,

$$\left(x^2+\frac{1}{x^2}\right)^2=1156$$

$$x^2+\frac{1}{x^2}=34$$

Again, on 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)

$= 2\times 8$

$= 16$

353. 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) $81\,a^2b^2c^2$ (b) $729\,a^2b^2c^2$

(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 $a+b+c=3a^{1/3}.b^{1/3}.c^{1/3}$

$(a+b+c)=3(abc)^{1/3}$

$\therefore \quad (a+b+c)^6=729a^2b^2c^2$

354. 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 $(a-b)^2=a^2+b^2-2ab=169-120$

$(a-b)^2=49 \Rightarrow (a-b)=7$

$\therefore \quad (a+b)(a-b)=7\times17$

$a^2-b^2=119$

II[nd] Method

Let $a=12,\ b=5$

$ab=60=12\times5$

$\therefore \quad a^2+b^2=(12)^2+(5)^2=25+114=169$

$\therefore \quad (a^2-b^2)=(12)^2-(5)^2$

$=144-25$

$=119$

355. 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) : $a+b-c=12$

$(a+b-c)^2=(12)^2$

$a^2+b^2+c^2+2(ab-bc-ca)=144$

$\therefore \quad 110+2(ab-bc-ca)=144$

$2(ab-bc-ca)=34$

$ab-bc-ca=17$

356. 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

SSC CHSL 10/07/2019 (Shift-II)

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

On squaring both,

$a^2+\frac{1}{a^2}=9-2=7$

On cubing both side,

$a^6+\frac{1}{a^6}=(7)^3-3\times7=343-21=322$

357. 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) : $a+\frac{1}{a}=2$

On squaring both side

$a^2+\frac{1}{a^2}=4-2=2$

If $a+\frac{1}{a}=k,\ a-\frac{1}{a}=\sqrt{k^2-4}$

$\therefore \ a^2-\frac{1}{a^2}=\sqrt{2^2-4}=0$

$\therefore \ a^4-\frac{1}{a^4}=\left(a^2+\frac{1}{a^2}\right)\left(a^2-\frac{1}{a^2}\right)=0$

OR

If $a+\frac{1}{a}=2 \ \Rightarrow a=1$

$\therefore a^4-\frac{1}{a^4}=1^4-\frac{1}{1^4}=0$

358. 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 expessed 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) $(x+y)^{\frac{1}{3}}+(y+z)^{\frac{1}{3}}=-(z+x)^{\frac{1}{3}}$

$(x+y)^{\frac{1}{3}}+(y+z)^{\frac{1}{3}}+(z+x)^{\frac{1}{3}}=0$

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,

$$x^3+y^3+z^3+3(x+y)(y+z)(z+x)=\frac{27}{8}(x+y)(y+x)(z+x)$$

$$\Rightarrow x^3+y^3+z^3=(x+y)(y+z)(z+x)\left[\frac{27}{8}-3\right]$$

$$\therefore \boxed{x^3+y^3+z^3=\frac{3}{8}(x+y)(y+z)(z+x)}$$

359. 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) : $a^2+b^2+c^2+2(ab+bc+ca)=(a+b+c)^2$

$152+2(ab+bc+ca)=(20)^2$

$2(ab+bc+ca)=400-152$

$ab+bc+ca=124$

360. 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) $(a-2b)^2=(a+2b)^2-8ab$

$=(10)^2-4\times9=64$

$a-2b=\pm8$

$|a-2b|=8$

361. If (a+b+4) {(ab + 4(a+b)} – 4ab = 0 and a ≠ –4, b ≠ –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,

$(1+(-1)+4)\{1\times(-1)+4(1+(-1))\}-4\times1\times(-1)=0$

$4\times(-1)+0+4=0$

$0=0$

$$\therefore \quad \frac{1}{(a+b+4)^{117}}-2^{-234}=\frac{1}{(1+(-1)+4)^{117}}-2^{-234}$$

$$=\frac{1}{(4)^{117}}-2^{-234}$$

$$=\frac{1}{2^{234}}-2^{-234}$$

$$=2^{-234}-2^{-234}$$

$$=0$$

362. 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) : $a=\sqrt{8}-\sqrt{7}$

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

$$b=\frac{1}{\sqrt{8}-\sqrt{7}}\times\frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}}$$

$$b=\sqrt{8}+\sqrt{7}$$

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

$$=\frac{\left(-\sqrt{7}-\sqrt{7}\right)^2-\left(\sqrt{8}-\sqrt{7}\right)\left(\sqrt{8}+\sqrt{7}\right)}{\left(\sqrt{8}+\sqrt{8}\right)^2-\left(\sqrt{8}-\sqrt{7}\right)\left(\sqrt{8}+\sqrt{7}\right)}$$

$$=\frac{\left(-2\sqrt{7}\right)^2-1}{\left(2\sqrt{8}\right)^2-1}=\frac{28-1}{32-1}=\frac{27}{31}$$

363. 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) : $(x+y)^2-z^2=8$

$(x+y+z)(x+y-z)=8$ .....(i)

$\because$ $(y+z)^2-x^2=10$

$(y+z+x)(y+z-x)=10$ .....(ii)

$\because$ $(x+z)^2-y^2=7$

$(x+z+y)(x+z-y)=7$ .....(iii)

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

$(x+y+z)(x+y-z+y+z-x+x+z-y)=8+10+7$

$(x+y+z)(x+y+z)=25$

$(x+y+z)^2=25$

$x+y+z=5$

364. The value of :

$$\frac{18.43\times18.43-6.57\times6.57}{11.86}$$

(a) 25 (b) 26
(c) 24.12 (d) 23.62

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

Ans. (a) : $\frac{18.43\times18.43-6.57\times6.57}{11.86}$

$=\frac{(18.43)^2-(6.57)^2}{11.86}$

$=\frac{(18.43+6.57)(18.43-6.57)}{11.86}$

$\left[\because a^2-b^2=(a+b)(a-b)\right]$

$=\frac{25\times11.86}{11.86}=25$

365. If $\frac{10}{7}\left(1-2.43\times10^{-3}\right)=1.417+x$ 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) : $\frac{10}{7}\left(1-2.43\times10^{-3}\right)=1.417+x$

$\frac{10}{7}(1-0.00243)=1.417+x$

$\frac{10}{7}\times0.99757=1.417+x$

$1.4251 = 1.4170 + x$

$x = 0.0081$

366. 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)

Ans. (d) : $\left(\frac{2a^2}{3bc}+\frac{2b^2}{3ca}+\frac{2c^2}{3ab}\right)$

$=\frac{2}{3}\left(\frac{a^3+b^3+c^3}{abc}\right)$

$=\frac{2}{3}\left(\frac{3abc}{abc}\right)$ $\left[\because(a+b+c)=0,\ \therefore a^3+b^3+c^3=3abc\right]$

$= 2$

367. 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)

Ans. (a) : $x = 3+2\sqrt{2}$

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

$\sqrt{x}=\sqrt{2}+1$

$\frac{1}{\sqrt{x}}=\sqrt{2}-1$

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

$\sqrt{x}-\frac{1}{\sqrt{x}}=2$

368. 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)

Ans. (a) : $a^2 + b^2 + 2b + 4a + 5 = 0$

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

$(a+2)^2 + (b+1)^2 = 0$

$a+2 = 0$ and $b+1 = 0$

$a = -2,\ b = -1$

$\frac{2a-3b}{2a+3b}=\frac{2\times(-2)-3\times(-1)}{2\times(-2)+3\times(-1)}$

$\frac{-4+3}{-4-3}=\frac{-1}{-7}=\frac{1}{7}$

369. 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)

Ans. (a) : $2a+\frac{1}{a}=4$

$a+\frac{1}{2a}=2$ (On dividing by 2)

On squaring both sides,

$a^2+\frac{1}{4a^2}+2\times a\times\frac{1}{2a}=4$

$a^2+\frac{1}{4a^2}=3$

370. 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)

Ans. (a) : Given : $a = 225, b = 226\ c = 227$

$a^3+b^3+c^3-3abc =$

$\left[\frac{1}{2}[a+b+c]\left[(a-b)^2+(b-c)^2+(c-a)^2\right]\right.$

$=\frac{1}{2}[225+226+227]\left[(225-226)^2+(226-227)^2+(227-225)^2\right]$

$=\frac{1}{2}[678][1+1+4]$

$=\frac{1}{2}\times678\times6=2034$

371. 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)

Ans. (d): $(a^{2/3} + 2a^{1/2} + 3a^{1/3} + 2a^{1/6} +1) (a^{1/3} – 2a^{1/6} +1) – a^{1/2} . (a^{1/2} – 2)$

(Let $a^{1/6} = x$, then $a^{1/3} = x^2$, $a^{1/2} = x^3$, $a^{2/3} = x^4$)

According ot question, $(x^4 + 2x^3 + 3x^2 + 2x + 1) (x^2 – 2x + 1) – x^3 (x^3–2)$

$\Rightarrow x^6 – 2x^5 + x^4 + 2x^5 – 4x^4 + 2x^3 + 3x^4 – 6x^3 + 3x^2 + 2x^3 – 4x^2 + 2x + x^2 – 2x + 1 – x^6 + 2x^3$

$\Rightarrow 4x^4 – 4x^4 – 6x^3 + 6x^3 – 4x^2 + 4x^2 + 1$

$\Rightarrow 1$

372. 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,

$$25a^2+\frac{1}{16a^2}+2\times5a\times\frac{1}{4a}=25$$

$$25a^2+\frac{1}{16a^2}=25-\frac{5}{2}$$

$$\boxed{25a^2+\frac{1}{16a^2}=\frac{45}{2}}$$

373. 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) :

$\frac{3}{7}$ of ab = 9 $\Rightarrow$ ab = 21

By cubing both sides,

$(a+b)^3 = (10)^3$

$a^3 + b^3 + 3ab(a+b) = 1000$

$a^3 + b^3 + 3\times21\times10 = 1000$

$sa^3 + b^3 = 1000 – 630$

$\therefore \boxed{a^3 + b^3 = 370}$

374. 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) :

$$A=\frac{(0.1)^3+(0.2)^3+(0.3)^3+3(0.005+0.016+0.027)+0.036}{(0.1)^2+(0.2)^2+(0.3)^2+0.04+0.06+0.12}$$

$$A=\frac{(1+8+27+3\times48+36)\times10^{-3}}{(1+4+9+22)\times10^{-2}}=\frac{216}{36}\times\frac{1}{10}=\frac{6}{10}$$

$$\therefore 60A=60\times\frac{6}{10}=36$$

375. 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) : $\therefore a + a^2b + b + ab^2 = 128$

$(a+b) + ab (a+b) = 128$

$(a+b) (1+ab) = 128$

$(1+ab) = \frac{128}{8} = 16$

$\therefore ab = 15$

$a^3 + b^3 = (a+b) [(a+b)^2 – 3ab]$

$= 8 [64 – 45]$

$= 8 \times 19 = 152$

376. 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) : $x^4+\frac{1}{x^4}=\frac{257}{16}$

$$\left(x^2+\frac{1}{x^2}\right)^2=\frac{257}{16}+2=\frac{257+32}{16}=\frac{289}{16}$$

$$x^2+\frac{1}{x^2}=\frac{17}{4}$$

$$\left(x+\frac{1}{x}\right)^2=\frac{17}{4}+2=\frac{25}{4}$$

$$x+\frac{1}{x}=\frac{5}{2}$$

$$\therefore\ x^3+\frac{1}{x^3}=\left(\frac{5}{2}\right)^3-3\times\left(\frac{5}{2}\right)=\frac{125}{8}-\frac{15}{2}=\frac{65}{8}$$

$$\therefore\ \frac{8}{13}\left(x^3+\frac{1}{x^3}\right)=\frac{8}{13}\times\frac{65}{8}=5$$

377. 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 $a - b = K$, $b - c = L$, $c - a = M$

$$\therefore \left[(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3\right] \div \left[(a-b)^2+(b-c)^3+(c-a)^3\right]$$

$$= \frac{x^3+y^3+z^3}{K^3+L^3+M^3}$$

$$= \frac{3xyz}{3KLM} \qquad \left[\because x+y+z=0,\ K+L+M=0\right]$$

$$= \frac{xyz}{KLM}$$

$$= \frac{(a^2-b^2)(b^2-c^2)(c^2-a^2)}{(a-b)(b-c)(c-a)}$$

$$= \frac{(a-b)(a+b)(b-c)(b+c)(c-a)(c+a)}{(a-b)(b-c)(c-a)}$$

$= (a + b)(b + c)(c + a)$

378. 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 $p \times p \times p = 1 \times 1 \times 1 = 1$

379. 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) $a + \frac{1}{a} + 2 = 0$

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

$\therefore a = -1$

$$a^{15} - \frac{1}{a^{100}} = (-1)^{15} - \frac{1}{(-1)^{100}}$$

$= -1 - 1 = -2$

380. 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,

$x = 3 + 2\sqrt{2}$

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

$x + \frac{1}{x} = 6 \Rightarrow x^2 + \frac{1}{x^2} = 36 - 2 = 34$

381. 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) $p + \frac{1}{p} = 112$

$(p - 112) = -\frac{1}{p}$

$$(p-112)^{15} + \frac{1}{p^{15}} = \left(-\frac{1}{p}\right)^{15} + \frac{1}{p^{15}}$$

$$= -\frac{1}{p^{15}} + \frac{1}{p^{15}} = 0$$

382. 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) : $2(x+y+z) = 15$

$x + y + z = \frac{15}{2}$

$x + y = 4 \Rightarrow x^2 + y^2 + 2xy = 16$

$y + z = 5 \Rightarrow y^2 + z^2 + 2yz = 25$

$z + x = 6 \Rightarrow z^2 + x^2 + 2zx = 36$

$2(x^2 + y^2 + z^2) + 2(xy + yz + zx) = 77$

$\left\{\because xy + yz + zx = 9,\ x + y + z = \frac{15}{2}\right\}$

$2(x^2 + y^2 + z^2) + 2 \times 9 = 77$

$2(x^2 + y^2 + z^2) = 77 - 18 = 59$

$\left(x^2 + y^2 + z^2\right) = \frac{59}{2}$

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

$$= \frac{15}{2} \times \left(\frac{59}{2} - 9\right) = \frac{15}{2} \times \frac{41}{2} = \frac{615}{4} = 153.75$$

383. 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): $(a + b)^3 = 5^3$
$a^3 + b^3 + 3ab(a + b) = 125$
$3ab \times 5 = 125 - 20 = 105$
$ab = 7$
$\therefore \quad a^2 + b^2 = 25 - 14 = 11$
Again squaring on both sides,
$a^4 + b^4 = 121 - 2 (ab)^2$
$= 121 - 2 \times 49 = 121 - 98 = 23$

384. 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 $x + \frac{1}{x} = 11$

385. 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) : $x^3 + y^3 + z^3 - 3xyz =$

$$\frac{1}{2}(x + y + z)\left[(x - y)^2 + (y - z)^2 + (z - x)^2\right]$$

$$= \frac{1}{2}(255 + 256 + 257)\left[(-1)^2 + (-1)^2 + (2)^2\right]$$

$$= \frac{1}{2} \times 768 \times 6 = 2304$$

386. 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) : $(x+2y)^2 = (x-2y)^2 + 8xy$
$= 9 + 40$
$x + 2y = 7$
$\therefore \; x^2 - 4y^2 = (x+2y)(x-2y)$
$= 7 \times 3 = 21$

387. 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) : $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
$64 = 88 - 3ab \times 4$
$12ab = 24$
$ab = 2$
$(a + b)^2 = (a - b)^2 + 4ab$
$= 16 + 8 = 24$
$(a + b) = \sqrt{24} = 2\sqrt{6}$
$\because \; (a^2 - b^2) = (a + b)(a - b)$
$= 2\sqrt{6} \times 4$
$= 8\sqrt{6}$

388. $(a + 2b)^2 - (a - 2b)^2$ is equal to:

(a) 10ab (b) 6ab
(c) 4ab (d) 8ab

SSC CHSL –14/10/2020 (Shift-I)

Ans. (d) : $(a + 2b)^2 - (a - 2b)^2$
$= a^2 + 4b^2 + 4ab - a^2 - 4b^2 + 4ab$
$= 8ab$

389. 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) : $(x+y)^3 = x^3 + y^3 + 3xy(x+y)$
$4^3 = 12 + 3xy \times 4$
$64 = 12 + 12xy$
$12xy = 52$
$xy = \frac{13}{3}$
$\because \; x + y = 4$
$x^2 + y^2 = 4^2 - 2 \times \frac{13}{3}$
$= \frac{48 - 26}{3} = \frac{22}{3}$
$x^4 + y^4 = \left(\frac{22}{3}\right)^2 - 2 \times \left(\frac{13}{3}\right)^2$
$= \frac{484}{9} - 2 \times \frac{169}{9}$
$= \frac{146}{9}$

390. 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]

$\therefore\ x^2+\frac{1}{x^2}=4^2-2=14$

$x^4+\frac{1}{x^4}=(14)^2-2=194$

391. 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) : $a + 3b = 12$

$a^2 + 9b^2 + 6ab = 144$

$a^2 + 9b^2 = 144 - 54 = 90$

$\therefore (a-3b)^2 = a^2 + 9b^2 - 6ab = 90 - 6\times9 = 90 - 54 = 36$

$(a - 3b) = 6$

392. 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) : $a^2+\frac{2}{a^2}=16$

$\therefore \frac{72a^2}{a^4+2+8a^2}=\frac{72a^2}{a^2\left(a^2+\frac{2}{a^2}+8\right)}$

$\Rightarrow \frac{72}{\left(a^2+\frac{2}{a^2}\right)+8}=\frac{72}{16+8}=\frac{72}{24}=3$

393. 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

$\because\ 1 + 9r^2 + 81r^4 = 256$

$(1 + 3r + 9r^2)(1 - 3r + 9r^2) = 256$

$(1 - 3r + 9r^2) = \frac{256}{32} = 8$

394. 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 $0.4 = a$

$0.6 = b$

$\because\ \frac{a^3+b^3}{a^2+b^2-ab}=\frac{\left(a^2+b^2-ab\right)(a+b)}{\left(a^2+b^2-ab\right)}$

$= a + b = 0.4 + 0.6 = 1.0$

395. 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,

$\therefore x+\frac{1}{x}=16-2=14$

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

$=196-2=194$

396. 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) : $(x+y)^3 = x^3 + y^3 + 3xy(x+y)$

$7^3 = 175 + 3xy\times7$

$343 = 175 + 21xy$

$21xy = 168 \Rightarrow xy = 8$

$(x + y)^2 = 7^2$

And $x^2 + y^2 = 7^2 - 2\times8 = 49 - 16 = 33$

then, $x^4 + y^4 = \left(x^2 + y^2\right)^2 - 2x^2y^2$

$= 33^2 - 2\times64$

$= 1089 - 128 = 961$

397. 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, $x^3+\frac{1}{x^3} = \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right)$

$= 216 - 3\times 6$

$= 216 - 18 = 198$

398. 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.

$\therefore \left(\frac{1}{x^3}+\frac{1}{y^3}\right) = \frac{1}{27}+\frac{1}{64}$

$= \frac{64+27}{27\times 64} = \frac{91}{1728}$

399. 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, $\because x + y + z = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$

According to the question,

$(x+y-z)^3+(y+z-x)^3+(z+x-y)^3 = k\,xyz$

$\because x+y+z=0$

$\therefore x+y=-z,\ z+x=-y,\ y+z=-x$ on putting,

$(-z-z)^3+(-x-x)^3+(-y-y)^3 = k\,xyz$

$-8z^3-8x^3-8y^3 = kxyz$

$-8(x^3+y^3+z^3) = k\,xyz$

$-8\times 3xyz = k\,xyz$

$-24xyz = k\,xyz$

$k = -24$

400. 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) : $4x^2+9y^2+z^2+49 = 12(x+y+z)$

$(4x^2-12x+9)+(9y^2-12y+4)$

$+(z^2-12z+36)=0$

$(2x-3)^2+(3y-2)^2+(z-6)^2=0$

$2x-3=0 \rightarrow x = \frac{3}{2}$

$3y-2=0 \rightarrow y = \frac{2}{3}$

$z-6=0 \rightarrow z=6$

$\therefore (4x+9y-z) = 4\times\left(\frac{3}{2}\right)+9\times\left(\frac{2}{3}\right)-(6)$

$= 6+6-6 = 6$

401. 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

$A = 1, B = 4, C = 7$

$\therefore A - B + C = 1 - 4 + 7 = 4$

402. 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) $\because a+b+c=8,\quad ab+bc+ca=11$

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

$= 8[8^2-3\times 11] = 8(64-33) = 8\times 31 = 248$

(III) Problems based on Factors of Polynomials and Remainder Theorem

403. Simplify the Expression:– (3x – 2y) (3x + 2y) $(9x^2 + 4y^2)$

(a) $81y^4 – 16x^4$ (b) $81y^4 + 16x^4$

(c) $81x^4 + 16y^4$ (d) $81x^4 – 16y^4$

SSC CHSL (Tier-I) 17/08/2023 (Shift-II)

Ans. (d) : Given that:

$(3x - 2y)(3x + 2y)(9x^2 + 4y^2)$

$\Rightarrow (9x^2 - 4y^2)(9x^2 + 4y^2)$ [$\because (a^2 - b^2) = (a + b)(a - b)$]

$\Rightarrow 81x^4 - 16y^4$

Hence, option (d) is correct

404. When x = 5 and y = -7 then the value of $(27x^3 + 58x^2y + 31xy^2 + 8y^3)$ will be :

(a) –1924 (b) 1924

(c) –1926 (d) 1926

SSC CGL (Tier-I) 21/07/2023 (Shift-II)

Ans. (a) : $x = 5, y = -7$

$27x^3 + 58x^2y + 31xy^2 + 8y^3$

$= 27 \times (5)^3 + 58 \times (5)^2 \times (-7) + 31 \times 5 \times (-7)^2 + 8 \times (-7)^3$

$= 3375 - 10150 + 7595 - 2744$

$= -1924$

405. When x = –4 and y = –1 then the value of $(3x^3 + 5x^2y + 12xy^2 + 7y^3)$ will be :

(a) –329 (b) –361

(c) –359 (d) –327

SSC CGL (Tier-I) 14/07/2023 (Shift-I)

Ans. (d): On putting $x = -4, y = -1$

$3x^3 + 5x^2y + 12xy^2 + 7y^3$ in the equation,

$= 3 \times (-4)^3 + 5 \times (-4)^2 \times (-1) + 12 \times (-4) \times (-1)^2 + 7 \times (-1)^3$

$= -192 - 80 - 48 - 7$

$= -327$

406. If $(a + b) = \sqrt{7}$ and $(a - b) = \sqrt{5}$ then find the value of $8ab(a^2 + b^2) - (a - b)^2$

(a) 27 (b) 23

(c) 21 (d) 19

SSC CHSL –07/06/2022 (Shift-I)

Ans. (d) : Given that,

$a + b = \sqrt{7}$

$(a + b)^2 = 7$

$a^2 + b^2 + 2ab = 7$ .....(1)

and

$(a - b) = \sqrt{5}$

$(a - b)^2 = 5$

$a^2 + b^2 - 2ab = 5$ .....(2)

Adding both the eq^n (1) and (2)

$a^2 + b^2 + 2ab + a^2 + b^2 - 2ab = 7 + 5$

$2a^2 + 2b^2 = 12$

$a^2 + b^2 = 6$ .....(3)

On putting the value of eq^n (3) in eq^n (1)

$a^2 + b^2 + 2ab = 7$

$6 + 2ab = 7$

$2ab = 1$

$ab = 1/2$ .....(4)

Hence,

$8ab(a^2 + b^2) - (a - b)^2$

$= 8 \times \frac{1}{2}(6) - (\sqrt{5})^2 = 4(6) - 5 = 24 - 5 = 19$

407. $(2x + 3y + 4z)(4x^2 + 9y^2 + 16z^2 - 6xy - 12yz - 8xz) = ?$

(a) $8x^3 - 27y^3 - 64z^3 - 72xyz$

(b) $8x^3 + 27y^3 - 64z^3 + 72xyz$

(c) $8x^3 + 27y^3 + 64z^3 + 72xyz$

(d) $8x^3 + 27y^3 + 64z^3 - 72xyz$

SSC CHSL –31/05/2022 (Shift-II)

Ans. (d) :

$(2x + 3y + 4z)(4x^2 + 9y^2 + 16z^2 - 6xy - 12yz - 8xz)$

$= (2x + 3y + 4z)[(2x)^2 + (3y)^2 + (4z)^2 - (2x)(3y) - (3y)(4z) - (2x)(4z)]$

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

$= (2x)^3 + (3y)^3 + (4z)^3 - 3(2x)(3y)(4z)$

$8x^3 + 27y^3 + 64z^3 - 72xyz$

408. What will be the remainder when $f(x) = 15x^3 - 14x^2 - 4x + 10$ is divided by $(3x + 2)$:

(a) 2 (b) 1

(c) –2 (d) –1

SSC CHSL –27/05/2022 (Shift-II)

Ans. (a) : From the question,

$f(x) = 15x^3 - 14x^2 - 4x + 10$, $3x + 2 = 0$

$x = -2/3$

$= 15\left(\frac{-2}{3}\right)^3 - 14\left(\frac{-2}{3}\right)^2 - 4\left(\frac{-2}{3}\right) + 10$

$= 15\left(\frac{-8}{27}\right) - 14\left(\frac{4}{9}\right) + \frac{8}{3} + 10$

$= -\frac{40}{9} - \frac{56}{9} + \frac{24}{9} + 10$

$= \frac{-96 + 24}{9} + 10 = \frac{-72}{9} + 10 = -8 + 10 = 2$

409. Find the coefficient of x in the expansion of $(3x - 4)^3$.

(a) 144 (b) 108

(c) –144 (d) –108

SSC CPO SI 11/11/2022 (Shift III$^{rd)}$

Ans. (a) : $(3x - 4)^3$

Formula $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$

$(3x - 4)^3 = (3x)^3 - (4)^3 - 3 \times 3x \times 4(3x - 4)$

$= 27x^3 - 64 - 108x^2 + 144x$

Coefficient of $x = 144$

410. If $(a + b - c = 5)$ and $(ab - bc - ac) = 10$ then find the value of $(a^2 + b^2 + c^2)$.

(a) 5 (b) 40

(c) 15 (d) 45

SSC CGL 18/04/2022 (Shift-I)
SSC CGL 29/04/2022 (Shift-I)
SSC CGL 20/04/2022 (Shift-II)

Ans. (a) : $a + b - c = 5$ ..... (I)

$ab - bc - ca = 10$ ..... (II)

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

$(5)^2 = a^2 + b^2 + c^2 + 2\,[ab - bc - ca]$ {By Eq^n (1)}

$25 = a^2 + b^2 + c^2 + 2\,[10]$ {By Eq^n (2)}

$a^2 + b^2 + c^2 = 25 - 20$

$a^2 + b^2 + c^2 = 5$

411. 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

412. 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) : $(2a-b-3c)(4a^2+b^2+9c^2+2ab+6ac-3bc)$

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

From option (c)

$8a^3 - b^3 - 27c^3 - 18abc$

$= (2a-b-3c)(4a^2+b^2+9c^2+2ab+6ac-3bc)$

413. 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.

414. 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 $x = 27y^2$

415. 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

416. 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 $x^2 = 12y$

417. $25a^2 - 9$ is factored as :

(a) (25a +1) (a–9) (b) (5a + 1) (5a–9)

(c) $(5a-3)^2$ (d) (5a + 3) (5a–3)

SSC CGL (Tier-I)-2019 – 07/03/2020 (Shift-III)

Ans. (d) : $25a^2 - 9 = (5a)^2 - (3)^2$

$= (5a+3)(5a-3)$ $[\because a^2 - b^2 = (a + b)(a - b)]$

418. 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 $(x^2 - 1)$

$(x^2-1) = (x+1)(x-1) = 0$

$x = -1, 1$

$-1+2+a-b = 0$

$a - b = -1$ ____(i)

$x^3 + 2x^2 - ax - b = 0$

on putting the value x = 1

$1 + 2 - a - b = 0$

$-a - b = -3$

$a + b = 3$ _____ (ii)

By solving the equation (i) and (ii)

a = 1

By putting the value of a in equation (ii)

b = 2

419. 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) $(4x^2 + 2x - 3y + 9y^2 - 12xy)$

$= 4x^2 + 9y^2 - 12xy + 2x - 3y$

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

$= (2x - 3y)(2x - 3y + 1)$

(b) $8x^3 + 27y^3 = (2x + 3y)\left[4x^2 + 9y^2 - 6xy\right]$

(c) $4x^2 + 2x - 3y + 36y^2 + 12xy$

$= 4x^2 + 9y^2 + 12xy + 2x - 3y + 27y^2$

$= (2x + 3y)^2 + (2x - 3y) + 27y^2$

(d) $4x^2 + 9y^2 + 12xy = (2x + 3y)^2$

Hence, (2x – 3y) is the factor of given expression in option (a)

420. (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

$ax = -by$

$x = -\frac{b}{a}y$

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 $a^2x^2 + 2abxy + b^2y^2$.

421. 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 $2x^2 – 5x – 12$.

422. Simplify the following expression.

$(2x – 3y)^3 – 18xy(2x – 3y)$

(a) $8x^3 – 72x^2y + 108xy^2 – 27y^3$
(b) $8x^3 – 27y^3 – 36x^2y – 54xy^2$
(c) $8x^3 – 27y^3$
(d) $8x^3 + 108xy^2 – 72x^2y$

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

Ans : (a) $(2x – 3y)^3 – 18xy\ (2x – 3y)$
$= 8x^3–27y^3 – 18xy\ (2x – 3y) – 18xy\ (2x–3y)$
$= 8x^3 – 27y^3 – 72x^2y + 108\ xy^2$

423. $(4x^3y – 6x^2y^2 + 4xy^3 – y^4)$ can be expressed as?

(a) $(x + y)^4 – y^4$ (b) $(x – y)^4 – x^4$
(c) $x^4 – (x – y)^4$ (d) $(x + y)^4 – x^4$

SSC CPO-SI – 09/12/2019 (Shift-I)

Ans. (c) From option (c)

$x^4 – (x – y)^4 = (x^2)^2 – ((x–y)^2)^2$
$= [x^2 – (x – y)^2]\ [x^2 + (x – y)^2]$
$= [x^2 – x^2 – y^2 + 2xy]\ [x^2 + x^2 + y^2 – 2xy]$
$= [–y^2 + 2xy]\ [2x^2 + y^2 – 2xy]$
$= –2x^2y^2 – y^4 + 2xy^3 + 4x^3y + 2xy^3 – 4x^2y^2$
$= 4x^3y – 6x^2y^2 + 4xy^3 – y^4$

424. 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) $(x^2 – x + 1)$

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

Ans. (d) :

$$x^2 + x + 1\overline{)\ x^4 + x^2 + 1\ (x^2 - x + 1}$$

$$\underline{-x^4 \pm x^2 \pm x^3}$$

$$1 - x^3$$

$$\underline{\mp x^3 \mp x^2 \mp x}$$

$$x^2 + x + 1$$

$$\underline{-x^2 \pm x \pm 1}$$

$$0$$

Hence, $\frac{x^4 + x^2 + 1}{x^2 + x + 1} = x^2 - x + 1$

425. 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)

SSC CHSL –13/10/2020 (Shift-III)

Ans. (a) : Given expression $3x^2 – 5x – 8$
$= 3x^2 + 3x – 8x – 8$
$= 3x\ (x+1) – 8(x+1)$
$= (x+1)\ (3x–8)$

426. 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 or x = 3

∴ By putting the value x = 3 in both equation

$K \times 3^3 + 4 \times 3^2 + 3\times3 - 4 = 3^3 - 4 \times 3 + K$

or $27K + 36 + 9 - 4 = 27 - 12 + K$

or $27K + 41 = 15 + K$

or $26K = -26$

$K = -1$

427. 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) : ∵ $x^3 - 6x^2 + ax + b$, is divisible by $(x^2 - 3x + 2)$ then $(x^2 - 3x + 2)$ will be the factor of polynomial $x^3 - 6x^2 + ax + b$

$\therefore x^2 - 3x + 2 = 0$

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

or $x(x-2) - 1(x-2) = 0$

$(x-2)(x-1) = 0$

$\therefore x = 2, x = 1$

∴ 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,

$2^3 - 6(2)^2 + a \times 2 + b = 0$

or $8 - 24 + 2a + b = 0$

or $2a + b = 16$ ____(i)

By putting the value of x = 1

$1^3 - 6(1)^2 + a \times 1 + b = 0$

or $1 - 6 + a + b = 0$

or $a + b = 5$ ____(ii)

By solving the equation (i) and (ii)

$2a + b = 16$

$a + b = 5$

$- \quad - \quad -$

$a \quad = 11$

Putting the value a = 11 in equation (ii) b = 5 – 11 = –6

Hence a = 11, b = –6

428. 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)

$2x - 3 = 0 \Rightarrow$ By putting the value $x = \frac{3}{2}$

Remainder = 7

$2 \times \frac{27}{8} + a \times \frac{9}{4} + \frac{3b}{2} - 2 = 7$

$\frac{27}{4} + \frac{9a}{4} + \frac{3b}{2} = 9$

$27 + 9a + 6b = 36$

$9a + 6b = 9$

$3a + 2b = 3$ _____(2)

Again x+2=0 ⇒ 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

429. 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)

430. 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

$a = 4, b = 9, h = 6, g = -1, f = -\frac{3}{2}, c = -20$

$$\therefore \quad \{3(g-f-c)\}/ab = \frac{3\times\left(-1+\frac{3}{2}+20\right)}{4\times 9}$$

$$= \frac{41/2}{12} = \frac{41}{24}$$

(IV) Problems based on Quadratic Equation and Nature of its Roots

431. If $a^2 + b^2 + 49c^2 + 18 = 2(b + 28c - a)$ then find the value of $(2a - b + 7c)$.

(a) –4 (b) 1

(c) 5 (d) –3

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

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

$a^2 + b^2 + 49c^2 + 18 = 2b + 56c - 2a$

$(a^2 + 2a + 1) + (b^2 - 2b + 1) + (7c)^2 - 56c + 16 = 0$

$(a+1)^2 + (b-1)^2 + (7c)^2 - 56c + (4^2) = 0$

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

On comparing -

$a + 1 = 0$

$a = -1$

$(b-1) = 0$

$b = 1$

$7c - 4 = 0$

$c = \frac{4}{7}$

According to the question,

$2a - b + 7c$

$= 2 \times (-1) - 1 + 7 \times \frac{4}{7}$

$= -2 - 1 + 4$

$= 1$

432. If $\frac{8r}{r^2 - 8r + 1} = \frac{1}{14}$ then find the value of $\left(r + \frac{1}{r}\right)$.

(a) 100 (b) 60

(c) 120 (d) 88

SSC CHSL –26/05/2022 (Shift-I)

Ans. (c) : Given that,

$$\frac{8r}{r^2 - 8r + 1} = \frac{1}{14}$$

$$\frac{8}{r - 8 + \frac{1}{r}} = \frac{1}{14}$$

$$r - 8 + \frac{1}{r} = 112$$

$$\therefore \quad \boxed{r + \frac{1}{r} = 120}$$

433. Find the value of x for the 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 MTS 13/09/2023 (Shift I[st])

Ans. (b) : $3x^2 + 5x - 2 = 0$

$3x^2 + 6x - x - 2 = 0$

$3x(x+2) - 1(x+2) = 0$

$(x+2)(3x-1) = 0$

$\therefore x = -2$ and $\frac{1}{3}$

434. 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

$$(\alpha+\beta)^2 = (\alpha-\beta)^2 + 4\alpha\beta$$

$$\left(\frac{B}{A}\right)^2 = 16 + \frac{4C}{A}$$

$$B^2 = 16A^2 + 4AC$$

$$B^2 - 10A^2 = 4AC + 6A^2$$

435. 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) $x^2 - 2520x + 14641 = 0$

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

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)

$\underline{\alpha^2 + \beta^2 - 2\alpha\beta = 20}$

$2(\alpha^2+\beta^2) = 84 \Rightarrow \alpha^2 + \beta^2 = 42$ ..... (iv)

From equation (iii) and (iv)

$42 + 2\alpha\beta = 64$

$\Rightarrow \alpha\beta = 11$ ..... (v)

$\because \alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2$

$= (42)^2 - 2 \times (11)^2$

$= 1764 - 242 = 1522$

And

$\alpha^4.\beta^4 = (\alpha\beta)^4$

$= (11)^4 = 14641$

Hence, quadratic equation

$x^2 - (\alpha^4+\beta^4)\, x + \alpha^4.\beta^4 = 0$

$\Rightarrow \boxed{x^2 - 1522x + 14641 = 0}$

436. 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) $\dfrac{(Q^2-2P)(2R+P)}{PR^2}$

(b) $\dfrac{(Q^2-2PR)(R+P)}{PR^2}$

(c) $\dfrac{(Q^2-2R)(2P+R)}{P^2R^2}$

(d) $\dfrac{(Q^2-2PR)(2R+2P)}{P^2R^2}$

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Ans. (b) : Sum of roots−

$\Rightarrow a + b = Q/P$ ..... (i)

Multiple of roots $(a.b) = R/P$ ..... (ii)

$$\therefore \frac{1}{a^2}+\frac{1}{b^2}+\frac{a}{b}+\frac{b}{a} = \frac{a^2+b^2}{a^2b^2}+\frac{a^2+b^2}{ab}$$

$$= \frac{a^2+b^2}{ab}\left[\frac{1}{ab}+1\right]$$

$$= \left\{\frac{(a+b)^2-2ab}{ab}\right\}\left(\frac{1}{ab}+1\right)$$

$$= \left\{\frac{\left(\frac{Q}{P}\right)^2-2\frac{R}{P}}{\frac{R}{P}}\right\}\left(\frac{P}{R}+1\right)$$

$$= \frac{(Q^2-2PR)}{RP}\left(\frac{P+R}{R}\right)$$

$$\boxed{= \frac{(Q^2-2PR)(R+P)}{PR^2}}$$

437. 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 $Ax^2 - A^2x + AB = 0$

$\because$ A and B are roots of quadratic equation.

Sum of roots $(A+B) = \dfrac{-(-A^2)}{A}$

$\Rightarrow A + B = A \Rightarrow \boxed{B = 0}$

Product of roots $(A.B) = \dfrac{AB}{A}$

$\Rightarrow A \times B = B$

$\Rightarrow \boxed{A = 1}$

Hence the value of A and B are 1 and 0 respectively.

438. 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

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

Ans. (a) : Given−

Quadratic equation

$x^2 - x - 1 = 0$

$\because \alpha$ and β are the roots of quadratic equation

$\Rightarrow \alpha + \beta = 1$..... (i)

$\Rightarrow \alpha.\beta = -1$..... (ii)

$\therefore (\alpha^2+\beta^2) = (\alpha+\beta)^2 - 2\,\alpha.\beta$

$= (1)^2 - 2 \times -1 = 3$

$\alpha^4 + \beta^4 = (\alpha^2+\beta^2)^2 - 2\alpha^2\beta^2$

$= 9 - 2 = 7$

$\therefore \alpha^8+\beta^8 = (\alpha^4+\beta^4)^2 - 2.\ \alpha^4.\beta^4$

$\Rightarrow \alpha^8+\beta^8 = (7)^2 - 2 \times 1$

$\Rightarrow \boxed{\alpha^8 + \beta^8 = 47}$

439. 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) $x^2 - 16x + 4 = 0$

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Ans. (c) : α and β are the roots of $x^2 - 2x + 4 = 0$

$$\therefore \alpha+\beta = -\frac{b}{a} = 2$$

$$\alpha\beta = \frac{c}{a} = 4$$

$\alpha^3+\beta^3 = (2)^3 - 3\times4\times2 = -16$

$\alpha^2+\beta^2 = (2)^2 - 2\times4 = -4$

Sum −

$$\frac{\alpha^3}{\beta^2}+\frac{\beta^3}{\alpha^2} = \frac{\alpha^5+\beta^5}{(\alpha\beta)^2}$$

Product $= \alpha\beta = 4$

$$(\alpha^3+\beta^3)(\alpha^2+\beta^2) = \alpha^5+\beta^5+\alpha^2\beta^2(\alpha+\beta)$$

$$-16\times(-4) = \alpha^5+\beta^5+16\times2$$

$$\alpha^5+\beta^5 = 32$$

Hence, equation,

$$x^2 - \left(\frac{\alpha^5+\beta^5}{(\alpha\beta)^2}\right)x + \alpha\beta = 0$$

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

440. 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) $10B^2 = 49CA$

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Ans. (d) : The roots of $Ax^2 + Bx + C = 0$ are $\alpha, \frac{5}{2}\alpha$.

$\alpha + \beta = -\frac{b}{a}$

$\therefore \alpha + \frac{5}{2}\alpha = \frac{-B}{A}$

$\frac{7}{2}\alpha = \frac{-B}{A}$

$\alpha = \frac{-2B}{7A}$

$\therefore \alpha.\beta = \frac{C}{A}$

$\alpha.\frac{5}{2}\alpha = \frac{C}{A}$

$\frac{5}{2}\alpha^2 = \frac{C}{A}$

$\left(\frac{-2B}{7A}\right)\times\left(\frac{-2B}{7A}\right)\times\frac{5}{2} = \frac{C}{A}$

$10B^2 = 49CA$

441. 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 $x^2 - x + 1 = 0$

$\alpha + \beta = -\frac{b}{a} = -\left(-\frac{1}{1}\right) = +1$, $\alpha.\beta = \frac{c}{a} = \frac{1}{1} = 1$

if α^3 and β^3 are the roots of a equation then

$\alpha^3 + \beta^3 = (\alpha + \beta)^3 - 3\alpha\beta(\alpha + \beta)$

$= 1^3 - 3 \times 1(1)$

$= -2$

$\alpha^3.\beta^3 = (\alpha\beta)^3 = 1^3$

$= 1$

Required equation $\Rightarrow x^2 -$ (sum of roots) x + product of roots $= 0$

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

442. 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) $a^2x^2 + 2acx + c^2 - b^2 = 0$

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Ans. (b) :

$ax^2 + bx + c = 0$

$a + b = \frac{-b}{a}$ and $a.b = \frac{c}{a}$

if the roots are $(ab + a + b)$ and $(ab - a - b)$

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 $\Rightarrow$

$x^2 -$ (sum of roots) x + product of roots $= 0$

$x^2 - \frac{2c}{a}x + \left(\frac{c^2 - b^2}{a^2}\right) = 0$

$a^2x^2 - 2acx + c^2 - b^2 = 0$

443. 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.

$\because D = B^2 - 4AC = 0$

$[b(c-a)]^2 - 4a(b-c) \times c(a-b) = 0$

$b^2(c-a)^2 - 4ac(b-c)(a-b) = 0$

$b^2(c^2+a^2-2ca) - 4ac[ab-b^2-ac+bc] = 0$

$b^2c^2 + a^2b^2 - 2b^2ac - 4a^2bc + 4b^2ac + 4a^2c^2 - 4abc^2 = 0$

$(bc)^2 + (ab)^2 + (-2ac)^2 + 2b^2ac - 4a^2bc - 4abc^2 = 0$

$(bc + ab - 2ac)^2 = 0$

$bc + ab = 2ac$

$\frac{2}{b} = \frac{1}{a} + \frac{1}{c}$

444. 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.

$\alpha + \beta = \frac{b}{a}, \quad \alpha.\beta = \frac{c}{a}$

$\therefore \frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\left(\frac{\frac{b}{a}}{\frac{c}{a}}\right)=\frac{b}{c}$

445. 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) : $3x^2 + 5x - 2 = 0$

$3x^2 + 6x - x - 2 = 0$

$3x(x+2) - 1(x+2) = 0$

$(x+2)(3x-1) = 0$

$\therefore x = -2$ and $\frac{1}{3}$

(V) Miscellaneous

446. Solve the following expression

$$\frac{1}{8}\left[\frac{1}{b-1}-\frac{1}{b+1}-\frac{2}{b^2+1}-\frac{4}{b^4+1}\right]$$

(a) $\frac{1}{b^8-1}$ (b) $\frac{1}{b^8+1}$

(c) $\frac{8}{b^8+1}$ (d) $\frac{8}{b^8-1}$

SSC CHSL (Tier-I) 14/08/2023 (Shift-IV)

Ans. (a) : Given that : $\frac{1}{8}\left[\frac{1}{b-1}-\frac{1}{b+1}-\frac{2}{b^2+1}-\frac{4}{b^4+1}\right]$

$$\Rightarrow \frac{1}{8}\left[\left\{\frac{(b+1)-(b-1)}{(b^2-1)}\right\}-\frac{2}{(b^2+1)}-\frac{4}{(b^4+1)}\right]$$

$$\Rightarrow \frac{1}{8}\left[\frac{b+1-b+1}{(b^2-1)}-\frac{2}{(b^2+1)}-\frac{4}{(b^4+1)}\right]$$

$$\Rightarrow \frac{1}{8}\left[\left\{\frac{2}{(b^2-1)}-\frac{2}{(b^2+1)}\right\}-\frac{4}{(b^4+1)}\right]$$

$$\Rightarrow \frac{1}{8}\left[\frac{4}{(b^4-1)}-\frac{4}{(b^4+1)}\right]$$

$$\Rightarrow \frac{1}{8}\times\frac{8}{(b^8-1)}=\frac{1}{(b^8-1)}$$

447. If (p + q + r) = 0, what will be the simplified value of the following expression

$$\left(\frac{p^2}{p^2-qr}+\frac{q^2}{q^2-pr}+\frac{r^2}{r^2-pq}\right)?$$

(a) 0 (b) 2

(c) –1 (d) 1

SSC CHSL (Tier-I) 03/08/2023 (Shift-II)

Ans. (b) : Given that: $p + q + r = 0$

suppose $p = 0, q = 1, r = -1$

According to the question,

$$\left(\frac{p^2}{p^2-qr}+\frac{q^2}{q^2-pr}+\frac{r^2}{r^2-pq}\right)$$

$$=\left(0+\frac{1}{(1)^2-0}+\frac{(-1)^2}{(-1)^2-0}\right)$$

$= 1 + 1 = 2$

448. Find the value of expression $\frac{1^2 - m^2}{(1+m)^2}$ if (1 + m) $\neq$ 0 :

(a) $\frac{1-m}{1+m}$ (b) 0

(c) $\frac{1+m}{1-m}$ (d) 1

SSC CGL (Tier-I) 20/07/2023 (Shift-I)

Ans. (a) : $\frac{1^2-m^2}{(1+m)^2}$

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

$$=\frac{(1+m)(1-m)}{(1+m)^2}$$

$$=\frac{1-m}{1+m}$$

449. 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)

$\because$ Area of rectangle = $l \times b$

As per question,

$(a^2 - b^2) = (a + b) \times$ breadth

$$\text{breadth} = \frac{(a+b)(a-b)}{(a+b)} = (a-b)$$

450. 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) 5/3 (d) 5/4

SSC Selection Post Graduate Level 08/02/2022 (Shift-III)

Ans. (d) $x^2 + y^2 - xy = 7$ ...(i)

$\because (x^2 + xy = y^2)(x^2 - xy + y^2) = (x^4 + x^2y^2 + y^4)$

$(x^2 + xy + y^2)(7) = 21$

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

$$\begin{array}{r} x^2 + xy + y^2 = 3 \\ x^2 - xy + y^2 = 7 \\ \hline 2xy = -4 \\ xy = -2 \end{array}$$

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

451. 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,

$$\left(a + 1 + \frac{1}{a+1}\right)^3 = 4^3$$

$$(a+1)^3 + \frac{1}{(a+1)^3} + 3 \times (a+1) \times \frac{1}{(a+1)}\left(a + 1 + \frac{1}{a+1}\right) = 64$$

$$(a+1)^3 + \frac{1}{(a+1)^3} + 3 \times 4 = 64$$

$$(a+1)^3 + \frac{1}{(a+1)^3} = 52$$

452. 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–

$$x^2 + \frac{1}{4x^2} - 1 = \frac{21}{4} - 1$$

$$\left(x - \frac{1}{2x}\right)^2 = \frac{17}{4}$$

$$\Rightarrow x - \frac{1}{2x} = \frac{\sqrt{17}}{2}$$

453. 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) : $a + b - c = 0$

$a + b = c$ .....(i)

Let, $a = b = 1, c = 2$

Which satisfy equation (i)

$$\therefore \quad \frac{(b-c)^2}{4bc} + \frac{(c-a)^2}{4ca} - \frac{(a+b)^2}{4ab}$$

$$= \frac{1}{4 \times 2} + \frac{1}{4 \times 2} - \frac{4}{4 \times 1}$$

$$= \frac{2}{8} - 1 = -\frac{3}{4}$$

454. 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,

$$\frac{x^2}{y^2} + 1 + \frac{2x}{y} = 16$$

$$\frac{x^2}{y^2}+1+2\times3=16 \qquad \left(\because \frac{x}{y}+1=4 \;\Rightarrow\; \therefore \frac{x}{y}=4-1=3\right)$$

$$\left(\frac{x^2+y^2}{y^2}\right)=10$$

455. 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, $\sqrt{4a+8b-c}$

$\sqrt{4\times8+8\times5-(-9)}$

$\sqrt{32+40+9}$

$\sqrt{81}$

$= 9$

456. 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–

$$a=\frac{\sqrt{5}+2}{\sqrt{5}-2} \qquad b=\frac{\sqrt{5}-2}{\sqrt{5}+2}$$

$$\Rightarrow b=\frac{\sqrt{5}-2}{\sqrt{5}+2}\times\frac{\sqrt{5}-2}{\sqrt{5}-2}$$

$$\Rightarrow a=\frac{\sqrt{5}+2}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2} \qquad \Rightarrow b=\frac{5+4-4\sqrt{5}}{1}=9-4\sqrt{5}$$

$$\Rightarrow a=\frac{5+4+4\sqrt{5}}{1}=9+4\sqrt{5}$$

$$\therefore a^2=81+80+72\sqrt{5}=161+72\sqrt{5}$$

$$\therefore b^2=81+80-72\sqrt{5}$$

$b^2=161-72\sqrt{5}$

According to the question,

$$2a^2+2b^2-5ab=2\left(161+72\sqrt{5}\right)+2\left(161-72\sqrt{5}\right)-5\times1$$

$$=322+2\times72\sqrt{5}+322-2\times72\sqrt{5}-5$$

$= 644 - 5$

$= 639$

457. 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

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Ans. (d) : $\sqrt{a^2+b^2+ab}+\sqrt{a^2+b^2-ab}=1$

On squaring both sides,

$$a^2+b^2+ab+a^2+b^2-ab+2\sqrt{(a^2+b^2)^2-a^2b^2}=1$$

$$2(a^2+b^2)+2\sqrt{a^4+b^4+a^2b^2}=1$$

$$\sqrt{a^4+b^4+a^2b^2}=\frac{1}{2}-(a^2+b^2)$$

$$a^4+b^4+a^2b^2=\frac{1}{4}+(a^2+b^2)^2-(a^2+b^2)$$

$$a^4+b^4+a^2b^2=\frac{1}{4}+(a^4+b^4+2a^2b^2)-a^2-b^2$$

$$a^2+b^2-a^2b^2=\frac{1}{4}$$

$$\therefore (1-a^2)(1-b^2)=1-a^2-b^2+a^2b^2$$

$$=1-\frac{1}{4}=\frac{3}{4}$$

458. 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)

$= (2-1)(2-3)(3-1)$

$= 1 \times (-1) \times 2 = -2$

459. 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)

$y^2 + y^3 = y + 7 + y^2 + 7y$

$y^3 = 8y + 7$

460. 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

$x = y = z = 2$

On putting the value in equation−

$= xyz - (x^2 + y^2 + z^2)$

$= 2 \times 2 \times 2 - (4 + 4 + 4) = -4$

461. 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),

$a^4 - a = a - 1$

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

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

462. 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, $x^2 = yz$

$k^{\frac{1}{a}} = k^{\frac{1}{2b}} . k^{\frac{1}{2c}}$

$k^{\frac{1}{a}} = k^{\left(\frac{1}{2b}+\frac{1}{2c}\right)}$

$\frac{1}{a} = \frac{1}{2b} + \frac{1}{2c}$, $\frac{1}{a} = \frac{c+b}{2bc}$

$ab + ac = 2bc$

Hence, $\frac{ab+bc+ca}{bc} = \frac{3bc}{bc} = 3$

Trick:

$x^2 = yz$

$x = y = z = 2$

$\therefore$ $a = b = c = 2$

$= \frac{ab+bc+ca}{bc}$

$= \frac{4+4+4}{4} = \frac{12}{4} = 3$

463. 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, $y = \frac{c+a}{b}, z = \frac{a+b}{c}$

$\therefore \frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right]$

$= \frac{1}{9}\left[\frac{1}{\frac{b+c}{a}+1} + \frac{1}{\frac{c+a}{b}+1} + \frac{1}{\frac{a+b}{c}+1}\right]$

$= \frac{1}{9}\left[\frac{a}{a+b+c} + \frac{b}{c+a+b} + \frac{c}{a+b+c}\right]$

$= \frac{1}{9}\left[\frac{a+b+c}{a+b+c}\right]$, $\frac{1}{9} \times 1 = \frac{1}{9}$

464. 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, $a = 12k, b = 4k, c = 3k$

$\because$ 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 $12\left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c}\right)$

$= 12\left(\frac{1}{12} + \frac{1}{8} + \frac{1}{15}\right) = 12\left[\frac{10+15+8}{120}\right]$

$= 12 \times \frac{33}{120} = \frac{33}{10}$

465. 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, $\sqrt{(b+c)^a + (c+a)^b - 1} = \sqrt{5^1 + 5^1 - 1} = \sqrt{9} = 3$

466. 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)

$x + y + z = 22$

$\therefore x = 7, y = 6, z = 9$

$\therefore \frac{xy + xz}{xyz} = \frac{y + z}{yz} = \frac{6 + 9}{54} = \frac{5}{18}$

467. 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

$\therefore \frac{\sqrt{a^2 + b^2 + c^2}}{2c} = \frac{\sqrt{64 + 16 + 1}}{2} = \frac{9}{2}$

468. If $3\sqrt{\frac{1-a}{a}} + 9 = 19 - 3\sqrt{\frac{a}{1-a}}$ then what is the value of a ?

(a) 3/10, 7/10 (b) 1/10, 9/10

(c) 2/5, 3/5 (d) 1/5, 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

$\frac{1-a}{a} + \frac{a}{1-a} + 2 = \frac{100}{9}$

$\frac{1 + a^2 - 2a + a^2 + 2a - 2a^2}{a(1-a)} = \frac{100}{9}$

$100a - 100a^2 = 9$

$100a^2 - 100a + 9 = 0$

$a = \frac{90}{100}, \frac{10}{100}$

$a = \frac{9}{10}, \frac{1}{10}$

469. If a + b = 10 and $\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$, then what is the value of $3ab + 4a^2 + 5b^2$?s

(a) 450 (b) 300

(c) 600 (d) 750

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Ans. (b) : $a+b = 10$ ..... (i)

$\sqrt{\frac{a}{b}} - 13 = -\sqrt{\frac{b}{a}} - 11$

$\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = 2$

On squaring both sides,

$\frac{a}{b} + \frac{b}{a} + 2 = 4$

$a^2 + b^2 = 2ab$

$(a-b)^2 = 0$

$a = b$

$\therefore a = b = 5$

$3ab + 4a^2 + 5b^2$

$= 3 \times 5 \times 5 + 4 \times 25 + 5 \times 25$

$= 75 + 100 + 125 = 300$

470. 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) :

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

$x + y = 2z$

$y = 2z - x$

$$\left[\frac{y}{(y-z)} + \frac{x}{x-z}\right]$$

On putting the value of y.

$$= \left[\frac{2z-x}{(2z-x-z)} + \frac{x}{x-z}\right]$$

$$= \left[\frac{2z-x}{z-x} + \frac{x}{x-z}\right]$$

$$= \left[\frac{2z-x}{z-x} - \frac{x}{z-x}\right]$$

$$= 2\left[\frac{z-x}{z-x}\right] = 2$$

471. $p^3+q^3+r^3 -3pqr = 4$. 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) : $a + b + c = q + r + r + p + p + q = 2(p+q+r)$

$a^3 + b^3 + c^3 - 3abc$

$$= \frac{1}{2}(a+b+c)\left[(a-b)^2 + (b-c)^2 + (c-a)^2\right]$$

$$= (p+q+r)\left[(q-p)^2 + (r-q)^2 + (p-r)^2\right]$$

$$= (p+q+r)\left[(p-q)^2 + (q-r)^2 + (r-p)^2\right]$$

$$= 2\left[p^3 + q^3 + r^3 - 3pqr\right]$$

$= 2 \times 4 = 8$

Method II -

By value putting, Equations = 4, Variables = 2

if $q = r = 0$

$p^3 = 4$, $a = 0$, $b = p$, $c = p$

Hence $a^3 + b^3 + c^3 - 3abc$

$= 0 + p^3 + p^3 - 0$

$= 2p^3 = 2 \times 4 = 8$

472. 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

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Ans. (a) : $a - \frac{1}{a} = b$

$$a - b = \frac{1}{a} \text{ ----------(i)}$$

Thus, $b - c = \frac{1}{b}$ ----------(ii)

$$c - a = \frac{1}{c} \text{ ----------(iii)}$$

From equation (i) × (ii) + equation (ii) × (iii) + equation (iii) × (i),

$$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = (a-b)(b-c) + (b-c)(c-a) + (c-a)(a-b)$$

$= ab - ac - b^2 + bc + bc - ab - c^2 + ca + ca - cb - a^2 + ab$

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

$$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} = (a^2 - 1 + b^2 - 1 + c^2 - 1) - (a^2 + b^2 + c^2) = -3$$

473. 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) $(a+3b^2)/(b-3a^2)$

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Ans. (a): Given–

$$\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 3, \left(\frac{x}{b}\right) - \left(\frac{y}{a}\right) = 9$$

$xb + ya = 3ab$ ..... (i)

$xa - yb = 9ab$ ..... (ii)

Putting $3ab$ in equation (ii)

$xa - yb = 3(xb+ya)$

$3xb + 3ya = xa - yb$

$3xb - xa = -yb - 3ya$

$x(3b-a) = -y(b+3a)$

$$\frac{x}{y} = \left(\frac{b+3a}{a-3b}\right)$$

474. 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

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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

$a-\frac{1}{a}=4$, $a-\frac{1}{a}=-2$

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

$a=\frac{4\pm\sqrt{36+4}}{2}$ $(a+1)^2-2=0,\ a+1=\pm\sqrt{2}$

$a=2\pm\sqrt{5}$ (None of these)

475. 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

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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

$$x^4+\frac{1}{x^4}=196-2$$

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

$$x^4-194=\frac{-1}{x^4} \quad \text{.....(i)}$$

$$x^9+x^7-194x^5-194x^3$$

$\Rightarrow$ $x^5(x^4-194)+x^3(x^4-194)$

$$x^5\times\left(\frac{-1}{x^4}\right)+x^3\times\left(\frac{-1}{x^4}\right)=-\left(x+\frac{1}{x}\right)$$

$= -4$

476. 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

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Ans. (a) :

$\because 3^x > 9^y$

$3^x > 3^{2y}$

$\therefore x > 2y$

$x > y$

Again

$\because 2^y > 4^z$

$2^y > 2^{2z}$

$\because y > 2z$

$y > z$

Hence, from the above we can say that,

$\therefore x > y > z$

477. If x = (1/8), which of the following has the largest values ?

(a) x/2 (b) x^2

(c) $\sqrt{x}$ (d) 1/x

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Ans. (d) :

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

On squaring both sides in equation (i)

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

Taking both sides square root in eq^n (i)

$$\sqrt{x}=\frac{1}{2\sqrt{2}}$$

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

Hence $\frac{1}{x}$ is the greatest

478. 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) :

$B = 1 + 2^{-P}$

$$=1+\frac{1}{2^P}=\frac{2^P+1}{2^P}=\frac{A}{A-1}$$

479. 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

$1 - 2 + 1 = 0$

$0 = 0$

$$\therefore \quad \frac{3y^2+x^2+z^2}{2y^2-xz}=\frac{3\times(-2)^2+1^2+1^2}{2\times(-2)^2-1\times1}=\frac{14}{7}=2$$

480. 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

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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
$b = 4$
$a = 2$
$\therefore \quad \frac{a+c}{b} = \frac{2+5}{4} = \frac{7}{4}$

481. 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) : $x_1x_2x_3 = 4(4 + x_1 + x_2 + x_3)$
On putting, $x_1 = x_2 = x_3 = 4$
$4 \times 4 \times 4 = 4(4 + 4 + 4 + 4)$
$64 = 64$

$$\therefore \quad \frac{1}{2+x_1} + \frac{1}{2+x_2} + \frac{1}{2+x_3} = \frac{1}{2+4} + \frac{1}{2+4} + \frac{1}{2+4}$$
$$= \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{3}{6}$$
$$= \frac{1}{2}$$

482. 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) $x^2 - xy + y^2 = \frac{x^4 + x^2y^2 + y^4}{x^2 + xy + y^2}$

$$= \frac{21}{256} \times \frac{16}{3} = \frac{7}{16} \quad ...(i)$$

$$x^2 + xy + y^2 = \frac{3}{16} \quad ...(ii)$$

By adding $2(x^2 + y^2) = \frac{10}{16} = \frac{5}{8}$

483. 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) : $x = 2 + \sqrt{3}$
$x - 2 = \sqrt{3}$
$(x-2)^2 = (\sqrt{3})^2$ [On squaring both sides]
$x^2 - 4x + 4 = 3$
$x^2 - 4x = -1$
On squaring both sides
$(x^2 - 4x)^2 = (-1)^2$
$x^4 - 8x^3 + 16x^2 = 1$

484. 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, $(1 + a)(1 + b)(1 + c)(1 + d)$

$$= \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{81}{16}$$

485. 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) : $\because \quad A = \frac{x-1}{x+1}$

$$\therefore \quad \frac{1}{A} = \frac{x+1}{x-1}$$

$$A - \frac{1}{A} = \frac{x-1}{x+1} - \frac{x+1}{x-1} = \frac{(x-1)^2 - (x+1)^2}{x^2-1}$$

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

Hence $A - \frac{1}{A} = \frac{-4x}{x^2-1}$

486. 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 $x^{18} + x^{12} + x^6 + 1$

$= x^{12}(x^6+1) + (x^6+1) = 0 + 0 = 0$

487. 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)

Given, $x = \frac{\sqrt{3}}{2}$

$$\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}$$

$$\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}} \times \frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}$$

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

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

$$= \frac{1+\sqrt{1-\frac{3}{4}}}{\frac{\sqrt{3}}{2}} = \frac{1+\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

488. 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

$(x-2)^3 = (\sqrt[3]{5})^3$

$x^3 - 8 - 6x(x-2) = 5$

$x^3 - 8 - 6x^2 + 12x - 4 = 1$

$\therefore \quad x^3 - 6x^2 + 12x - 12 = 1$

489. 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 the given expression

$$\frac{3x+2y}{3x-y} = \frac{3\times3+2\times5}{3\times3-5} = \frac{19}{4}$$

490. 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, $x^2 = p$, $y^2 = k^2$

$\Rightarrow x = \sqrt{p} \qquad \Rightarrow y = k$

$\therefore \left(\sqrt{p}\right)^2 \pm 2\times\sqrt{p}\times k + k^2$

On taking, $\pm 2\sqrt{p}k = \frac{1}{9}\sqrt{p}$

$$\boxed{k = \pm\frac{1}{18}}$$

491. 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) $\left[\left(a^{-2}b^3\right) \div \left(a^1b^{-1}\right)\right] \times \left[\left(a^2b^{-4}\right) \div \left(a^{-1}b^2\right)\right]$

$$= \left[\left(\frac{b^3}{a^2}\right) \div \left(\frac{a}{b}\right)\right] \times \left[\left(\frac{a^2}{b^4}\right) \div \left(\frac{b^2}{a}\right)\right]$$

$$= \left[\frac{b^3 \times b}{a^2 \times a}\right] \times \left[\frac{a^2 \times a}{b^4 \times b^2}\right]$$

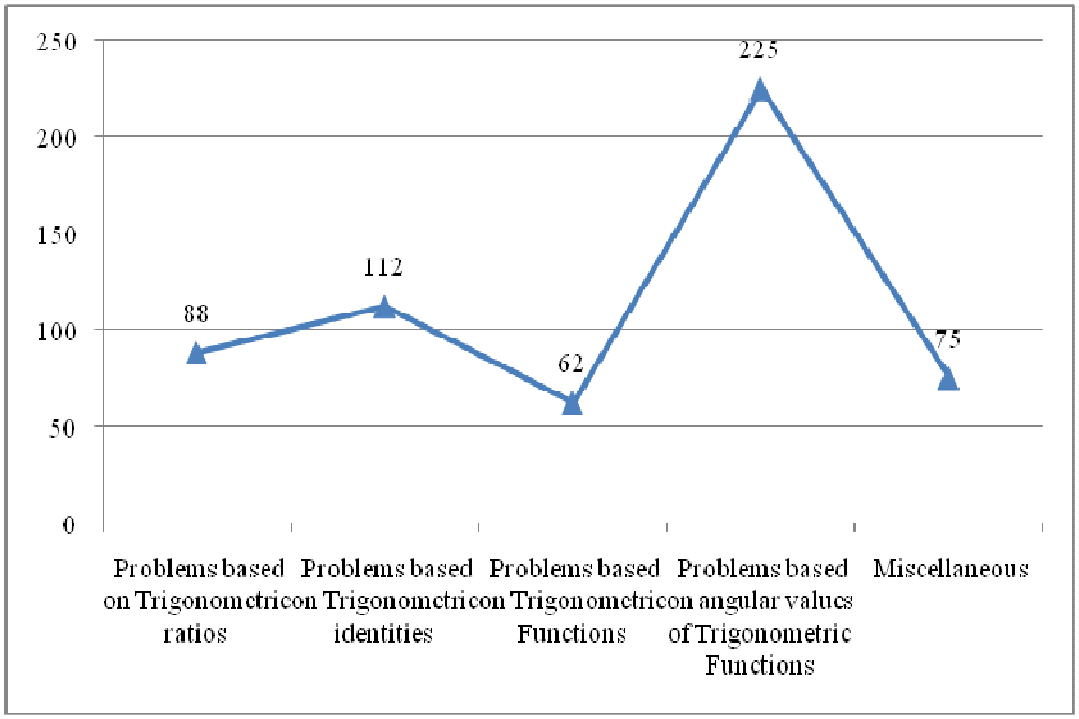
$$= \frac{b^4}{a^3} \times \frac{a^3}{b^6}$$

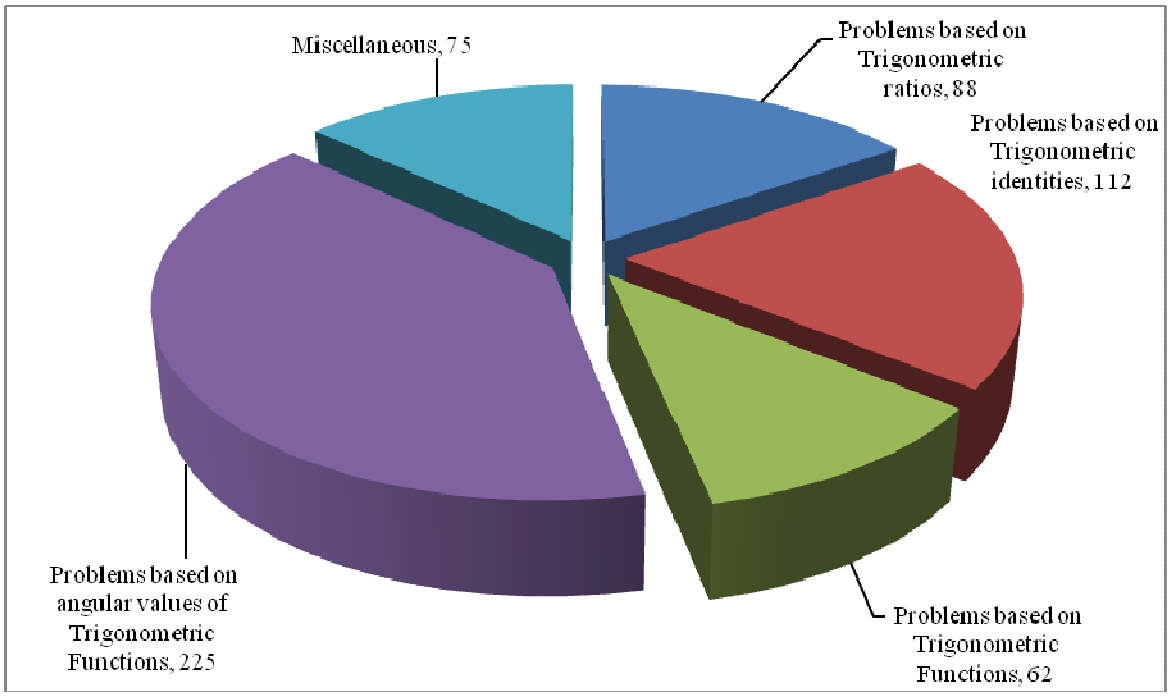
$$= \frac{1}{b^2}$$

02. Trigonometry

Based On TCS Pattern			
Typewise	**Exam**	**Question No.**	**Years**
Type-I **Problems based on Trigonometric ratios**	**CGL (Tier-1)**	**24**	**(2017–2023)**
	CGL (Tier-2)	**2**	
	CHSL (Tier-1)	**20**	
	CHSL (Tier-2)	**–**	
	Selection Post VII, VIII, XI	**2**	
	SSC MTS	**10**	
	SSC GD	**10**	
	SSC CPO	**12**	
Type-II **Problems based on Trigonometric identities**	**CGL (Tier-1)**	**26**	**(2017–2023)**
	CGL (Tier-2)	**3**	
	CHSL (Tier-1)	**30**	
	CHSL (Tier-2)	**1**	
	Selection Post VII, VIII, XI	**2**	
	SSC MTS	**28**	
	SSC GD	**23**	
	SSC CPO	**3**	
Type-III **Problems based on Trigonometric Functions**	**CGL (Tier-1)**	**22**	**(2017–2023)**
	CGL (Tier-2)	**2**	
	CHSL (Tier-1)	**18**	
	CHSL (Tier-2)	**–**	
	Selection Post VII, VIII, XI	**2**	
	SSC MTS	**10**	
	SSC GD	**9**	
	SSC CPO	**2**	
Type-IV **Problems based on angular values of Trigonometric Functions**	**CGL (Tier-1)**	**65**	**(2017–2023)**
	CGL (Tier-2)	**10**	
	CHSL (Tier-1)	**40**	
	CHSL (Tier-2)	**5**	
	Selection Post VII, VIII, XI	**–**	
	SSC MTS	**55**	
	SSC GD	**40**	
	SSC CPO	**10**	
Type-V **Miscellaneous**	**CGL (Tier-1)**	**21**	**(2017–2023)**
	CGL (Tier-2)	**2**	
	CHSL (Tier-1)	**21**	
	CHSL (Tier-2)	**–**	
	Selection Post VII, VIII, XI	**2**	
	SSC MTS	**9**	
	SSC GD	**15**	
	SSC CPO	**2**	

Trend Analysis of Questions topicwise from CGL (Pre & Mains) CHSL (Pre & Mains) Selection Post VII, VIII, XI, SSC MTS, SSC GD & Other Exams (2017-2023)





02. Trigonometry

(I) Problems based on Trigonometric Ratios

1. If $\tan3\theta.\tan7\theta = 1$, where 7θ is an acute angle, then find the value of $\cot15\theta$.

(a) $-\sqrt{3}$ (b) 1

(c) -1 (d) $\sqrt{3}$

SSC MTS 03/05/2023 (Shift II[nd])

Ans. (c) : $\tan3\theta.\tan7\theta = 1$ (where 7θ is an acute angle)

$\tan7\theta = \cot3\theta$

$\tan7\theta = \tan(90° - 3\theta)$

$7\theta = 90° - 3\theta$

then $(3\theta + 7\theta) = 90°$

$10\theta = 90°$

$\theta = 9°$

then $\cot 15\theta$

$\cot (15\times9)°$

$= \cot 135°$

$= \cot (90\times1+45°) = -\tan 45°$

$= -1$

2. If $\sin\theta = \frac{8}{17}$ then find the value of $\tan\theta$.

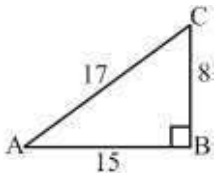
(a) $\frac{17}{15}$ (b) $\frac{8}{15}$

(c) $\frac{15}{17}$ (d) $\frac{15}{8}$

SSC CGL 05/12/2022 (Shift-I)

Ans. (b) : $\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$\sin\theta = \frac{8}{17}$



$AB = \sqrt{17^2 - 8^2}$

$= \sqrt{289 - 64}$

$= \sqrt{225} = 15$

$\tan\theta = \frac{P}{B}$

Hence $\tan\theta = \frac{BC}{AB} = \frac{8}{15}$

3. If $\cos A = \frac{9}{41}$, then find the value of $\cot A$.

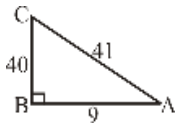
(a) $\frac{41}{40}$ (b) $\frac{9}{40}$

(c) $\frac{40}{9}$ (d) $\frac{9}{41}$

SSC CGL 01/12/2022 (Shift-IV)

Ans. (b) : Given that

$\cos A = \frac{9}{41}$ $\left(\because \cos A = \frac{\text{Base}}{\text{Hypotenuse}}\right)$



$BC = \sqrt{41^2 - 9^2}$

$= \sqrt{1681 - 81} = 40$

$\cot A = \frac{\text{Base}}{\text{Perpendicular}} = \frac{9}{40}$

4. If $\cot A = \frac{15}{8}$ then get the value of $\tan2A$ will be?

(a) 240/173 (b) 240/161

(c) 220/171 (d) 200/161

SSC CGL 06/12/2022 (Shift-II)

Ans. (b) : According to question,

$\cot A = \frac{15}{8}$

then $\tan A = \frac{8}{15}$ $\cot A = \frac{1}{\tan A}$

$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$

$= \frac{2\times\frac{8}{15}}{1 - \frac{64}{225}}$

$= \frac{16\times225}{15\times161} = \frac{240}{161}$

5. If $8\cot\theta = 6$ then find the value of $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}$.

(a) 7 (b) 2

(c) 5 (d) 12

SSC MTS 01/09/2023 (Shift I[st])