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QUANTITATIVE APTITUDE

Mock 01: 17th February 2018

Previous Years' E-Mock Paper

Mock 01 : 17th February 2018

1. What is the unit digit of the sum of first 111 whole numbers?
(a) 4 (b) 6
(c) 5 (d) 0

2. How many 100 digit positive number are there?
(a) 9×10^{99} (b) 9×10^{100}
(c) 10100 (d) 11×10^{98}

3. What is the value of $\frac{5.6\times0.36+0.42\times3.2}{0.8\times2.1}$?
(a)2 (b) 1
(c) 3 (d) 3 /2

4. What is the value of $\frac{(1.2)^3+(0.8)^3+(0.7)^3-2.016}{(1.35)[(1.2)^2+(0.8)^2+(0.7)^2-0.96-0.84-0.56]}$?
(a) ¼ (b) ½
(c) 1 (d) 2

5. What is the unit digit of $(217)^{413}\times (819)^{547} \times (414)^{624} \times (342)^{812}$?
(a) 2 (b) 4
(c) 6 (d) 8

6. What is the value of $S = \frac{1}{1\times3\times5}+\frac{1}{1+4}+\frac{1}{3\times5\times7}+\frac{1}{4\times7}+\frac{1}{5\times7\times9}+\frac{1}{7\times10}+\cdots$upto20 terms, then what is the value of S?
(a) 6179/15275 (b) 6070/14973
(c) 7191/15174 (d) 5183/16423

7. Which of the following is TRUE?
I. $\frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt{5}}$ II. $\frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt{5}}$
III. $\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$ IV. $\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}}$
(a) Only I (b) Only II
(c) Only III (d) Only IV

8. N is the largest two digit number, which when divided by 3, 4 and 6 leaves the remainder 1, 2 and 4 respectively. What is the remainder when N is divided by 5?
(a) 4 (b) 2
(c) 0 (d) 1

9. Which of the following is TRUE?
I. $\sqrt[3]{11} > \sqrt{7} > \sqrt[4]{45}$ II. $\sqrt{7} > \sqrt[3]{11} > \sqrt[4]{45}$
III. $\sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$ IV . $\sqrt[4]{45} > \sqrt{7} > \sqrt[3]{11}$
(a) Only I (b) Onl y II
(c) Only III (d) Only IV

10. A and B are positive integers. If A + B + AB = 65, then what is the difference between A and B (A, B ≤ 15)?
(a) 3 (b) 4
(c) 5 (d) 6

11. What is the value of $14^3+ 16^3+ 18^3+ \ldots + 30^3$?
(a) 134576 (b) 120212
(c) 115624 (d) 111672

12. What is the value of
$\sqrt{4600+\sqrt{540+\sqrt{1280+\sqrt{250+\sqrt{36}}}}}$?
(a) 69 (b) 68
(c) 70 (d) 72

13. 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

14. If $P = 7 + 4\sqrt{3}$ and PQ = 1, then what is the value of $1/P^2+ 1/Q^2$?
(a) 196 (b) 194
(c) 206 (d) 182

15. 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

16. 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

17. 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

18. 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

19. 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

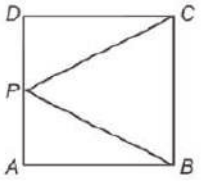
20. If α and β are the roots of equation $x^2 - x + 1 = 0$, then which equation will have roots α^3 and β^3?
(a) $x^2 + 2x + 1 = 0$ (b) $x^2 - 2x - 1 = 0$
(c) $x^2 + 3x - 1 = 0$ (d) $x^2 - 3x + 1 = 0$

21. 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

22. Cost of 4 pens, 6 note books and 9 files is Rs 305. Cost of 3 pens, 4 notebooks and 2 files is Rs 145. What is the cost (inRs) of 5 pens, 8 notebooks and 16 files?
(a) 415 (b) 465
(c) 440 (d) Cannot be determined

23. ABC is a right angled triangle. ∠BAC = 90° and ∠ACB = 60°. What is the ratio of the circum radius of the triangle to the side AB?
(a) 1 : 2 (b) 1 : $\sqrt{3}$
(c) 2 :$\sqrt{3}$ (d) 2 : 3

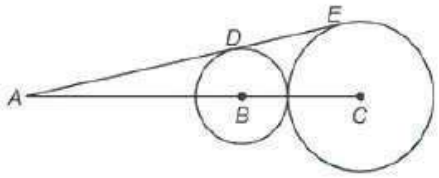
24. In the given figure, ABCD is a square whose side is 4 cm. P is a point on the side AD. What is the minimum value (in cm) of BP + CP?



(a) $4\sqrt{5}$ (b) $4\sqrt{4}$
(c) $6\sqrt{3}$ (d) $4\sqrt{6}$

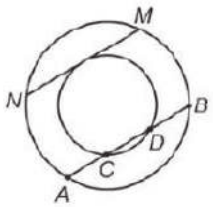
25. Triangle ABC is similar to triangle PQR and AB : PQ = 2 : 3. AD is the median to the side BC in triangle ABC and PS is the median to the side QR intriangle PQR. What is the value of $(BD/QS)^2$?
(a) 3/5 (b) 4/9
(c) 2/3 (d) 4/7

26. In the given figure, B and C are the centres of the two circles. ADE is the common tangent to the two circles. If the ratio of the radius of both the circles is 3 : 5 and AC = 40, then what is the value of DE?



(a) $3\sqrt{15}$ (b) $5\sqrt{15}$
(c) $6\sqrt{15}$ (d) $4\sqrt{15}$

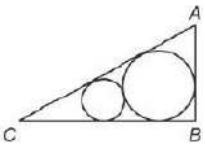
27. In the given figure, AB = 30 cm and CD = 24 cm. What is the value (in cm) of MN?



(a) 18 (b) 9
(c) 12 (d) 15

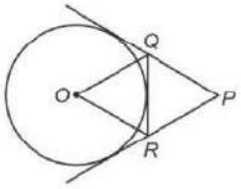
28. AB and AC are the two tangents to a circle whose radius is 6 cm. If ∠BAC = 60°, then what is the value (in cm) of $\sqrt{(AB)^2 + (AC)^2}$?
(a) $6\sqrt{6}$ (b) $4\sqrt{6}$
(c) $9\sqrt{3}$ (d) $8\sqrt{3}$

29. In the given figure, ABC is a right angled triangle. $\angle ABC = 90°$ and $\angle ACB = 60°$. If the radius of the smaller circle is 2 cm, then what is the radius (in cm) of the larger circle?



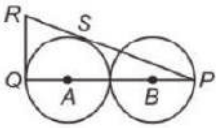
(a) 4 (b) 6
(c) 4.5 (d) 7.5

30. In the given figure, O is centre of the circle. Circle has 3 tangents. If $\angle QPR = 45°$, then what is the value (in degrees) of $\angle QOR$?



(a) 67.5 (b) 72
(c) 78.5 (d) 65

31. In the given, two identical circles of radius 4 cm touch each other. A and B are the centres of the two circles. If RQ is a tangent to the circle, then what is the length (in cm) of RQ?

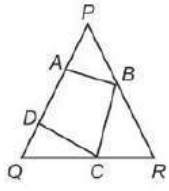


(a) $3\sqrt{3}$ (b) $2\sqrt{6}$
(c) $4\sqrt{2}$ (d) $6\sqrt{2}$

32. The radius of two circles is 3 cm and 4 cm. The distance between the centres of the circles is 10 cm. What is the ratio of the length of direct common tangent to the length of the transverse common tangent?
(a) $\sqrt{51} : \sqrt{68}$ (b) $\sqrt{33} : \sqrt{17}$
(c) $\sqrt{66} : \sqrt{51}$ (d) $\sqrt{28} : \sqrt{17}$

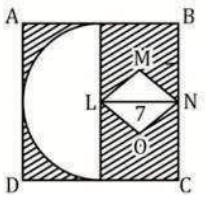
33. ABC is a triangle. AB = 5 cm, AC = $\sqrt{41}$ cm and BC = 8 cm. AD is perpendicular to BC. What is the area (in cm^2) of triangle ABD?
(a) 12 (b) 6
(c) 10 (d) 20

34. In the given figure, PQR is a triangle and quadrilateral ABCD is inscribed in it. QD = 2 cm, QC = 5 cm, CR = 3 cm, BR = 4 cm, PB = 6 cm, PA = 5 cm and AD = 3 cm. What is the area ($in\ cm^2$) of the quadrilateral ABCD?



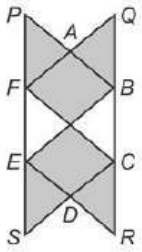
(a) $(23\sqrt{21})/4$ (b) $(15\sqrt{21})/4$
(c) $(17\sqrt{21})/5$ (d) $(23\sqrt{21})/5$

35. IN the given figures, ABCD is a square of side 14 cm. E and F are mid points of sides AB and DC respectively. EPF is a semicircle whose diameter is EF. LMNO is a square. What is the area (in cm^2) of the shaded region?



(a) 108.5 (b) 94.5
(c) 70 (d) 120

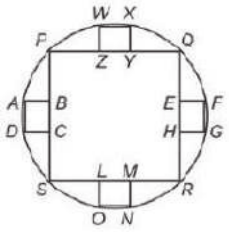
36. In the given figure, ABCDEF is a regular hexagon whose side is 6 cm, APF, QAB, DCR and DES are equilateral triangles. What is the area (in cm^2) of the shaded region?



(a) $24\sqrt{3}$ (b) $18\sqrt{3}$
(c) $72\sqrt{3}$ (d) $36\sqrt{3}$

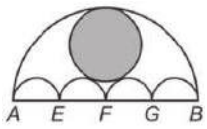
37. Length and breadth of a rectangle are 8 cm and 6 cm respectively. The rectangle is cut on its four vertices such that the resulting figure is a equilateral octagon. What is the side (in cm) of the octagon?
(a) $3(\sqrt{11}) - 7$ (b) $5\sqrt{13} - 8$
(c) $4(\sqrt{7}) - 11$ (d) $6(\sqrt{11}) - 9$

38. In the given figure, radius of a circle is $14\sqrt{2}$ cm. PQRS is a square. EFGH, ABCD, WXYZ and LMNO are four identical squares. What is the total area (in cm^2) of all the small squares?



(a) 31.36 (b) 125.44
(c) 62.72 (d) 156.8

39. In the given figure, AB, AE, EF, FG and GB are semicircles. AB = 56 cm and AE = EF = FG = GB. What is the area (in cm^2) of the shaded region?



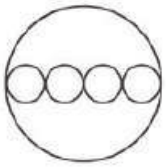
(a) 414.46 (b) 382.82
(c) 406.48 (d) 394.24

40. A right prism has a square base with side of base 4 cm and the height of prism is 9 cm. The prism is cut in three parts of equal heights by two planes parallel to its base. What is the ratio of the volume of the top, middle and the bottom part respectively?
(a) 1 : 8 : 27 (b) 1 : 1 : 1
(c) 1 : 8 : 20 (d) 1 : 7 : 20

41. Radius of base of a hollow cone is 8 cm and its height is 15 cm. A sphere of largest radius is put inside the cone. What is the ratio of radius of base of cone to the radius of sphere?
(a) 5 : 3 (b) 4 : 1
(c) 2 : 1 (d) 7 : 3

42. The ratio of curved surface area of a right circular cylinder to the total area of its two bases is 2 : 1. If the total surface area of cylinder is 23100 cm^2, then what is the volume (in cm^3) of cylinder?
(a) 247200 (b) 269500
(c) 312500 (d) 341800

43. A solid cylinder has radius of base 14 cm and height 15 cm. 4 identical cylinders are cut from each base as shown in the given figure. Height of small cylinder is 5 cm. What is the total surface area (in cm^2) of the remaining part?



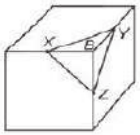
(a) 3740 (b) 3432
(c) 3124 (d) 2816

44. 10 identical solid spherical balls of radius 3 cm are melted to form a single sphere. In this process 20% of solid is wasted. What is the radius (in cm) of the bigger sphere?
(a) 24 (b) 12
(c) 8 (d) 6

45. The radius of base of a solid cylinder is 7 cm and its height is 21 cm. It is melted and converted into small bullets. Each bullet is of same size. Each bullet consisted of two parts viz. a cylinder and a hemisphere on one of its base. The total height of bullet is 3.5 cm and radius of base is 2.1 cm. Approximately how manycomplete bullets can be obtained?
(a) 83 (b) 89
(c) 74 (d) 79

46. A cuboid of size 50 cm × 40 cm × 30 cm is cut into 8 identical parts by 3 cuts. What is the total surface area (in cm^2) of all the 8 parts?
(a) 11750 (b) 14100
(c) 18800 (d) 23500

47. A right triangular pyramid XYZB is cut from cube as shown in figure. The side of cube is 16 cm. X, Y and Z are mid points of the edges of the cube. What is the total surface area (in cm^2) of the pyramid?



(a) $48[(\sqrt{3})+1]$ (b) $24[4+(\sqrt{3})]$
(c) $28[6+(\sqrt{3})]$ (d) $32[3+(\sqrt{3})]$

48. What is the value of [(sin x + sin y) (sin x – sin y)]/[(cosx + cosy) (cosy – cosx)]?
(a) 0 (b) 1
(c) – 1 (d) 2

49. What is the value of [(tan 5θ + tan 3θ)/4 cos 4θ (tan 5θ – tan 3θ)]?
(a) sin 2θ (b) cos 2θ
(c) tan 4θ (d) cot 2θ

50. What is the value of $(4/3)\cot^2(\pi/6) + 3\cos^2(150°) - 4\,\text{cosec}^2 45° + 8\sin(\pi/2)$?
(a) 25/4 (b) 1
(c) – 7/2 (d) 13/2

51. What is the value of sin (B – C) cos (A – D) + sin (A – B) cos (C – D) + sin (C – A) cos (B – D)?
(a) 3/2 (b) – 3
(c) 1 (d) 0

52. $\dfrac{\{[4\cos(90-A)\sin^3(90+A)]-\}}{\cos\left(\frac{180+8A}{2}\right)}$?
(a) 1 (b) – 1
(c) 0 (d) 2

53. What is the value of cos [(180 – θ)/2] cos [(180 – 9θ)/2] + sin [(180 – 3θ)/2] sin [(180 – 13θ)/2]?
(a) sin 2θ sin 4θ (b) cos 2θ cos 6θ
(c) sin 2θ sin 6θ (d) cos 2θ cos 4θ

54. What is the value of $[\tan^2(90-\theta) - \sin^2(90-\theta)]\,\text{cosec}^2(90-\theta)\cot^2(90-\theta)$?
(a) 0 (b) 1
(c) – 1 (d) 2

55. Two points P and Q are at the distance of x and y (where y > x) respectively from the base of a building and on a straight line. If the angles of elevation of the top of the building from points P and Q are complementary, then what is the height of the building?
(a) xy (b) $\sqrt{y/x}$
(c) $\sqrt{x/y}$ (d) $\sqrt{xy}$

56. The tops of two poles of height 60 metres and 35 metres are connected by a rope. If the rope makes an angle with the horizontal whose tangent is 5/9 metres, then what is the distance (in metres) between the two poles?
(a) 63 (b) 30
(c) 25 (d) 45

57. A Navy captain going away from a lighthouse at the speed of $4[(\sqrt{3}) - 1]$ m/s. He observes that it takes him 1 minute to change the angle of elevation of the top of the lighthouse from 60°to 45°. What is the height (in metres) of the lighthouse?
(a) $240\sqrt{3}$ (b) $480[(\sqrt{3}) - 1]$
(c) $360\sqrt{3}$ (d) $280\sqrt{2}$

Direction (58–62); The table given below shows the number of applicants who have applied for exam at various centres as percentage of total number of applicants. The table also shows the number online applicants and absent applicants as a percentage of total applicants of each centre. Total number of applicants is 1200000.

Exam Centre	Total Applicants	Online Applicants	Absent Applicants
F	15%	30%	36%
G	25%	44%	25%
H	20%	52%	32%
J	24%	46%	18%
K	16%	38%	20%

58. If A equals to 15% of total applicants who are present at exam centre F and B equals to present applicants at exam centre K, then A is what percent of B?
(a) 18.18 (b) 11.25
(c) 13.33 (d) 14.28

59. Total number of offline applicants from exam centre H, K and F are how much less than the total number of present applicants from exam centre G and J?
(a) 111420 (b) 100920
(c) 127370 (d) 109990

60. What are the total number of offline applicants from the exam centre F, H, J and G?
(a) 393720 (b) 963000
(c) 564720 (d) 428540

61. What is the ratio of total number of present applicants from exam centre K to total number of offline applicants from exam centre J?
(a) 40 : 41 (b) 80 : 81
(c) 10 : 9 (d) 7 : 11

62. What are the total number of present applicants from exam centre H and G together?
(a) 238200 (b) 151800
(c) 388200 (d) 442650

63. Solution A contains 10% acid and solution B contains 30% acid. In what ratio should solution A be mixed with Solution B to obtain a mixture with 25% acid?
(a) 1 : 2 (b) 3 : 1
(c) 1 : 3 (d) 2 : 1

64. In what ratio should coffee powder costing Rs 2500/kg be mixed with coffee powder costing Rs 1500/kg so that the cost of the mixture is Rs 2250/kg?
(a) 1 : 4 (b) 4 : 1
(c) 3 : 1 (d) 1 : 3

65. A and B started a partnership business investing in the ratio of 3 : 8. C joined them after 4 months with an amount equal to 3/4th of B. What was their profit (in Rs) at the end of the year if C got Rs 24,000 as his share?
(a) 120000 (b) 150000
(c) 90000 (d) 18000 0

66. A and B invest in a business in the ratio 4 : 5. After 10 months B leaves the business after withdrawing his investment. In the first year the business made a profit of Rs 49,000. What is B's share (in Rs) of this profit?
(a) 25000 (b) 20000
(c) 18000 (d) 22000

67. Working together A and B can do a job in 40 days, B and C in 36 days and all three together in 24 days. In how many days can B alone do the job?
(a) 60 (b) 90
(c) 72 (d) 12 0

68. A, B and C can do a job working alone in 50, 75 and 20 days respectively. They all work together for 4 days, then C quits. How many days will A and B take to finish the rest of the job?
(a) 20 (b) 30
(c) 18 (d) 24

69. A can do 50% of the job in 16 days, B can do 1/4th of the job in 24 days. In how many days can they do 3/4th of the job working together?
(a) 24 (b) 9
(c) 2 1 (d) 18

70. A and B can together complete a task in 18 hours. After 6 hours A leaves. B takes 36 hours to finish rest of the task. How many hours would A have taken to do the task if he worked alone?
(a) 54 (b) 45
(c) 21 (d) 27

71. 1 packet of biscuits costs Rs 16 but a pack of 4 of the same packet of biscuits costs Rs 56. What is the effective discount (in %) on the pack?
(a) 8 (b) 1 0
(c) 7.5 (d) 12.5

72. The cost price of an article is Rs x. It is marked up by 200%. It is sold at Rs 540 after giving 25% discount. What is the value of x (in Rs)?
(a) 360 (b) 250
(c) 300 (d) 240

73. A Rs 750 tin of cheese is offered at 8% discount and a Rs 1,250 tin of butter at 20% discount. If we buy 5 tins of cheese and 3 tins of butter, what is the effective discount we get (in %)?
(a) 12 (b) 15
(c) 14 (d) 16

74. The selling price of an article is Rs 816 if the discount on it is 15%. What would be the selling price of the article (in Rs) if the discount on it is 25%?
(a) 750 (b) 720
(c) 800 (d) 700

75. The entry ticket at a fun park was increased in the ratio 7 : 9, due to which footfalls fell in the ratio 13 : 11. What is the new daily collection (in Rs), if the daily collection before the price hike was Rs 2,27,500?
(a) 237500 (b) 247500
(c) 232500 (d) 242500

76. If 6A = 4B = 9C; What is A : B : C?
(a) 6 : 4 : 9 (b) 9 : 4 : 6
(c) 4 : 9 : 6 (d) 6 : 9 : 4

77. If 50 less had applied and 25 less selected, the ratio of selected to unselected would have been 9 : 4. So how many candidates had applied if the ratio ofselected to unselected was 2 : 1.
(a) 125 (b) 250
(c) 375 (d) 500

78. What is the fourth proportional to 189, 273 and 153?
(a) 117 (b) 299
(c) 221 (d) 187

79. Rs. 11,550 has to be divided between X, Y & Z such that X gets 4/5 of what Y gets and Y gets 2/3 of what Z gets. How much more does Z get over X (in Rs)?
(a) 7200 (b) 1800
(c) 2160 (d) 2450

80. Before a battle the ratio of tanks to planes in an army was 5 : 3. During the war 1000 tanks were destroyed and 800 planes were destroyed. The ratio of tanks to planes became 2 : 1. What is the number of tanks after the war.
(a) 2000 (b) 1000
(c) 3000 (d) 4000

81. The average marks of 50 students in an examination was 65. It was later found that the marks of one student had been wrongly entered as 83 instead of 38. The correct average is?
(a) 63.9 (b) 64.5
(c) 64.7 (d) 64.1

82. In a class of 50 students there are 22 girls who scored an average of 35 marks in the test. What is the average marks of the boys if the class average is 42 marks?
(a) 50 (b) 52 .5
(c) 47.5 (d) 55

83. The average of 41 consecutive odd numbers is 49. What is the largest number.
(a) 89 (b) 91
(c) 93 (d) 95

84. A batsman scores 87 runs in the 21st match of his career. His average runs per match increases by 2. What was his average before the 21st match.
(a) 45 (b) 46
(c) 44 (d) 43

85. Oil equal to 20% of the weight of ground nut is extracted in a mill. The matter left after extraction is sold as cattle feed at the rate of Rs 12.5/kg. The groundnuts are bought at Rs 20/kg. The processing cost is Rs 5/kg. At what price (Rs per kg) should the oil be sold to earn 20% profit on total costs (Total cost = Cost of groundnuts and Processing costs)?
(a) 250 (b) 150
(c) 200 (d) 100

86. If a vendor sells a coconut at Rs 14.4 he makes 10% loss. If he wants to make 25% profit, then at what price (in Rs) should he sell?
(a) 18 (b) 20
(c) 16 (d) 22

87. At a village trade fair a man buys a horse and a camel together for Rs 51,250. He sold the horse at a profit of 25 % and the camel at a loss of 20 %. If he sold both the animals at the same price, then the cost price of the cheaper animal was Rs _____.
(a) 6600 (b) 7500
(c) 25000 (d) 20000

88. On a certain item profit is 150%. If the cost price increases by 25% what will be the new profit margin (in %)?
(a) 25 (b) 50
(c) 100 (d) 75

89. 40% are the passing marks. A student gets 250 marks yet fails by 38 marks. What is the maximum marks?
(a) 720 (b) 750
(c) 800 (d) 840

90. Ravi is 12 years younger than Surya. Ravi's age is 40% of the sum of his and Surya's age. What will be Surya's age 9 years hence?
(a) 36 (b) 24
(c) 33 (d) 45

91. 5% of a = b, then b% of 20 is the same as _____.
(a) 20% o f a/2 (b) 50% of a /20
(c) 50% of a/ 2 (d) 20% of a /20

92. A man's annual income has increased by Rs 5 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays Rs 10,000 more income tax. What is his increased income (in Rs lakhs)?
(a) 20 (b) 25
(c) 15 (d) 10

93. A racing car going at an average speed of 108 km/hr takes 15 minutes to complete a lap on a racing track. By how much should it increase its speed (in km/hr) to complete the lap in 12 minutes?
(a) 24 (b) 21
(c) 27 (d) 30

94. Train A takes 45 minutes more than train B to travel a distance of 450 km. Due to engine trouble speed of train B falls by a quarter, so it takes 30 minutes more than Train A to complete the same journey. What is the speed of Train A (in km/hr)?
(a) 90 (b) 120
(c) 100 (d) 110

95. Two cars A and B travel from one city to another, at speeds of 72 km/hr and 90 km/hr respectively. If car B takes 1 hour lesser than car A for the journey, then what is the distance (in km) between the two cities?
(a) 270 (b) 360
(c) 240 (d) 400

96. B starts 4 minutes after A from the same point, for a place at a distance of 7 miles from the starting point. A on reaching the destination turns back and walks a mile where he meets B. If A's speed is a mile in 8 minutes then B's speed is a mile in ___ minutes.
(a) 9 (b) 12
(c) 10 (d) 8

97. If the amount on a certain principal in 3 years at 12% rate of interest compounded annually is Rs 12,000, what will be the amount (in Rs) after the 4thyear?
(a) 14330 (b) 15440
(c) 13440 (d) 14550

98. The amount (in Rs) received at 10% per annum compound interest after 3 yrs is Rs 1,19,790. What was the principal?
(a) 90000 (b) 1,00,000
(c) 80000 (d) 75000

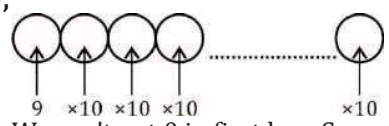
99. In how many months will Rs 8,000 yield Rs 2,648 as compound interest at 20% per annum compounded semi-annually?
(a) 18 (b) 24
(c) 12 (d) 30

100. What is the rate of interest (in %) if simple interest earned on a certain sum for the 3rd year is Rs 2,000 and compound interest earned in 2 years is Rs4,160?
(a) 8 (b) 10
(c) 12 (d) 6

Solutions

1. (c); Whole number = 0, 1, 2, 3, 4, ...110
Sum of whole no.
$= 0 + \frac{110\times111}{2} = 55 \times 111 = 610\boxed{5}$
$\downarrow$
$unit\ digit = 5$

2. (a);



We can't put 0 in first box. So remaining no. is 9
So, 100 digit +ive number = $\mathbf{9 \times 10^{99}}$

3. (a); $\frac{5.6\times0.36}{0.8\times2.1} + \frac{0.42\times3.2}{0.8\times2.1}$
$= \frac{12}{10} + \frac{8}{10} = 2$

4. (d); Above eqn. is in form
$\Rightarrow \frac{2(a^3+b^3+c^3-3abc)}{2\times(a+b+c)[a^2+b^2+c^2-ab-bc-ca]}$
[a+b+c = 2.7 & given in question (1.35), therefore multiply & divide by 2]
Where a = 12, b = 0.8, c = 0.7
As we know $a^3 + b^3 + c^3 - 3abc = (a + b + c)[a^2 + b^2 + c^2 - ab - bc - ca]$
So, Numerator & Denominator cancel out Except 2 in numerator
⇒ 2 is the answer

5. (d); Cyclicity of 7, 2 is 4
Cyclicity of 9, 4 is 2
So, unit digit.
$(217)^{413}\times(819)^{547}\times(414)^{624}\times(342)^{812}$
$= 7^1 \times 9^1 \times 4^2 \times 2^4$ [divide power of 7, 2 by 4 remainder = $(217)^1$ & $(342)^4$ if power divide completely than power remain 4 same in 9, 2 but by 2 $(819)^1$ & $(4)^2$]
Hence,
Unit digit=7×9×16×16
=(63) ×(256)
= 3×6=18
= 8 answer

6. (b); Here we can break S = S_1 + S_2 (each of 10 terms)
$S_1 = \frac{1}{1\times3\times5} + \frac{1}{3\times5\times7} + \ldots\ldots\ldots\ldots\ldots + \frac{1}{19\times21\times23}$
$a_{10} = a + (n-1)d$
$a_{10} = 1 + 9 \times 2 = 19$
Similarly
$S_2 = \frac{1}{1\times4} + \frac{1}{4\times7} + \frac{1}{7\times10} + \ldots + \frac{1}{28\times31}$
Now S = S_1 + S_2
$S = \frac{1}{4}\left[\frac{4}{1\times3\times5} + \frac{4}{3\times5\times7} + \ldots + \frac{4}{19\times21\times23}\right] + \frac{1}{3}\left[\frac{3}{1\times4} + \frac{3}{4\times7} + \ldots \frac{3}{28\times31}\right]$
$S = \frac{1}{4}\left[\frac{1}{1\times3} - \frac{1}{3\times5} + \frac{1}{3\times5} - \frac{1}{5\times7} + \ldots + \frac{1}{19\times21} - \frac{1}{21\times23}\right] + \frac{1}{3}\left[1 - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} + \cdots + \frac{1}{28} - \frac{1}{31}\right]$
$= \frac{1}{4}\left[\frac{1}{3} - \frac{1}{483}\right] + \frac{1}{3}\left[1 - \frac{1}{31}\right]$
$\Rightarrow \frac{1}{4}\times\frac{160}{483} + \frac{1}{3}\times\frac{30}{31} \Rightarrow \frac{6070}{14973}$

7. (c); Take the numbers from options
$\sqrt[3]{12},\ \sqrt[2]{5},\ \sqrt[4]{29}$
L.C.M. of (3, 2, 4) = 12
Taking 12 power of these numbers
$(12)^{\frac{12}{3}},\ (5)^{\frac{12}{2}},\ (29)^{\frac{12}{4}}$
$(12)^4,\ (5)^6,\ (29)^3$
20736, 15625, 24389
The higher the value of x, $\frac{1}{x}$ will be smaller
So,
$\frac{1}{20736},\ \frac{1}{15625}(LARGEST),\ \frac{1}{24389}(SMALLEST)$
Hence,
$\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$

8. (a); Difference between divisor and remainder is same (3 – 1), (4 – 2), (6 – 4) =2 in each case
So, LCM of 3, 4, 6 = 12 **× 8→ [As we are talking about largest 2 digit no.]**
So, No. is 96 – 2 = 94
When 94 is divided by 5
$Reminder = \frac{94}{5} = 4$

9. (c); $\sqrt[3]{11}, \sqrt[2]{7}, \sqrt[4]{45}$
LCM of 3, 2, 4 = 12
$(11)^{12/3}, (7)^{12/2}, (45)^{12/4}$
So,
$(11)^4,\ (7)^6,\ (45)^3$
14641 , 117649 , 91125
Clearly
$\sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$

10. (c); $\underset{5}{A} + \underset{10}{B} + \underset{5\times10}{AB} = 65$
Then B – A = 10 – 5 = 5

11. (d); $(2 \times 7)^3 + (2 \times 8)^3 + (2 \times 9)^3 + \cdots (2 \times 15)^3$
$\Rightarrow 2^3[7^3 + 8^3 + 9^3 + \cdots 15^3]$
As we know $1^3 + 2^3 + 3^3 + \ldots n^3 = \left[\frac{n(n+1)}{2}\right]^2$
$\Rightarrow 2^3\left[\left(\frac{15\times16}{2}\right)^2 - \left(\frac{6\times7}{2}\right)^2\right]$
$\Rightarrow [8[(120)^2 - (21)^2]$
$\Rightarrow 8 \times 141 \times 99$
$\Rightarrow$ **111672**

12. (b); $\sqrt{4600+\sqrt{540+\sqrt{1280+\sqrt{256}}}}$

$=\sqrt{4600+\sqrt{540+\sqrt{1296}}}$

Similarly $=\sqrt{4624}=68$

13. (a); Let Put x = 1 & y = 0 in eq. given in question

Then z = –1 comes out

Now put all the values

$\Rightarrow \frac{3\times0+(1)^2+(-1)^2}{2\times0-(1)(-1)} \Rightarrow \frac{2}{1}=2$

14. (b); $P = 7+4\sqrt{3}$

$\frac{1}{P}=\frac{1}{7+4\sqrt{3}}\times\frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

$\frac{1}{P}=(7-4\sqrt{3})$

As given in question PQ = 1

$Q=\frac{1}{P}$

$Q=\frac{1}{7-4\sqrt{3}}$

$\frac{1}{Q}=7+4\sqrt{3}$

$\left(\frac{1}{P}\right)^2+\left(\frac{1}{Q}\right)^2=(7-4\sqrt{3})^2+(7+4\sqrt{3})^2$

= 2 (49 + 48) = **194**

15. (c); If $a^3+3a^2+9a=1$ ... (i)

Multiply eq (i) by 'a'

$a^4+3a^3+9a^2=a$ ... (ii)

now multiply eqn. (i) by 3

$3a^3+9a^2+27a=3$ ... (iii)

Subtract (iii) from (ii)

$a^4+3a^3+9a^2=a$

$3a^3+9a^2+27a=3$

$a^4-27a=a-3$

$a^4+3=28a$

TO FIND

$\frac{a^4+3}{a}=a^3+\frac{3}{a} \Rightarrow \frac{28a}{a}=28$

16. (d); As we know

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

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

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

Put (ii) in (i)

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

$13-3=1[(1)^2-3(xy+yz+zx)]$

$\Rightarrow xy+yz+zx=\frac{-9}{3}=-3$

17. (d); Let a + b = 6K, b + c = 9K, a = 2K, c = 5K

∴ a + b + c = 11K

If C = 5K then b = 9K – 5K = 4K

So, $\frac{a+c}{b}=\frac{2K+5K}{4K}=\frac{7}{4}$

18. (c); Let PUT x = 0, y = 0 and $z^3 = 3$

Then comes out

P = z, Q = z, R = –z

$P^3+Q^3+R^3-3PQR=z^3+z^3-z^3-3\times z\times z\times(-z)$

$=z^3+3z^3=4z^3=4\times3=12$

Method-2

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

$x^3+y^3+z^3-3xyz=3$ ...(i)

P = y + z – x

Q = z + x – y

R = x + y – z

$P^3+Q^3+R^3-3PQR=\frac{(P+Q+R)}{2}[(P-Q)^2+(Q-R)^2+(R-P)^2]$

$=\frac{(x+y+z)}{2}[4(y-x)^2+4(z-y)^2+4(x-z)^2]$

$=2(x+y+z)[y^2+x^2-2xy+z^2+y^2-2zy+x^2+z^2-2xz]$

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

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

then,

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

$= 4\times3$

$= 12$

19. (b); Let $x_1=x_2=x_3=4$

Then $\Rightarrow \left[\frac{1}{2+4}\right]+\left[\frac{1}{2+4}\right]+\left[\frac{1}{2+4}\right]=\frac{3}{6}=\frac{1}{2}$

20. (a); $\alpha+\beta=\frac{-b}{a}=\frac{-(-1)}{1}=1$

$\alpha\beta=\frac{c}{a}=\frac{1}{1}=1$

$\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta) \Rightarrow (1)^3-3\times1(1)=-2$

So, eqn. is

$x^2-(\alpha^3+\beta^3)x+\alpha^3\beta^3=0$

$\Rightarrow x^2+2x+1=0$

21. (c);

$(3x+5y+7z=49)\times3$ ..... 1 $(multiply\ by 3)$

$9x+8y+21z=126$ 2

$7y = 21$

$y = 3$

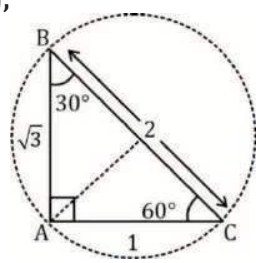
22. (b); According to question

$(4P+6N+9F=305)\times2$ ... $(i)(multiply\ by\ 2)$

$3P+4N+2F=145$ ... (ii)

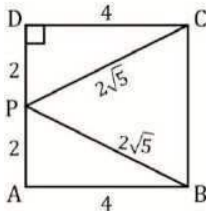
$5P + 8N + 16F = 465\ Rs.$

23. (b);



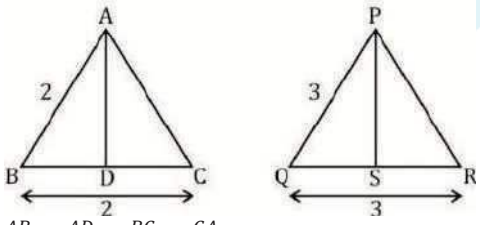
∠ACB = 60 given
So, ABC = 30°
Suppose AC = 1
So, AB = $\sqrt{3}$& BC = $\sqrt{3+1} = 2$
So,
$circumradius \quad : \quad AB$
$1 \quad : \quad \sqrt{3}$
(circumradius is half of hypotenuse=BC/2)

24. (a);



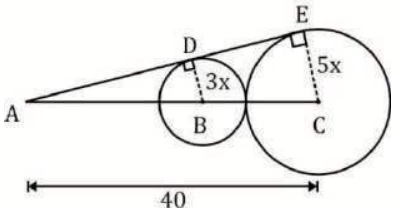
Minimum value of BP + CP when P is on mid point of AD
So,
$BP + CP = 2\sqrt{5} + 2\sqrt{5}$
BP + CP = $4\sqrt{5}$

25. (b);



$\frac{AB}{PQ} = \frac{AD}{PS} = \frac{BC}{QR} = \frac{CA}{PR} \quad \because (\Delta ABC \sim \Delta PQR)$
Also BD = BC/2
QS = QR/2
$\left(\frac{BD}{QS}\right)^2 = \left(\frac{BC/2}{QR/2}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$

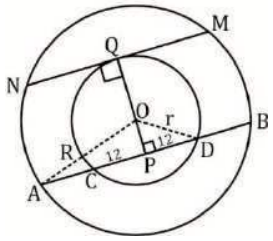
26. (d);



Given r : R = 3 : 5 (R=radius of circle with centre c and r=cicle with centre b)

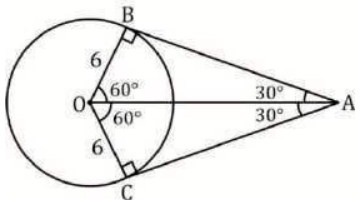
ΔABD ~ ΔACE
$\frac{AB}{AC} = \frac{BD}{CE} = \frac{3}{5}$
⇒ AB + BC = 40
5k = 40
k = 8
so, BC = AC-AB=5k-3k=2k=2×8=16
BC=r+R
3x+5x=16, therefore
Radius r = 3 × 2 = 6
R = 5 × 2 = 10
Hence
Direct common Tangent = $\sqrt{(BC)^2-(R-r)^2}$
$= \sqrt{(16)^2-(10-6)^2}$
$= \sqrt{240} = 4\sqrt{15}$

27. (a);



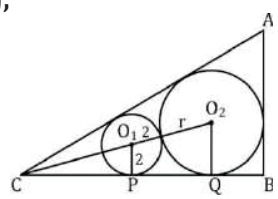
AB = 30, CD = 24
CP = PD = 12
AC = DB = 3
$r^2 - 12^2 = R^2 - 15^2$
$R^2 - r^2 = 81$
In Δ OQN
$(NQ)^2 = R^2 - r^2 = 81 \Rightarrow NQ = 9$ cm
NM = NQ + QM ⇒ $\boxed{NM \Rightarrow 18\ cm}$

28. (a);



OB = 6
So, AB =OB/Tan(30)= $6\sqrt{3}$ = AC
Now
$\sqrt{(AB^2 + AC^2)}$
$\Rightarrow \sqrt{\left(6\sqrt{3}\right)^2 + \left(6\sqrt{3}\right)^2}$
$= \sqrt{216} = 6\sqrt{6}$ cm

29. (b);



Let the centers are O_1 & O_2

From ΔCO_1P,

$sin\,30° = \frac{O_1P}{O_1C}$

$O_1C = 4\,cm$

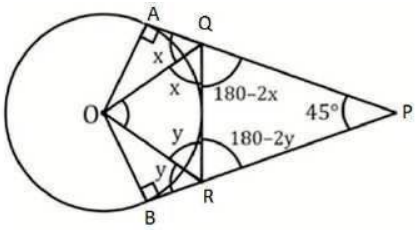
$CO_2 = 6 + r \Rightarrow QO_2 = r$

From ΔCO_2Q,

$sin\,30° = \frac{r}{CO_2} \Rightarrow CO_2 = 2r \Rightarrow 2r = 6 + r$

r = 6 cm

30. (a);



Let

$\angle OQA = \angle OQR = x$

$\angle QRO = \angle ORB = y$

In triangle PRQ

$\angle Q + \angle R + \angle P = 180$

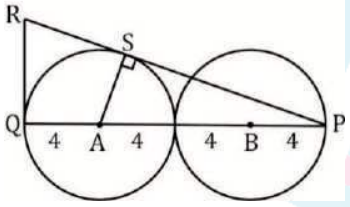
$\Rightarrow 180 - 2y + 180 - 2x + 45 = 180$

$2(x + y) = 225$

$x + y = 112\frac{1}{2}$

$\angle QOR = 180 - (x+y) = 180 - 112\frac{1}{2} \Rightarrow 67\frac{1}{2}°$

31. (c);



QP = 4 × 4 = 16

AP = 12, AS = 4

$PS = \sqrt{(12)^2 - (4)^2} = 8\sqrt{2}$

$\Delta PQR \sim \Delta PSA$

$\frac{RQ}{AS} = \frac{QP}{PS} \Rightarrow \frac{RQ}{4} = \frac{16}{8\sqrt{2}}$

$RQ = 4\sqrt{2}$ cm

32. (b); r = 3, R = 4, D = 10

Direct common Tangent $= \sqrt{(D)^2 - (R-r)^2}$

$= \sqrt{100 - 1} = \sqrt{99}$

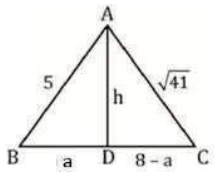
Indirect common Tangent

$= \sqrt{(D)^2 - (R+r)^2} = \sqrt{51}$

DCT : ICT $= \sqrt{99} : \sqrt{51}$

$= \sqrt{33} : \sqrt{17}$

33. (b);



AS BC=8

LET BD=a then CD=8-a

$(5)^2 - a^2 = \left(\sqrt{41}\right)^2 - (8-a)^2$

$25 - a^2 = 41 - 64 - a^2 + 16a$

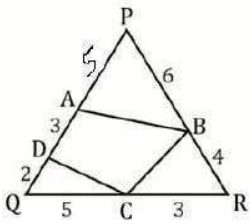
a = 3

So, h = 4 cm

$A = \frac{1}{2} \times 4 \times 3 = 6cm$

[**Hitting method** → ABD is right angle triangle Hypotenus = 5 so, either base (BD) and perpendicular (Ad) is 3 & 4. Because of Triplets (3, 4, 5). In any case area $= \frac{1}{2} \times 4 \times 3 = 6$]

34. (c);



Are of $\Delta = \frac{1}{2} \times ab\,\sin\theta$

Let $\Delta PAB = x$, $\Delta DQC = y$

$\Delta BCR = z$

$\Rightarrow \frac{area\ of\ \Delta PAB}{area\ of\ \Delta PQR} = \frac{\frac{1}{2} \times 5 \times 6 \times sin\,P}{\frac{1}{2} \times 10 \times 10 \times sin\,P} = \frac{3}{10}$

Similarly,

$\frac{area\ of\ \Delta CQD}{area\ of\ \Delta PQR} = \frac{1}{8}$ AND $\frac{area\ of\ \Delta BRC}{area\ of\ \Delta PQR} = \frac{3}{20}$

Let area of ΔPQR = 40

$area\ of\ PAB : area\ of\ DQC : area\ of\ BCR$

12 : 5 : 6

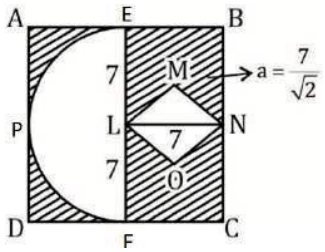
Then of $\Delta PQR = \frac{1}{2} \times 8 \times 2\sqrt{21} = 8\sqrt{21}$

$40 - 8\sqrt{21}$,

So, AREA ABCD= $(40 - \{12 + 5 + 6\})$

$= 17 \rightarrow \frac{8\sqrt{21}}{40} \times 17 = \frac{17\sqrt{21}}{5}$

35. (b);



FROM THE FIG. Let side of smaller square=a(LO)

$LN = \sqrt{2}a = 7 \Rightarrow a = (MN) = \frac{7}{\sqrt{2}}$

area of shaded region —

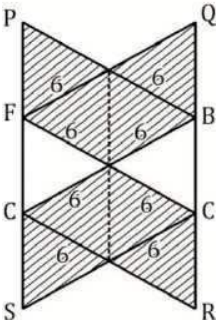
⇒ area of large square – (area of semicircle + area of smaller square)

$\Rightarrow 14 \times 14 - \left[\frac{22}{7} \times \frac{7 \times 7}{2} + \frac{7}{\sqrt{2}} \times \frac{7}{\sqrt{2}}\right]$

$\Rightarrow 196 - \left[77 + \frac{49}{2}\right]$

$\Rightarrow 94.5\ cm^2$

36. (c);

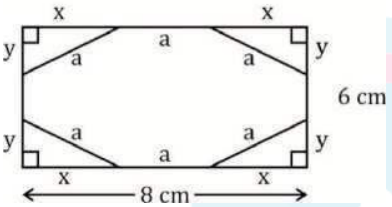


Total there are 10 equilateral Δ's is this but 8 are shaded

So, area of shaded region is

$8 \times \frac{\sqrt{3}}{4} \times 6 \times 6 = 72\sqrt{3}$

37. (a); An equilateral polygon is a polygon which has all sides of the same length. Except in the triangle case, it need not be equiangular (need not have all angles equal), but if it does then it is a regular polygon



2x + a = 8 (LENGTH)

$x = \frac{8-a}{2} \Rightarrow 4 - \frac{a}{2}$

2y + a = 6 (BREADTH)

$y \Rightarrow 3 - \frac{a}{2}$

HENCE W.R.TO FIG

$x^2 + y^2 = a^2$

$\left(4-\frac{a}{2}\right)^2 + \left(3-\frac{a}{2}\right)^2 = a^2$

On solving this eqn.

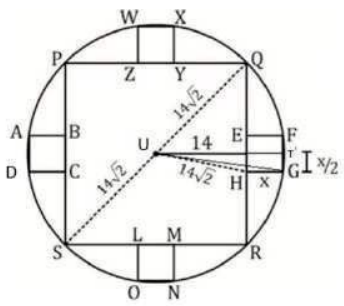
$\Rightarrow a^2 + 14a - 50 = 0 \Rightarrow \frac{-14 \pm \sqrt{(14)^2 - 4 \times 1 \times -50}}{2 \times 1}$

$\Rightarrow -7 \pm \frac{\sqrt{396}}{2} \Rightarrow -7 \pm 3\sqrt{11}$

So, $3\sqrt{11} - 7$

Side can't be negative that's why took positive value

38. (b);



FROM FIG.

SQ = $14\sqrt{2} + 14\sqrt{2} = 28\sqrt{2}$

Side of square = $28\sqrt{2} = \sqrt{2}a$

a = 28

let side of small square=X

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

UG = $14\sqrt{2}$(radius of circle)

NOW By pythagorus in triangle UTG

$\Rightarrow (14 + x)^2 + \left(\frac{x}{2}\right)^2 = \left(14\sqrt{2}\right)^2$

$= 196 + x^2 + 28x + \frac{x^2}{4} = 196 \times 2$

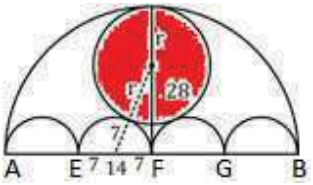
$\Rightarrow 5x^2 + 112x - 196 \times 4 = 0$

$\Rightarrow (x + 28)(5x - 28) = 0$

x → can't be negative $\Rightarrow x = \frac{28}{5}$

Area of 4 small square = $4 \times \frac{28}{5} \times \frac{28}{5} = 125.44\ cm^2$

39. (d);



According to question

$(7 + r)^2 = (7)^2 + (28 - r)^2$

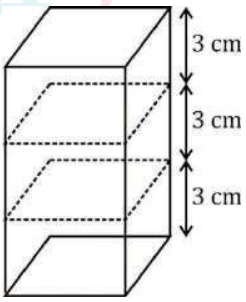
$(7 + r)^2 - (28 - r)^2 = 7^2$

$\Rightarrow 2r = \frac{112}{5}$

Area of shaded region = πr^2

$= \frac{22}{7} \times \frac{112}{10} \times \frac{112}{10} = 394.24\ cm^2$

40. (b);



TOTAL height=9

Ht of each part =3

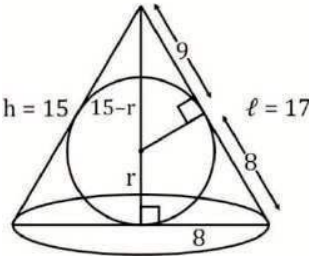
Therefore Ratio of area of

$First : Middle : bottom$

$4^2 \times 3 : 4^2 \times 3 : 4^2 \times 3$

1 : 1 : 1

41. (a);



According to fig.

$(15-r)^2-r^2 = 9^2$ and,

$(15-2r) = \frac{81}{15} = \frac{27}{5}$

$r = \frac{24}{5}$

$ratio\ of\ radius\ cone : Ratio\ of\ radius\ of\ sphere$

$8 : {}^{24}/_{5}$

$5 : 3$

42. (b); GIVEN RATIO IS

$\frac{2\pi rh}{2\pi r^2} = \frac{2}{1}$

h = 2r

Total surface area = 2πr(h + r)

23100 = 2πr (3r)

r^2 = 175 × 7

r = 35

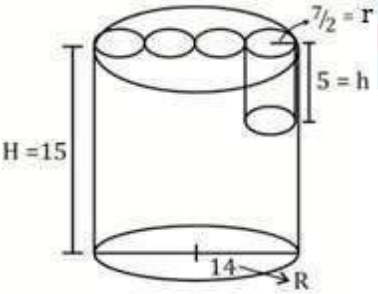
then, h = 2r = 70

volume = $\pi r^2 h$

$= \frac{22}{7} \times 35 \times 35 \times 70$

$\Rightarrow$ 269500 cm^3

43. (b);



Total surface area = 2πR (R + H) + 8 (2πrh)

$= 2 \times \frac{22}{7} \times 14(14 + 15) + 8 \times 2 \times \frac{22}{7} \times 5 \times \frac{7}{2}$

$\Rightarrow 2 \times 22 \times 2 \times 29 + 22 \times 40 \Rightarrow 3432\ cm^2$

44. (d); Volume of sphere = $\frac{4}{3}\pi r^3$

Volume remain after 20% wastage

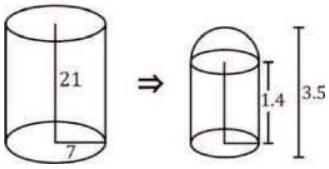
And then this volume of 10 small sphere is used for making big sphere

$= 10 \times \frac{4}{3} \times \pi \times 3 \times 3 \times 3 \times \frac{80}{100} = \frac{4}{3} \times \pi R^3$

$\Rightarrow 10 \times \frac{4}{3} \times \pi \times 3 \times 3 \times 3 \times \frac{4}{5} = \frac{4}{3} \times \pi R^3$

R =3× 2= 6 cm

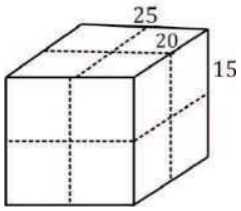
45. (a);



$No.\ of\ bullets = \frac{volume\ of\ cyl.}{Volume\ of\ bullet}$

$= \frac{\pi \times 7 \times 7 \times 21}{\pi \times 2.1 \times 2.1 \times 1.4 + \frac{2}{3} \times \pi \times 2.1 \times 2.1 \times 2.1} = 83\frac{1}{3} \approx 83$

46. (c);



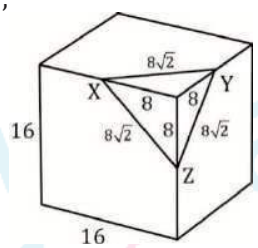
Total surface area of cuboid = 2 (ℓb + bh + hℓ)

There are 8 parts so, T.S.A. of 8 parts = 8 × 2 [20 × 25 + 25 × 15 + 15 × 20]

= 16[500 + 300 + 375]

= 18800 cm^2

47. (d);



Total surface area of pyramid

$= 3 \times \frac{1}{2} \times 8 \times 8 + \frac{\sqrt{3}}{4} \times 8\sqrt{2} \times 8\sqrt{2}$

$= 32\sqrt{3} + 96$

$= 32\ (\sqrt{3} + 3)$

48. (b); $\Rightarrow \frac{2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right) \times 2\sin\frac{(x-y)}{2} \times \cos\frac{(x+y)}{2}}{2\cos\frac{(x+y)}{2}.\cos\left(\frac{(x-y)}{2}\right).2\sin\frac{(x+y)}{2}\sin\frac{(x-y)}{2}}$

$\Rightarrow 1$

Method-2

$\frac{[(\sin x+\sin y)(\sin x-\sin y)]}{[(\cos x+\cos y)(\cos y-\cos x)]}$

$\Rightarrow \frac{\sin^2 x-\sin^2 y}{\cos^2 y-\cos^2 x}$

$\Rightarrow \frac{(\sin^2 x-\sin^2 y)}{[-(1-\sin^2 x)+(1-\sin^2 y)]}$

$\Rightarrow \frac{\sin^2 x-\sin^2 y}{(\sin^2 x-\sin^2 y)}$

= 1

49. (b); $\Rightarrow \frac{\frac{\sin 5\theta}{\cos 5\theta}+\frac{\sin 3\theta}{\cos 3\theta}}{4\cos 4\theta\left(\frac{\sin 5\theta}{\cos 5\theta}-\frac{\sin 3\theta}{\cos 3\theta}\right)}$

$\Rightarrow \frac{\sin 5\theta \cos 3\theta+\sin 3\theta \cos 5\theta}{4\cos 4\theta(\cos 3\theta \sin 5\theta-\sin 3\theta \cos 5\theta)}$

$\Rightarrow \frac{\sin 2\times 4\theta}{4\cos 4\theta.\cos 2\theta}$

$\Rightarrow \frac{2\sin 4\theta \cos 4\theta}{4\cos 4\theta.\sin 2\theta} \Rightarrow \frac{2\times 2\sin 2\theta.\cos 2\theta}{4\sin 2\theta}$

$\Rightarrow \cos 2\theta$

50. (a); Instead of P, it should be π. SO when we put π then value is

$\Rightarrow \frac{4}{3}\left(\sqrt{3}\right)^2 + 3\left(-\frac{\sqrt{3}}{2}\right)^2 - 4 \times \left(\sqrt{2}\right)^2 + 8 \times 1$

$\Rightarrow \frac{25}{4}$

51. (d); Let A = B = C = D

$So,$

$\sin 0 \cos 0 + \sin 0 \cos 0 + \sin 0 \cos 0 = 0$

52. (b); $\frac{4 \sin A.\cos^3 A - 4 \cos A \sin^3 A}{-\sin 4A}$

$\Rightarrow \frac{4 \sin A \cos A(\cos^2 A - \sin^2 A)}{-2 \sin 2A \cos 2A} \Rightarrow \frac{4 \sin A \cos A \cos 2A}{-2 \sin 2A \cos 2A} \Rightarrow -1$

since $[\sin 2A = 2 \sin A \cos A]$

53. (b); $\sin\frac{\theta}{2}\sin\frac{9\theta}{2} + \cos\frac{3\theta}{2}\cos\frac{13\theta}{2}$

$= \frac{1}{2}[2 \sin\frac{\theta}{2}\sin\frac{9\theta}{2} + 2\cos\frac{3\theta}{2}\cos\frac{13\theta}{2}]$

$[As\ we\ know\ \ 2 \sin A \sin B = \cos(A-B) - \cos(A+B)$

$2 \cos A \cos B = \cos(A+B) + \cos(A-B)]$

$\Rightarrow \frac{1}{2}[\cos 4\theta - \cos 5\theta + \cos 8\theta + \cos 5\theta]$

$\Rightarrow \frac{1}{2}[\cos 4\theta + \cos 8\theta]$

$= \frac{1}{2} \times 2 \cos 6\theta \,.\, \cos 2\theta$

since (cos A +cos b=2cos(a+b)/2 .cos(a-b)/2)

$= \cos 6\theta \,.\, \cos 2\theta$

54. (b); Put θ = 45 in eqn.

$\Rightarrow [1 - \left(\frac{1}{\sqrt{2}}\right)^2] \times \left(\sqrt{2}\right)^2 \times 1 = \left(1 - \frac{1}{2}\right) \times 2 = 1$

Method-2

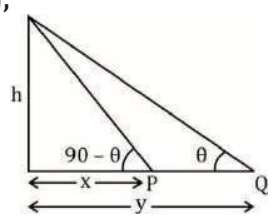
$[\tan^2(90-\theta) - \sin^2(90-\theta)]\, cosec^2(90-\theta) \,.\, \cot^2(90-\theta)$

$= (\cot^2\theta - \cos^2\theta).\sec^2\theta \,.\, \tan^2\theta$

$= \cos^2\theta\left(\frac{1-\sin^2\theta}{\sin^2\theta}\right).\sec^2\theta \,.\, \tan^2\theta$

$\Rightarrow \cos^2\theta \,.\, \frac{\cos^2\theta}{\sin^2\theta} \,.\, \frac{1}{\cos^2\theta} \,.\, \frac{\sin^2\theta}{\cos^2\theta} \Rightarrow 1$

55. (d);



$\tan(90-\theta) = \frac{h}{x} = \cot\theta$ ...(i)

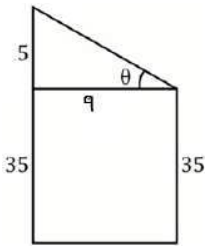
$\tan\theta = \frac{h}{y}$ ...(ii)

$(i) \times (ii) \Rightarrow \tan\theta \times \cot\theta = \frac{h^2}{xy}$

$h = \sqrt{xy}$

[shortcut: —if angle of elevation are complementary then h = $\sqrt{xy}$]

56. (d);



GIVEN

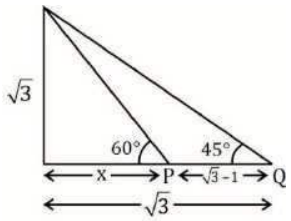
$\tan\theta = \frac{P}{B} = \frac{5}{9}$

IF

5 → 25 (60 – 35) [GIVEN TOTAL HT AS 60 IN QUES]

1 → 5 ⇒ 9 → 45 cm .

57. (a);



Let height of light house=$\sqrt{3}$

Tan45= height/base

Base=$\sqrt{3}$

Tan 60=$\frac{\sqrt{3}}{x}$

x=1 ,therefore,

$(\sqrt{3}-1)distance \rightarrow 60\times 4\ (\sqrt{3}-1)$

1 → 240

HENCE,(height) $\sqrt{3} \rightarrow 240\sqrt{3}$

58. (b); Let x be Total number of applicants.

A : B

$x \times \frac{15}{100} \times \frac{64}{100} \times \frac{15}{100} : x \times \frac{16}{100} \times \frac{80}{100}$

A : B ⇒A: B

45:400 ⇒9:80

$\frac{9}{80} \times 100 = 11.25\%$

59. (b); Let x be Total number of applicants

(G and I) (H, K and F)

$\Rightarrow \left(x \times \frac{25}{100} \times \frac{75}{100} + x \times \frac{(24)}{100} \times \frac{82}{100}\right) - \left(x \times \frac{20}{100} \times \frac{48}{100} + x \times \frac{16}{100} \times \frac{62}{100} + x \times \frac{15}{100} \times \frac{70}{100}\right)$

$= x\left[\frac{(1875+1968)-(960+992+1050)}{10000}\right]$

$= x\left[\frac{3843-3002}{10000}\right] \Rightarrow 1200000 \times \frac{841}{10000} = 100920$

60. (c); F H J G

$x \times \frac{15}{100} \times \frac{70}{100} + x \times \frac{20}{100} \times \frac{48}{100} + x \times \frac{24}{100} \times \frac{54}{100} + x \times \frac{25}{100} \times \frac{56}{100}$

$\Rightarrow \frac{x(1050+1400+960+1296)}{10000} = \frac{1200000 \times 4706}{10000}$

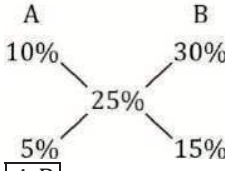
Total number of applicants = 564720

61. (b);

$$\underset{80}{K} : \underset{81}{J}$$
$$x \times \frac{16}{100} \times \frac{80}{100} : x \times \frac{24}{100} \times \frac{54}{100}$$

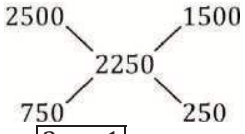
62. (c); $1200000 \times \frac{20}{100} \times \frac{68}{100} + 1200000 \times \frac{25}{100} \times \frac{75}{100}$
$\Rightarrow 163200 + 225000 \Rightarrow 388200$

63. (c);



$\boxed{A:B \quad 1:3}$

64. (c);

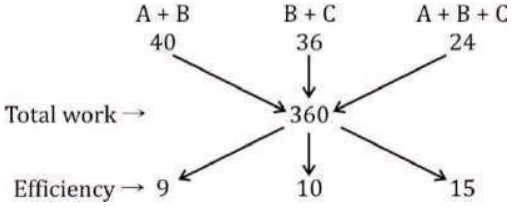


$\Rightarrow \boxed{3 : 1}$

65. (c); $A : B : C$
$3 \times 12 : 8 \times 12 : 8 \times \frac{3}{4} \times 8$
$3 : 8 : 4$
If $4 \rightarrow 24000$
$15 \rightarrow \frac{24000}{4} \times 15 \Rightarrow 90000\ Rs.$

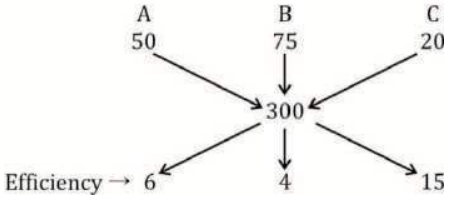
66. (a);
$A : B$
$4 \times 12 : 5 \times 10$
$24 : 25$
If $49 \rightarrow 49000$
$25 \rightarrow 25000$ Rs.

67. (b);



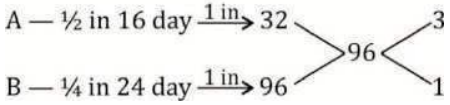
B's efficiency = (10 + 9) – 15 = 4,
B can do in = $\frac{360}{4}$ = 90 days

68. (a);



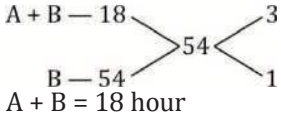
A + B + C in 4 day = 4 × (6 + 4 + 15) = 100
Remaining = (300 – 100) = 200
$(A+B)\ DO\ IN\ = \frac{200}{10} = 20\ days.$

69. (d);



$(A+B) do\ in = \frac{96 \times \frac{3}{4}}{4} = 18\ days$

70. (d);



A + B = 18 hour
B do ⅔ work in 36 hour
B do 1 work in 54 hour
A's efficiency = 2
A can do in $\frac{54}{2}$ = 27 hours.

71. (d); 1 packet → 16 Rs.
4 packet → 4 × 16 = Rs. 64 → M.P.
S.P. → 56 Rs.
$Discount\% = \frac{8}{64} \times 100 = 12.5\%$

72. (d); LET CP = 100
MP = 300
$SP = 300 \times \frac{75}{100} = 225$
If 225 → 540
100 → $\frac{540}{225} \times 100$=Rs. 240

73. (c);

I	II
750	1250
↓×5	↓×3
15	15
1	1

$d\% = \frac{1 \times \frac{8}{100} + 1 \times \frac{20}{100}}{2} \times 100$
D%= $\frac{28}{200} \times 100$ = 14%

74. (b); With reference to question
$MP \times \frac{85}{100} = 816 \Rightarrow MP = \frac{816 \times 100}{85}$
SP if discount is 25%
S.P. = $\frac{816}{85} \times 100 \times \frac{75}{100} = Rs.720$

75. (b); NEW:OLD
TICKET----- 7 : 9
NUMBERS-------- 13 : 11
91 : 99
91 → 227500
99 → $\frac{227500}{91} \times 99 \Rightarrow$ Rs. 247500

76. (d); 6A = 4B = 9C = 36 (LET)
A = 6
B = 9
C = 4
So, 6 : 9 : 4

77. (c);

$Selected : unselected$

2 : 1

$Total : unselected$

$3x : x$

$\Rightarrow \frac{3x-50}{x-25} = \frac{13}{4} \Rightarrow x = 125$

Total = 3 × 125 = 375

78. (c); $\frac{189}{273} = \frac{153}{x} \Rightarrow x = 221$

79. (d);

$x \quad y \quad z$

$\frac{8A}{5} : 2A : 3A$

8 : 10 : 15

⇓

$\frac{7}{33} \times 11550 = Rs.2450$

80. (a); $Tank : Planes$

5 : 3

$\frac{5x-1000}{3x-800} = \frac{2}{1} \Rightarrow x = 600$

tanks after war (5 × 600) – 1000 = 2000

81. (d); Total marks = 50 × 65

New average = $\frac{65\times50-83+38}{50}$ = 64.1

Alternate method:-

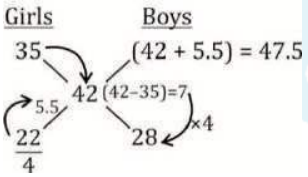
Diff. in wrong marks

(38 – 83) = - 45

Divide by no. of students= $\frac{-45}{50}$ = – 0.9

Now, New average = 65 – 0.9 = 64.1

82. (c);



Alternate METHOD:

Total marks = 50 × 42 = 2100

Girls marks = 22 × 35 = 770

$Boys = \frac{(2100-770)}{28} = 47.5$

83. (a); METHOD FIRST:-

Average=(smallest+largest)/2

49×2=smallest+largest.....(1)

Total number is 41

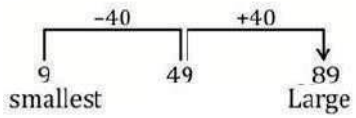
Let smallest=x , so largest=x+80

From eq 1.....

98=2x+80

X=9(smallest) , largest=9+80=89

SHORTCUT:-



Another method

$N_1 = x$, $N_2 = (x + 2)$, $N_3 = (x + 4)$ ..... $N_{41} = (x + 80)$

Sum ⇒ x + x + 2 + x + 4 .....+ x + 80

So, according to question

$Average = \frac{41x+2[1+2+\cdots40]}{41} = 49$

$41x + \frac{2\times40\times41}{2} = 49 \times 41 \Rightarrow x = 9$

Largest = x + 80 = 89

84. (a); Average of total Run till 20th match = x

According to ques

$\frac{20x+87}{21} = (x + 2)$

20x + 87 = 21x + 42

x = 45

Another method:-

21thMach score = 87

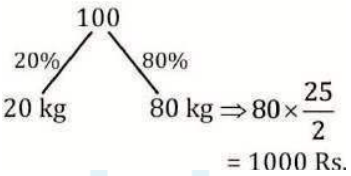
Average ↑es by 2 so → 2 × 21 = 42

Average before 21th match ⇒ 87 – 42 = 45

85. (d); Let total ground nut = 100 kg

C.P. = (20 + 5) × 100 = Rs. 2500

S.P. = $\frac{2500\times120}{100}$=Rs. 3000



(3000 – 1000)

$= \frac{2000}{20\ kg} Rs.$

= 100/kg

86. (b); C.P × $\frac{90}{100}$ = 14.4

CP = 16

If want to sell at 25% profit

SP = 16 × $\frac{5}{4}$ = 20 Rs.

87. (d); H + C = 51250

$H \times \frac{5}{4} = C \times \frac{4}{5}$

$H : C$

16:25

Horse = $\frac{16}{41} \times 51250 \Rightarrow Rs.20000$

88. (c); Old CP = 100, Profit = 150%, SP = 250

If CP ↑es by 25% =100 × $\frac{5}{4}$ = 125

P% = $\frac{(250-125)}{125} \times 100 = 100\%$

89. (a); 40% → (250 + 38)

100% → $\frac{288}{40} \times 100 = 720$

90. (d); $\frac{R}{R+S} = \frac{40}{100} = \frac{2}{5} \Rightarrow \frac{R=2}{S=3})1 \rightarrow 12\ years$

Surya present age = 12 × 3 = 36

9 year hence it will be = 36 + 9 = 45 year.

91. (d); $\frac{5}{100} \times a = b \Rightarrow b = \frac{a}{20}$

B% of 20 = $\frac{a}{20}$ of 20%

= 20% of $\frac{a}{20}$

92. (b); According to question

$x \times \frac{12}{100} + \frac{10000}{100000} = (x+5) \times \frac{10}{100} \Rightarrow \frac{10x}{100} + \frac{5}{10}$

x = 20 lakh

[New ↑es income = 20 + 5 = 25 lakh]

93. (c); New speed = $\frac{108 \times 15}{12} = 135$ km/hr

Increase in speed = 135 – 108 = 27 km/hr

ANOTHER METHOD:-

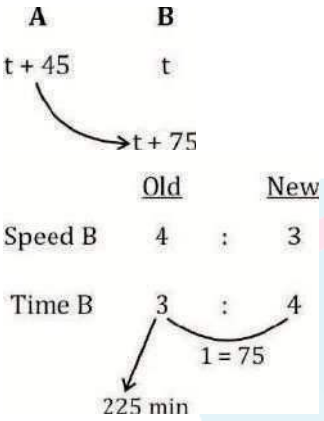
$time_A : time_B = 5 : 4$

$speed_A : Speed_B = \underbrace{4 : 5}_{1}$

4 → 108

1 → 27 kmph

94. (c);



A = 225 + 45 = 270

Speed of A = $\frac{450}{270} \times 60 = 100$ km/hr

95. (b); $S_A : S_B = 72 : 90$

$S_A : S_B = 4 : 5$

$T_A : T_B = \underbrace{5 : 4}_{1=1\ hour}$

Distance = 5 × 72 = 360 km

<u>Another Method</u>

$S_A = 72, \quad T_A = (x+1)$

$S_B = 90, \quad T_B = x$

72 (x + 1) = 90x

x = 4 hour

D = S × T

= 90 × 4

= 360 km

96. (c); Speed of A = 1 mile in 8 min.

Hence he cover 8 mile in 64 min

B start after 4 min

So, B cover in (64 – 4) = 60 min

60 min → 6 mile

1 mile → 10 min

97. (c); Amount after 3 years = Rs. 12000

So, amount after 4thyear

$\Rightarrow 12000 \times \frac{112}{100} = 13440\ Rs.$

98. (a); With reference to question

$P \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} = 119790$

P = 90000 Rs.

99. (a); $\frac{Amount}{principle} = \frac{10648}{8000} = \frac{1331}{1000} \Rightarrow \sqrt[3]{\frac{1331}{1000}} = \frac{11}{10}$

In 3y ears. But it is half yearly so $\frac{3}{2}$ year = 18 months

100. (a); S.I. of 2 year = 2000 + 2000

C.I. of 2 year = 4160

Difference = 160

$r\% = \frac{160}{2000} \times 100 = 8\%$

r=8%

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TIER-II / MAINS 2015-18

Previous Years' Solved Mock Papers

(English Medium)

3100 Questions with Detailed Solutions

All Shifts Papers of 2017, 2016 & 2015

QUANTITATIVE APTITUDE

Mock 02: 18th February 2018

Previous Years' E-Mock Paper

Mock 02 : 18th February 2018

1. How many three digit numbers are there in which all the digits are odd?
(a) 100 (b) 125
(c) 500 (d) 250

2. If the sum of ten different positive integers is 100, then what is the greatest possible number among these 10 numbers?
(a) 45 (b) 91
(c) 55 (d) 64

3. If N = 0.369369369369... and M = 0.531531531531..., then what is the value of (1/N) + (1/M)?
(a) 11100/2419 (b) 111/100
(c) 1897/3162 (d) 2419/11100

4. If A = $\frac{0.216+0.008}{0.36+0.04-0.12}$ and B = $\frac{0.729-0.027}{0.81+0.09+0.27}$, then what is the value of $(A^2 + B^2)^2$?
(a) 0.8 (b) 1
(c) 1.4 (d) 2.2

5. If A = $\frac{1}{1\times2}+\frac{1}{1\times4}+\frac{1}{2\times3}+\frac{1}{4\times7}+\frac{1}{3\times4}+\frac{1}{7\times10}$ ... upto 20 terms, then what is the value of A ?
(a) 379/308 (b) 171/140
(c) 379/310 (d) 420/341

6. If $56 \times 75 \times 60 \times 84 \times 210 = 2^p \times 3^q \times 5^r \times 7^s$, then what is the value of [(p + q)/s] + r?
(a) 6 (b) 8
(c) 12 (d) 10

7. If $A = 3\frac{1}{4} \times 4\frac{1}{4} \div 34 - \frac{47}{32} + \frac{47}{16}$ and $B = 2\frac{1}{2} + 5\frac{1}{2} \div 55 - \frac{11}{10}$, then what is the value of A – B ?
(a) 5/8 (b) 1
(c) 0 (d) 3/8

8. What is the sum of all natural numbers between 100 and 400 which are divisible by 13?
(a) 5681 (b) 5334
(c) 5434 (d) 5761

9. If the least common multiple of two numbers, 1728 and K is 5184, then how many values of K are possible?
(a) 11 (b) 8
(c) 6 (d) 7

10. If $(3^{33} + 3^{33} + 3^{33})(2^{33} + 2^{33}) = 6^x$, then what is the value of x?
(a) 34 (b) 35
(c) 33 (d) 33.5

11. Which of the following statement(s) is/are true?
I. $(65)^{1/6} > (17)^{1/4} > (12)^{1/3}$
II. $(17)^{1/4} > (65)^{1/6} > (12)^{1/3}$
III. $(12)^{1/3} > (17)^{1/4} > (65)^{1/6}$
(a) Only I (b) Only III
(c) Only II (d) None of these

12. If $P = 7 + 4\sqrt{3}$ and PQ = 1, then what is the value of $(1/P^2) + (1/Q^2)$?
(a) 148 (b) 189
(c) 194 (d) 204

13. If $x = (\sqrt{5}) + 1$ and $y = (\sqrt{5}) - 1$, then what is the value of $(x^2/y^2) + (y^2/x^2) + 4[(x/y) + (y/x)] + 6$?
(a) 31 (b) $23\sqrt{5}$
(c) $27\sqrt{5}$ (d) 25

14. 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

15. A root of equation $ax^2 + bx + c = 0$ (where a, b and c are rational numbers) is $5 + 3\sqrt{3}$. What is the value of $(a^2 + b^2 + c^2)/(a + b + c)$?
(a)35/3 (b) 37/3
(c) – 105/11 (d) – 105/13

16. 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

17. 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

18. 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

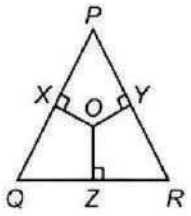
19. If x + y = 3, then what is the value of $x^3 + y^3 + 9xy$?
(a) 15 (b) 81
(c) 27 (d) 9

20. $A = (x^8 - 1)/(x^4 + 1)$ and $B = (y^4 - 1)/(y^2 + 1)$. If x = 2 and y = 9, then what is the value of $A^2 + 2AB + AB^2$?
(a) 96475 (b) 98625
(c) 92425 (d) 89125

21. 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

22. If (x/a) + (y/b) = 3 and (x/b) – (y/a) = 9, then what is the value of x/y?
(a) (b + 3 a)/(a – 3 b) (b) (a + 3 b)/(b – 3 a)
(c) (1 + 3 a)/(a + 3 b) (d) (a + 3 b^2)/(b – 3 a^2)

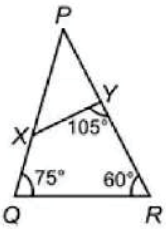
23. In the given figure, OX, OY and OZ are perpendicular bisectors of the three sides of the triangle. If ∠ QPR = 65° and ∠PQR = 60°, then what is the value (in degrees) of ∠QOR + ∠POR ?



(a) 250 (b) 180
(c) 210 (d) 125

24. In a triangle PQR, ∠PQR = 90°, PQ = 10 cm and PR = 26 cm, then what is the value (in cm) of inradius of incircle?
(a) 9 (b) 4
(c) 8 (d) 6

25. In the given figure, if $\frac{QR}{XY} = \frac{14}{9}$ and PY = 18 cm, then what is the value (in cm) of PQ ?

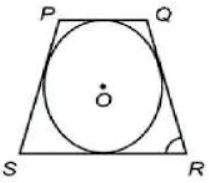


(a) 28 (b) 18
(c) 21 (d) 24

26. In a triangle PQR, PX, QY and RZ be altitudes intersecting at O. If PO = 6 cm, PX = 8 cm and QO = 4 cm, then what is the value (in cm) of QY?
(a) 6.3 (b) 5.8
(c) 6 (d) 7

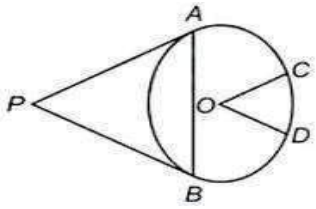
27. A line cuts two concentric circles. The lengths of chords formed by that line on the two circles are 4 cm and 16 cm. What is the difference (in cm^2) in square of radii of two circles ?
(a) 240 (b) 120
(c) 60 (d) 90

28. In the given figure, a circle touches the sides of the quadrilateral PQRS. The radius of the circle is 9 cm. ∠RSP = ∠SRQ = 60° and ∠PQR = ∠QPS = 120°. What is the perimeter (in cm) of the quadrilateral ?



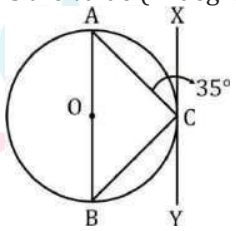
(a) $36\sqrt{3}$ (b) $24\sqrt{3}$
(c) $48\sqrt{3}$ (d) 32

29. In the given figure, from the point P two tangents PA and PB are drawn to a circle with centre O and radius 5 cm. From the point O, OC and OD are drawn parallel to PA and PB respectively. If the length of the chord AB is 5 cm, then what is the value (in degrees) of ∠COD?



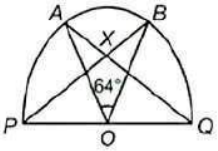
(a) 90 (b) 120
(c) 150 (d) 135

30. In the given figure, AB is a diameter of the circle with centre O and XY is the tangent at a point C. If ∠ACX = 35°, then what is the value (in degrees) of ∠CAB ?



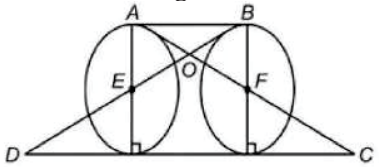
(a) 45 (b) 35
(c) 55 (d) 65

31. In the given figure, PQ is a diameter of the semicircle PABQ and O is its center. ∠AOB = 64°. BP cuts AQ at X. What is the value (in degrees) of ∠AXP ?



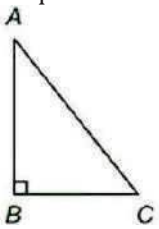
(a) 36 (b) 32
(c) 58 (d) 54

32. In the given figure, E and F are the centers of two identical circles. What is the ratio of area of triangle AOB to the area of triangle DOC ?



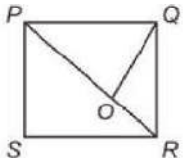
(a)1 : 3 (b) 1 : 9
(c)1 : 8 (d) 1 : 4

33. In the given figure, in a right angle triangle ABC, AB = 12 cm and AC = 15 cm. A square is inscribed in the triangle. One of the vertices of square coincides with the vertex of triangle. What is the maximum possible area (in cm^2) of the square ?



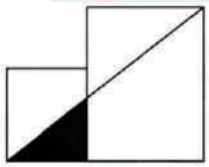
(a) 1296/49 (b) 25
(c) 1225/36 (d) 1225/64

34. In the given figure, PQRS is a square of side 8 cm. ∠PQO = 60°. What is the area (in cm^2) of the triangle POQ ?



(a) $32\sqrt{3}$ (b) $24[(\sqrt{3}) - 1]$
(c) $48[(\sqrt{3}) - 1]$ (d) $16[3 - (\sqrt{3})]$

35. In the given figure, two squares of sides 8 cm and 20 cm are given. What is the area (in cm^2) of the shaded part ?

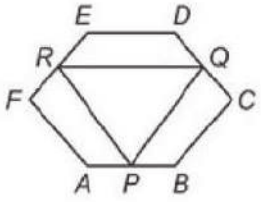


(a) 120/7 (b) 160/7
(c) 180/7 (d) 240/13

36. The area of a regular hexagon is equal to the area of the square. What is the ratio of the perimeter of the regular hexagon to the perimeter of square?

(a) $\sqrt{6\sqrt{3}} : \sqrt{3\sqrt{6}}$ (b) $2\sqrt{3} : \sqrt{6\sqrt{2}}$
(c) $\sqrt{6\sqrt{3}} : 2$ (d) $\sqrt{6\sqrt{3}} : 2\sqrt{3}$

37. In the given figure, ABCDEF is a regular hexagon of side 12 cm. P, Q and R are the mid points of the sides AB, CD and EF respectively. What is the area (in cm^2) of triangle PQR ?

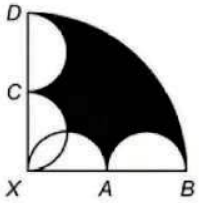


(a) $27\sqrt{6}$ (b) $81\sqrt{3}$
(c) $54\sqrt{3}$ (d) $54\sqrt{6}$

38. A man is running at the speed of 20 km/hr. What is time (in seconds) taken by man to cover one round of a circular garden of radius 350 metres?

(a) 412 (b) 336
(c) 396 (d) 376

39. In the given figure, four identical semicircles are drawn in a quadrant. XA = 7 cm. What is the area (in cm^2) of shaded region ?



(a) 70 (b) 140
(c) 77 (d) 84

40. A regular hexagonal base prism has height 8 cm and side of base is 4 cm. What is the total surface area (in cm^2) of the prism?

(a) $54(3 + \sqrt{3})$ (b) $36(3 + \sqrt{3})$
(c) $48(4 + \sqrt{3})$ (d) $24(4 + \sqrt{3})$

41. A cube is placed inside a cone of radius 20 cm and height 10 cm, one of its face being on the base of the cone and vertices of opposite face touching thecone. What is the length (in cm) of side of the cube?

(a) 5 (b) 6
(c) 8 (d) 9

42. A cylinder of radius 4.5 cm and height 12 cm just fits in another cylinder completely with their axis perpendicular. What is the radius (in cm) of secondcylinder?

(a) 5 (b) 6
(c) 15 (d) 7.5

43. A right circular cylinder has height 28 cm and radius of base 14 cm. Two hemispheres of radius 7 cm each are cut from each of the two bases of thecylinder. What is the total surface area (in cm^2) of the remaining part?

(a) 3842 (b) 4312
(c) 3296 (d) 4436

44. Two spheres of equal radius are taken out by cutting from a solid cube of side $(12 + 4\sqrt{3})$ cm. What is the maximum volume (in cm^3) of each sphere?

(a) 1077.31 (b) 905.14
(c) 966.07 (d) 1007.24

45. Three toys are in a shape of cylinder, hemisphere and cone. The three toys have same base. Height of each toy is $2\sqrt{2}$cm. What is the ratio of the totalsurface areas of cylinder, hemisphere and cone respectively?

(a) $4 : 3 : [(\sqrt{2}) + 1]$ (b) $4 : 3 : [2 + (\sqrt{2})]$
(c) $4 : 3 : 2\sqrt{2}$ (d) $2 : 1 : (1 + \sqrt{2})$

46. A solid cube is cut into 27 identical cubes. What is the percentage increase in the total surface area?
(a) 150 (b) 200
(c) 300 (d) 250

47. A regular square pyramid has side of its base 20 cm and height 45 cm is melted and recast into regular triangular pyramids of equilateral base of side 10cm and height $10\sqrt{3}$ cm. What are the total numbers of regular triangular pyramid?
(a) 24 (b) 20
(c) 27 (d) 28

48. What is the value of [(sin 7x – sin 5x)÷(cos 7x + cos 5x)] – [(cos 6x – cos 4x)÷(sin 6x + sin 4x)]?
(a) 1 (b) 2 tan x
(c) tan 2 x (d) tan (3x/2)

49. What is the value of [($\cos^3 2\theta$ + 3 cos 2θ)÷($\cos^6 \theta$ – $\sin^6 \theta$)]?
(a) 0 (b) 1
(c) 4 (d) 2

50. What is the value of $tan\left(\frac{\pi}{4}+A\right) \times tan\left(\frac{3\pi}{4}+A\right)$?
(a) 1 (b) 0
(c) cot A/2 (d) – 1

51. What is the value of $\left[(sec\ 2\theta+1)\sqrt{sec^2\theta-1}\right] \times \frac{1}{2}(cot\ \theta - tan\ \theta)$?
(a) 0 (b) 1
(c) cosec θ (d) sec θ

52. What is the value of sin (630° + A) + cos A?
(a) $\sqrt{3}/2$ (b) 1/2
(c) 0 (d) $2/\sqrt{3}$

53. What is the value of [(sin 59° cos 31° + cos 59° sin 31°)÷(cos 20° cos 25° – sin 20° sin 25°)]?
(a) $1/\sqrt{2}$ (b) $2\sqrt{2}$
(c) $\sqrt{3}$ (d) $\sqrt{2}$

54. What is the value of cos (90 – B) sin (C – A) + sin (90 + A) cos (B + C) – sin (90 – C) cos (A + B)?
(a) 1 (b) sin (A+ B – C)
(c) cos (B+ C – A) (d) 0

55. Two trees are standing along the opposite sides of a road. Distance between the two trees is 400 metres. There is a point on the road between the trees.The angle of depressions of the point from the top of the trees are 45° and 60°. If the height of the tree which makes 45° angle is 200 metres, then what will be theheight (in metres) of the other tree?
(a) 200 (b) $200\sqrt{3}$
(c) $100\sqrt{3}$ (d) 250

56. A tower stands on the top of a building which is 40 metres high. The angle of depression of a point situated on the ground from the top and bottom of thetower are found to be 60° and 45° respectively. What is the height (in metres) of tower?
(a) $20\sqrt{3}$ (b) $30(\sqrt{3}+1)$
(c) $40(\sqrt{3}-1)$ (d) $50(\sqrt{3}-1)$

57. From a point P, the angle of elevation of a tower is such that its tangent is 3/4. On walking 560 metres towards the tower the tangent of the angle ofelevation of the tower becomes 4/3. What is the height (in metres) of the tower?
(a) 720 (b) 960
(c) 840 (d) 1030

Directions (58-62): The table below shows the sales of milk in six different states as a percentage of total sales. In each state only two milkmen A and B sells the milk. The table below shows the sales of salesman A as percentage of total sale of milk in each state. The total sales of milk is 200000 litres.

Statsse	Sales of milk	Sales by a salesman A
P	24%	65%
Q	10%	80%
R	17%	50%
S	13%	70%
T	22%	60%
U	14%	80%

58. What are the average sales of milk (in litres) by the salesmen A in all the given states?
(a) 21866.67 (b) 26466.6
(c) 19200 (d) 26000

59. What is the respective ratio of sales of milk in state P and Q by salesmen B and the sales of milk in state R and T by salesmen A?
(a) 52 : 109 (b) 104 : 217
(c) 52 : 31 (d) 31 : 57

60. What will be the central angle (in degrees) formed by the average sale of milk in state Q, T and S together?
(a) 112.6 (b) 72
(c) 36 (d) 54

61. What will be difference (in litres) in the sale of milk in state T by salesmen B and the total sale of milk in state R and S together?
(a) 17600 (b) 42400
(c) 38800 (d) 19000

62. What is the difference (in litres) between the sale of milk in state R by salesmen A and the sale of milk in the same state by the salesmen B?
(a) 2000 (b) 0
(c) 12000 (d) 8000

63. A beaker contains acid and water in the ratio 1 : x. When 300 ml of the mixture and 50 ml of water are mixed, the ratio of acid and water becomes 2 : 5.What is the value of x?
(a) 2 (b) 1
(c) 3 (d) 4

64. A mixture is composed of 11 parts of pure milk and 2 parts of water. If 35 litres of water were added to the mixture then the new mixture will contain twiceas much pure milk as water, then how many litres of pure milk does the original mixture contain?
(a) 110 (b) 55
(c) 220 (d) 70

65. A starts a taxi service by investing Rs 25 lakhs. After 3 months, B joins the business by investing Rs 40 lakhs then 4 months after B joined, C too joins themby investing Rs 50 lakhs. One year after A started the business they make Rs 2,73,000 in profit. What is C's share of the profit (in Rs)?
(a) 100000 (b) 1,25,000
(c) 75000 (d) 1,50,000

66. A, B and C invest in a business in the ratio 4 : 5 : 7. C is a sleeping partner, so his share of profits will be half of what it would have been if he were a workingpartner. If they make Rs 36,000 profit of which 25% is reinvested in the business, how much does B get (in Rs)?
(a) 7560 (b) 10800
(c) 8640 (d) 9200

67. A can do a work in 36 days and B in 12 days. If they work on it together for 3 days, then what fraction of work is left?
(a) 2/3 (b) 1/3
(c) 1/4 (d) 1/5

68. A can paint a house in 45 days and B can do it in 15 days. Along with C, they did the job in 5 days only. Then, C alone can do the job in how many days?
(a) 12 (b) 9
(c) 15 (d) 8

69. A,B and C together can finish a task in 7.5 days. C is thrice as productive as A and B alone can do the task in 15 days. In how many days can A and C do the job if B goes on leave?
(a) 30 (b) 10
(c) 20 (d) 15

70. A, B and C can do job in 9, 12 and 36 days respectively if they worked alone. A leaves after they have worked together for 3 days. In how many days can Band C do the rest of the job?
(a) 3 (b) 4
(c) 5 (d) 6

71. Giving two successive discounts of 40% is equal to giving one discount of _____%.
(a) 80 (b) 96
(c) 64 (d) 72

72. If a website is selling smartphone at Rs 18,000 which is marked at Rs 25,000, then what is the discount (in %) at which the smartphone is being sold?
(a) 25 (b) 22
(c) 28 (d) 20

73. If on an item there is 12% discount on the marked price of Rs 10,000 but the item is sold at Rs 8,360 only then what additional discount (in %) did thecustomer get?
(a) 6 (b) 7
(c) 5 (d) 8

74. A shopkeeper marks up his wares by 125% and offers 25% discount. What will be the selling price if the cost price (in Rs) is Rs 640?
(a) 1080 (b) 1000
(c) 920 (d) 860

75. Priya's marks in History and Geography are in the ratio 5 : 7. If she got 14 marks more in Geography than in History, what are her History marks?
(a) 49 (b) 42
(c) 56 (d) 35

76. The ratio of present ages of Rahul and his sister is 3 : 4. Before 10 years the ratio of their ages was 13:19. What is Rahul's present age (in years)?
(a) 36 (b) 48
(c) 42 (d) 54

77. What is the third proportional to 9 and 15?
(a) 30 (b) 27
(c) 36 (d) 25

78. According to the will, the wealth of Rs 11,50,000 was to be divided between the son and the daughter in the ratio 2/3 : 5/4. How much share did the son get(in Rs lakhs)?
(a) 5 (b) 6
(c) 7 (d) 4

79. If Rs 7,800 is to be divided between A, B and C in the ratio 1/2 : 1/3 : 1/4, then how much share will B get (in Rs)?
(a) 3600 (b) 1800
(c) 2400 (d) 1200

80. Bunty had candies and chewing gums in his sweet box in the ratio 7 : 13. After he has eaten 8 candies and 11 chewing gums the ratio became 1 : 2. Howmany candies does he have now?
(a) 65 (b) 35
(c) 54 (d) 27

81. The average weight of P, Q and R is 71 kg. If the average weight of P and Q be 66 kg and that of Q and R be 76.5 kg, then the weight (in kg) of Q is.
(a) 60 (b) 72
(c) 81 (d) 75

82. Rita buys 5 sarees at an average cost of Rs 2250. If she buys three more sarees at an average cost of Rs 2750, what will be the average (in Rs) of all thesarees she buys?

(a) 2437.5 (b) 2500
(c) 2450 (d) 2332.5

83. In a one day match of 50 overs in an innings the team A had a run rate of 5.3 runs per over. Team B is playing and 5 overs are left and the required run rate to tie the match is 7.2 per over to match the score of Team A. What is team B's score?
(a) 265 (b) 238
(c) 254 (d) 229

84. Average of all even numbers between 104 and 148 is _____.
(a) 128 (b) 130
(c) 124 (d) 126

85. A vendor buys bananas at 4 for Rs 3 and sells at 3 for Rs 4. What will be the result?
(a) 43.75% profit (b) 77.7% loss
(c) 77.7% profit (d) 43.75% loss

86. A wholesaler sells a watch to a retailer at a profit of 8% and the retailer sells it to a customer at a profit of 12%. If the customer pays Rs. 8,448 what had it cost (approximately) to the wholesaler (in Rs)?
(a) 6984 (b) 6082
(c) 7120 (d) 7022

87. A trader had 2000 kgs of rice. He sold a part of it at 10% profit and the rest at 16% profit, so that he made a total profit of 14.2%. How much rice (in kg) didhe sell at 10% profit?
(a) 1400 (b) 600
(c) 800 (d) 1000

88. A used car dealer sells a car for Rs 7.6 lakhs and makes some loss. If he had sold it for Rs 9.2 lakhs his profit would have been thrice his loss. What was thecost price of the car (in Rs lakhs)?
(a) 8.5 (b) 8.75
(c) 8.25 (d) 8

89. 0.09% of 25% of 1200 is equal to_____.
(a) 0.27 (b) 2.7
(c) 27 (d) 270

90. When a number is increased by 20, it becomes 116% of itself. What is the number?
(a) 100 (b) 250
(c) 125 (d) 400

91. Two numbers are 50% and 75% lesser than a third number. By how much percent is the second number to be enhanced to make it equal to the first number?
(a) 50 (b) 25
(c) 75 (d) 100

92. Price of petrol increased from Rs 60/liter to Rs 75/liter. How much should the consumption of petrol be reduced (in %) so as to increase expenditure by only10%?
(a) 12 (b) 20
(c) 15 (d) 18

93. A train has to cover a distance of 900 km in 25 hours. What should be its average speed in meters/second?
(a) 20 (b) 10
(c) 18 (d) 36

94. If a boat goes upstream at a speed of 18 km/hr and comes back the same distance at 30 km/hr. What is the average speed (in km/hr) for the total journey?
(a) 22.5 (b) 24
(c) 20.5 (d) 25

95. Two cyclists A and B start cycling at 21 km/hr and 24 km/hr towards each other. They meet after 1 hour and 12 minutes. How far (in km) were they from each other when they started?
(a) 48 (b) 42
(c) 54 (d) 36

96. Excluding stoppages, the speed of a bus is 60 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?
(a) 12 (b) 9
(c) 15 (d) 10

97. If in 3 years at simple interest the principal increases by 15%. What will be the approximate compound interest earned (in Rs lakhs) on Rs 15 lakhs in 3years at the same rate?
(a) 7.81 (b) 2.87
(c) 2.36 (d) 3.38

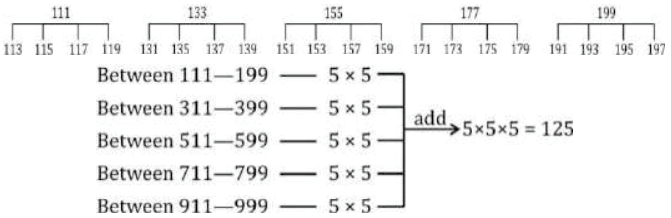
98. If the amount received at the end of 2nd and 3rd year at compound Interest on a certain Principal is Rs 9,600 and Rs 10,272 respectively, what is the rate of interest (in %)?
(a) 7 (b) 8
(c) 6 (d) 5

99. A invested an amount of x rupees in a bank for 2 years which gave 5% interest in year 1 and 6% interest in year 2. The amount received after 2 years is Rs24,486. What is the value of x?
(a) 23000 (b) 22500
(c) 22000 (d) 21500

100. What is the difference (in Rs) in Compound interest earned in 1 year on a sum of Rs 10,000 at 40% per annum compounded quarterly and annually?
(a) 461 (b) 346
(c) 463 (d) 641

Solutions

1. (b); Smallest three digit number with all digit odd – 111
Largest three digit number with all digit odd – 999
In between 111 — 199 there are 125 no. which have all odd digits



Method-2
Here we need to form a 3 digit Number given condition that all three digits of No. are odd the digits we can use here are all the digits from 0 to 9 and since nothing is mentioned about the digit being Related or not, we always consider the value with repetition case.
So Making & empty space – odd odd odd.
The total Number of ways of filling the unit digit is 5, since we can use only one out of 1, 3, 5, 7, 9 similarly the total Number of ways of filling the feus digit and hundreds digit is 5.
So the answer here will be 5×5×5=125

2. (c); To find the greatest value , when sum of 10 integers is 100 is possible only if we take 1 to 9 value because 1to 9 is the smallest natural numbers and let 10^{th} value which is greatest is x
For greatest among these integers
Sum=(1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9) + x
100=45 + x
x = 55

3. (a); Given
N = 0.369369369 .....
&M = 0.531531531.....
$N = \frac{369}{999}$ & $M = \frac{531}{999}$
(As 0.abcabcabc = $\frac{abc}{999}$)
Value of $\frac{1}{N} + \frac{1}{M} = \frac{999}{369} + \frac{999}{531}$
$= \frac{11100}{2419}$

4. (b); given
$A = \frac{0.216+0.008}{0.36+0.04-0.12} \Rightarrow \frac{(0.6)^3+(0.2)^3}{(0.6)^2+(0.2)^2-0.6\times0.2}$
as we know $\Rightarrow \frac{a^3+b^3}{a^2+b^2-ab} \Rightarrow \frac{(a+b)(a^2+b^2-ab)}{(a^2+b^2-ab)}$
Hence, A ⇒ (a + b) ⇒ 0.6 + 0.2 ⇒ 0.8
Similarly,
$B = \frac{(0.9)^3-(0.3)^3}{(0.9)^2+(0.3)^2+0.9\times0.3} \Rightarrow \frac{a^2-b^3}{a^2+b^2+ab}$
$\Rightarrow \frac{(a-b)(a^2+b^2+ab)}{(a^2+b^2+ab)}$ $\left[\begin{matrix} a^3-b^3=(a-b)(a^2+b^2+ab) \\ \& \\ a^3+b^3=(a+b)(a^2+b^2-ab) \end{matrix}\right]$
B ⇒ 0.9 – 0.3 = 0.6
So, $(A^2+B^2)^2 \Rightarrow [(0.8)^2+(0.6)^2]^2 = 1$

5. (d); GIVEN
$A = \frac{1}{1\times2} + \frac{1}{1\times4} + \frac{1}{2\times3} + \frac{1}{4\times7} \ldots . 20\ terms$
Break above series in two parts $A=A_1+A_2$
$A_1 = \frac{1}{1\times2} + \frac{1}{2\times3} + \frac{1}{3\times4} + \cdots + \frac{1}{10\times11}(10^{TH}\ term)$
$A_1 = \left[1-\frac{1}{2}+\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}+\ldots+\frac{1}{10}-\frac{1}{11}\right]$
$A_1 = \left[1-\frac{1}{11}\right] = \frac{10}{11}$
&
$A_2 = \frac{1}{1\times4} + \frac{1}{4\times7} + \frac{1}{7\times10} + \ldots + \frac{1}{28\times31}$
$A_2 = \frac{1}{3}\left[1-\frac{1}{4}+\frac{1}{4}-\frac{1}{7}+\frac{1}{7}-\frac{1}{10}+\ldots+\frac{1}{28}-\frac{1}{31}\right]$ $[S_{10} = a+(n-1)d = 1+(10-1)\times3 = 28]$
$A_2 = \frac{1}{3}\left[1-\frac{1}{31}\right] = \frac{10}{31}$
$\therefore A = A_1 + A_2$
$A = \frac{10}{11} + \frac{10}{31} = \frac{420}{341}$

6. (b); GIVEN EQUATION
$56 \times 75 \times 60 \times 84 \times 210 = 2^p \times 3^q \times 5^4 \times 7^s$
$2^8 \times 3^4 \times 5^7 \times 7^3 = 2^p \times 3^q \times 5^r \times 7^s$
On comparing both side
p = 8, q = 4, r = 7, s = 3
The value of $\left[\frac{(p+q)}{s}\right] + r$
$\Rightarrow \left[\frac{8+4}{3}\right] + 4 \Rightarrow 8$

7. (d); GIVEN
$A = 3\frac{1}{4} \times 4\frac{1}{4} \div 34 - \frac{47}{32} + \frac{47}{16}$
$A \Rightarrow \frac{13}{4} \times \frac{17}{4} \times \frac{1}{34} - \frac{47}{32} + \frac{47}{16}$
$= \frac{13}{32} + \frac{47}{32} = \frac{60}{32} = \frac{30}{16}$
&
$B = 2\frac{1}{2} + 5\frac{1}{2} \div 55 - \frac{11}{10}$
$= \frac{25+1-11}{10}$
$= \frac{15}{10}$
SO,
$A - B = \frac{30}{16} - \frac{15}{10} = \frac{60}{160} = \frac{3}{8}$

8. (a); TO find the sum of natural No. which is divisible by 13 between 100 and 400 ,we should calculate
Sum of no. between 1– 400, divisible by 13 is
$S_1 \Rightarrow \frac{30}{2}[2\times13 + (30-1)\times13]$
$[sum = \frac{n}{2}[2\times a + (n-1)d](as\ there\ are \frac{400}{13} = 30\ numbers)$
$S_1 = 15[26 + 29 \times 13]$.....(1)

Sum of no. between 1–100, divisible by 13 is

$S_2 \Rightarrow \frac{7}{2}[2 \times 13 + 6 \times 13]$

$S_2 \Rightarrow 7 \times 13 \times 4$ .....(2)

$\therefore$ sum of No. between 100-400 are = $S_1 - S_2$

$= 5681$

9. (d); One number which is given is 1728

Let another number is K

LCM (K, 1728) = 5184

LCM (K, $3^3 \times 2^6$)=$2^6 \times 3^4$

K=3^4 *is fix*, as we know LCM of 3^4&3^3 is 3^4

And power of 2 is possible from (0-6) i.e [$2^{(0-6)}$]

As we know LCM of $2^{(0-6)}$&2^6 is 2^6 which is given in LCM or RHS

So total value possible is 0-6 = 7 values

10. (a); GIVEN

$(3^{33} + 3^{33} + 3^{33})(2^{33} + 2^{33}) = 6^x$

$\Rightarrow 3^{33} \times (1 + 1 + 1)2^{33}(1 + 1) = 6^x$

$\Rightarrow 3^{33} \times 3 \times 2^{33} \times 2 = 6^x$

$\Rightarrow 3^{34} \times 2^{34} = 6^x$

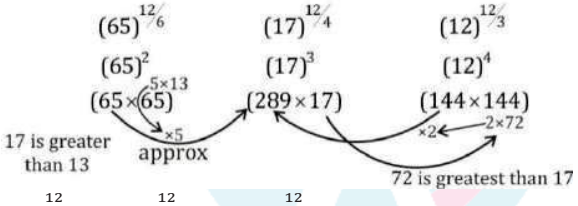
$\Rightarrow (2 \times 3)^{34} = 6^x$

$\therefore$ x = 34

11. (b); Take different options separately from question

$(65)^{1/6}$, $(17)^{1/4}$ &$(12)^{1/3}$

LCM (6, 4, 3) = 12



$(65)^{\frac{12}{6}}$, $(17)^{\frac{12}{4}}$ & $(12)^{\frac{12}{3}}$

$(65)^2$, $(17)^3$ & $(12)^4$

$(12)^4$ *is greater* than $(17)^3$ which is greater than$(65)^2$

$\therefore$ correct sequence is

$(12)^{\frac{1}{3}} > (17)^{\frac{1}{4}} > (65)^{\frac{1}{6}}$

12. (c); GIVEN:-

P = $7 + 4\sqrt{3}$ .....(1) &PQ = 1

$Q = \frac{1}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$ &$Q = \frac{1}{P}$

Q = $7 - 4\sqrt{3}$.....(2)

From equ 1 & 2

$P \times Q = (7 + 4\sqrt{3})(7 - 4\sqrt{3})$

$= (49)^2 - (4\sqrt{3})^2 = 1$

&

$P + Q = 7 + 4\sqrt{3} + 7 - 4\sqrt{3} = 14$

So, the value of

$\frac{1}{P^2} + \frac{1}{Q^2} = \frac{(P^2+Q^2)}{P^2Q^2} = \frac{(P+Q)^2-2PQ}{(PQ)^2}$

$\Rightarrow \frac{(14)^2-2\times1}{1}$

$\Rightarrow 194$

13. (d); GIVEN:-

x = $\sqrt{5} + 1$.....(1)

y = $\sqrt{5} - 1$.....(2)

FROM EQ (1)&(2)

x + y = $2\sqrt{5}$&

$x \times y = 4$

$x^2 + y^2 = (x + y)^2 - 2xy = 4 \times 5 - 2 \times 4$

$x^2 + y^2 = 12$

So, the value of

$= \frac{x^2}{y^2} + \frac{y^2}{x^2} + 4\left[\frac{x}{y} + \frac{y}{x}\right] + 6$

$= \frac{x^4+y^4}{x^2y^2} + 4\left[\frac{x^2+y^2}{xy}\right] + 6$

$= \frac{(x^2+y^2)^2-2x^2y^2}{x^2y^2} + 4\left[\frac{(x+y)^2-2xy}{xy}\right] + 6$ .....(3)

Put all values in eq 3

$\frac{(12)^2-2\times16}{16} + 4 \times \frac{(12)}{4} + 6 \Rightarrow 7 + 18 \Rightarrow 25$

14. (a); GIVEN

$x = 2 + \sqrt{3}$,

$y = 2 - \sqrt{3}$&

z = 1

HENCE from above given values

$x \times y \times z = 4 - 3 = 1$&

$x + y + z = 4 + 1 = 5$

and also the sum of their square is

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

= 7 + 7 + 1

= 15

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

$(5)^2 = 15 + 2(xy + yz + zx)$

$xy + yz + zx = \frac{10}{5} = 2$

Find

$\frac{x}{yz} + \frac{y}{xz} + \frac{z}{xy} + 2\left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right]$

$\frac{x^2+y^2+z^2}{xyz} + 2\left[\frac{xy+yz+zx}{xyz}\right]$

Put values

$\Rightarrow \frac{15}{1} + \frac{2[5]}{1} \Rightarrow 25$

15. (c); GIVEN EQUATION IS

$ax^2 + bx + c = 0$

one root (α) = $5 + 3\sqrt{3}$

Second root (β) = $5 - 3\sqrt{3}$

[As we know if one root is $5 + 3\sqrt{3}$ *THEN* second is $5 - 3\sqrt{3}$]

$\alpha + \beta = \frac{-b}{a}$.....(1) & $\alpha \times \beta = \frac{c}{a}$.....(2)

ON PUTTING THE VALUES

Equation 1 and 2 becomes

$10 = \frac{-b}{a}$ & $25 - 3 \times 3 \times 3 = \frac{c}{a} = -2$

So from above value of

a = 1, b = –10, c = –2

So, value of $\frac{(a^2+b^2+c^2)}{a+b+c} = \frac{100+4+1}{1-10-2} = \frac{-105}{11}$

16. (a);GIVEN

$x = \frac{a}{b} + \frac{b}{a}$, $y = \frac{b}{c} + \frac{c}{b}$, $\&z = \frac{c}{a} + \frac{a}{c}$

put a = b = c = 1

x = y = z will come out as 2

put in eqn. to find xyz – $(x^2 + y^2 + z^2)$

$\Rightarrow 2 \times 2 \times 2 - (4 + 4 + 4) \Rightarrow -4$

17. (d);GIVEN EQUATION IS

$\left[a + \frac{1}{a}\right]^2 - 2\left[a - \frac{1}{a}\right] = 12$

$\left(a - \frac{1}{a}\right)^2 + 4 - 2\left(a - \frac{1}{a}\right) = 12$ .....(1)

AS WE KNOW $\left[\left(a + \frac{1}{a}\right)^2 = \left(a - \frac{1}{a}\right)^2 + 4\right.$

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

$\left.a^2 + \frac{1}{a^2} + 2 = a^2 + \frac{1}{a^2} + 2\right]$, **HENCE we put** $\left(a + \frac{1}{a}\right)^2$ *in place of* $\left(a - \frac{1}{a}\right)^2 + 4$

Now let $(a - \frac{1}{a}) = y$, then eq 1 becomes

$y^2 - 2y - 8 = 0$

$y \Rightarrow \frac{2 \pm \sqrt{4+32}}{2}$

$y = 4, -2$

Now

$a - \frac{1}{a} = 4$

$(a^2 - 1 - 4a) = 0$

$a \Rightarrow \frac{4 \pm \sqrt{16+4}}{2}$

$a \Rightarrow 2 \pm \sqrt{5}$ = None of these

18. (b);From question given eq is $x^2 - 4x + 1 = 0$

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

Squaring both sides

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

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

$\Rightarrow x^4 + \frac{1}{x^4} = 194 \ldots\ldots (t)$

To find

$\Rightarrow x^9 + x^7 - 194x^5 - 194x^3$

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

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

From equation (t) the value of

$(x^4 - 194) = -\frac{1}{x^4}$

Put value of $(x^4 - 194) = -\frac{1}{x^4}$ in eqn. (i)

$\frac{-1}{x^4}(x^3 + x^5)$

$\Rightarrow -\left(x + \frac{1}{x}\right) \Rightarrow -4$

19. (c); GIVEN

x + y = 3

cubing both side

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

$x^3 + y^3 + 3xy\,(3) = 27$

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

20. (b);GIVEN

$A = \frac{x^8 - 1}{x^4 + 1}$ & $B = \frac{y^4 - 1}{y^2 + 1}$

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

Simplify both A & B

$A = \frac{(x^4-1)(x^4+1)}{(x^4+1)}$ & $B = \frac{(y^2-1)(y^2+1)}{(y^2+1)}$

$A = (x^4 - 1)$& B= $(y^2 - 1)$

If x = 2 & y = 9

Then

$A = 2^4 - 1 \Rightarrow 15$

$B = 9^2 - 1 \Rightarrow 80$

To find,put value of A & B

$\Rightarrow A^2 + AB^2 + 2AB$

$\Rightarrow (15)^2 + 15 \times (80)^2 + 2 \times 15 \times 80$

= 225 + 96000 + 2400

$\Rightarrow$ 98625

21. (b);GIVEN EQ SOLVING THOSE EQUATIONS

$x - 4y = 0 \quad \ldots(i)$

$x + 2y = 24 \quad \ldots(ii)$

$-6y = -24$

$y = 4$

put in (i) y = 4,

then x = 16

value of

$\frac{(2x+3y)}{(2x-3y)} \Rightarrow \frac{2\times16+3\times4}{2\times16-3\times4}$

$= \frac{44}{20} = \frac{11}{5}$

22. (a);GIVEN

$\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 3$, $\&\left(\frac{x}{b}\right) - \left(\frac{y}{a}\right) = 9$

$xb + ya = 3ab$ .....(1)

& $xa - yb = 9ab \ldots\ldots(2)$

put value of 3ab from eq 2 in eq 1

$xb + ya = \frac{xa-yb}{3}$

3xb + 3ya = xa – yb

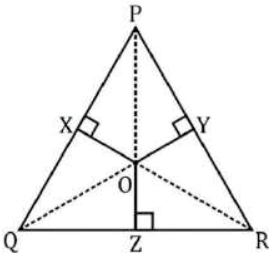
3xb – xa = – yb – 3ya

x (3b – a) = – y (b + 3a)

$\Rightarrow \frac{x}{y} = \left(\frac{b+3a}{a-3b}\right)$

23. (a);given figure PQR is a triangle and X,Y & Z are perpendicular and given are ∠ PQR = 60

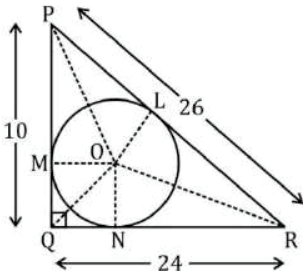
& ∠QPR = 65



As ∠ PQR = 60

So angle POR = 2 × PQR = 120 [angle of centre is double of angle at vertex]
∠QPR = 65 So angle QOR = 2 × QPR = 130
∠POR + ∠QOR = 250

24. (b); Given figure is aright angled triangle of 10,24,26

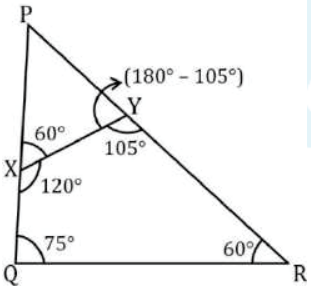


From the figure
$QR = \sqrt{PR^2 - PQ^2} = \sqrt{26^2 - 10^2} = \sqrt{36 \times 16}$
QR = 24
$Inradius = \frac{area\ of\ PQR}{semi\ perimeter\ of\ PQ}$
$= \frac{\frac{1}{2} \times 24 \times 10}{\frac{1}{2}(24+26+10)}$
⇒ 4

Method-2

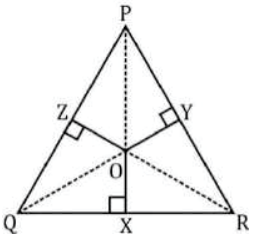
Inradius of right angle tringle(r)= $\frac{PQ+QR-PR}{2}$
$= \frac{10+24-26}{2}$
= 4

25. (a); FROM THE GIVEN FIGURE
$\frac{QR}{XY} = \frac{14}{9}$ & PY=18 GIVEN



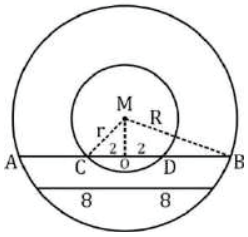
∠XYR = 105
So, PYX = (180 – 105) = 75
∠YXQ = 120
So, PXY = (180 – 120) = 60
∴ ΔPQR ≈ ΔPYX
$\frac{QR}{XY} = \frac{PQ}{PY} \Rightarrow \frac{14}{9} = \frac{PQ}{18}$
⇒ PQ = 28

26. (d); GIVEN IS



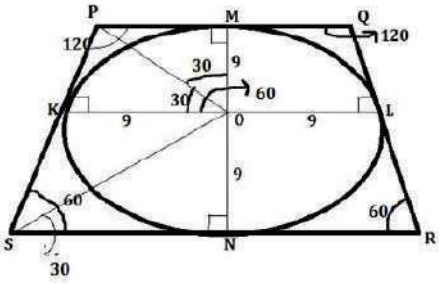
PO = 6 (given)
PX = 8 (given)
So, OX = 2
QO = 4 (given)
∠QXO = ∠PYO = 90° (given in ques)
∠QOX = ∠POY [corresponding angle]
So
ΔQOX ≈ ΔPOY
$\frac{QO}{PO} = \frac{OX}{OY}$
$\frac{4}{6} = \frac{2}{OY} \Rightarrow OY = 3$
So, QY = QO + OY = 4 + 3 ⇒ 7

27. (c); AB=16 & CD=4 (GIVEN IN QUES)



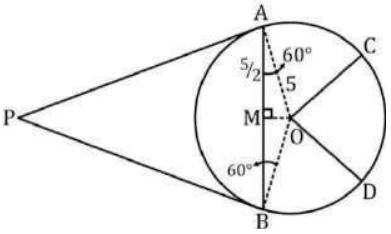
SO,
CO = OD = 2 & AO = OB = 8
In ΔMCO, let CM=r (radius of smaller circle)
$CM^2 = OM^2 + OC^2$
$r^2 = OM^2 + OC^2$
$r^2 = OM^2 + (2)^2$ ...(i)
In ΔMBO , let MB =R (radius of bigger circle)
$MB^2 = OM^2 + OB^2$
$R^2 = OM^2 + (8)^2$ ...(ii)
From (i) & (ii)
$r^2 - 2^2 = R^2 - (8)^2$
$R^2 - r^2 = 64 - 4 = 60$

28. (c); Here given a diagram as shown in the question



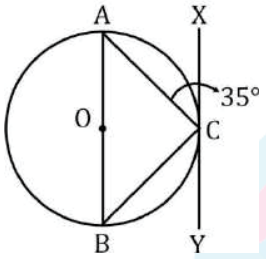
∠RSP = ∠SRO = 60 (Given)
∠PQR = ∠QPS = 120 (Given)
In a quadrilateral PMOK
∠MOK = 180 – 120 = 60
∠POM = ∠KOP = 30
OK = OM = 9 (Given)
In ΔPOM
$\tan 30 = \frac{PM}{9} \Rightarrow PM = 3\sqrt{3} = PK = MQ = QL$
Similarly In ΔSON ⇒ $\tan 30 = \frac{ON}{SN}$
$SN = 9\sqrt{3} = SK = NR = RL$
So, perimeter PQRS
$= 3\sqrt{3} \times 4 + 9\sqrt{3} \times 4$
$= 4 \times 12\sqrt{3} = 48\sqrt{3}$

29. (b);



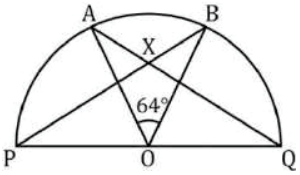
AB = 5 (Given)
Radius = 5 (given)
Hence ΔAOB is an equilateral triangle,
So,
θ = 60° = ∠BOM
because AO = OB = radius
∠AOB = 60
∠PAM = ∠PBM = 90 – 60 = 30 each
∠APB = 180 – (30 + 30) = 120 = ∠COD
Because PA∥OC & PB∥OD

30. (c);



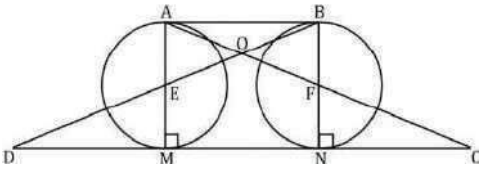
∠ACB = 90 [angle on semicircle is always 90]
∠ACX = 35
∠ACX = ∠ABC = 35° (it is a property)
So,
∠BAC or ∠CAB = (90 – 35) = 55°

31. (c); GIVEN DIAGRAM PQ is diameter of circle with center O, angle AOB=64



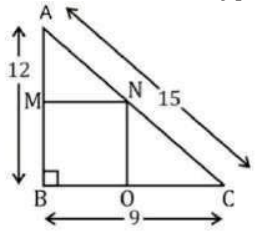
If we draw line AP Then
$\angle APB = \frac{1}{2}\angle AOB = 32$ (Angle at circumference with same arc is always half of the angle at center)
∠PAQ = 90
(angle at semicircle with diameter is always 90)
So,
∠AXP = 180 – (∠APB+∠PAQ)=180-(90+22) = 58°

32. (b); ACCORDING TO QUESTION FIGURE IS DRAWN, two circles with center E & F



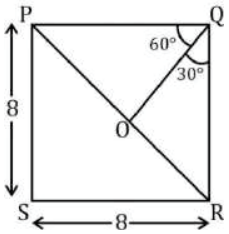
∠AEB ≈ MED
∠AFB ≈ CFN
So,
AB = DM = CN
& AB = MN
[As shown in fig]
$\frac{AB}{DM+MN+NC} = \frac{AB}{DC} = \frac{1}{3}$
So,
$\frac{Area\ of\ \Delta AOB}{Area\ of\ \Delta DOC} = \frac{AB^2}{DC^2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$

33. (a); GIVEN
AB=12, AC=15 hence by triplets 9,12,15
BC=9 & ABC Is a right angled triangle ,if a square of maximum area is to be constructed then its fourth vertex is on hypotenuse as shown in figure



AB = 12, AC = 15 [Given]
So, BC = 9 [by triplets]
A side of square MNOB
$\Rightarrow \frac{12\times9}{12+9}$
$= \frac{36}{7}$ $\left[side = \frac{AB\times BC}{AB+BC}\right]$
So,
Area of square = $\left(\frac{36}{7}\right)^2 = \frac{1296}{49}$

34. (d); A square PQRS with side 8 and ∠PQO = 60 are given



∠PQO = 60
So, ∠OQR = 30°
Area of PQR = $\frac{8\times8}{2}$=32
Area of PQR = Area of POQ + Area of QOR
$32 = \frac{1}{2}\times PQ \times QO\ sin\ 60 + \frac{1}{2}\times OQ \times QR \times sin\ 30$
$32 = \frac{1}{2}\times OQ\left[8\times\frac{\sqrt{3}}{2} + 8\times\frac{1}{2}\right]$
OQ = $\frac{2\times32}{4(\sqrt{3}+1)}$
Area of ΔPOQ = $\frac{1}{2}\times8\times\frac{8\times2}{\sqrt{3}+1}\times\frac{\sqrt{3}}{2}$
$= 2\times\frac{16\times\sqrt{3}}{\sqrt{3}+1}\times\frac{\sqrt{3}-1}{\sqrt{3}-1}$
+
$\Rightarrow \frac{16\times2(3-\sqrt{3})}{2} \Rightarrow 16(3-\sqrt{3})$

Shortcut method:-

$Area\ of\ POQ : Area\ QOR$

$\sin 60 : \sin 30$

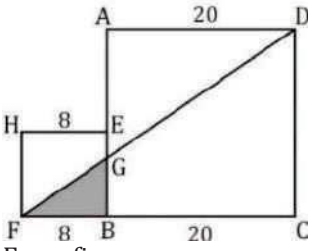
$\sqrt{3} : 1$

Area of PQR = 32

So, Area of POQ is

$\frac{\sqrt{3}}{\sqrt{3}+1} \times 32 \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = 16(3-\sqrt{3})$

35. (b); TWO square of side 20 & 8 as shown by diagram



From fig

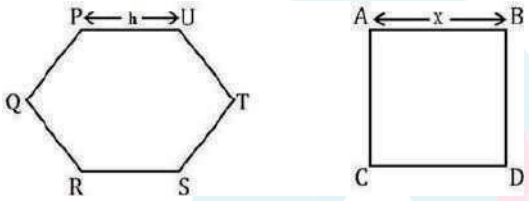
$\Delta FGB \approx \Delta FDC$

$\frac{GB}{DC} = \frac{FB}{FC} \Rightarrow \frac{GB}{20} = \frac{8}{28} \Rightarrow GB = \frac{40}{7}$

Area of shaded part is

$A = \frac{1}{2} \times 8 \times \frac{40}{7} \Rightarrow A = \frac{160}{7}$

36. (d);



Given in question

Area of PQRSTU = Area of ABCD

Let side of hexagon is h and side of square is x

$6 \times \frac{\sqrt{3}}{4} \times [\text{side of hexagon (h)}]^2$

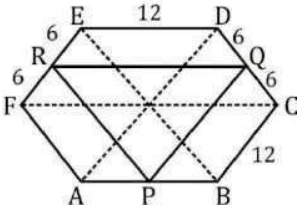
$= [\text{side of square (x)}]^2$

$\frac{h^2}{x^2} = \frac{2}{3\sqrt{3}} \Rightarrow \frac{h}{x} = \frac{\sqrt{2}}{\sqrt{3\sqrt{3}}}$

$\frac{perimeter\ of\ hexagonal}{Perimeter\ of\ square} = \frac{6\times\sqrt{2}}{4\times\sqrt{3\sqrt{3}}}$

$= \frac{\sqrt{2\times3\times3\times\sqrt{3}}}{\sqrt{3\times4\times\sqrt{3}\times\sqrt{3}}} = \frac{\sqrt{6\sqrt{3}}}{2\sqrt{3}}$

37. (b); ABCDE is a regular hexagon with side 12



As we know

Diagonal of regular hexagonal = 2 × side

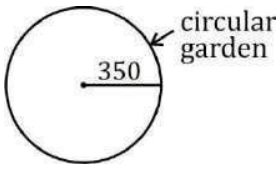
FC = EB = AD = 2 × 12 = 24

RQ = $\frac{FC+ED}{2} = \frac{12+24}{2}$=18

So, Area of equilateral triangle PQR

$= \frac{\sqrt{3}}{4} \times 18 \times 18 = 81\sqrt{3}$

38. (c);



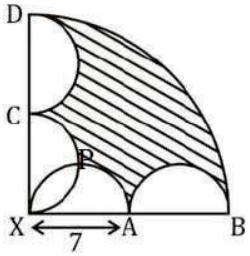
Speed of man = 20 km/hr (GIVEN), radius=350 m

Speed in m/s = $20 \times \frac{5}{18}$

$D = 2\pi r = 2 \times \frac{22}{7} \times 350$

$T = \frac{Distance}{Speed} = \frac{2\times\frac{22}{7}\times350}{20\times\frac{5}{18}} \Rightarrow 396\ sec.$

39. (d);



Area of shade portion = Area of quadrant – (Area of four semicircle – area of arc XP)

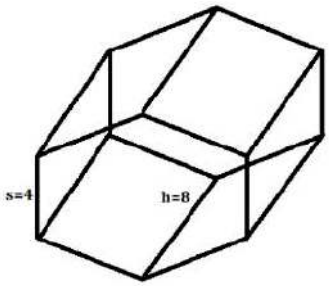
$= \frac{\pi r^2\theta}{360} - \frac{4\pi r_1^2\theta}{360} - \left(\frac{7}{2}\right)^2\left[\frac{\pi}{2}-1\right]$

$= \frac{22}{7} \times \frac{14\times14\times90}{360} - \left[4 \times \frac{22}{7} \times \frac{49\times180}{4\times360} - \frac{49}{4} \times \frac{(22-14)}{14}\right]$

$= 11 \times 14 - [11 \times 7 - 7]$

$\Rightarrow 154 - 70 = 84$

40. (c);



Prism base is hexagon of base side = 4 cm

Height = 8 cm

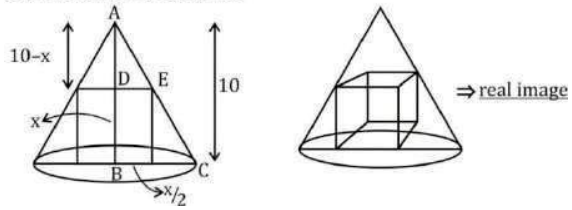
T. Surface area of Prism ⇒ C.S. Area + 2 × area of base = perimeter of base × ht + $2 \times \frac{\sqrt{3}}{4} \times a^2$

$= 6 \times 4 \times 8 + 2 \times \frac{\sqrt{3}}{4} \times 4 \times 4 \times 6$

$= 48\ (4 + \sqrt{3})$

41. (c);

from front view it looks like



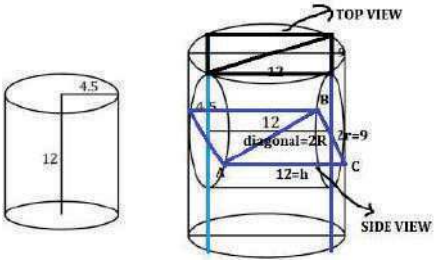
AB = 10 (HEIGHT GIVEN)

Let DB = x therefore DE=x/2
So, AD = 10 – x
BC = 20 cm (radius given)
ΔADE ≈ ABC

$\frac{AD}{AB} = \frac{DE}{BC} \Rightarrow \frac{10-x}{10} = \frac{\frac{x}{2}}{20} \Rightarrow \frac{10-x}{10} = \frac{x}{40}$

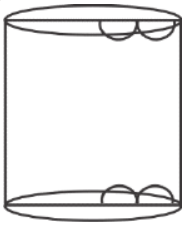
400 – 40x = 10x ⇒ x ⇒ 8 cm

42. (d); if a cylinder of radius 4.5 and height 12 is fitted into another cylinder horizontally then radius of cylinder is



In figure given the view of cylinder in both side and top view
In abc triangle
AC=ht of 1st cylinder=12 &BC=diameter of 1st cylinder=9
Hence AB is the diameter of new cylinder
diameter = $\sqrt{(BC)^2 + (AC)^2}$
$2r = \sqrt{9^2 + 12^2} = 15$
$r = \frac{15}{2} = 7.5\ cm$

43. (b);

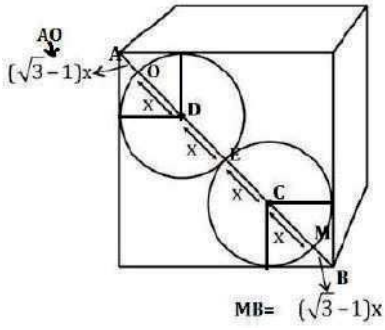


T.S.A of cylinder | Area of four circles | lateral surface are of spheres

$2\pi \times 28 \times + 2\pi \times 14^2 - 4\pi \times 7^2 + 8\pi \times 7^2$

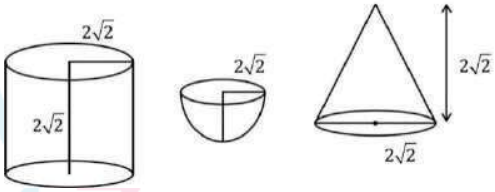
$= 2\pi\ (28 \times 14 + 14^2 + 2 \times 7^2) = 4312 cm^2$

44. (b); FROM the question two spheres of maximum sides are cut from cube of side $(12 + 4\sqrt{3})$
For maximum condition spheres must be cut diagonally as shown in diagram



Side of cube = $(12 + 4\sqrt{3})$ (GIVEN)
Diagonal = $(12 + 4\sqrt{3})\ \sqrt{3}$
Diagonal = $12\sqrt{3} + 12$ ... (i)
As shown is fig
Let radius of sphere is x hence, DIAGONAL OF CUBE= AD=$\sqrt{3}x$
As OD=x , so AO=$(\sqrt{3}-1)x$
Similarly
CB=$(\sqrt{3})x$, BM=$(\sqrt{3}-1)x$
SO According to figure
Diagonal (AB)=AO+BM+OD+DE+CE+CM
D = $(\sqrt{3}-1)x + (\sqrt{3}-1)x + 4x$
D = $(2\sqrt{3}+2)x$ ... (ii)
Compare (i) & (ii)
$6(2\sqrt{3}+12) = (2\sqrt{3}+12)x$
$x = 6$ [radius]
Diagonal of cube = $a\sqrt{3}$
Volume of sphere = $\frac{4}{3}\pi \times 6 \times 6 \times 6$
V = 288 π
V = 288 × 3.14
V = 905.14 cm^3

45. (a);



Ratio of total surface area of cylinder, hemisphere & cone IS
$Cylinder : Hemisphere : Cone$

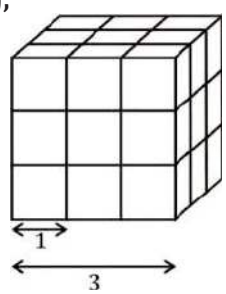
$2\pi r(r+h)$: $3\pi r^2$: $\pi r(r+\ell)$

$2(2\sqrt{2}+2\sqrt{2})$: $3 \times 2\sqrt{2}$: $2\sqrt{2} + \sqrt{(2\sqrt{2})^2 \times 2}$

$8\sqrt{2}$: $6\sqrt{2}$: $2\sqrt{2}(1+\sqrt{2})$

4: 3 : $(1+\sqrt{2})$

46. (b);



Suppose side of big cube is 3 cm
And small cube is 1 cm as big cube is cut by three small cube
So,
T.S.A. of big cube = $6 \times (3)^2 = 54$

T.S.A. of 1 small cube = $6 \times (1)^2 = 6$
There are 27 small cube
T.S.A. of 27 small cube = 27×6
% increase in T.S.A. = $\frac{(27\times6-54)}{54} \times 100 = 200\%$

47. (a); A square base pyramid of side 20 and height 45 is recasted into equilateral triangular pyramid of side 10 and height $10\sqrt{3}$, *then number of pyramid constructed are*
Volume of square pyramid = N × volume of triangular pyramid
$\frac{1}{3} \times 20 \times 20 \times 45 = N \times \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 10 \times 10 \times 10\sqrt{3}$
N = 2 × 2 × 2 × 3
N= 24

48. (b); GIVEN
$\frac{\sin 7x-\sin 5x}{\cos 7x+\cos 5x} - \left[\frac{\cos 6x-\cos 4x}{\sin 6x+\sin 4x}\right]$
$\frac{2\cos\left(\frac{7x+5x}{2}\right)\sin\left(\frac{7x-5x}{2}\right)}{2\cos\left(\frac{7x+5x}{2}\right)\cos\left(\frac{7x-5x}{2}\right)} - \left[\frac{-2\sin\left(\frac{6x+4x}{2}\right)\sin\left(\frac{6x-4x}{2}\right)}{2\sin\left(\frac{6x+4x}{2}\right)\cos\left(\frac{6x-4x}{2}\right)}\right]$
$\Rightarrow \tan x + \tan x = 2\tan x$

49. (c); GIVEN
$\frac{\cos^3 2\theta+3\cos 2\theta}{\cos^6\theta-\sin^6\theta}$
Put θ = 30°
$\frac{\cos^3 60+3\cos 60}{\cos^6 30-\sin^6 30} = \frac{\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}+3\times\frac{1}{2}}{\frac{3}{4}\times\frac{3}{4}\times\frac{3}{4}-\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}} \Rightarrow \frac{13}{8}\times\frac{64}{26} \Rightarrow 4$

50. (d); Value of
$\tan\left(\frac{\pi}{4}+A\right)\times\tan\left(\frac{3\pi}{4}+A\right)$
$\Rightarrow \frac{1+\tan A}{1-\tan A}\times\frac{\tan(90+45)+\tan A}{1-\tan(90+45)\tan A}$
$\Rightarrow \left(\frac{1+\tan A}{1-\tan A}\right)\times\frac{(\tan A-1)}{(1+\tan A)} \Rightarrow -1$

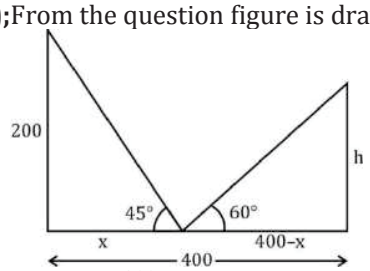
51. (b); GIVEN
$\left((\sec 2\theta+1)\sqrt{\sec^2\theta-1}\right)\times\frac{1}{2}(\cot\theta-\tan\theta)$
$[(\sec 2\theta+1)\tan\theta]\times\frac{1}{2}(\cot\theta-\tan\theta)$
$\left[\left(\frac{1}{\cos 2\theta}+1\right)\tan\theta\right]\times\frac{1}{2}(\cot\theta-\tan\theta)$
$\left[\frac{(1+2\cos^2\theta-1)\tan\theta}{2\cos^2\theta-1}\right]\times\frac{1}{2}(\cot\theta-\tan\theta)$
$\left[\frac{2\cos\theta\sin\theta}{2\cos^2\theta-1}\right]\times\frac{1}{2}\left[\frac{\cos\theta}{\sin\theta}-\frac{\sin\theta}{\cos\theta}\right]$
$= \left[\frac{\sin 2\theta}{\cos 2\theta}\times\frac{1}{2}\frac{\cos 2\theta}{\sin\theta\cos\theta}\right] = 1$

52. (c); $\sin(630+A)+\cos A$
$\Rightarrow \sin[2\times360-(90-A)]+\cos A$
$\Rightarrow -\sin(90-A)+\cos A$
$\Rightarrow -\cos A+\cos A \Rightarrow 0$

53. (d); $\frac{\sin 59\cos 31+\cos 59\sin 31}{\cos 20\cos 25-\sin 20\sin 25}$
$\sin(A+B) = \sin A\cos B+\cos A\sin B$ ------
FORMULA
$\cos(A+B) = \cos A\cos B - \sin A\sin B$ -----
FORMULA
$\Rightarrow \frac{\sin(59+31)}{\cos(20+25)} = \frac{\sin 90}{\cos 45} = \sqrt{2}$

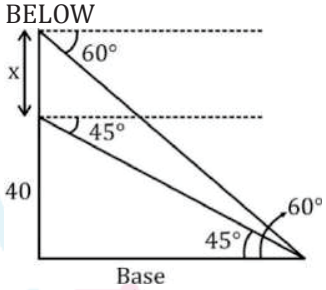
54. (d); $\cos(90-B)\sin(C-A)+\sin(90+A)\cos\binom{B+}{C}$
$-\sin(90-C)\cos(A+B)$
$\Rightarrow \sin B\sin(C-A)+\cos A\cos(B+C)$
$-\cos C\cos(A+B)$
$\Rightarrow \sin B[\sin C\cos A-\cos C\sin A]+$
$\cos A[\cos B\cos C-\sin B\sin C]$
$-\cos C[\cos A\cos B-\sin A\sin B]$
$\Rightarrow 0$

55. (b); From the question figure is drawn



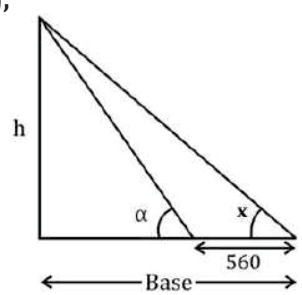
$\tan 45 = \frac{200}{x} \Rightarrow x = 200\text{m}$
$\tan 60 = \frac{h}{400-200} \Rightarrow h = 200\sqrt{3}\text{m}$

56. (c); WITH REFERENCE TO QUESTION , FIG IS GIVEN BELOW



$\tan 45 = \frac{40}{base}$
Base = 40 m
$\tan 60 = \frac{x+40}{Base}$
$\sqrt{3} = \frac{x+40}{40} \Rightarrow x = 40(\sqrt{3}-1)\text{m}$

57. (b);



Given = $\tan x = \frac{3}{4}$ & $\tan\alpha = \frac{4}{3}$
$\tan x = \frac{h}{base} = \frac{3}{4}$
Therefore $base = \frac{4h}{3}$ ... (1)
$\tan\alpha = \frac{h}{base-560}$
Put value of base in above eq from eq 1
$\frac{4}{3} = \frac{3h}{4h-560\times3}$
16h – 560 × 12 = 9h
h= $\frac{560\times12}{7}$ = 960 m

58. (a); given total sales of milk in all states is x=200000

Total sales by A salesman in all states

$$= x\left[\underset{P}{\frac{24}{100}\times\frac{65}{100}}+\underset{Q}{\frac{10}{100}\times\frac{80}{100}}+\underset{R}{\frac{17}{100}\times\frac{50}{100}}+\underset{S}{\frac{13}{100}\times\frac{70}{100}}+\underset{T}{\frac{22}{100}\times\frac{60}{100}}+\underset{U}{\frac{14}{100}\times\frac{80}{100}}\right]$$

Total sales by A salesman in all states

$$=\frac{x[1560+800+850+910+1320+1120]}{100\times100}$$

Hence Average sales by A salesman in all states = $\frac{200000\times6560}{100\times100\times6}\Rightarrow 21866.67$ lit

59. (b); ratio of sales of milk in P & Q states by B salesman and R &T states by A salesman is

$(P+Q)\ by\ B\ salesman : (R+T)\ by\ A\ salesman$

$$\left[\frac{24}{100}\times\frac{35}{100}+\frac{10}{100}\times\frac{20}{100}\right] : \left[\frac{17}{100}\times\frac{50}{100}+\frac{22}{100}\times\frac{60}{100}\right]$$

$$(840+200) : (850+1320)$$

$$1040 : 2170$$

$$\Rightarrow\ 104 : 217$$

60. (d); To find central angle by average sales in Q,T & S states together , we first have to find percentage of sales by

(Q + T + S) states = (10 + 22 + 13) = 45%

average sales= 15%

If 100% represent complete → 360°

15% is equal to → $\frac{360}{100}\times 15=54°$

61. (b); Difference of sales in T states by salesman B and sales of milk in R&S states is

Difference=[T by salesman B – (R + S)] × 200000

Difference= $\left[\frac{30}{100}-\frac{22}{100}\times\frac{40}{100}\right]\times 200000$

difference⇒ $\frac{2120}{100\times100}\times 200000 \Rightarrow 42400$

62. (b); The sales of milk in R state by salesman A & B is equal

both A & B salesman selling 50% milk

So,

Difference=0

63. (a); GIVEN ratio

$Acid:Water$

$1:x$

when 50 ml water is mixed with mixture the ratio is 2:5,hence According to question

$$\Rightarrow \frac{\frac{1}{x+1}\times300}{\frac{x}{x+1}\times300+50}=\frac{2}{5}$$

⇒ 300 × 5 = 2 [300x + 50x + 50]

⇒ 1500 = 700x + 100 ⇒ x = 2

64. (a); In a given Mixture ratio of

$Milk:Water$

$11x:2x$

When 35 lit water is added ratio becomes 2:1,According to question

$$\frac{11x}{2x+35}=\frac{2}{1}$$

11x = 4x + 70 ⇒ x = 10

milk in original mix = 11x = 11 × 10 = 110

65. (c); According to questions

$$\underset{300}{25\times12}:\underset{360}{40\times9}:\underset{250}{50\times5}$$

30: 36 :25

C's share = $\frac{25}{(25+36+30)}\times 273000$

= 75000 Rs.

66. (b); GIVEN ratio in question

$A\quad B\quad C$

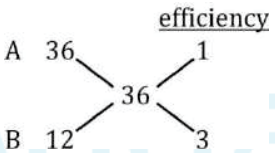
4 5 $\frac{7}{2}\rightarrow$ due to sleeping partner

8 : 10 : 7

B get = $36000\times\frac{75}{100}\times\frac{10}{(8+10+7)}$ [as 25% reinvested therefore 75% is distributed amongs them]

B get= 10800 Rs.

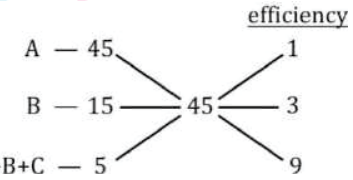
67. (a);



Work done by (A +B) in 3 days = 3 × 4 = 12

Remaining work = $\frac{(36-12)}{36}=\frac{2}{3}$

68. (b);



A + B + C = 9 unit

A=1 UNIT, B=3 unit

So,

C = 5 unit/day

C do in = $\frac{45}{5}$ = 9 days.

69. (d); given

C : A = 3x : x

(A + B + C)'s 7.5 day = B's 15 day

(A + C)'s 7.5 day = B's 7.5 days

A + C = B

3x + x = B

Hence ratio of

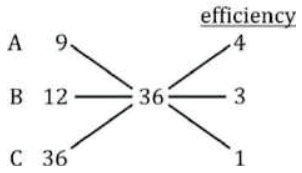
A : B : C

1 : 4 : 3 =(8 total unit)

Total work = 8 × 7.5 = 60

A & C do in = $\frac{60}{4}$ = 15 days

70. (a);



(A + B + C) in 3 day = 3 × (4 + 3 +1)
= 24 unit
Remain work = (36 – 24) = 12 unit
B & C do remaining work in = $\frac{12}{3+1}$ = 3 days.

71. (c); Successive discount of 40
= $x + x - \frac{x \times x}{100}$ = 40 + 40 – $\frac{40 \times 40}{100}$ = 80 – 16 = 64

2nd method

Let CP = 100
Now 2 discount of 40
SP = 100 × $\frac{60}{100} \times \frac{60}{100}$ = 36
Discount = (100 – 36) = 64

72. (c); Given
MP = 25000&
SP = 18000
S.P=$MP \times \left(\frac{100-D}{100}\right)$,
$25000 \times \left(\frac{100-D}{100}\right) = 18000$
2500 – 25D = 1800
25D = 700
D = 28%

73. (c); GIVEN
MP = 10,000
SP = 8,360
D_1 = 12%
D_2 = ?
Go by series operation
$MP \times \left(\frac{100-D_1}{100}\right) \times \left(\frac{100-D_2}{100}\right) = SP$
$10{,}000 \times \left(\frac{100-D_1}{100}\right) \times \left(\frac{100-D_2}{100}\right) = 8360$
$88 \times (100 - D_2) = 8360$
$D_2 = 100 - 95$
$D_2 = 5\%$

74. (a); C.P = 640
M.P = 640 × $\frac{9}{4}$=1440 (as marked price is 125 % more than cp, means 2.25 times of cp)
S.P. = $M.P. \times \frac{100-D}{100}$
= 1440 × $\frac{3}{4}$
= 1080 Rs.

75. (d); GIVEN RATIO
$History : Geography$
5 : 7
2 ⇓ = 14
If difference in history and geography is 14
Then 2 → 14
History masrks 5 → 7 × 5 = 35 marks

76. (a); GIVEN
Present age → $Rahul:Sister$
$3x : 4x$
10 year before age → $3x - 10 : 4x - 10$
13 19
10 year before → $3x - 10 : 4x - 10$
13 19
By cross multiply
57x – 190 = 52x – 130
x = 12
Present age of Rahul = 3x = 3 × 12 = 36

77. (d); Given no isA= 9 &B= 5 , let third number C=x

A	B	C
9	15	x

As we knowrelation between three number is
$B^2 = AC$
$(15)^2 = 9 \times x$
x = 25 = C

78. (d); Total given Wealth = 11,50,000
Given ratio between son and daughter is
$Son:Daughter$
$2/3 : 5/4$
8 : 15
Son get = $\frac{8}{23}$ × 1150000 = 4,00,000

79. (c); GIVEN RATIO OF
$A : B : C$
$1/2 : 1/3 : 1/4$
6 : 4 : 3
B get = $\frac{4}{13}$ × 7800 = 2400 Rs.

80. (d); Given ratio of
$Candy:Chewing\ gum$
7 : 13
According to Question,
$\frac{7x-8}{13x-11} = \frac{1}{2}$
⇒ 14x – 16 = 13x – 11
x = 5
Remaining candy = 7 × 5 – 8 = 27

81. (b); According to question
Total wt. (P + Q + R) = 71 × 3 ...(i)
Total wt. (P + Q) = 66 × 2 ...(ii)
Total wt. (Q + R) = 76.5 × 2 ...(iii)
Add (ii) and (iii) then sub (i)
P + 2Q + R – (P + Q + R)
Q= 285 – 213
Q= 72 kg

82. (a); GIVEN PRICE
Total 5 sarees = 2250 × 5 ...(i)
Total 3 sarees = 2750 × 3 ...(ii)
Average of all 8 sarees = $\frac{11250+8250}{8}$= 2437.5

83. (d); Team A total run = 5.3 × 50 = 265
Run rate for team B for remaining5 over is 7.2
Total run remains = 7.2 × 5 = 36
Team B current score = 265 – 36 = 229

84. (d); Average of all even no. from 104 — 148
148 = 104 + (n – 1) × 2
N = 23
Sum = $\frac{23}{2}[208 + 22 \times 2]$
Average = $\frac{23\times126\times2}{23\times2}$=126
Short approach :-
No. b/w 104 — 148
= $\frac{(148-104)}{2} + 1 = 23$
So, average is = $\frac{(n+1)}{2}$ = 12th term
Average = 104 + 11 × 2 = 126
THIRD APPROACH:-
Average of Even No. between 104 and 148
First number=106
Last number =146
Average=$\frac{first\ no.+last\ no.}{2}$
Average=$\frac{(106+146)}{2}$=126

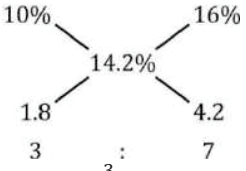
85. (c); If CP of a is b and SP of b is a then

4 3
3 4

P or ℓ % =$\frac{(a)^2-(b)^2}{(b)^2} \times 100 = \frac{(4)^2-(3)^2}{(3)^2} \times 100$
= $\frac{700}{9}$ = 77.7% profit

86. (a); The question best method is do in chain form
Let CP = x
Now according to question
$x \times \left(\frac{100\pm\frac{P}{L}}{100}\right)\left(\frac{100\pm\frac{P}{L}}{100}\right) = 8448$
$x \times \frac{108}{100} \times \frac{112}{100} = 8448 \Rightarrow x = 6984$

87. (b); By allegation



He Sold $\frac{3}{10} \times 2000 = 600\ kg$ at 10% profit

88. (d); LET
CP = x lac
According to question,
3 (x – 7.6) = (9.2 – x)
3x – 22.8 = 9.2 – x
4x = 32 ⇒ x = 8 lac

89. (a); Given
0.09% of 25% of 1200
= $\frac{9}{100} \times \frac{1}{100} \times \frac{25}{100} \times 1200 = \frac{27}{100} = 0.27$

90. (c); Let no. be x
Now with reference to question
x + 20 = 1.16 × x
20 = 0.16x
x = 125

91. (d); Let No. A, B, C
Let
C = 100 Then according to ques b is 75% lesser than c
B = 25
& a is 50% lesser than c
A= 50
So, $b \times \frac{x}{100} = a\ 25 \times \frac{x}{100} = 50$
x = 200%
No. should increased by (200 – 100) = 100%

92. (a); Suppose consumption = 10 liter
T. expenditure = 60× 10=600
If Total expenditure ↑es by 10% = $\frac{600\times110}{100}$ = 660
Now consumption of fuel = $\frac{660}{75}$ = 8.8 liter
Consumption cut = (10 – 8.8) = 1.2 liter
= $\frac{1.2}{10} \times 100 = 12\%$
Shortcut
Old price = 60
If 10% ↑es = 66
Consumption reduced % = $\frac{(75-66)}{75} \times 100$ =12%

93. (b); Given
Distance = 900
Time = 25 hour
Speed = $\frac{900}{25}$
Convert speed in m/s = $\frac{900}{25} \times \frac{5}{18}$ = 10 m/sec

94. (a); Upstream = 18, Downstream = 30
$Average\ speed = \frac{2\times(upstream)\times(downstream)}{upstream + downstream}$
= $\frac{2\times18\times30}{48}$
= 3× 7.5 = 22.5 km/hr

95. (c); Given
A speed = 21 km/hr
B speed = 24 km/hr
Relative speed = (21 + 24) = 45 km/hr
D = S × T
T = $\frac{D}{Relative.Speed}$
$1 + \frac{1}{5} = \frac{D}{45}$
D = 54 km

96. (c); Speed without stoppage = 60 km/hr
Speed with stoppage = 45 km/hr
$Stop\ per\ hour = \frac{(Speed\ without\ stoppage - Speed\ with\ stoppage)}{Speed\ without\ stoppage} \times 60$
= $\frac{60-45}{60} \times 60 = 15\ min$

97. (c); T = 3 year

S.I. = 0.15x, Principle = x

$S.I = \frac{P \times T \times R}{100}$

$0.15x = \frac{x \times 3 \times R}{100}$

R = 5%

C.I. = Amount – Principle

$\text{Amount} = 15\left[1 + \frac{5}{100}\right]^3 = 17.36$

C.I. = 17.36 – 15

= 2.36 lac

98. (a); GIVEN

$C.I.\ on\ 2nd\ year = \boxed{9600}$

$C.I.\ on\ 3rd\ year = 10272 \Big] Diff = 672$

CI on second year will work as principle for third year

Difference of ci work as interest for third year

$\frac{p \times R \times t}{100} = interest$

$\frac{9600 \times R}{100} = 672$

R = 7%

99. (c); Let x is principle

1st year rate = 5%,

Second year = 6%

Average = $\frac{5+6}{2} = 5.5\%$

$\text{Amount} = x + \frac{x \times 5.5 \times 2}{100} = 24486$

$111x = 24486 \times 100$

$x = 22000$

100. (d); GIVEN P = 10,000; R = 40% T=1

C.I. (Annually) = $\frac{10{,}000 \times 40 \times 1}{100}$ = 4000 Rs.

C.I. (Quarterly) = $10{,}000\left[1 + \frac{10}{100}\right]^4 - 10{,}000$

= 4641

Difference in CI (ANNUALLY & QUARTERLY)

= 4641 – 4000 = 641 Rs.

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Previous Years' E-Mock Paper

Mock 03 : 19th February 2018

1. If N = 1 + 11 + 111 + 1111 + ... +111111111, then what is the sum of the digit's of N?
(a) 45 (b) 18
(c) 36 (d) 5

2. What is the sum of first 40 terms of 1 + 3 + 4 + 5 + 7 + 7 + 10 + 9 + ...?
(a) 1010 (b) 1115
(c) 1030 (d) 1031

3. What is the value of $\frac{1}{0.2}+\frac{1}{0.02}+\frac{1}{0.002}+\cdots$ upto 9 terms?
(a) 222222222 (b) 111111111
(c) 555555555 (d) 525252525

4. What is the value of $\frac{3.6\times1.62+0.48\times3.6}{1.8\times0.8+10.8\times0.3-2.16}$?
(a) 2.4 (b) 2
(c) 4 (d) 3

5. If $\frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{x}}}}=\frac{5}{8}$, then what is the value of x ?
(a) 2 (b) 3
(c) 1 (d) 4

6. If $\left(1+\frac{1}{2}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{6}\right)\left(1+\frac{1}{8}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{5}\right)\left(1-\frac{1}{7}\right)=1+\frac{1}{x}$, then what is the value of x ?
(a) 6 (b) 8
(c) 5 (d) 7

7. What is the value of $\frac{1}{3\times7}+\frac{1}{7\times11}+\frac{1}{11\times15}+\ldots+\frac{1}{899\times903}$?
(a) 21/509 (b) 18/403
(c) 25/301 (d) 29/31

8. What is the unit digit of $1^5 + 2^5 + 3^5 + ... + 20^5$?
(a) 0 (b) 5
(c) 2 (d) 4

9. x, y and z are prime numbers and x + y + z = 38. What is the maximum value of x?
(a) 19 (b) 23
(c) 31 (d) 29

10. N is the smallest three digit prime number. When N is divided by 13, then what will be the remainder?
(a) 8 (b) 9
(c) 7 (d) 10

11. How many natural numbers are there between $\sqrt{261}$ and $\sqrt{45109}$?
(a) 144 (b) 196
(c) 168 (d) 195

12. What is the value of $\sqrt{121}+\sqrt{12321}+\sqrt{1234321}+\sqrt{123454321}$?
(a) 12345 (b) 123456
(c) 12344 (d) 123454

13. $p^3 + q^3 + r^3 - 3pqr = 4$. 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

14. If α and β are the roots of the equation $x^2 + x - 1 = 0$, then what is the equation whose roots are α^5 and β^5?
(a) $x^2 + 7x - 1 = 0$ (b) $x^2 - 7x - 1 = 0$
(c) $x^2 - 11x - 1 = 0$ (d) $x^2 + 11x - 1 = 0$

15. If x and y are natural numbers such that x + y = 2017, then what is the value of $(-1)^x + (-1)^y$?
(a) 2 (b) – 2
(c) 0 (d) 1

16. If $x + (1/x) = (\sqrt{3} + 1)/2$, then what is the value of $x^4 + (1/x^4)$?
(a) $(4\sqrt{3} - 1)/4$ (b) $(4\sqrt{3} + 1)/2$
(c) $(-4\sqrt{3} - 1)/4$ (d) $(-4\sqrt{3} - 1)/2$

17. 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

18. 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

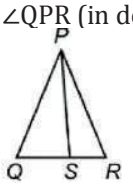
19. If the roots of the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ are equal, then which of the following is true?
(a) b = (a + c)/ ac (b) 2/b = (1/ a) + (1/c)
(c) 2b = (1/ a) + (1/c) (d) abc= ab + bc+ ca

20. If $[\sqrt{a^2 + b^2 + ab}] + [\sqrt{a^2 + b^2 - ab}] = 1$, then what is the value of $(1 - a^2)(1 - b^2)$?
(a) 1/4 (b) 4/7
(c) 5/4 (d) 3/4

21. 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

22. 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

23. In the given figure, PQ = PS = SR and ∠QPS = 40°, then what is the value of ∠QPR (in degrees) ?

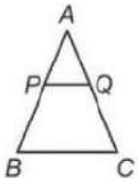


(a) 45 (b) 60
(c) 75 (d) 50

24. In triangle PQR, C is the centroid. PQ = 30 cm, QR = 36 cm and PR = 50 cm. If D is the midpoint of QR, then what is the length (in cm) of CD?

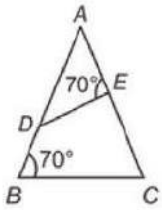
(a) $(4\sqrt{86})/3$ (b) $(2\sqrt{86})/3$
(c) $(5\sqrt{86})/3$ (d) $(5\sqrt{86})/2$

25. In the given figure, AQ = $4\sqrt{2}$ cm, QC = $6\sqrt{2}$ cm and AB = 20 cm. If PQ is parallel to BC, then what is the value (in cm) of PB ?



(a) 8 (b) 12
(c) 6 (d) 15

26. In the given figure, if AD = 12 cm, AE = 8 cm and EC = 14 cm, then what is the value (in cm) of BD ?



(a) 50/3 (b) 15
(c) 8/3 (d) 44/3

27. Two circles are having radii 9 cm and 12 cm. The distance between their centres is 15 cm. What is the length (in cm) of their common chord?

(a) 6.8 (b) 13. 6
(c) 7.2 (d) 14. 4

28. Two circles touch each other at point T. Two common tangents of the circles meet at point P and none of the tangents passes through T. These tangents touch the larger circle at points B and C. If the radius of the larger circle is 15 cm and CP = 20 cm, then what is the radius (in cm) of the smaller circle?

(a) 3.5 (b) 3.75
(c) 4.25 (d) 4.45

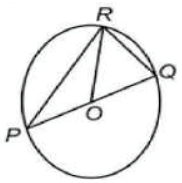
29. Two circles touch each other at point X. A common tangent touch them at two distinct points Y and Z. If another tangent passing through X cut YZ at Aand XA= 16 cm, then what is the value (in cm) of YZ?

(a) 18 (b) 24
(c) 16 (d) 32

30. There are 8 equidistant points A, B, C, D, E, F, G and H (in same order) on a circle. What is the value of ∠FDH (in degrees)?

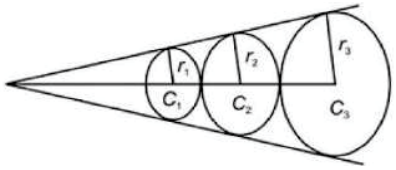
(a) 22.5 (b) 45
(c) 30 (d) 42 .5

31. In the given figure, O is the centre of the circle and ∠QOR = 50°. Then what is the value of ∠RPQ (in degrees) ?



(a) 15 (b) 25
(c) 20 (d) 30

32. Three circles C_1, C_2 and C_3 with radii r_1, r_2 and r_3 (where $r_1 < r_2 < r_3$) are placed as shown in the given figure. What is the value of r_2 ?

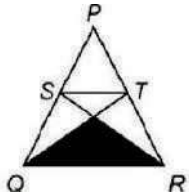


(a) $\sqrt{r_1 r_3}$ (b) $(r_1 + r_3)/2$
(c) $(2r_1r_2)/(r_1 + r_2)$ (d) $\sqrt{r_1 + r_3}$

33. An equilateral triangle of area 300 cm^2 is cut from its three vertices to form a regular hexagon. Area of hexagon is what percent of the area of triangle?

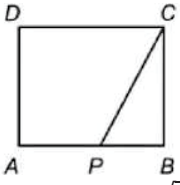
(a) 66.66% (b) 33.33%
(c) 83.33% (d) 56.41%

34. In the given figure, PQR is an equilateral triangle with side as 12 cm. S and T are the mid points of the sides PQ and PR respectively. What is the area (in cm^2) of the shaded region ?



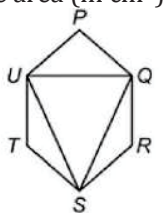
(a) $10\sqrt{3}$ (b) $12\sqrt{3}$
(c) $9\sqrt{3}$ (d) $14\sqrt{3}$

35. ABCD is a rectangle. P is a point on the side AB as shown in the given figure. If DP = 13, CP = 10 and BP = 6, then what is the value of AP ?



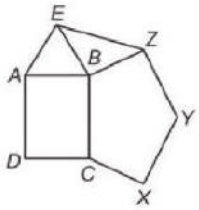
(a) $\sqrt{105}$ (b)$\sqrt{133}$
(c) 12 (d) 10

36. In the given figure, PQRSTU is a regular hexagon of side 12 cm. What is the area (in cm^2) of triangle SQU ?



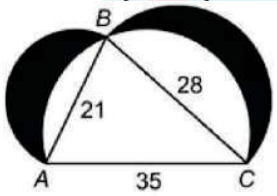
(a) $162\sqrt{3}$ (b) $216\sqrt{3}$
(c) $108\sqrt{3}$ (d) $54\sqrt{3}$

37. In the given figure, ABCD is a square, BCXYZ is a regular pentagon and ABE is an equilateral triangle. What is the value (in degrees) of ∠EBZ ?



(a) 102 (b) 98
(c) 78 (d) 64

38. In the given figure, 3 semicircles are drawn on three sides of triangle ABC. AB = 21 cm, BC = 28 cm and AC = 35 cm. What is the area (in cm^2) of the shaded part ?



(a) 588 (b) 324
(c) 294 (d) 286

39. The sum of radii of the two circles is 91 cm and the difference between their area is 2002 cm^2. What is the radius (in cm) of the larger circle?
(a) 56 (b) 42
(c) 63 (d) 49

40. A right triangular prism has equilateral triangle as its base. Side of the triangle is 15 cm. Height of the prism is $20\sqrt{3}$ cm. What is the volume (in cm^3) ofthe prism?
(a) 1125 (b) 6750
(c) 4500 (d) 3375

41. The height of a cone is 45 cm. It is cut at a height of 15 cm from its base by a plane parallel to its base. If the volume of the smaller cone is 18480 cm^3,then what is the volume (in cm^3) of the original cone?
(a) 34650 (b) 61600
(c) 36960 (d) 62370

42. The ratio of the curved surface area and total surface area of a right circular cylinder is 2 : 5. If the total surface area is 3080 cm^2, then what is the volume (in cm^3) of the cylinder?
(a) $4312\sqrt{6}$ (b) $3822\sqrt{6}$
(c) $4522\sqrt{6}$ (d) $4642\sqrt{6}$

43. The radius and height of a solid cylinder are increased by 2% each. What will be the approximate percentage increase in volume?
(a) 6.76 (b) 5.88
(c) 6.12 (d) 3.34

44. A sphere of radius 21 cm is cut into 8 identical parts by 3 cuts (1 cut along each axis). What will be the total surface area (in cm^2) of each part?
(a) 844.5 (b) 1732.5
(c) 1039.5 (d) 1115.6

45. Two identical hemispheres of maximum possible size are cut from a solid cube of side 14 cm. The bases of the hemispheres are part of the two opposite faces of cube. What is the total volume (in cm^3) of the remaining part of the cube?
(a) 1556.33 (b) 898.5
(c) 1467.33 (d) 1306.67

46. Identical cubes of largest possible size are cut from a solid cuboid of size 65 cm × 26 cm × 3.9 cm. What is the total surface area (in cm^2) of all the small cubes taken together?
(a) 30420 (b) 15210
(c) 20280 (d) 16440

47. A regular triangular pyramid is cut by 2 planes which are parallel to its base. The planes trisects the altitude of the pyramid. Volume of top, middle and bottom part is V_1, V_2 and V_3 respectively. What is the value of $V_1 : V_2 : V_3$?
(a) 1 : 8 : 27 (b) 1 : 8 : 19
(c) 2 : 9 : 27 (d) 1 : 7 : 19

48. What is the value of [(cos 7A + cos 5A) ÷ (sin 7A – sin 5A)]?
(a) tan A (b) tan 4 A
(c) cot 4 A (d) cot A

49. What is the value of [1 – sin (90 – 2A)] / [1 + sin (90 + 2A)]?
(a) sinA.cosA (b) $\cot^2 A$
(c) $\tan^2 A$ (d) $\sin^2 A.\cos A$

50. What is the value of sin 75° + sin 15°?
(a) $\sqrt{3}$ (b) $2\sqrt{3}$
(c) $\sqrt{\frac{3}{2}}$ (d) $3/\sqrt{2}$

51. What is the value of [(cos 3θ + 2cos 5θ + cos 7θ)÷(cos θ + 2cos 3θ + cos 5θ)] + sin 2θ tan 3θ?
(a) cos 2θ (b) sin 2θ
(c) tan 2θ (d) cot θ s in 2θ

52. What is the value of [2 sin (45 + θ) sin (45 – θ)]/cos 2θ?
(a) 0 (b) tan 2θ
(c) cot 2θ (d) 1

53. What is the value of $\sin(90° + 2A)[4 - \cos^2(90° - 2A)]$?
(a) $2(\cos^3 A - \sin^3 A)$ (b) $2(\cos^3 A + \sin^3 A)$
(c) $4(\cos^6 A + \sin^6 A)$ (d) $4(\cos^6 A - \sin^6 A)$

54. What is the value of $[\cos(90 + A) \div \sec(270 - A)] + [\sin(270 + A) \div \text{cosec}(630 - A)]$?
(a) 3 sec A (b) tan A secA
(c) 0 (d) 1

55. On walking 100 metres towards a building in a horizontal line, the angle of elevation of its top changes from 45° to 60°. What will be the height (inmetres) of the building?
(a) $50(3 + \sqrt{3})$ (b) $100(\sqrt{3} + 1)$
(c) 150 (d) $100\sqrt{3}$

56. The upper part of a tree broken over by the wind make an angle of 60° with the ground. The distance between the root and the point where top of the tree touches the ground is 25 metres. What was the height (in metres) of the tree?
(a) 84.14 (b) 93.3
(c) 98.2 5 (d) 120.2 4

57. The height of a tower is 300 meters. When its top is seen from top of another tower,then the angle of elevation is 60°. The horizontal distance betweenthe bases of the two towers is 120 metres. What is the height (in metres) of the small tower?
(a) 88.24 (b) 106.7 1
(c) 92.15 (d) 112.6 4

Directions (58-62): The given table shows the number (in percent) of employees working in different departments of an organization. The table also shows the ratio of males and females and the ratio of employees living in city Z and employee living in city Y. The total number of employees in the organization are 80000.

Department	Number of employees	Gender	City
		M : F	Z : Y
A	10%	7 : 3	1 : 9
B	22%	13 : 9	3 : 19
C	12%	1 : 2	5 : 1
D	20%	3 : 2	1 : 3
E	36%	8 : 1	5 : 13

58. How many employees of department A and C together are living in city Z?
(a) 9000 (b) 9200
(c) 8800 (d) 8200

59. Male employees of department E is what percent of the employees living in city Z from department A?
(a) 1600 (b) 2400
(c) 3200 (d) 4200

60. What is the ratio of male employee working in department B and D together to female employee working in department A and E together?
(a) 13 : 8 (b) 25 : 7
(c) 23 : 9 (d) 7 : 9

61. On an average how many residents of city Y are working in each department?
(a) 11360 (b) 12420
(c) 9130 (d) 10940

62. What are the total number of employee in department A and E together?
(a) 29400 (b) 17600
(c) 46400 (d) 36800

63. If a dairy mixes cow's milk which contains 10% fat with buffalo's milk which contains 20% fat, then the resulting mixture has fat (120/7) % of fat. What ratio was the cow's milk mixed with buffalo's milk?
(a) 2 : 5 (b) 1 : 5
(c) 2 : 3 (d) 2 : 1

64. In what ratio should tea costing Rs 300/kg be mixed with tea costing Rs 200/kg so that the cost of the mixture is Rs 225/kg?
(a) 3 : 1 (b) 1 : 3
(c) 1 : 4 (d) 4 : 1

65. A and B started a partnership business investing some amount in the ratio of 5 : 6. C joined then after 6 months with an amount equal to 2/3rdof B.What was their profit (in Rs) at the end of the year if C got Rs 21,600 as his share?
(a) 46800 (b) 56160
(c) 70200 (d) 1,40,400

66. A and B invest in a business in the ratio 2 : 5. If 50% of the total profit goes to charity and A's share is Rs 3.6 lakhs, the total profit is Rs _____lakhs.
(a) 12.6 (b) 25.2
(c) 37.8 (d) 16.8

67. A is thrice as productive as C. Together they can complete a job in 22.5 days. If B joins them after they have worked for 15 days then in how many days can they finish the rest of the job if B alone can do the job in 15 days?
(a) 6 (b) 3
(c) 9 (d) 2

68. If A, B and C can do a job working alone in 12, 18 and 36 days respectively. They all work together for 2 day, then B quits. How many days will A and C take to finish rest of the job?
(a) 9 (b) 6
(c) 3 (d) 4

69. If A, B and C together do a job in 4 days, A and C together do the job in 4.5 days and B and C together do the job in 12 days then in how many days can C alone do the job?
(a) 36 (b) 6
(c) 18 (d) 12

70. If A alone can do a job in 40 days then, in how many days can B alone do the job if together they can do the job in 8 days?

(a) 15 (b) 10
(c) 20 (d) 25

71. 1 bottle of honey costs Rs 240 but a pack of 4 of the same bottles costs Rs 768. What is the effective discount (in %) on the pack?
(a) 16 (b) 25
(c) 10 (d) 20

72. If the cost price of an article is Rs x . It is marked up by 100%. It is sold at Rs 1,200 after giving 20% discount. What is value of x?
(a) 750 (b) 1500
(c) 1000 (d) 2000

73. A Rs 1000 box of cookies is offered at 10% discount and a Rs 400 bar of chocolate at 8% discount. If we buy 2 boxes of cookies and 3 bars of chocolate,what is the effective discount we get (in %)?
(a) 9 (b) 9 .25
(c) 8.75 (d) 8.5

74. The price of a product after getting 20% discount is Rs 3,024 which includes 5% tax on selling price. What was the marked price (in Rs) of the product?
(a) 3780 (b) 2742
(c) 3600 (d) 2880

75. The price of a movie ticket was increased in the ratio 9 : 10. What is the increase in the revenue (in Rs.) of the cinema hall, if the original fare was Rs180 and 2200 tickets were sold.
(a) 44000 (b) 440000
(c) 39600 (d) 396000

76. If 2A = 3B = 8C; What is A : B : C?
(a) 8 : 3 : 2 (b) 8 : 4 : 3
(c) 2 : 3 : 8 (d) 12 : 8 : 3

77. What is the Number of candidates who had applied if the ratio of selected to unselected was 14 : 25. If 35 less had applied and 10 less selected, the ratio of selected to unselected would have been 3 : 5?
(a) 195 (b) 205
(c) 185 (d) 175

78. What is the fourth proportional to 6, 24 and 83?
(a) 249 (b) 332
(c) 166 (d) 498

79. Rs 10,200 has to be divided between A,B & C so that A gets 2/3 of what B gets and B gets 1/4 of what C gets. How much more does C get over A (inRs)?
(a) 6000 (b) 7200
(c) 1800 (d) 1200

80. Before a battle there were the ratio of captains to soldiers was 2 : 7. During the war 25 captains and 100 soldiers were martyred. The new ratio of captains to soldiers became 3 : 10. What is the number of soldiers after the war?
(a) 250 (b) 200
(c) 150 (d) 100

81. The average marks of 18 students in an examination was 60. It was later found that the marks of one student had been wrongly entered as 63 instead of36. The correct average is:
(a) 59 (b) 59 .5
(c) 58 (d) 58 .5

82. In a class of 60 students there are 20 girls who scored an average of 40 marks in the test, what is the average marks of the boys if the class average is 60 marks?
(a) 60 (b) 70
(c) 50 (d) 80

83. The average of 44 consecutive odd numbers is 144.What is the largest number?
(a) 189 (b) 191
(c) 187 (d) 193

84. A batsman makes 100 runs in the 25thmatch of his career. His average runs per match increases by 1.4. Find his average before the 25thmatch.
(a) 65 (b) 55
(c) 75 (d) 45

85. An oil refinery buys oil at Rs 3600 per barrel. There is 10% wastage. If the refinery wants to earn 5% profit then at what price should it sell including 8%tax on selling price? (in Rs per barrel)
(a) 3674 (b) 3711
(c) 4219 (d) 4536

86. A vendor sells a coconut at Rs 24 and suffers 24% loss. If he wants to make 14% profit, then at what price (in Rs) should he sell?
(a) 32 (b) 30
(c) 36 (d) 28

87. A villager buys a goat and a sheep together for Rs 14,250. He sold the sheep at a profit of 10% and the goat at a loss of 20%. If he sold both the animals at the same price, then what was the cost price of the cheaper animal?
(a) 8250 (b) 6600
(c) 7500 (d) 6000

88. On a certain item profit is 120%. If the cost price increases by 10% then what will be the new profit margin (in %) if selling price remains the same?
(a) 50 (b) 60
(c) 100 (d) 90

89. If 35% are the passing marks. A student gets 200 marks yet fails by 24 marks. What is the maximum marks?
(a) 820 (b) 550
(c) 640 (d) 680

90. A student gets 22 marks more in French than what she got in German. Her German marks are 28% of the sum of her French and German marks. Whatare her French marks?
(a) 14 (b) 36
(c) 18 (d) 42

91. 2% of a = b, then b% of 10 is the same as:
(a) 200% of a (b) 20% of a /100
(c) 20% of a/10 (d) 200% of a /10

92. A man's annual income has increased by Rs 1.2 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays the same amount of tax as before. What is his increased income (in Rs lakhs)?
(a) 8.4 (b) 7.2
(c) 9.6 (d) 6

93. A car travelling at an average speed of 72 km/hr takes 9 minutes to travel a certain distance. By how much should it increase its speed (in km/hr) to travel the same distance in 8 minutes?
(a) 8 (b) 9
(c) 7 (d) 6

94. Train A takes 1 hour more than train B to travel a distance of 720 km. Due to engine trouble speed of train B falls by a third, so it takes 3 hours more than Train A to complete the same journey? What is the speed of Train A (in km/hr)?
(a) 80 (b) 90
(c) 60 (d) 70

95. Two cars A and B travel from one city to another city, at speeds of 60 km/hr and 108 km/hr respectively. If car B takes 2 hours lesser time than car A for the journey, then what is the distance (in km) between the two cities?
(a) 240 (b) 270
(c) 300 (d) 330

96. B starts 4.5 minutes after A from the same point, for a place at a distance of 3.5 miles from the starting point. A on reaching the destination turns back and walk a mile where he meets B. If A's speed is a mile in 6 minutes then B's speed is a mile in ____ minutes?
(a) 8 (b) 10
(c) 12 (d) 9

97. If compound interest received on a certain amount in the 3rdyear is Rs. 12,100, what will be the compound interest (in Rs) for the 4thyear on the same amount if rate of interest is 9%?
(a) 17080 (b) 15669
(c) 13189 (d) 14376

98. The amount received at 10% per annum compound interest after 3 yrs is Rs 10,648. What was the principal (in Rs)?
(a) 8000 (b) 9000
(c) 8500 (d) 7500

99. In how many years will Rs 25,000 yield Rs 8,275 as compound interest at 10% per annum compounded annually?
(a) 2 (b) 4
(c) 3 (d) 5

100. What is the rate of interest if simple interest earned on a certain sum for the 3rdyear is Rs 1,750 and compound interest earned for 2 years is Rs 3622.5?
(a) 8 (b) 9
(c) 10 (d) 7

Solutions

1. (a); $N = 1 + \underset{(1+1)}{2} + \underset{(1+1+1)}{3} + \underset{(1+1+1+1)}{4} \ldots\ldots+9$

$N = \frac{10\times9}{2} \Rightarrow 45$

2. (c);

S = 1 + 3 + 4 + 5 + 7 + 7 + 10 + 9 + ... 40 terms

From above given question break the series into two series

$S_1 = 1 + 4 + 7 + 10 + \ldots\ldots+n_{20}$ & $S_2 = 3 + 5 + 7 + \ldots\ldots\ldots+n_{20}$

Sum = $\frac{n}{2}[2 \times a + (n - 1) d]$
n = no. of terms
a = first no. of series
d = difference of series

Sum $(S_1) = \frac{20}{2}[2 \times 1+(n - 1) \times 3]$

$= \frac{20}{2} \times (2 + 57)$

$S_1 = 590$

$S_2 = 3 + 5 + 7 + \ldots\ldots\ldots+n_{20}$

Sum $(S_2) = \frac{20}{2}[2 \times 3 + (20 - 1) \times 2] = 440$

Sum (s) = $S_1 + S_2$

= 590 + 440

= 1030

3. (c); GIVEN

$\frac{1}{0.2} + \frac{1}{0.02} + \frac{1}{0.002} + \ldots + \frac{1}{0.000000002}$

$\Rightarrow \frac{10}{2} + \frac{10^2}{2} + \frac{10^3}{2} + \ldots + \frac{10^9}{2}$

$\Rightarrow \frac{1}{2}[10 + 10^2 + 10^3 + \cdots + 10^9]$

AS

$[10 + 10^2 + 10^3 + \cdots + 10^9]$ this series is in gp with common ratio of 10 so apply sum of gp formula here

Sum $\Rightarrow \frac{1}{2} \times \left[10 \times \frac{[10^9-1]}{9}\right]$

$= \frac{1}{2} \times \left[10 \times \frac{999999999}{9}\right]$

$\Rightarrow 555555555$

Sum of GP
$S = \frac{a(r^n-1)}{(r-1)}$
a = 1st no. of series
r = ratio of series

4. (d); GIVEN

$\frac{3.6\times1.62+0.48\times3.6}{1.8\times0.8+10.8\times0.3-2.16}$

$\Rightarrow \frac{3.6\times[1.62+0.48]}{0.3[4.8+10.8]-2.16}$

$\Rightarrow \frac{3.6\times2.1}{4.68-2.16} \Rightarrow 3$

5. (a); GIVEN

$\frac{1}{1+\frac{1}{1+\frac{1}{1+\frac{1}{x}}}} = \frac{5}{8}$

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

$\Rightarrow \frac{2x+1}{3x+2} = \frac{5}{8}$

$\Rightarrow 16x + 8 = 15x + 10$

$x \Rightarrow 2$

6. (b); GIVEN:- $\left(1+\frac{1}{2}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{6}\right)\left(1+\frac{1}{8}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{5}\right)\left(1-\frac{1}{7}\right) = 1 + \frac{1}{x}$

$\Rightarrow \left(\frac{3}{2}\right)\times\left(\frac{5}{4}\right)\times\left(\frac{7}{6}\right)\times\left(\frac{9}{8}\right)\times\left(\frac{2}{3}\right)\times\left(\frac{4}{5}\right)\times\left(\frac{6}{7}\right)$

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

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

Compare both side

x = 8

7. (c); GIVEN SERIES

$\frac{1}{3\times7} + \frac{1}{7\times11} + \frac{1}{11\times15} + \ldots + \frac{1}{899\times903}$

Multiply & divide each term of above eqn. by 4

$= \frac{1}{4}\left[\frac{4}{3\times7} + \frac{4}{7\times11} + \frac{4}{11\times15} + \ldots \frac{4}{899\times903}\right]$

$\Rightarrow \frac{1}{4}\left[\frac{1}{3} - \frac{1}{7} + \frac{1}{7} - \frac{1}{11} + \frac{1}{11} - \frac{1}{15} + \ldots + \frac{1}{899} - \frac{1}{903}\right]$

As we know $\frac{1}{3} - \frac{1}{7} = \frac{4}{3\times7}$, similarly other also

$\Rightarrow \frac{1}{4}\left[\frac{1}{3} - \frac{1}{903}\right]$

$\Rightarrow \frac{1}{4} \times \frac{(301-1)}{903}$

$\Rightarrow \frac{300}{4\times903} \Rightarrow \frac{25}{301}$

8. (a); GIVEN:- Unit digit of $1^5 + 2^5 + 3^5 + \ldots\ldots + 20^5$

Cyclicity of 2, 3, 7, 8 is 4 [Repetition of unit digit after every 4 cycle]

& Cyclicity of 4, 9 is 2

So divide the power of given series by 4 & 2

$\Rightarrow 1 + 2 + 3 + 4 + \ldots.. + 20$

Sum = $\frac{20\times21}{2} = 21\boxed{0}$

∴ unit digit is 0

9. (c); x + y + z = 38 (where x, y & z are prime numbers)

maximum value of x is possible, when we put minimum value of y and z

when z = 2, y = 3 then x = 33

or

z = 2, y = 5 then x = 31

Now by options given $\boxed{31}$ is the max. value.

10. (d); Smallest three digit no is 100

But 100 is not prime number.

Smallest 3 digit prime no. is 101

When 101 divided by 13

Remainder = 10

11. (b); Square root of 261 = near about 16
Square root of 45109 = near about 212
So, Natural no. b/w them is (212 – 16) = 196

12. (c); GIVEN SERIES
$\sqrt{121} + \sqrt{12321} + \sqrt{1234321} + \sqrt{123454321}$
Taking square root
$\Rightarrow 11 + 111 + 1111 + 11111$
$\Rightarrow 12344$

13. (b); GIVEN
$p^3 + q^3 + r^3 - 3pqr = 4$ — (given) & $\begin{bmatrix} a = q + r \\ b = r + p \\ c = p + q \end{bmatrix}$
Put value of a, b & c in given eqn. to find $a^3 + b^3 + c^3 - 3abc$
$\Rightarrow (q + r)^3 + (r + p)^3 + (p + q)^3 - 3(q + r)(r + p)(p + q)$
$\Rightarrow q^3 + r^3 + 3qra + r^3 + p^3 + 3rpb + p^3 + q^3 + 3pqc - 3(q + r)(r + p)(p + q)$
$\Rightarrow 2[q^3 + r^3 + p^3] + 3q^2r + 3qr^2 + 3r^2p + 3rp^2 + 3p^2q + 3pq^2 - 3(q + r)(r + p)(p + q)$
On further solving
$\Rightarrow 2(p^3 + r^3 + q^3 - 3pqr)$
$\Rightarrow 2 \times 4 = 8$

14. (d); Given eqn. is $x^2 + x - 1 = 0$
On comparing above eqn. with general eqn.
$ax^2 + bx + c = 0$
Roots of eqn. are α & β
$\boxed{\alpha + \beta = -1}$ ... (i)
$\boxed{\alpha \times \beta = -1}$ ... (ii)
AS WE KNOW $\boxed{\begin{matrix} \alpha + \beta = \frac{-b}{a} \\ \& \\ \alpha \times \beta = \frac{c}{a} \end{matrix}}$
FROM EQ (ii), fifth power of eq2 is : $(\alpha\beta)^5 = -1$
& $\alpha^2 + \beta^2 = 1 + 2 = 3$
Cubing eq1 frm both sides
$(\alpha + \beta)^3 = \alpha^3 + \beta^3 + 3\alpha b(\alpha + \beta)$
$-1 = \alpha^3 + \beta^3 + 3$
$\alpha^3 + \beta^3 = -4$
hence
$(\alpha^3 + \beta^3) \times (\alpha^2 + \beta^2) = -4 \times 3$
$\alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta) = -12$
$\alpha^5 + \beta^5 = -12 + 1 = -11$
Eqn. when roots are α^5&β^5 is
$x^2 - (\alpha^5 + \beta^5)x + \alpha^5\beta^5 = 0$
$x^2 - (-11)x + (-1) = 0$
$\boxed{x^2 + 11x - 1 = 0}$

15. (c); If x + y = 2017 (given)
To find $(-1)^x + (-1)^y$
For any values of x & y
Either x or y must be odd & other must be even as sum of odd & even is always odd.
So,
Let's take x = 2000, y = 17
$\Rightarrow (-1)^{2000} + (-1)^{17}$
$\Rightarrow 1 - 1 \Rightarrow 0$

16. (c); $x + \frac{1}{x} = \frac{\sqrt{3}+1}{2}$
Squaring both side
$x^2 + \frac{1}{x^2} + 2 = \frac{3+1+2\sqrt{3}}{2\times 2}$
$x^2 + \frac{1}{x^2} = 1 + \frac{\sqrt{3}}{2} - 2 \Rightarrow -1 + \frac{\sqrt{3}}{2}$
Again squaring both side
$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 1 + \frac{3}{4} - \sqrt{3}$
$\Rightarrow x^4 + \frac{1}{x^4} = \frac{4+3-4\sqrt{3}-8}{4}$
$\boxed{x^4 + \frac{1}{x^4} \Rightarrow \frac{(-1-4\sqrt{3})}{4}}$

17. (c); To find $a^3 + \frac{1}{a}$
$\Rightarrow \frac{a^4+1}{a}$
Given eqn. $a + a^2 + a^3 - 1 = 0$ ...(i)
Multiply eqn. (i) by (a) & then subtract eq 1from that equation
$a^2 + a^3 + a^4 - a = 0$
$\underline{a + a^2 + a^3 - 1}$
$a^4 - 2a + 1 = 0$
$\Rightarrow \frac{a^4+1}{a} = 2$

18. (a); GIVEN
$a - \left(\frac{1}{a}\right) = b, \quad b - \left(\frac{1}{b}\right) = c \quad \& \quad c - \frac{1}{c} = a$
$\Rightarrow a - b = \frac{1}{a}$ ... (i)
, $b - c = \frac{1}{b}$ ... (ii)
& $c - a = \frac{1}{c}$ ... (iii)
Now, eq (i)×eq (ii) + eq(ii)×eq(iii) + eq(iii)× eq(i)
$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} \Rightarrow (a - b)(b - c) + (b - c)(c - a) + (c - a)(a - b)$
$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} \Rightarrow ab - ac - b^2 + bc + ca - cb - a^2 + ab + bc - ac - c^2 + ac$
$\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca} \Rightarrow ab + bc + ca - (a^2 + b^2 + c^2)$ ...(a)
Now from given eqn.
$a - \frac{1}{a} = b \Rightarrow a^2 - 1 = ab$
similarly
$b^2 - 1 = cb$ and $c^2 - 1 = ac$
Put ab, bc& ca in eqn. (a)
$\Rightarrow a^2 - 1 + b^2 - 1 + c^2 - 1 - (a^2 + b^2 + c^2)$
$\Rightarrow -3$

19. (b); $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$
As we know $B^2 = 4AC \Rightarrow B^2 - 4AC = 0$
$\Rightarrow b^2(c - a)^2 - 4a(b - c)c(a - b) = 0$
$\Rightarrow b^2(c - a)^2 - 4ac(ab - b^2 - ac + bc) = 0$

$\Rightarrow b^2(c^2+a^2-2ac)-4a^2bc+4ab^2c+4a^2c^2-4abc^2=0$

$\Rightarrow a^2b^2+b^2c^2+2ab^2c-4a^2bc+4a^2c^2-4abc^2=0$

$\Rightarrow (ab)^2+(bc)^2+(-2ac)^2+2.(ab)(bc)+2(bc)(-2ac)+2(-2ac)(ab)=0$

$\Rightarrow (ab+bc-2ac)^2=0$

$\Rightarrow ab+bc=2ac$

$\Rightarrow \frac{2}{b}=\frac{1}{c}+\frac{1}{a}$

20. (d); ATQ,

$\sqrt{(a^2+b^2+ab)}+\sqrt{(a^2+b^2-ab)}=1$

Squaring both sides

$a^2+b^2+ab+a^2+b^2-ab+2\sqrt{(a^2+b^2)^2-(ab)^2}=1$

$\Rightarrow \sqrt{(a^2+b^2)^2-(ab)^2}=\frac{1}{2}-(a^2+b^2)$

$\Rightarrow$ Again squaring both sides

$a^4+b^4+2a^2b^2-a^2b^2=\frac{1}{4}+(a^2+b^2)^2-(a^2+b^2)$

$\Rightarrow a^4+b^4+a^2b^2=\frac{1}{4}+a^4+b^4+2a^2b^2-a^2-b^2$

$\Rightarrow a^2+b^2-a^2b^2=\frac{1}{4}$ ... (i)

Now,

$(1-a^2)(1-b^2)$

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

$=1-(a^2+b^2-a^2b^2)=1-\frac{1}{4}=\frac{3}{4}$

ALTERNATE SOLUTION

GIVEN

$\sqrt{(a^2+b^2+ab)}+\sqrt{(a^2+b^2-ab)}=1$

Put $a=\frac{1}{2}$ & $b=0$

Then value of $(1-a^2)(1-b^2)$

$\Rightarrow \left(1-\frac{1}{4}\right)(1-0)$

$\Rightarrow \frac{3}{4}$

21. (b); GIVEN EQUATIONS

$(3x+4y-11=18)\times 3$ ... (i)

$(8x-6y+12=6)\times 2$ ... (ii)

$9x+12y=87$

$16x-12y=-12$

$25x=75$

$x=3,\quad y=5$

value of $(5x-3y-9)$

$=5\times 3-3\times 5-9\Rightarrow -9$

22. (b); $a+b+c=\frac{7}{12}$ ... (i)

$7a-11b-13c=\frac{-7}{12}$ ... (ii)

$3a-4b+5c=\frac{3}{4}$ ... (iii)

Multiply (i) by (4) and add with eq (iii)

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

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

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

Again multiply (i) by 11 & add with eq no...(ii), we get

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

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

$18a-2c=\frac{70}{12}$

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

Add eqn. (iv) & (v)

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

$\left(9a-c=\frac{35}{12}\right)\times 9$

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

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

and

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

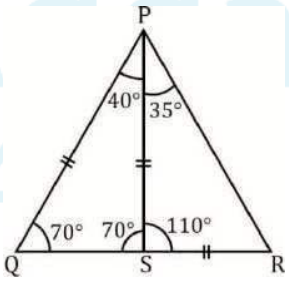
$9\left(\frac{1}{3}\right)-c=\frac{35}{12}$

$c=\frac{36-35}{12}$

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

$\boxed{a+c=\frac{1}{3}+\frac{1}{12}=\frac{5}{12}}$

23. (c);



$\angle QPS=40$ (Given)

As PQ = PS

HENCE

$\angle PQS=\angle PSQ=\frac{(180-40)}{2}=70$

$\angle PSQ=70$

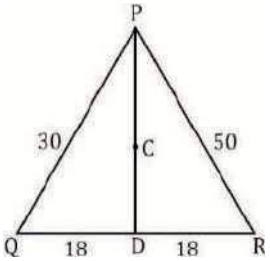
So, $\angle PSR=180-70=110$

As PS = SR

So, $\angle RPS=\angle SRP=\frac{(180-110)}{2}=35$

$\therefore \boxed{\angle QPR=40+35=75}$

24. (a);



By apollonius theorem

$(PQ)^2+(PR)^2=2[(PD)^2+(QD)^2]$

$(30)^2 + (50)^2 = 2[PD^2 + (18)^2]$

$\Rightarrow \frac{3400}{2} = PD^2 + 324$

$PD^2 = 1700 - 324 = 1376$

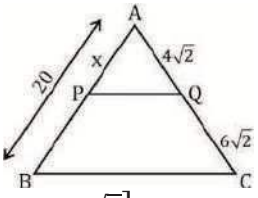
$PD = 4\sqrt{86}$

If C is centroid

$CD = \frac{1}{3} \times PD$

$\therefore CD = \frac{1}{3} \times 4\sqrt{86} = \frac{4\sqrt{86}}{3}$

25. (b);



$AQ = 4\sqrt{2}$

$QC = 6\sqrt{2}$ Given

$AB = 20$

$\Delta ABC \sim \Delta APQ$

$\frac{AB}{AP} = \frac{AC}{AQ}$

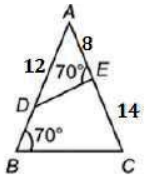
$\frac{20}{x} = \frac{(4\sqrt{2}+6\sqrt{2})}{4\sqrt{2}}$

$20 \times 4\sqrt{2} = x \times 10\sqrt{2} \Rightarrow x = 8$

$PB = AB - AP \Rightarrow = 20 - 8$

$PB \Rightarrow 12$

26. (c);



Given in question AE=8, EC=14 , AD=12

According to figure$\angle AED=70$ &$\angle ABC=70$

$\angle A$ Is common

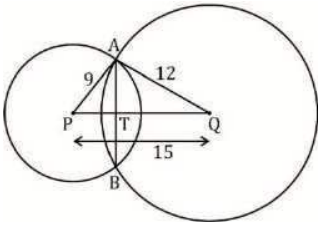
Hence $\Delta ABC \sim \Delta AED$

SO $\frac{AD}{AC} = \frac{AE}{AB}$

$\frac{12}{22} = \frac{8}{12+BD} \Rightarrow BD=\frac{32}{12}$

$BD=\frac{8}{3}$

27. (d);



$\angle PAQ = 90$ [angle by radius of two circle from center to a common point at circumference is always 90]

Area of APQ

$\frac{1}{2} \times AP \times AQ = \frac{1}{2} \times AT \times 15$

$\frac{1}{2} \times 9 \times 12 = \frac{1}{2} \times AT \times 15$

$AT = \frac{36}{5}$

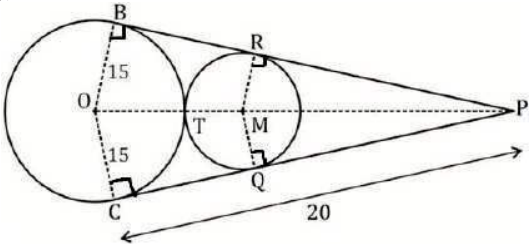
$AB = 2 \times AT$

$= 2 \times \frac{36}{5}$

$AB = 2 \times 7.2$

$AB = 14.4$

28. (b);



$OC = OT = 15$

$PC = 20$ GIVEN

Triangle OCP is right angled triangle, so

$PO = \sqrt{15^2 + 20^2}$

$PO = 25$

$\frac{OC}{PC} = \frac{15}{20} = \frac{3}{4}$

As triangle OCP & MQP are similar

similarly

$\frac{MQ}{PQ} = \frac{3K}{4K}$ & $PM = 5K$ .....(1)

Therefore PT=PO-OT

$PT = (25 - 15) = 10$

HENCE FROM EQ 1

AS

TM=MQ=3K &PM=5K

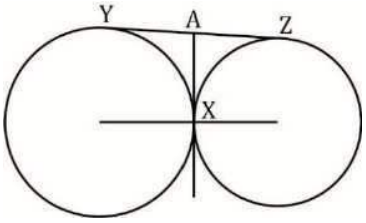
TM+PM=10

$(5K + 3K) = 10$

$K = 1.25$

Radius of smaller(TM=MQ) $= 3K = 3 \times 1.25 = 3.75$

29. (d);



According to diagram

YA &AX are tangent to bigger circle

So YA=AX=16

similarly for smaller circle

AZ & AX are tangent

Hence AZ=AX=16

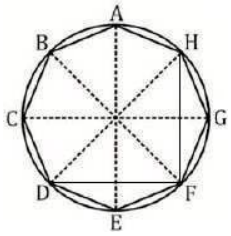
THEREFORE

YZ = AY+AZ

YZ = 16+16

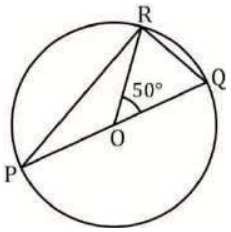
YZ = 32

30. (b);



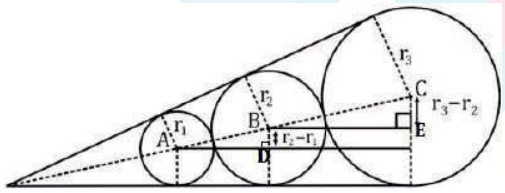
DH = diameter
As
FD = FH = same distance between two sides
& ∠DFH = 90° (angle in a semi-circle)
So, ∠HDF = ∠FHD = $\frac{90}{2}$ = 45°

31. (b);



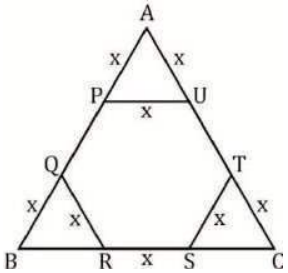
∠ROQ = 50
∠ROP = ∠(180 – 50) = ∠130
AS
RO=OP(RADIUS OF CIRCLE)
THEREFORE
∠RPO = ∠ORP=$\frac{180-130}{2}$ = 25°

32. (a);



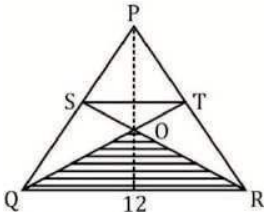
ΔABD ~ ΔBCE
$\frac{AB}{BD} = \frac{BC}{CE}$
$\frac{r_1+r_2}{r_2-r_1} = \frac{r_3+r_2}{r_3-r_2}$
$\Rightarrow \frac{r_2}{r_1} = \frac{r_3}{r_2}$ [By componendo & Dividendo rule]
$\Rightarrow {r_2}^2 = r_1.r_3$
$\boxed{r_2 = \sqrt{r_1.r_3}}$

33. (a); let ABC is an equilateral triangle inside which a hexagon of side x is drawn



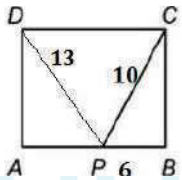
Area of ΔABC = $\frac{\sqrt{3}}{4}$ × 3x × 3x
Area of hexagon = $6 \times \frac{\sqrt{3}}{4} \times x \times x$
Ratio of
$\frac{\text{area of ABC}}{\text{area of PQRSTU}} = \frac{6}{9} \times 100 = 66.66\%$

34. (b); PQR is an equilateral triangle



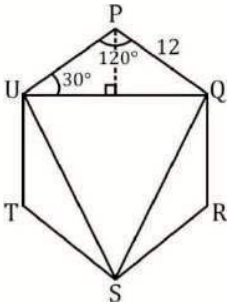
In equilateral triangle
Area of PQR = Area of POR + Area of QOP + Area of QOR
Area of POR = Area of QOP = Area of QOR
So, Area of Δ QOR = $\frac{1}{3}$ × Area of PQR
$= \frac{1}{3} \times \frac{\sqrt{3}}{4} \times 12 \times 12$
Area of QOR⇒ $12\sqrt{3}$ cm²

35. (a);



ABCD is a rectangle hence CBP & DAP are right angled triangle
BP=6, CP=10 &DP=13 GIVEN
In triangle CBP
CB=$\sqrt{100-36}$ =8
CB=DA=8
Hence in triangle DAP
AP=$\sqrt{169-64}$
AP=$\sqrt{105}$

36. (c);



In hexagon (regular) angle between two sides is 120°
∠UPQ = 120°
So, UQ = $12\sqrt{3}$
UQ=SU=SQ(distance between two equal sides), hence SUQ is an equilateral triangle
∴ Area of SQU = $\frac{\sqrt{3}}{4} \times 12\sqrt{3} \times 12\sqrt{3}$
= $108\sqrt{3}$ cm²