# CDS - II 2018
# Elementary Mathematics Question Paper

1. The highest four-digit number which is divisible by each of the numbers 16, 36, 45, 48 is
   A. 9180 B. 9360
   C. 9630 D. 9840
2. If $x = y^a, y = z^b$ and $z = x^c$, then the value of abc is
   A. 1 B. 2
   C. -1 D. 0
3. If $x = 2 + 2^{2/3} + 2^{1/2}$, then the value of the expression $x^3 - 6x^2 + 6x$ will be
   A. 2 B. 1
   C. 0 D. -2
4. How many five-digit numbers of the form XXYXX is/are divisible by 33?
   A. 1 B. 3
   C. 5 D. Infinite
5. A five-digit number XY235 is divisible by 3 where X and Y are digits satisfying $X + Y \le 5$. What is the number of possible pairs of values of (X, Y)?
   A. 5 B. 6
   C. 7 D. 9
6. If $x^2 - 6x - 27 > 0$, then which one of the following is correct?
   A. $-3 < x < 9$ B. $x < 9$ or $x > -3$
   C. $x > 9$ or $x < -3$ D. $x < -3$ only
7. The number of divisors of the number 38808, exclusive of the divisors 1 and itself, is
   A. 74 B. 72
   C. 70 D. 68
8. HCF and LCM of two polynomials are (x+3) and $(x^3 - 9x^2 - x + 105)$ respectively. If one of the two polynomials is $x^2 - 4x - 21$, then the other is
   A. $x^2 + 2x - 21$ B. $x^2 + 2x + 15$
   C. $x^2 - 2x - 15$ D. $x^2 - x - 15$
9. If α and β are two real numbers such that $\alpha + \beta = -\frac{q}{p}$ and $\alpha\beta = \frac{r}{p}$, where $1 < p < q < r$, then which one of the following is the greatest?
   A. $\frac{1}{\alpha + \beta}$ B. $\frac{1}{\alpha} + \frac{1}{\beta}$
   C. $-\frac{1}{\alpha\beta}$ D. $\frac{\alpha\beta}{\alpha + \beta}$
10. Two workers 'A' and 'B' working together completed a job in 5 days. Had 'A' worked twice as efficiently as he actually did and 'B' worked one-third as efficiently as the actually did, the work would have completed in 3 days. In how many days could 'A' alone complete the job?
    A. $3\frac{1}{2}$ days B. $4\frac{1}{6}$ days
    C. $5\frac{1}{2}$ days D. $6\frac{1}{4}$ days
11. If $x^6 + \frac{1}{x^6} = k\left(x^2 + \frac{1}{x^2}\right)$, then k is equal to
    A. $\left(x^2 - 1 + \frac{1}{x^2}\right)$ B. $\left(x^4 - 1 + \frac{1}{x^4}\right)$
    C. $\left(x^4 + 1 + \frac{1}{x^4}\right)$ D. $\left(x^4 - 1 - \frac{1}{x^4}\right)$
12. If the sum of the squares of three consecutive natural numbers is 110, then the sum of their cubes is
    A. 625 B. 654
    C. 684 D. 725
13. The product of two integers p and q, where $p > 60$ and $q > 60$, is 7168 and their HCF is 16. The sum of these two integers is
    A. 256 B. 184
    C. 176 D. 164
14. If $\log_{10} 2 = 0.3010$ and $\lg o_{10} 3 = 0.4771$, then the value of $\log_{100}(0.72)$ is equal to
    A. 0.9286 B. $\bar{1} \cdot 9286$
    C. 1.8572 D. $\bar{1} \cdot 8572$
15. If $a^x = b^y = c^x$ and $abc = 1$, then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ will be equal to
    A. -1 B. 0
    C. 1 D. 3

16. If α and β are the roots of the equation $ax^2+bx+c=0$, then the value of $\frac{1}{a\alpha+b}+\frac{1}{a\beta+b}$ is

A. $\frac{a}{bc}$  B. $\frac{b}{ac}$

C. $\frac{c}{ab}$  D. $\frac{1}{abc}$

17. Consider the following statements in respect of three 3-digit numbers XYZ, YZX and ZXY :

1. The sum of the numbers is not divisible by $(X+Y+Z)$.
2. The sum of the numbers is divisible by 111.

Which of the above statements is/are correct?

A. 1 only  B. 2 only

C. Both 1 and 2  D. Neither 1 nor 2

18. The number of all pairs (m, n), where m and n are positive integers, such that $\frac{1}{m}+\frac{1}{n}-\frac{1}{mn}=\frac{2}{5}$ is

A. 6  B. 5

C. 4  D. 2

19. If $a=xy^{p-1}, b=yz^{q-1}, c=zx^{r-1}$, then $a^{q-r}b^{r-p}c^{p-q}$ is equal to

A. abc

B. xyz

C. 0

D. None of the above

20. The number of sides of two regular polygons are in the ratio 5 : 4. The difference between their interior angles is 9°. Consider the following statements :

1. One of them is a pentagon and the other is a rectangle.
2. One of them is a decagon and the other is an octagon.
3. The sum of their exterior angles is 720°.

Which of the above statements is/are correct?

A. 1 only  B. 2 only

C. 1 and 3  D. 2 and 3

21. The minimum value of the expression $2x^2+5x+5$ is

A. 5  B. 15/8

C. -15/8  D. 0

22. If H is the harmonic mean of P and Q then the value of $\frac{H}{P}+\frac{H}{Q}$ is

A. 1  B. 2

C. $\frac{P+Q}{PQ}$  D. $\frac{PQ}{P+Q}$

23. The sum of all possible products taken two at a time out of the numbers $\pm1, \pm2, \pm3, \pm4$ is

A. 0  B. -30

C. 30  D. 55

24. The remainder when $3x^3-2x^2y-13xy^2+10y^3$ is divided by $(x-2y)$ is equal to

A. Zero  B. y

C. $y-5$  D. $y+3$

25. If $ab+bc+ca=0$, then the value of $\frac{(b^2-ca)(c^2-ab)+(a^2-bc)(c^2-ab)+(a^2-bc)(b^2-ca)}{(a^2-bc)(b^2-ca)(c^2-ab)}$ is

A. -1  B. 0

C. 1  D. 2

26. What is the principal amount which earns ₹ 210 as compound interest for the second year at 5% per annum?

A. ₹ 2000  B. ₹ 3200

C. ₹ 4000  D. ₹ 4800

27. In an examination, 50% of the candidates failed in English, 40% failed in Hindi and 15% failed in both the subjects. The percentage of candidates who passed in both English and Hindi is

A. 20%  B. 25%

C. 60%  D. 75%

28. A train 100 m long passes a platform 100 m long in 10 seconds. The speed of the train is

A. 36 kmph  B. 45 kmph

C. 54 kmph  D. 72 kmph

29. A cyclist covers his first 20 km at an average speed of 40 kmph, another 10 km at an average speed of 10 kmph and the last 30 km at an average speed of 40 kmph. Then the average speed of the entire journey is

A. 20 kmph B. 26.67 kmph
C. 28.24 kmph D. 30 kmph

30. In a race of 1000 m, A beats B by 150 m, while in another race of 3000 m, C beats D by 400 m. Speed of B is equal to that of D. (Assume that A, B, C and D run with uniform speed in all the events). If A and C participate in a race of 6000 m, then which one of the following is correct?

A. A beats C by 250 m
B. C beats A by 250 m
C. A beats C by 115.38 m
D. C beats A by 115.38 m

31. The sum of ages of a father, a mother, a son Sonu and daughters Savita and Sonia is 96 years. Sonu is the youngest member of the family. The year Sonu was born, the sum of the ages of all the members of the family was 66 years. If the father's age now is 6 times that of Sonu's present age, then 12 years hence, the father's age will be

A. 44 years B. 45 years
C. 46 years D. 48 years

32. 'A' is thrice as good a workman as 'B' and takes 10 days less to do a piece of work than 'B' takes. The number of days taken by 'B' alone to finish the work is

A. 12 B. 15
C. 20 D. 30

33. Out of 85 children playing badminton or table tennis or both, the total number of girls in the group is 70% of the total number of boys in the group. The number of boys playing only badminton is 50% of the number of boys and the total number of boys playing badminton is 60% of the total number of boys. The number of children playing only table tennis is 40% of the total number of children and a total of 12 children play badminton and table tennis both. The number of girls playing only badminton is

A. 14 B. 16
C. 17 D. 35

34. A person bought two articles X and Y from a departmental store. The sum of prices before sales tax was Rs. 130. There was no sales tax on the article X and 9% sales tax on the article Y. The total amount the person paid, including the sales tax was Rs. 136.75. What was the price of the article Y before sales tax?

A. Rs. 75 B. Rs. 85
C. Rs. 122 D. Rs. 125

35. According to Mr. Sharma's will, half of his property goes to his wife and the rest is equally divided between his two sons, Ravi and Raj. Some years later, Ravi dies and leaves half of his property to his widow and rest to his brother Raj. When Raj dies he leaves half of his property to his widow and remaining to his mother, who is still alive. The mother now owns Rs. 88,000 worth of the property. The total worth of the property of Mr. Sharma was

A. Rs. 1,00,000 B. Rs. 1,24,000
C. Rs. 1,28,000 D. Rs. 1,32,000

36. X bought 4 bottles of lemon juice and Y bought one bottle of orange juice. Orange juice per bottle costs twice the cost of lemon juice per bottle. Z bought nothing but contributed Rs. 50 for his share of the drink which they mixed together and shared the cost equally. If Z's Rs. 50 is covered from his share, then what is the cost of one bottle of orange juice?

A. Rs. 75 B. Rs. 50
C. Rs. 46 D. Rs. 30

37. Ten (10) years before, the ages of a mother and her daughter were in the ratio 3:1. Ion another 10 years from now, the ratio of their ages will be 13:7. What are their present ages?

A. 39 years, 21 years
B. 55 years, 25 years
C. 75 years, 25 years
D. 49 years, 31 years

38. In a class of 60 boys, there are 45 bots who play chess and 30 boys who play carrom. If every boy of the class plays at least one of the two games, then how many boys play carrom only?

A. 30 B. 20
C. 15 D. 10

39. Two equal amounts were borrowed at 5% and 4% simple interest. The total interest after 4 years amounted to ₹ 405. What was the total amount borrowed?

A. ₹ 1075 B. ₹ 1100
C. ₹ 1125 D. ₹ 1150

40. Twelve (12) men work 8 hours per day and require 10 days to build a wall. If 8 men are available, how many hours per day must they work to finish the work in 8 days?

A. 10 hours B. 12 hours
C. 15 hours D. 18 hours

41. A milk vendor bought 28 litres of milk at the rate of ₹ 8.50 per litre. After adding some water he sold the mixture at the same price. If his gain is 12.5%, how much water did he add?

A. 4.5 litres B. 4 litres
C. 3.5 litres D. 3 litres

42. The minute hand of a clock overtakes the hour hand after every 72 minutes of correct time. How much time does the clock lose or gain in a day of normal time?

A. Lose $121\frac{9}{11}$ minutes

B. Lose $157\frac{1}{11}$ minutes

C. Gain $121\frac{9}{11}$ minutes

D. Gain $157\frac{1}{11}$ minutes

43. A thief steals a car parked in a house and goes away with a speed of 40 kmph. The theft was discovered after half an hour and immediately the owner sets off in another car with a speed of 60 kmph. When will the owner meet the thief?

A. 55 km from the owner's house and one hour after the theft.
B. 60 km from the owner's house and 1.5 hours after the theft
C. 60 km from the owner's house and 1.5 hours after the discovery of the theft
D. 55 km from the owner's house and 1.5 hours after the theft

44. X and Y together can finish a job in 6 days. X can alone do the same job in 12 days. How long will Y alone take to do the same job?

A. 16 days B. 12 days
C. 10 days D. 8 days

45. Twelve (12) persons can paint 10 identical rooms in 16 days. In how many days can 8 persons paint 20 such rooms?

A. 12 B. 24
C. 36 D. 48

46. There are n zeros appearing immediately after the decimal point in the value of $(0.2)^{25}$. It is given that the value of $\log_{10} 2 = 0.30103$. The value of n is

A. 25 B. 19
C. 18 D. 17

47. The ratio of the sum and difference of the ages of the father and the son is 11 : 3. Consider the following statements :

1. The ratio of their ages is 8 : 5.
2. The ratio of their ages after the son attains twice the present age will be 11 : 8.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

48. The solution of linear inequalities $x + y \geq 5$ and $x - y \leq 3$ lies

A. Only in the first quadrant
B. In the first and second quadrants
C. In the second and third quadrants
D. In the third and fourth quadrants

49. It is given that the equations $x^2 - y^2 = 0$ and $(x-a)^2 + y^2 = 1$ have single positive solution. For this, the value of 'a' is

A. $\sqrt{2}$ B. 2

C. $-\sqrt{2}$ D. 1

50. If α, β and γ are the zeros of the polynomial $f(x) = ax^3 + bx^2 + cx + d$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to

A. $\frac{b^2 - ac}{a^2}$ B. $\frac{b^2 - 2ac}{a}$

C. $\frac{b^2 - 2ac}{b^2}$ D. $\frac{b^2 - 2ac}{a^2}$

**Consider the following for the next 04 (four) items that follow :**

In an examination of Class XII, 55% students passed in Biology, 62% passed in Physics, 60% passed in Chemistry, 25% passed in Physics and Biology, 30% passed in Physics and Chemistry, 28% passed in biology and Chemistry. Only 2% failed in all the subjects.

51. What percentage of students passed in all the three subjects?

A. 6 B. 5

C. 4 D. 3

52. What percentage of students passed in exactly one subject?

A. 21 B. 23

C. 25 D. 27

53. If the number of students is 360, then how many passed in at least two subjects?

A. 270 B. 263

C. 265 D. 260

54. What is the ratio of number of students who passed in both Physics and Chemistry to number of students who passed in both Biology and Physics but not Chemistry?

A. 7 : 10 B. 10 : 7

C. 9 : 7 D. 7 : 9

55. Data on ratings of hotels in a city is measured on

A. Nominal scale B. Ordinal scale

C. Interval scale D. Ratio scale

56. The average marks of section A are 65 and that of section B are 70. If the average marks of both the sections combined are 67, then the ratio of number of students of section A to that of section B is

A. 3 : 2 B. 1 : 3

C. 3 : 1 D. 2 : 3

57. The median of 19 observations is 30. Two more observations are made and the values of these are 8 and 32. What is the median of the 21 observations?

A. 32

B. 30

C. 20

D. Cannot be determined due to insufficient data

58. As the number of observations and classes increases, the shape of a frequency polygon

A. Tends to become jagged

B. Tends to become increasingly smooth

C. Stays the same

D. Veries only if data become more reliable

59. Let $\bar{x}_1$ and $\bar{x}_2$ (where $\bar{x}_2 > \bar{x}_1$) be the means of two sets comprising $n_1$ and $n_2$ (where $n_2 < n_1$) observations respectively. If $\bar{x}$ is the mean when they are pooled, then which one of the following is correct?

A. $\bar{x}_1 < \bar{x} < \bar{x}_2$

B. $\bar{x} > \bar{x}_2$

C. $\bar{x} < \bar{x}_1$

D. $(\bar{x}_1 - \bar{x}) + (\bar{x}_2 - \bar{x}) = 0$

60. Consider the following statements :

Statement I :

Median can be computed even when the end intervals of a frequency distribution are open.

Statement II :

Median is a positional average.

Which one of the following is correct in respect of the above statements?

A. Both Statement I and Statement II are true and Statement II is the correct explanation of Statement I

B. Both Statement I and Statement II are true and Statement II is not the correct explanation of Statement I

C. Statement I is true but Statement II is false.

D. Statement I is false but Statement II is true.

61. If $\cos\theta = \frac{1}{\sqrt{5}}$, where $0 < \theta < \frac{\pi}{2}$, then $\frac{2\tan\theta}{1-\tan^2\theta}$ is equal to

A. 4/3 B. -4/3

C. 1/3 D. -2/3

62. If $0 < \theta < 90^\circ, 0 < \phi < 90^\circ$ and $\cos\theta < \cos\phi$, then which one of the following is correct?

A. $\theta < \phi$

B. $\theta > \phi$

C. $\theta + \phi = 90^\circ$

D. No conclusion can be drawn

63. On the top of a hemispherical dome of radius r, there stands a flag of height h. From a point on the ground, the elevation of the top of the flag is 30°. After moving a distance d towards the dome, when the flag is just visible, the elevation is 45°. The ratio of h to r is equal to

A. $\sqrt{2}-1$ B. $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C. $\frac{\sqrt{3}+1}{2\sqrt{2}}d$ D. $\frac{(\sqrt{3}+1)(\sqrt{2}-1)}{2\sqrt{2}}d$

64. Let $\sin(A+B) = \frac{\sqrt{3}}{2}$ and $\cos B = \frac{\sqrt{3}}{2}$, where A, B are acute angles. What is $\tan(2A-B)$ equal to?

A. 1/2 B. $\sqrt{3}$

C. $\frac{1}{\sqrt{3}}$ D. 1

65. Consider the following statements :

1. If $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$, where $0 < \theta < 90^\circ$, then $\theta = 60^\circ$.

2. If $3\tan\theta + \cot\theta = 5\operatorname{cosec}\theta$, where $0 < \theta < 90^\circ$, then $\theta = 60^\circ$.

Which of the statements given above is/are correct?

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

66. Consider the following statements :

1. $\cos^2\theta = 1 - \frac{p^2+q^2}{2pq}$, where p, q are non-zero real numbers, is possible only when p = q.

2. $\tan^2\theta = \frac{4pq}{(p+q)^2} - 1$, where p, q are non-zero real numbers, is possible only when p = q.

Which of the statements given above is/are correct?

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

67. Consider the following statements :

1. $\cos\theta + \sec\theta$ can never be equal to 1.5.

2. $\sec^2\theta + \operatorname{cosec}^2\theta$ can never be less than 4.

Which of the statements given above is/are correct?

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

68. If $\sin^2 x + \sin x = 1$, then what is the value of

$\cos^{12} x + 3\cos^{10} x + 3\cos^3 x + \cos^6 x$?

A. -1 B. 0

C. 1 D. 8

69. If $3\sin\theta + 5\cos\theta = 4$, then what is the value of $(3\cos\theta - 5\sin\theta)^2$?

A. 9 B. 12

C. 16 D. 18

70. If $\cot\theta(1+\sin\theta) = 4m$ and $\cot\theta(1-\sin\theta) = 4n$, then which one of the following is correct?

A. $(m^2 + n^2)^2 = mn$

B. $(m^2 - n^2)^2 = mn$

C. $(m^2 - n^2)^2 = m^2n^2$

D. $(m^2 + n^2)^2 = m^2n^2$

71. If base and hypotenuse of a right triangle are $(u^2 - v^2)$ and $(u^2 + v^2)$ respectively and the area of the triangle is 2016 square units, then the perimeter of the triangle may be

A. 224 units B. 288 units

C. 448 units D. 576 units

72. A circle is inscribed in an equilateral triangle of side of length *l*. The area of any square inscribed in the circle is

A. $\frac{l^2}{2}$ B. $\frac{\sqrt{3}\ l^2}{4}$

C. $\frac{l^2}{4}$ D. $\frac{l^2}{6}$

73. Walls (excluding roofs and floors) of 5 identical rooms having length, breadth and height 6 m, 4 m and 2.5 m respectively are to be painted. Out of five rooms, two rooms have one square window each having a side of 2.5 m. Paints are available only in cans of 1 litre; and 1 litre of paint can be used for painting 20 square metres. The number of cans required for painting is

A. 10 B. 12

C. 13 D. 14

74. Let S be the parallelogram obtained by joining the mid-points of the parallelogram T. Consider the following statements :

1. The ratio of area of T so that of S is 2 : 1.
2. The perimeter of S is half of the sum of diagonals of T.

Which of the above statements is/are correct?

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

75. The sides of a triangle are 5 cm, 6 cm and 7 cm. The area of the triangle is approximately

A. 14.9 $cm^2$ B. 14.7 $cm^2$

C. 14.5 $cm^2$ D. 14.3 $cm^2$

76. There is path of width 5 m around a circular plot of land whose area is $144\pi\ m^2$. The total area of the circular plot including the path surrounding it is

A. $349\pi\ m^2$ B. $289\pi\ m^2$

C. $209\pi\ m^2$ D. $149\pi\ m^2$

77. The lateral surface area of a cone is $462\ cm^2$. Its slant height is 35 cm. The radius of the base of the cone is

A. 8.4 cm B. 6.5 cm

C. 4.2 cm D. 3.2 cm

78. A semi-circular plate is rolled up to form a conical surface. The angle between the generator and the axis of the cone is

A. 60° B. 45°

C. 30° D. 15°

79. A solid right cylinder is of height π cm. If its lateral surface area is half its total surface area, then the radius of its base if

A. π/2 cm B. π cm

C. 1/π cm D. 2/π cm

80. A rectangular block of length 20 cm, breadth 15 cm and height 10 cm is cut up into exact number of equal cubes. The least possible number of cubes will be

A. 12 B. 16

C. 20 D. 24

81. If the diagonal of a cube is of length *l*, then the total surface area of the cube is

A. $3\ l^2$ B. $\sqrt{3}\ l^2$

C. $\sqrt{2}\ l^2$ D. $2\ l^2$

82. An equilateral triangle, a square and a circle have equal perimeter. If T, S and C denote the area of the triangle, area of the square and area of the circle respectively, then which one of the following is correct?

A. T < S < C B. S < T < C

C. C < S < T D. T < C < S

83. The areas of two similar triangles are $\left(7-4\sqrt{3}\right)\text{cm}^2$ and $\left(7+4\sqrt{3}\right)\text{cm}^2$ respectively. The ratio of their corresponding sides is

A. $7-4\sqrt{3}$ B. $7-3\sqrt{3}$
C. $5-\sqrt{3}$ D. $5+\sqrt{3}$

84. The chord of a circle is $\sqrt{3}$ times its radius. The angle subtended by this chord at the minor arc is k times the angle subtended at the major arc. What is the value of k?

A. 5 B. 2
C. 1/2 D. 1/5

85. In a triangle ABC, the sides AB, AC are produced and the bisectors of exterior angles of $\angle ABC$ and $\angle ACB$ intersect at D. If $\angle BAC = 50^\circ$, then $\angle BDC$ is equal to

A. 115° B. 65°
C. 55° D. 40°

86. Two cones have their heights in the ratio 1 : 3. If the radii of their bases are in the ratio 3 : 1, then the ratio of their volumes will be

A. 1 : 1 B. 2 : 1
C. 3 : 1 D. 9 : 1

87. If two lines AB and OD intersect at O such that $\angle AOC = 5\angle AOD$, then the four angles at O are

A. 40°, 40°, 140°, 140°
B. 30°, 30°, 150°, 150°
C. 30°, 45°, 75°, 210°
D. 60°, 60°, 120°, 120°

88. If a point P moves such that the sum of the squares of its distances from two fixed points A and B is a constant, then the locus of the point P is

A. A straight line
B. A circle
C. Perpendicular bisector of AB
D. An arbitrary curve

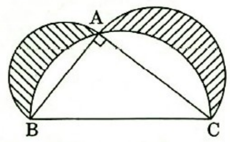
89. If ABC is a right-angled triangle with AC as its hypotenuse, then which one of the following is correct?

A. $AC^3 < AB^3 + BC^3$ B. $AC^3 > AB^3 + BC^3$
C. $AC^3 \le AB^3 + BC^3$ D. $AC^3 \ge AB^3 + BC^3$

90. The area of the region bounded externally by a square of side 2a cm and internally by the circle touching the four sides of the square is

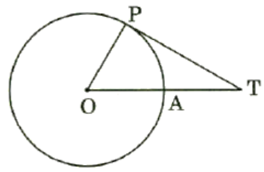
A. $(4-\pi)a^2$ B. $(\pi-2)a^2$
C. $(8-\pi)a^2/2$ D. $(\pi-2)a^2/2$

91. In the figure given below, ABC is a right-angled triangle where $\angle A = 90^\circ, AB = p$ cm and $AC = q$ cm. On the three sides as diameters semicircles are drawn as shown in the figure. The area of the shaded portion, in square cm, is



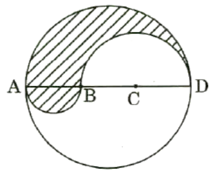

A. pq B. $\pi\left(p^2+q^2\right)/2$
C. $\pi\left(p^2+q^2\right)$ D. pq/2

92. In the figure given below, the radius of the circle is 6 cm and AT = 4 cm. The length of tangent PT is



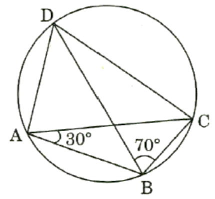

A. 6 cm B. 8 cm
C. 9 cm D. 10 cm

93. In the figure given below, ABCD is the diameter of a circle of radius 9 cm. The lengths AB, BC and CD are equal. Semicircles are drawn on AB and BD as diameters as shown in the figure. What is the area of the shaded region?



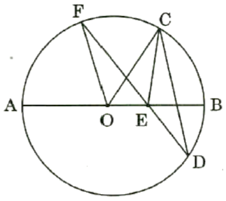

A. $9\pi$ B. $27\pi$
C. $36\pi$ D. $81\pi$

94. In the figure given below, what is $\angle BCD$ equal to?



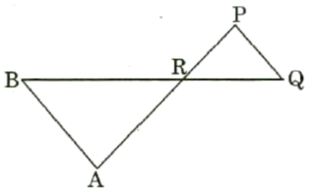

A. 70° B. 75°
C. 80° D. 90°

95. In the figure given below, AB is the diameter of the circle whose centre is at O. Given that $\angle ECD = \angle EDC = 32^\circ$, then $\angle CEF$ and $\angle COF$ respectively are



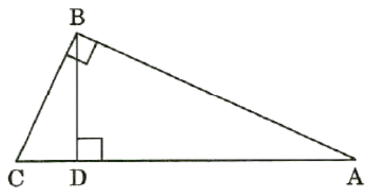

A. 32°, 64°  B. 64°, 64°
C. 32°, 32°  D. 64°, 32°

96. In the figure given below, $\Delta ABR \sim \Delta PQR$. If $PQ = 3$ cm, $AB = 6$ cm, $BR = 8.2$ cm and $PR = 5.2$ cm, then QR and AR are respectively



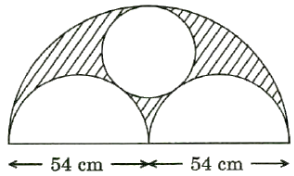

A. 8.2 cm, 10.4 cm
B. 4.1 cm, 6 cm
C. 2.6 cm, 5.2 cm
D. 4.1 cm, 10.4 cm

97. In the figure given below, ABC is a triangle with AB perpendicular to BC. Further BD is perpendicular to AC. If AD = 9 cm and DC = 4 cm, then what is the length of BD?



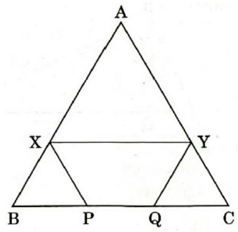

A. 13.36 cm  B. 36/13 cm
C. 13/2 cm  D. 6 cm

98. In the figure given below, the diameter of bigger semicircle is 108 cm. What is the area of the shaded region?



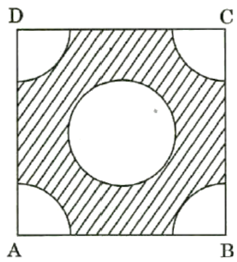

A. $201\pi$ cm$^2$  B. $186.3\pi$ cm$^2$
C. $405\pi$ cm$^2$  D. $769.5\pi$ cm$^2$

99. In the figure given below, ABC is an equilateral triangle with each side of length 30 cm. XY is parallel to BC, XP is parallel to AC and YQ is parallel to AB. If $XY + XP + YQ$ is 40 cm, then the value of PQ is




A. 5 cm  B. 12 cm
C. 15 cm  D. 10 cm

100. In the figure given below, ABCD is a square of side 4 cm. Quadrants of a circle of diameter 2 cm are removed from the four corners and a circle of diameter 2 cm is also removed. What is the area of the shaded region?




A. $5\frac{7}{9}$ cm$^2$  B. $7\frac{7}{9}$ cm$^2$
C. $9\frac{5}{7}$ cm$^2$  D. $9\frac{5}{6}$ cm$^2$

# ANSWERS

1. Ans. B.
LCM of 16,36,45 & 48
16 = 2 x 2 x 2 x 2
36 =2 x 3 x 2 x 3
45 = 3 x 3 x 5
48 = 2 x 2 x 2 x 2 x 3
LCM = 2 x 2 x 2 x 2 x 3 x 3 x 5 = 720
On dividing 9999 (highest 4 digit no.) by 720, we get
639 as remainder,
Hence, required number = 9999 - 639 = 9360

2. Ans. A.
$$x = y^a, y = z^b, z = x^c$$
Putting value of Z in y & y in X, we get
$$y = (x^c)^b$$
$$x = \left((x^c)^b\right)^c$$
$$x = x^{abc}$$
On comparing powers, we get
abc = 1

3. Ans. A.
$$x = 2 + 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$$
$$x - 2 = 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$$
Cubing both sides
$$(x - 2)^3 = \left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\right)^3$$
$$x^3 - 8 - 6x^2 + 12x = 4 + 2 + 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}}\left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\right)$$
$$x^3 - 8 - 6x^2 + 12x = 6 + 3 \times 2(x - 2)$$
$$x^3 - 6x^2 + 12x - 6x = 6 - 12 + 8$$
$$x^3 - 6x^2 + 6x = 2$$

4. Ans. B.
33 = 11 x 3
Number x * y * x
Divisible by 11 = (x + y + x) - (x + x) = y
Hence, y being a single digit number must be divisible by 11 or else be zero.
For divisibility by 3, number must be divisible by 3
x + x + 0 + x + x
= 4x
For 3,6 &9, we will get '4x' as multiple of 3
Hence, number can be one of below three:
33033, 66066 & 99099
Hence, answer is 3.

5. Ans. C.
As x4235 is divisible by 3,
x + 4 + 2 + 3 + 5 is divisible by 3
x + 4 + 10 is divisible by 3
Also, x + 4 <= 5,
hence (x+4) can be 2 or 5 (as both 12 & 15 are divisible by 3)
For x + 4 = 2, solution (1,1), (2,0)
For x + y = 5, solution (5,0), (4,1), (3, 2), (2, 3), (1,4)
Hence, there are 7 possible pairs.

6. Ans. C.
$$x^2 - 6x - 27 > 0$$
$$x^2 - 9x + 3x - 27 > 0$$
$$x(x - 9) + 3(x - 9) > 0$$
$$(x + 3)(x - 9) > 0$$
Either, x + 3 > 0 & x – 9 > 0
or x + 3 < 0 and x – 9 < 0
Taking x + 3 > 0 & x – 9 > 0
x > - 3 & x > 9
x > 9
Taking x + 3 < 0 & x – 9 < 0
X < – 3 & x < 9
X < – 3
Hence, X < – 3 or x > 9

7. Ans. C.
38808 = 2 x 2 x 2 x 3 x 7 x 7 x 11 x 3
$$= 2^3 \times 3^2 \times 7^2 \times 11^1$$
No. of divisors = (3+1)(2+1)(2+1)(1+1)
= 72
Excluding one & itself = 72 - 2 = 70

8. Ans. C.
HCF x LCM = p(x) x q(x)
$(x+3)(x^3-9x^2-x+105)=(x^2-4x-21)\times q(x)$
$(x+3)(x^3-9x^2-x+105)=(x-7)(x+3)\times q(x)$
$$q(x)=\frac{x^3-9x^2-x+105}{x-7}$$
Thus, answer is $x^2-2x-15.$

9. Ans. C.
As 1 < p < q < r
Hence, $\alpha+\beta=-\frac{q}{p}$ is negative
$\alpha\beta=\frac{r}{p}$ is both positive & its magnitude is greater than one.
Option (A) $\frac{1}{\alpha+\beta}=-\frac{p}{q}$ is negative
Option (B) $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}$
$=-\frac{q}{p}\left(\frac{p}{r}\right)$
$=-\frac{q}{r}$ is negative
Option (C) $-\frac{1}{\alpha\beta}=-\frac{p}{r}$
Option (D) $\frac{\alpha\beta}{\alpha+\beta}=\frac{r}{p}\times-\frac{p}{q}=-\frac{r}{q}$
As r > p
Hence, option a is bigger than option d
As q > p
Hence, option c > option b
As r > q
So, $\frac{1}{r}<\frac{1}{q}$
Hence, $-\frac{p}{r}>-\frac{p}{q}$
Thus, option c is biggest.

10. Ans. D.
Let total work = 1
For full work let A takes days = a
1 day work of A = 1/a
Similarly, B takes days b
1 day work of B = 1/b
5 days work of:
$A+B=5\left(\frac{1}{a}+\frac{1}{b}\right)$ … (i)
If A worked twice the original efficiency, then 1 day of work of A = 2/a
If B worked 1/3rd effectively, then 1 day work of B = 1/3b
3 days work both $=3\left(\frac{2}{a}+\frac{1}{3b}\right)$
Acc. to the question,
$$5\left(\frac{1}{a}+\frac{1}{b}\right)=3\left(\frac{2}{a}+\frac{1}{3b}\right)$$
$$\frac{5}{a}+\frac{5}{b}=\frac{6}{a}+\frac{1}{b}$$
$$\frac{4}{b}=\frac{1}{a}$$
$$4a=b$$
Putting above eq. in (i)
$$5\left(\frac{1}{a}+\frac{1}{b}\right)=1$$
$$\frac{5}{4a}=\frac{1}{5}$$
$$a=6\frac{1}{4}\text{ days}$$

11. Ans. B.
$$x^6+\frac{1}{x^6}=k\left(x^2+\frac{1}{x^2}\right)$$
Using identity
$$a^3+b^3=(a+b)(a^2-ab+b^2)$$
$$(x^2)^3+\left(\frac{1}{x^2}\right)^3=\left(x^2+\frac{1}{x^2}\right)\left(x^4-1+\frac{1}{x^4}\right)$$
$$\therefore k=x^4-1+\frac{1}{x^4}$$

12. Ans. C.
Let numbers be x, x+1, x+2

$$x^2 + (x+1)^2 + (x+2)^2 = 110$$

$$x^2 + x^2 + x + 2x + x^2 + 4 + 4x = 110$$

$$3x^2 + 6x - 105 = 0$$

$$x^2 + 2x - 35 = 0$$

$$x^2 + 7x - 5x - 35 = 0$$

x(x+7) - 5(x+7) =0
(x-5) (x+7) = 0
x =5, -7
As ‘x’ is a natural number, hence x = 5
Number are 5, 6, 7

$$= (5)^3 + (6)^3 + (7)^3$$

= 125 + 216 +343 = 684

13. Ans. C.
As 16 is their HCF, hence
Let P = 16x & q = 16y
P x Q = Product
16x * 16y = 7168
xy = 28
As HCF is 16, hence the sum of the two numbers must be a multiple of 16, this removes option (b) & (d)
Using option (a),
16x + 16y = 256
X + y = 16 & xy = 256
On solving,
X = 2 & y = 14
Thus, P = 16x2 = 32, which is less than 60.
Using option (b), 16(x+y) =176
= x + y = 1 & xy = 28
=> x = 4 & y = 7
P = 16x4 = 64 &
Q = 16 x 7 = 112

14. Ans. B.

$$= \log_{100}(0.72)$$

$$= \frac{\log(0.72)}{\log(100)}$$

$$= \frac{\log\left(\frac{72}{100}\right)}{\log 100}$$

$$= \frac{\log(72) - \log(100)}{\log(100)}$$

$$= \frac{\log(2^3 \times 3^2) - \log(10^2)}{\log(10^2)}$$

$$= \frac{\log(2)^3 + \log(3^2) - 2\log(10)}{2\log(10)}$$

$$= \frac{3\log(2) + 2\log(3) - 2}{2}$$

$$= \frac{3(0.301) + 2(0.4771) - 2}{2}$$

$$= \frac{0.903 + 0.9542 - 2}{2}$$

$$= \frac{-0.1428}{2}$$

$$= -0.0714$$

$$= \bar{1}.9286$$

15. Ans. B.
Let $a^x = b^y = c^z = k$

$$a^x = k$$

$$a = k^{\frac{1}{x}}$$

$$b = k^{\frac{1}{y}}$$

$$c = k^{\frac{1}{z}}$$

$$abc = k^{\frac{1}{x}} k^{\frac{1}{y}} k^{\frac{1}{z}}$$

$$1 = k^{\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)}$$

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

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

16. Ans. B.
As α & β are roots of equation
$$ax^2+bx+c=0$$
Then, α + β = -b/a
And, α * β = -c/a

From the given:
$$\frac{1}{a\alpha+b}+\frac{1}{a\beta+b}$$
= $[(a\beta+b)+(a\alpha+b)]/[(a\alpha+b)*(a\beta+b)]$
Solving the above, and using above, we get b/ac

17. Ans. C.
The three numbers can be written as:
xyz = 100x + 10y + z
yzx = 100y + 10z + x
zxy = 100z + 10x + y
Adding above three, we get
= 100(x+y+z) + 10(x+y+z) + (x+y+z)
= (x+y+z) (100+10+1)
= (x+y+z)(111)
Hence, this number is divisible by both (x+y+z) & 111.
Hence, option C is correct.

18. Ans. C.
We can, rewrite this equation
1/m+1/n−1/mn=2/5
5m+5n−5=2mn
If m=n, then we have 2m2−10m+5=0.
There are no integer roots for this.
Now suppose m<n. Then we can say that 10n>2mn⇒5>m.
If m=1 we get 5n=2n; n=0, no solutions.
If m=2 we get 5n+5=4n; n=−5, no solutions
If m=3 we get 5n+10=6n; n=10.
If m=4 we get 5n+15=8n; 3n=15, so n=5.

Therefore, there are 4 positive solutions, (m,n)∈{(10,3),(3,10),(4,5),(5,4)}.

19. Ans. D.
Right hand side
$$= a^{q-r}\,b^{r-p}\,c^{p-q}$$
$$= (xy^{p-1})^{q-r}\,(xy^{q-1})^{r-p}\,(xy^{r-1})^{p-q}$$
$$= x^{q-r}y^{(p-1)(q-r)}\,x^{r-p}y^{(q-1)(r-p)}\,x^{p-q}y^{(r-1)(p-q)}$$
$$= x^{q-r+r-p+p-q}\,y^{(p-1)(q-r)+(q-1)(r-p)+(r-1)(p-q)}$$
$$= x^0\,y^{pq-pr-q+r+qr-pq-r+p+pr-qr-p+q}$$
$$= 1\times y^0 = 1\times 1$$
$$= 1$$

20. Ans. D.
Let the sides be 5x & 4x interior angle of regular polygon = ((n-2)180)/n
$$\therefore \frac{(5x-2)180}{5x}-\frac{(4x-2)180}{4x}=9$$
$$=\frac{[(20x-8)-(20x-10)]180}{20x}=9$$
=> x = 2
Sides are 10 & 8
Hence, point 1 is wrong & point 2 is right.
Sum of exterior angles of any regular polygon is 360.
Hence, the sum of their exterior angles will be 360+360 = 720.
Hence, point 3 is also correct.

21. Ans. B.
$$2x^2+5x+5$$
$$ax^2+bx+c.$$
If a > 0, Min value $=\frac{4ac-b^2}{4a}$
$$=\frac{4\times2\times5-25}{8}=\frac{40-25}{8}=\frac{15}{8}$$

22. Ans. B.
If H is harmonic mean of P & Q, then

$$H = \frac{2PQ}{P+Q}$$

$$\frac{H}{P}+\frac{H}{Q} = \left[\frac{2PQ}{(P+Q)P}+\frac{2PQ}{Q(P+Q)}\right]$$

$$= \frac{2Q}{P+Q}+\frac{2P}{P+Q}$$

$$= \frac{2(P+Q)}{P+Q} = 2$$

23. Ans. A.
Let us multiply first two numbers
$\pm1$ & $\pm2$
1 x 2 = 2, 1 x-2 = -2, -1 x 2 = -2, -1 x -2 = 2
Adding above 4, we get sum as 0.
The same is valid for all the possible combination.
Hence, total sum will be zero.

24. Ans. A.
$f(x) = 3x^3 - 2x^2y - 13xy^2 + 10y^3$
Using remainder theorem,
x - 2y = 0
x = 2y
$f(2y) = 3(2y)^3 - 2(2y)^2y - 13(2y)y^2 + 10y^3$
$= 24y^3 - 8y^3 - 26y^3 + 10y^3 = 0.$

25. Ans. B.

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

$ab + bc + ca = 0$ ... (i)
$b^2 - ca$
$= b^2 + ab + bc$ (using (i))
$= b(b + a + c)$
$= c^2 - ab$
$= c^2 + bc + ca$
$= c(a + b + c)$
Similarly,
$a^2 - bc = a(a + b + c)$
Equation becomes

$$\frac{cb(b+a+c)^2+ac(a+b+c)^2+ab(a+b+c)^2}{(a^2-bc)(b^2-ca)(c^2-ab)}$$

$$= \frac{(b+a+c)^2(cb+ac+ab)}{(a^2-bc)(b^2-ca)(c^2-ab)}$$

$$= \frac{(b+a+c)^2(0)}{(a^2-bc)(b^2-ca)(c^2-ab)} = 0$$

26. Ans. C.

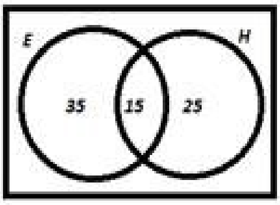
$$210 = P\left(1+\frac{R}{100}\right)\times\frac{R\times T}{100}$$

$$210 = P\left(1+\frac{5}{100}\right)\times\frac{(5\times1)}{100}$$

$$= 210 = P\left(\frac{105}{100}\right)\times\frac{5}{100}$$

P = 4000

27. Ans. B.
$n(E \cup H) = n(E) + n(H) - n(E \cap H)$
$= 50 + 40 - 15 = 75\%$
Percentage pass
$= 100 - 75 = 25\%$




28. Ans. D.
Total distance = 100 + 100 = 200m
Time= 10 sec
Speed = Distance / Time
= 200/10 = 20m/sec
= 20* 18/5 = 72 km/h

29. Ans. B.

Let $d_1, d_2$ & $d_3$ be 20 km, 10 km & 30 km & $S_1, S_2, S_3$ be 40 km/h, 10m/h & 40km/h.

Hence, $T_1 = \frac{d_1}{S_1} = \frac{20}{40} = \frac{1}{2}\text{hr.}$

$$T_2 = \frac{d_2}{S_2} = \frac{10}{10} = 1\text{hr.}$$

$$T_3 = \frac{d_3}{S_3} = \frac{30}{40} = \frac{3}{4}\text{hr.}$$

Total distance = 20 + 10 +30 = 60 km

Total time $= \frac{1}{2} + 1 + \frac{3}{4}$

$$= \frac{2+4+3}{4} = \frac{9}{4}\text{hr.}$$

Speed = Distance/Time

$$= \frac{60}{9} \times 4 = 26.67 \text{ kmph}$$

30. Ans. C.

As A beats B by 150m, hence

Speed of A($S_A$)/Speed by B

$$(S_B) = \frac{1000}{850} = \frac{20}{17}$$

As C beats D by 400m, hence

Speed of C($S_C$)/Speed by D

$$(S_D) = \frac{3000}{2600} = \frac{15}{13}$$

Let speed of A & B be 20x & 17x

Let speed of C & D be 15y & 13y

As $S_B$ & $S_D$ hence

17x = 13y

X = 13/17y

$$\frac{S_A}{S_C} = \frac{20x}{15y} = \frac{4x}{3y}$$

$$= \frac{4}{3y}\left(\frac{13y}{17}\right) = \frac{52}{51}$$

Let A beats C by K metres, thus

$$\frac{6000}{6000 - K} = \frac{52}{51}$$

$$51 \times 6000 = 52(6000 - K)$$

K = 115.38m

31. We shall use F for father, M for mother, A for Sonu, B for Savita & C for Sonia (for present ages)

F + M + A + B + C = 96

When Sonu was born:

(F - A) + (M - A) + (A - A) + (B - A) + (C - A) = 66

F + M + A + B + C - 5A = 66

96 - 5A = 66

5A = 96 - 66 = 30

A = 30/5 = 6

Also, F = 6A = 6 x 6 = 36 years

After 12 years

Father's age = F + 12 = 36 + 12 = 48 years

32. Ans. B.

Let A takes days to finish work = x

Let B takes days to finish work = x + 10

As A is thrice more efficient, hence B will take 3 times the time taken by A.

x + 10 = 3x

Solving, we get: x = 5

Time taken by B = x + 10 = 15 days

33. Ans. A.

Let total number of boys = x

Let total number of girls = 70% of x = 0.7x

Total = x + 0.7x

85 = 1.7x

x = 50

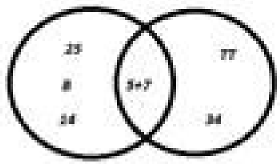
Number of boys = 50

Number of girls = 0.7 x 50 = 35

Number of boys playing only badminton = 50% of 50 = 25

No. of children playing TT only = 40% of 85 = 34

No. of children playing both = 12




No. of girls playing only Badminton = Total students – Boys playing only Badminton –Children playing both games - Children playing only TT
= 85 - 25 - 12 - 34 = 14

34. Ans. (A)
Solution:
Let the price of article X and Y be x and y respectively
Price of articles before sales tax= Rs. 130
Price of article after sales tax = Rs. 136.75
Difference in prices = sales tax on article Y
136.75 – 130 = 9% of y
6.75 = y* 9/100
y = 6.75*100/9 = Rs. 75

35. Ans. (C)
Solution:
Initially according to the will
Mr. Sharma's wife share = 50%
Ravi's share = 25% = Raj's share
After Ravi's death
Ravi's widow share = 25%/2 = 12.5%
Raj's share = Raj's initial share + remaining share of raj's = 25% + 12.5% = 37.5%
After Raj's Death,
Raj's widow share = 37.5/2 % = 18.75%
Mr. Sharma's wife's share = 50% + remaining share of Raj = 50% + 18.75% = 68.75%
68.75% of Mr. Sharma's Property = Rs. 88000
100% of Mr. Sharma's Property = 88000* 100/68.75 = Rs. 128000

36. Ans. (B)
Solution:
Let the price of one lemon juice bottle = Rs. x
So, the price of one orange juice bottle = Rs. 2x
So the price of one orange and 4 lemon juice bottle will be = 2x + 4*x = 6x
Z'share in this will be = 6x/3 = 2x = 50
Therefore 2x = price of orange juice bottle = Rs. 50

37. Ans. (B)
Solution:
Let the present ages of mother and daughter be x and y
So, according to the question

$$\frac{x-10}{y-10} = \frac{3}{1}$$
$$x = 3y - 30 + 10$$
$$x = 3y - 20$$

Also

$$\frac{x+10}{y+10} = \frac{13}{7}$$
$$7x + 70 = 13y + 130$$

Putting the value of x in the above equation, we get

$$7(3y-20) + 70 = 13y + 130$$
$$8y = 200$$
$$y = 25$$

Therefore x = 3*25 – 20 = 55

38. Ans. (C)
Solution:
Total number of boys = 60
Number of boys who play chess = 45
Number of boys who play carrom = 30
Since all the 60 boys play atleast one game
Number of boys who play carrom only will be = 60 – (number of boys who play chess) = 60 – 45 = 15

39. Ans. C.
Let total amount is P

$$SI = \frac{P \times R \times T}{100}$$

After 4 years,

$$SI = \frac{P\times4\times4}{100} + \frac{P\times5\times4}{100}$$
$$405 = \frac{36P}{100}$$

P = 1125

40. Ans. C.
M x D x H =Work

$$M_1D_1H_1 = M_2D_2H_2$$

12 x 8 x 10 = 8 x H x 8
H 15 hours per day

41. Ans. C.
Let the water added be x litre
Cost price (CP) = 28 x 8.5 = 238
New Volume = 28 + x
Selling price (SP) = 8.5 x (28 + x)
= 238 + 8.5x
Profit = 8.5x

Profit % $= \frac{\text{Profit}}{\text{CP}} \times 100$

$$12.5 = \frac{8.5x}{238} \times 100$$

$$x = \frac{238 \times 12.5}{8.5 \times 100}$$

X = 3.5 litres

42. In a correct clock, the minute hand gains 55 minutes(space) over the hour hand in 60 minutes.
To be together again, the minute hand must gain 60 minutes over the hour hand.
55 minutes are gained in 60 minutes
60 minutes are gained in (60/55) x 60 min =720/11 min.
But, they are together after 72 min.
Lose in 72 min =72-(720/11) =72/11 min.
Lose in 24 hours =(72/11 * (60*24)/72)min = 1440/11
The clock loses 1440/11 = 130(10/11) minutes in 24 hours.
Alternative way to solve above kind of problems in exams is using a direct formula.
Whenever there is an overtaking of a minute hand and loss/gain of time involved:

$$\left(\frac{720}{11} - M\right)\left(\frac{60 \times 24}{M}\right) \text{ minutes}$$

M= intervals of M minutes of correct time

Plugging, M=72 in the above formula we will get the same answer. Negative means clock loses.
43. Ans. B.
Let the owner meets thief x hours after discovering theft.
Distance travelled by thief till then = 40 (x + 1/2)
Distance travelled by owner till then = 60(x)
According to question,
60(x) = 40 (x + 1/2)
60x = 40x + 20
20 x = 20
X = 1 hour
Distance travelled = 60 x 1 = 60km
They meet 60km from owner's house & 1.5 hour after theft.
44. Ans. B.
Let Y takes y days to finish the work alone

$$\frac{1}{y} + \frac{1}{12} = \frac{1}{6}$$

$$\frac{1}{y} = \frac{1}{6} - \frac{1}{12}$$

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

$$y = 12 \text{ days}$$

45. Ans. D.
As we know, $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$$\frac{12 \times 16}{10} = \frac{8 \times D_2}{20}$$

$$D_2 = 48 \text{ days.}$$

46. Ans. D.
Lets say, $(0.2)^{25}$=x
log $(0.2)^{25}$=log x
25log (0.2)=log x
25(log 2-log 10=log x
25(0.30101-1)=log x
log x = -17.47475

Therefore, Characteristic=17=number of zeroes immediately after decimal point in $(0.2)^{25}$

47. Ans. B.
Let age of father = x
Let age of son = y
Ac. To question

$$\frac{x+y}{x-y}=\frac{11}{3}$$

3x + 3y = 11x - 11y
14y = 8x
7y = 4x

$$\frac{7}{4}=\frac{x}{y}$$

x:y = 7:4
Age of son after son attains twice his present age = 2y
Age of father after son attains, twice his present age = y+x

$$\frac{x+y}{2y}=\frac{\frac{7}{4}y+y}{2y}$$

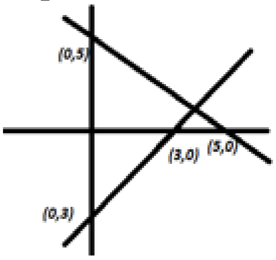
$$=\frac{7y+4y}{4\times 2y}=\frac{11}{8}$$

= 11:8
Hence, only B is correct.

48. Ans. B.

$$x+y\geq 5$$

a + x = 0, y = 5
a + y = 0, x = 5
a + x = 0, y = 0, the equation is not satisfied at origin, thus it lies away from origin




$$x-y\leq 3$$

a + x = 0, y = -3
a + y = 3, x = 3
a + x =0, y = 0, the equation is satisfied by origin; thus solution lies towards origin.
As per graph, solution lies in quadrant I & II.

49. Ans. A.

$$x^2-y^2=0$$

$$x^2=y^2$$

$$(x-a)^2+y^2=1$$

$$x^2+a^2-2ax+y^2=1$$

$$x^2+a^2-2ax+x^2-1=0$$

$$2x^2-2ax+a^2-1=0$$

For a single positive solution, D=0

$$b^2-4ac=0$$

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

$$4a^2-8a^2+8=0$$

$$-4a^2+8=0$$

$$a^2=2$$

$$a=\pm\sqrt{2}$$

As it has a single positive solution, that is only possible when a=$\sqrt{2}$

50. Ans. D.

$$f(x)=ax^3+bx^2+cx+d$$

$$(\alpha+\beta+\gamma)^2=\alpha^2+\beta^2+\gamma^2+2(\alpha\beta+\beta\gamma+\alpha\gamma)$$

For a cubic eq.

$$ax^3+bx^2+cx+d=0$$

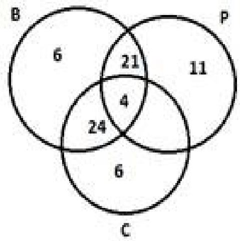
$$\alpha+\beta+\gamma=-\frac{b}{a}$$

$$\alpha\beta+\beta\gamma+\alpha\gamma=\frac{c}{a}$$

$$\left(-\frac{b}{a}\right)^2=\alpha^2+\beta^2+\gamma^2+2\left(\frac{c}{a}\right)$$

$$\alpha^2+\beta^2+\gamma^2=\frac{b^2}{a^2}-\frac{2c}{a}$$
$$=\frac{b^2-2ca}{a^2}$$

51. Ans. C.
$$n(A\cup B\cup C) = n(A)+n(B)+n(C)-n(A\cap B)-n(B\cap C)-n(C\cap A) + n(A\cap B\cap C)$$
A=Biology, B=Physics, C=Chemistry
$98 = 55+62+60-25-30-28+n(A\cap B\cap C)$
$$n(A\cap B\cap C)=4\%$$
Using this, we can find all values of Venn diagram.
52. Ans. B.
Students passed in only Biology = 6%
Students passed in only Physics =11%
Students passed in only Chemistry = 6%
Total 23%




53. Ans. A.
At least 2 pass = 21 + 24 + 26 + 4 = 75% of total students
$$=\frac{75}{360}\times 100=270.$$

54. Ans. B.
Students who passed both B & C = 30%
Students who passes both A & B but not C = 21%
Ratio = 30/21 = 10/7 = 10:7

55. 40. Ans. B.
In ordinal scale, the various categories can be logically arranged in a meaningful order; however the difference between categories is not meaningful.
Example: $1^{st}$, $2^{nd}$ , $3^{rd}$ etc.

56. Ans. A.
Let the ratio be x:y
Average marks of section A = 65
Average marks of section A = 65x
Average marks of section B = 70
Average marks of section B = 70y
Total Average = 67
Total marks of both sections = 61(x+y)
According to question,
65x + 70y = 67(x+y)
65x + 70y = 67x + 67y
3y = 2x
3/2 = x/y

57. Ans. B.
Since, of the two added observations one is lesser than the median & another is more.
Hence, they will have no effect on the median. Median will be stay 30.

58. With increasing number of observations, the shape of frequency polygon tends to become increasingly smooth.

59. Ans. A.
Since $\bar{X}_2 > \bar{X}_1$
On pooling $n_1$ & $n_2$, the larger set of observation $(n_1+n_2)$ will have a mean lower than $\bar{X}_2$ (because of n, observations) but more than $\bar{X}_1$ (because of $n_2$ observations terms). Thus, it will be in between $\bar{X}_2$ & $\bar{X}_1$
$$\therefore\ \bar{X}_2 > \bar{X} > \bar{X}_1$$

60. Ans. D.
1) Median cannot be computed when the end intervals of a frequency distribution are open.
2) Median is the term that lies at the centre or mid of a given set of observations arranged in ascending order.
Hence, median is a positional average.

Hence, option D is correct.

61. Ans. B.

$\cos\theta = \frac{1}{\sqrt{5}}$ ... (i)

Squaring both sides

$$\cos^2\theta = \frac{1}{5}$$

$$1 - \sin^2\theta = \frac{1}{5}$$

$$\sin^2\theta = \frac{4}{5}$$

$\sin\theta = \frac{2}{\sqrt{5}}$ ... (ii)

Dividing (ii) by (i)

$$\tan\theta = 2$$

Putting $\tan\theta = 2$ in given equation

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

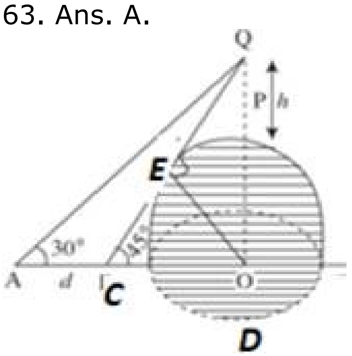
62. Ans. B.

$$\cos\theta < \cos\emptyset$$

& both θ & φ are between 0 & 90 as θ increases, cos θ decreases.

Hence $\theta > \emptyset$

63. Ans. A.




In $\Delta QCD, \frac{QD}{CD} = \tan 45 = 1$

$$CD = QD = h + r$$

In $\Delta ECD, \frac{ED}{CD} = \sin 45 = \frac{1}{\sqrt{2}}$

$$CD = ED\sqrt{2} = r\sqrt{2}$$

$$h + r = r\sqrt{2}$$

$$h = (\sqrt{2} - 1)r$$

64. Ans. C.

$$\sin(A + B) = \frac{\sqrt{3}}{2}$$

$$\sin(A + B) = \sin(60)$$

A + B = 60 ... (i)

$$\cos B = \frac{\sqrt{3}}{2}$$

$$\cos B = \cos(30)$$

$$B = 30$$

Putting B = 30 in eq. (i)

$$A + 30 = 60$$

$$A = 60 - 30 = 30$$

$$\tan(2A - B) = \tan(2 \times 30 - 30)$$

$$= \tan 30 = \frac{1}{\sqrt{3}}$$

65. Ans. C.

1) $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4,$

Put θ = 60

$$= \frac{\cos 60}{1 - \sin 60} + \frac{\cos 60}{1 + \sin 60}$$

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

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

Hence, (1) is true.

2) $3\tan\theta + \cot\theta = 5\,\mathrm{cosec}\,\theta$

Put $\theta = 60$ in LHS & RHS separately

$$3\tan 60 + \cot 60$$
$$3 \times \sqrt{3} + \frac{1}{\sqrt{3}}$$
$$= \frac{9+1}{\sqrt{3}} = \frac{10}{\sqrt{3}}$$
$$5\,\mathrm{cosec}\,\theta$$
$$5\,\mathrm{cosec}(60)$$
$$5 \times \frac{2}{\sqrt{3}} = \frac{10}{\sqrt{3}}$$

Hence (2) is also true, so correct option is C.

66. Ans. C.

(1) $\cos^2\theta = 1 - \frac{p^2+q^2}{2pq}$ … (i)

$$(p-q)^2 = p^2 + q^2 - 2pq$$

As $(p-q)^2 \geq 0$

Hence, $p^2 + q^2 - 2pq \geq 0$

$$p^2 + q^2 \geq 2pq$$
$$\frac{p^2+q^2}{2pq} \geq 1$$
$$1 - \frac{p^2+q^2}{2pq} \leq 0$$
$$\mathrm{Cos}^2\theta \leq 0$$

$\cos^2\theta$ cannot be less than 0, hence

$\cos^2\theta = 0$,

which is possible only when

$$\frac{p^2+q^2}{2pq} = 1$$
$$p^2 + q^2 = 2pq$$
$$p^2 + q^2 - 2pq = 0$$
$$(p-q)^2 = 0$$
$$p = q$$

(2) $\tan^2\theta = \frac{4pq}{(p+q)^2} - 1$

$$\tan^2\theta \geq 0$$
$$\frac{4pq}{(p+q)^2} - 1 \geq 0$$
$$\frac{4pq - (p+q)^2}{(p+q)^2} \geq 0$$
$$\frac{4pq - p^2 - q^2 - 2pq}{(p+q)^2} \geq 0$$
$$-p^2 + q^2 + 2pq \geq 0$$
$$p^2 + q^2 - 2pq \leq 0$$
$$(p-q)^2 \leq 0$$

LHS cannot be negative as it is square term

$(p-q)^2 = 0$

p - q = 0
p = q

67. Ans. C.

(1) As we know that $Am \geq GM$

$$\frac{a+b}{2} \geq \sqrt{ab}$$

$$\frac{\cos\theta + \sec\theta}{2} \geq \sqrt{\cos\theta \times \sec\theta}$$

$$\cos\theta + \sec\theta \geq 2\sqrt{1}$$

$$\cos\theta + \sec\theta \geq 2$$

Hence, (1) is correct.

(2) $\sec^2\theta + \mathrm{cosec}^2\theta$

$$1 + \tan^2\theta + 1 + \cot^2\theta$$

$$2 + \tan^2\theta + \cot^2\theta \text{----------(1)}$$

Also, we know

$$\tan^2\theta + \cot^2\theta \geq 2$$

using equation (1), we have:

$$2 + \tan^2\theta + \cot^2\theta \geq 2 + 2$$

$$2 + \tan^2\theta + \cot^2\theta \geq 4$$

Hence (2) is also correct.

68. Ans. C.

$$\mathrm{Sin}^2 x + \sin x = 1$$

$$\sin x = 1 - \sin^2 x$$

$$\sin x = \cos^2 x$$

$$\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x$$

$$= (\cos^4 x + \cos^2 x)^3$$

$$= ((\cos^2 x)^2 + \cos^2 x)^3$$

$$= (\sin^2 x + \cos^2 x)^3$$

$$= (1)^3 = 1$$

69. Ans. D.

$$3\sin\theta + 5\cos\theta = 4$$

If $a\sin\theta + b\cos\theta = c$

Then $a\cos\theta - b\sin\theta = \pm\sqrt{a^2 + b^2 - c^2}$

Taking a = 3, b = 5 & c = 4, we get

$$3\cos\theta - 5\sin\theta = \sqrt{(3)^2 + (5)^2 - (4)^2}$$

$$= \sqrt{9 + 25 - 16} = 3\sqrt{2}$$

Squaring both sides

$$(3\cos\theta - 5\sin\theta)^2 = \left(3\sqrt{2}\right)^2 = 18$$

70. Ans. B.

We can write that:

m=cot θ(1+sinθ)/4

n=cot θ(1-sinθ)/4

Then, mn=[cot θ(1+sinθ)/4][cot θ(1-sinθ)/4]

mn=cot $^2$ θ(1-sin $^2$θ)/16

(using cot $^2$ θ=cos $^2$θ/sin $^2$θ and 1-sin $^2$θ=cos $^2$θ)

mn=[(cos $^2$θ/sin $^2$θ)* cos $^2$θ ]/16

mn= cos4θ /16sin $^2$θ---------- (1)

Now, let us try to evaluate:

(m $^2$-n $^2$) $^2$

[cot $^2$ θ(1+sin $^2$θ)/16- cot $^2$θ(1-sin $^2$θ)/16] $^2$

{[cot $^2$ θ(1+sin $^2$θ) - cot $^2$θ(1-sin $^2$θ)]/16} $^2$

[(4 sinθ cot $^2$ θ)/16] $^2$

cos4θ /16sin $^2$θ---------------(2)

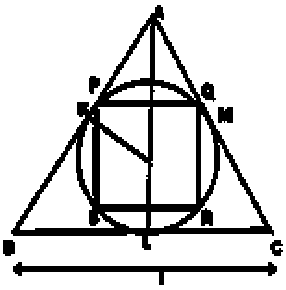
As equation (1) is equal to equation (2), so option B is the answer

71. Ans. B.

The only possible triplet for the above data, with the given area of right-angled triangle is: (P,B,H): (32,126,130)

So the perimeter is (32+126+130) = 288 units

72. Ans. D.



As ABC is an equilateral triangle, then

$$BL = \frac{l}{2}$$

In $\Delta ABL,$

$$AB^2 = AL^2 + BL^2$$

$$l^2 = AL^2 + \left(\frac{l}{2}\right)^2$$

$$AL = \frac{\sqrt{3}l}{2}$$

$$AO + OL = \frac{\sqrt{3}l}{2} \quad \text{... (i)}$$

Also AO:OL=2:1 (property of equilateral triangle, O is the center of the circle)

$$AO = 2 * OL$$

Put above value in eq. (i)

$$2OL + OL = \frac{\sqrt{3}l}{2}$$

$$3OL = \frac{\sqrt{3}l}{2}$$

$$OL = \frac{l}{2\sqrt{3}}$$

$$OL = OR = \frac{1}{2} SQ$$

(OL, OR radius and SQ is diameter)

$$\frac{l}{2\sqrt{3}} = \frac{1}{2} QS$$

So other diagonal PR is also of same length:

$$PR = \frac{l}{\sqrt{3}}$$

Area of square PQRS in terms of diagonal is given by:

Area $PQRS = \frac{1}{2} \times QS \times PR$

$$= \frac{1}{2} \times \frac{l}{\sqrt{3}} \times \frac{l}{\sqrt{3}}$$

$$= \frac{l^2}{6}.$$

73. Ans. B.
Length (L) = 6m
Breadth (B) = 4m
Height (H) = 2.5m
CSA of room = 2(L+B)H
= 2(6+4) x 2.5
= 50 sq.metre
CSA of 5 rooms = 50 x 5 = 250 sq.metre
Side of window = 2.5m
Area of window = 2.5 x 2.5 = 6.25 sq. metre
Area of 2 window = 2 x 6.25 = 12.5 sq. metre
Net area to be painted = 250 - 12.5 = 237.5 sq. metre
20 $m^2$ require = 1l

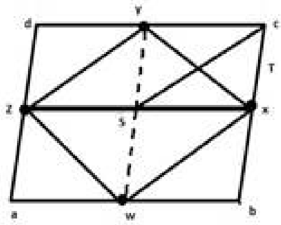
$1m^2$ require $= \frac{1}{20} l$

$237.5m^2$ require $= \frac{1}{20} \times 237.5$

= 11.875
Thus, 12 cans are required.

74. Ans. A.
Let us draw a parallel lines joining opposite vertices of parallelogram S & is parallel to other two sides

Area $wxz = \frac{1}{2}$ area $(abxz)$ (If a triangle & a parallelogram lie on the same base & between same parallel lines then the area of the triangle will be half of the area of parallelogram)



Similarly,

Area $xyz = \frac{1}{2}\text{area}(xcdz)$

Adding above two, we get

Area $wxyz = \frac{1}{2}\text{area}(abcd)$

Thus, (1) is true.

(2) ab = dc (opposites sides of parallelogram)

$$\frac{1}{2}ab = \frac{1}{2}dc$$

$$wb = yc$$

Also, ws = sy (diagonals of parallelogram bisects each other)

& $wsx = syc$ (corresponding angles)

$\therefore$ $\Delta wsx$ is congruent to $\Delta syc$

$$wx = sc$$

Similarly, yx = sb, zy = as & zw = ds

Adding the above four, we get

$wx + yx + zy + zw = sc + sb + as + ds$

Perimeter of S = ac + bd

Perimeter of S = Sum of diagonal of T

Hence (2) is false.

75. Ans. B.

a =5, b = 6, c = 7

$$s = \frac{5+6+7}{2} = 9$$

Area $= \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{9(4)(3)(2)}$$

$$= 3 \times 2\sqrt{6}$$

$$= 14.69 = 14.7\ cm^2$$

76. Ans. B.

Let r be radius of inner circle.

$$\pi r^2 = 144\pi$$

r = 12m

Let R be outer radius of path

R = 12 + 5 = 17m

Area $= \pi R^2$

$= \pi(17)^2 = 289\pi m^2$

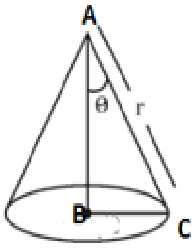
77. Ans. C.

LSA of cone $= \pi rl$

$$= \frac{22}{7} \times r \times 35 = \frac{21}{5}$$

r = 4.2 cm

78. Ans. C.




Let radius of semi-circle = R

Perimeter of semi circle = circumference of base of cone

$$\pi R = 2\pi r$$

R = 2r

In Δ ABC

$$\frac{BC}{AC} = \sin\theta$$

$$\frac{r}{R} = \sin\theta$$

$$\frac{r}{2r} = \sin\theta$$

$$\sin\theta = \frac{1}{2}$$

θ = 30°

79. Ans. B.

Let radius of cylinder be r

LSA $= 2\pi rh$

$$= 2\pi r(\pi)$$

TSA $= 2\pi r(h + r)$

$$= 2\pi r(\pi + r)$$

According to question,

TSA $= 2 \times LSA$

$$2\pi r(\pi + r) = 2(2\pi r(\pi))$$

$$\pi + r = 2\pi$$

$$r = \pi$$

80. Ans. D.
HCF of 10, 15, 20 is 5
Hence, squares are of side 5 cm
Volume of cuboid = lbh

$$= 20 \times 15 \times 10 = 3000 \text{ cm}^3$$

Volume of cube

$$= (5)^3 = 125 \text{ cm}^3$$

No. of cubes = 3000/125 = 24

81. Ans. D.
Let the side of cube = a

Diagonal $= \sqrt{3a}$

$$l = \sqrt{3a}$$

$$a = \frac{l}{\sqrt{3}}$$

Total surface area (TSA) = $6a^2$

$$= 6\left(\frac{l}{\sqrt{3}}\right)^2 = 2l^2$$

82. Ans. A.
Let a be the side of square
Let l be the side of equilateral triangle.
Let r be the radius of circle.
Let P be the perimeter of each one.
For square P = 4a
For triangle P = l x 3
L = P/3

Area $= \frac{\sqrt{3}}{4}\left(\frac{P}{3}\right)^2$

$$= \frac{P^2}{12\sqrt{3}} = \frac{P^2}{20.78}$$

For square, a=P/4, area is p^2/16
For circle, P = 2πr

$$r = \frac{P}{2\pi}$$

Area $= \pi r^2$

$$= \pi\left(\frac{P}{2\pi}\right)^2$$

Area $= \frac{P^2}{4\pi} = \frac{P^2}{12.56}$

Area of circle>area of square > area of triangle
C > S > T

83. Ans. A.
For similar triangles,
Area of triangle 1/Area of triangle 2

$$= \frac{(\text{side})^2}{(\text{side})^2}$$

$$\frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}} = \left(\frac{l_1}{l_2}\right)^2$$

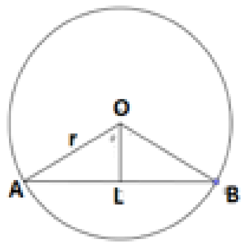
$$\sqrt{\frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}}} = \frac{l_1}{l_2}$$

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

$$= \sqrt{\frac{(7 - 4\sqrt{3})^2}{49 - 48}}$$

$$= 7 - 4\sqrt{3} = \frac{l_1}{l_2}$$

84. Ans. B.




Let radius be r

$$AB = \sqrt{3}r$$

$$BL = \frac{\sqrt{3}}{2} r$$

In $\Delta OLB,$

$$\frac{LB}{OB} = \sin\left(\frac{\theta}{2}\right)$$

$$\frac{r\sqrt{3}}{2r} = \sin\left(\frac{\theta}{2}\right)$$

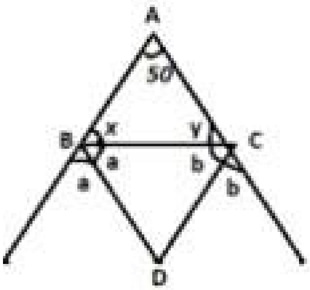
$$\sin\frac{\theta}{2} = \sin(60^\circ)$$

$$\frac{\theta}{2} = 60$$

$$\theta = 60 \times 2 = 120^\circ$$

Minor angle = 120
Major angle = 360 - 120 = 240 = 2 x 120
Thus, k = 2

85. Ans. B.




In $\Delta ABC,$

$$50 + x + y = 130$$

$$x + y = 130$$

$$x + a + a = 180$$ &

$$y + b + b = 180$$

Adding both, we get
x + y + 2a = 2b = 360
130 + 2(a+b) = 360
2(a+b) = 230
a + b = 115

In $\Delta BCD,$

a + b + D = 180
115 + D = 180
D = 65°

86. Ans. C.

Let $\frac{h_1}{h_2} = \frac{1}{3}$

$$h_1 = \frac{h_2}{3}$$

& $\frac{r_1}{r_2} = \frac{3}{1}$

$$r_1 = 3r_2$$

$$\frac{v_1}{v_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$$

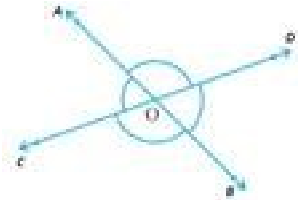
$$\frac{v_1}{v_2} = \frac{r_1^2 h_1}{r_2^2 h_2}$$

$$= \frac{(3r_2)^2(h_2)}{r_2^2 \times h_2 \times 3}$$

$$= \frac{9r_2^2 h_2}{3r_2^2 h_2}$$

$$\frac{v_1}{v_2} = \frac{3}{1}$$

87. Ans. B.




$$\angle AOC = 5\angle AOD$$

$$\angle AOC + \angle AOD = 180$$

$$\angle AOD + 5\angle AOD = 180$$

$$\angle AOD = \frac{180}{6}$$

$\angle AOD = 30 = \angle BOC$ (Vertically opposite)

$$\angle AOC = 5 \times 30$$

$= 150 = \angle BDO$ (Vertically Opposites)

∴ 4 angles are 30, 30, 150, 150

88. Ans. B.
The locus is a circle.
Standard equation of circle is

$$(x-a)^2 + (y-b)^2 = r^2,$$

where (a,b) is centre & r is the radius of circle.

89. Ans. B.
Let us take a set of number which satisfy Pythagoras triplet. Say 3,4,5 (AB, BC & AC respectively)

$$(3)^2 + (4)^2$$
$$= 9 + 16 = 25$$
$$= (5)^2$$

Now, $AB^3 = (3)^2 = 27$

$$(BC)^3 = (4)^3 = 64$$
$$(AC)^3 = (5)^3 = 125$$
$$\mathbf{AC^3 > AB^3 + BC^3}$$

Thus, option B is correct.

90. Ans. A.


Side of square = 2a
Area = $(2)^2$ = $4a^2$
Radius of circle = a
Area = $\pi a^2$

Remaining area $= 4a^2 - \pi a^2$

$$= (4-\pi)a^2$$

91. Ans. D.
Shaded area = area of semi circles with dia AB & AC + area of triangle – area of of semi circle with dia BC.

$$= \frac{\pi(p)^2}{8} + \frac{\pi(q)^2}{8} + \frac{1}{2}p.q - \frac{\pi(BC)^2}{8}$$

In Δ ABC,

$$AB^2 + AC^2 = BC^2$$
$$p^2 + q^2 = BC^2$$

Putting $BC^2$ in above equations
Shaded area

$$= \frac{\pi p^2}{8} + \frac{\pi q^2}{8} + \frac{pq}{2} - \frac{\pi(p^2+q^2)}{8}$$
$$= \frac{pq}{2}$$

92. Ans. B.
OT = OA + AT
OT = 6 + 4 = 10

In $\Delta OPT,$

$$(OP)^2 + (PT)^2 = (OT)^2$$
$$(6)^2 + (PT)^2 = (10)^2$$
$$PT^2 = 100 - 36$$

PT = 8 cm

93. Ans. B.
Shaded area = area of (semi circle Y +semi circle Z – semi circle X)
As AD = 18 (diameter)
AB = BC = CD = 6 cm
Shaded area

$$= \frac{\pi}{2}\left(\frac{AD}{2}\right)^2 + \frac{\pi}{2}\left(\frac{AB}{2}\right)^2 - \frac{\pi}{2}(CD)^2$$
$$= \frac{\pi}{2}(9)^2 + \frac{\pi}{2}(3)^2 - \frac{\pi}{2}(6)^2$$
$$= \frac{\pi}{2}(81 + 9 - 36) = 27\pi$$

94. Ans. C.

$$\angle BDC = \angle BAC = 30^\circ$$

(angles formed in same segment are equal)

In $\Delta BDC, \angle BDC + \angle BCD + \angle CBD = 180$

$$180^{\circ} = 30 + \angle BCD + 70$$

$$\angle BCD = 80^{\circ}$$

95. Ans. B.

$$\angle CEF = \angle ECD + \angle EDC$$

(exterior angle supplementary)

$$\angle CEF = 32 + 32 = 64^{\circ}$$

$$\angle COF = 2\angle CDF$$

(degree measure theorem)

$$\angle COF = 2 \times 32 = 64^{\circ}$$

96. Ans. D.

As $\Delta ABR \sim \Delta PQR$

$$\frac{AB}{PQ} = \frac{BR}{QR} = \frac{AR}{PR}$$

$\frac{6}{3} = \frac{8.2}{QR}$ & $\frac{6}{3} = \frac{AR}{5.2}$

QR = 4.1 & AR = 10.4

97. Ans. D.

In $\Delta BCD$ & $\Delta ACB$

$\angle BCD = \angle ACB$ (common)

$\angle BDC = \angle ABC$ (90 degree)

$$\Delta BCD \sim \Delta ACB$$

$$\frac{BC}{AC} = \frac{CD}{CB}$$

$$BC^2 = CD.AC$$

$$BC^2 = 4 \times 13$$

$$BC^2 = 52$$

In $\Delta BCD$,

$$BC^2 = BD^2 + CD^2$$

$$52 = BD^2 + (4)^2$$

$$BD^2 = 52 - 16 = 36$$

BD = 6 cm

98. Ans. C.

CD = CO + OD

54 = OC + r

OC = 54 - r

In $\Delta OCP$,

$$OC^2 + (PC)^2 = OP^2$$

$$(54 - r)^2 + (27)^2 = (27 + r)^2$$

$$= 2916 + r^2 - 108r + (27)^2 = (27)^2 + r^2 + 54r$$

= 2916 = 162r

R = 18

Area of shaded region = area of bigger semicircle –area of 2 small semi circle – area of small circle

$$= \frac{\pi(54)^2}{2} - 2 \times \frac{\pi(27)^2}{2} - \pi(18)^2$$

$$= \pi(1458 - 1053) = 405\pi$$

99. Ans. D.

In the given figure, as XY || BC

$\angle AXY = \angle ABC$ (corresponding angles)

& $\angle AYX = \angle ACB$ (corresponding angles)

$\Delta AXY$ is also an equilateral triangle

XY + XP + YQ = 40

AX + XB + YQ = 40

30 + YQ = 40

YQ = 10 = QC

Similarly, XP = 10 = BP

BC = BP + PQ + QC

30 = 10 + PQ + 10

PQ = 10

100. Ans. C.

Area of shaded region = Area of square – area of circle – 4 x area of quadrant

$$= side^2 - \pi r^2 - 4 \times \frac{1}{4}\pi r^2$$

$$= (4)^2 - \pi(1)^2 - \pi(1)^2$$

$$= 16 - \frac{44}{7} = 9\frac{5}{7} cm^2$$