CDS - 2018
Elementary Maths Question Paper

1. $5^{17}+5^{18}+5^{19}+5^{20}$ is divisible by
   A. 7 B. 9
   C. 11 D. 13
2. If $a+b=2c$, then what is the value of $\frac{a}{a-c}+\frac{c}{b-c}$?
   A. -1 B. 0
   C. 1 D. 2
3. If $x=y^{1/a}, y=z^{1/b}$ and $z=x^{1/c}$ where $x\neq 1$ $y\neq 1, z\neq 1$, then what is the value of abc?
   A. -1 B. 1
   C. 0 D. 3
4. If 2b = a + c and $y^2=xz$, then what is $x^{b-c}y^{c-a}z^{a-b}$ equal to?
   A. 3 B. 2
   C. 1 D. -1
5. Which one of the following is correct?
   A. Decimal expansion of a rational number is terminating.
   B. Decimal expansion of a rational number is non-terminating.
   C. Decimal expansion of an irrational number is terminating.
   D. Decimal expansion of an irrational number is non-terminating and non-repeating.
6. If the roots of the equation $px^2+x+r=0$ are reciprocal to each other, then which one of the following is correct?
   A. P = 2r B. P = r
   C. 2p = r D. P = 4r
7. If $65x-33y=97$ and $33x-65y=1$, then what is xy equal to?
   A. 2 B. 3
   C. -2 D. -3
8. If $\frac{b}{y}+\frac{z}{c}=1$ and $\frac{c}{z}+\frac{x}{a}=1$, then what is $\frac{ab+xy}{bx}$ equal to?
   A. 1 B. 2
   C. 0 D. -1
9. If $\frac{a^2-1}{a}=5$, then what is the value of $\frac{a^6-1}{a^3}$?
   A. 125 B. -125
   C. 140 D. -140
10. If $x+y+z=0$, then what is $(y+z-x)^3+(z+x-y)^3+(x+y-z)^3$ equal to?
    A. $(x+y+z)^3$
    B. $3(x+y)(y+z)(z+x)$
    C. 24xyz
    D. -24xyz
11. If (x + 3) is a factor of x^3+3x^2+4x+k, then what is the value of k?
    A. 12 B. 24
    C. 36 D. 72
12. The smallest integer with 4 digits which is a perfect square is
    A. 1000
    B. 1024
    C. 1089
    D. None of the above
13. Which one of the following is a zero of the polynomial $3x^3+4x^2-7$?
    A. 0 B. 1
    C. 2 D. -1
14. There are two numbers which are greater than 21 and their LCM and HCF are 3003 and 21 respectively. What is the sum of these numbers?
    A. 504 B. 508
    C. 514 D. 528
15. If and are the roots of the equation $ax^2+bx+c=0$, then what is the value of the expression $(\alpha+1)(\beta+1)$?
    A. $\frac{a+b+c}{a}$ B. $\frac{b+c-a}{a}$
    C. $\frac{a-b+c}{a}$ D. $\frac{a+b-c}{a}$
16. The remainder when $3x^3+kx^2+5x-6$ is divided by $(x+1)$ is -7. What is the value of k?
    A. -14 B. 14
    C. -7 D. 7
17. If f(x) and g(x) are pol5m.omials of degree and q respectively, then the degree
    {f(x) ± g(x)} (if it is non-zero) is
    A. Greater than min(p, q)
    B. Greater than max(p, q)
    C. Less than or equal to max(p, q)
    D. Equal to min(p, q)

18. What is the value of $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}-\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$?

A. $-2\sqrt{15}$ B. $2\sqrt{15}$

C. $\sqrt{15}$ D. $-\sqrt{15}$

19. What is the value of $\frac{1}{1+x^{b-a}+x^{c-a}}+\frac{1}{1+x^{a-b}+x^{c-b}}+\frac{1}{1+x^{a-c}+x^{b-c}}$ Where $x \neq 0$?

A. -1 B. 0

C. 1 D. 3

20. The sum of a number and its square is 20. Then the number is

A. - 5 or 4 B. 2 or 3

C. - 5 only D. 5 or - 4

21. If the price of wheat rises by 25%, then by how much percent must a man reduce his consumption in order to keep his budget the same as before?

A. 15% B. 20%

C. 25% D. 30%

22. $\frac{1}{25}$ of the students who registered did not appear for the examination, $\frac{11}{20}$ of those who appeared passed. If the number of registered students is 2000, the number who passed is

A. 1920 B. 1056

C. 1020 D. 864

23. What is the difference between $0.\bar{9}$ and 0-9?

A. 0 B. 0.099

C. 0.1 D. 0.09

24. If A : B = 1 : 2, B : C = 3 : 4, C : D = 2 : 3 and D : E = 3 : 4, then what is B : E equal to?

A. 3 : 2 B. 1 : 8

C. 3 : 8 D. 4 : 1

25. A work when done by 10 women is completed in 12 days. The same work can be completed in 8 days when done by 5 men. How many days will it take to complete when 6 women and 3 men are employed to perform the same job?

A. 12 B. 10

C. 8 D. 5

26. A man undertakes to do a certain work in 150 days. He employs 200 men. He finds that only a quarter of the work is done in 50 days. How many additional men should he employ so that the whole work is finished in time?

A. 75 B. 85

C. 100 D. 120

27. A train moving with a speed of 60 km per hour crosses an electric pole in 30 seconds. What is the length of the train in metres?

A. 300 B. 400

C. 500 D. 600

28. ₹ 120 is distributed among A, B and C so that A's share is ₹ 20 more than B's and W 20 less than C's. What is B's share?

A. ₹ 10 B. ₹ 15

C. ₹ 20 D. ₹ 25

29. In the following table of inverse variation, what are the values of A, B and C respectively?

M	15	-6	2	C
N	-4	A	B	60

A. 10, -20, -1 B. 10, -1, 30

C. -30, 10, -1 D. -1, -30, 10

30. A person borrowed ₹ 5,000 at 5% rate of interest per annum and immediately lent it at 5.5%. After two years he collected the amount and settled his loan. What is the amount gained by him in this transaction?

A. ₹ 25 B. ₹ 50

C. ₹ 100 D. ₹ 200

31. At present the average of the ages of a father and a son is 25 years. After seven years the son will be 17 years old. What will be the age of the father after 10 years?

A. 44 years B. 45 years

C. 50 years D. 52 years

32. If 5 tractors can plough 5 hectares of land in 5 days, then what is the number of tractors required to plough 100 hectares in 50 days?

A. 100 B. 20

C. 10 D. 5

33. A merchant commences with a certain capital and gains annually at the rate of 25%. At the end of 3 years he has ₹ 10,000. What is the original amount that the merchant invested?

A. ₹ 5,120 B. ₹ 5,210

C. ₹ 5,350 D. ₹ 5,500

34. Which one of the following decimal numbers is a rational number with denominator 37?

A. 0-459459459 . . .

B. 0-459459459

C. 0-0459459459 . . .

D. 0-00459459 . . .

35. The annual income of a person decreases by ₹ 64 if the annual rate of interest decreases from 4% to 3.75%. What is his original annual income?

A. ₹ 24,000

B. ₹ 25,000

C. ₹ 25,600

D. ₹ 24,600

36. For $0 < m < 1$, which one of the following is correct?

A. $\log_{10} m < m^2 < m < m^{-1}$

B. $m < m^{-1} < m^2 < \log_{10} m$

C. $\log_{10} m < m < m^{-1} < m^2$

D. $\log_{10} m < m^{-1} < m < m^2$

37. A gentleman left a sum of 39,000 to be distributed after his death among his widow, five sons and four daughters. If each son receives 3 times as much as a daughter receives, and each daughter receives twice as much as their mother receives, then what is the widow's share?

A. ₹ 1,000

B. ₹ 1,200

C. ₹ 1,500

D. None of the above

38. Three numbers which are co-prime to each other, are such that the product of the first two is 286 and that of the last two is 770. What is the sum of the three numbers?

A. 85 B. 80

C. 75 D. 70

39. The age of a woman is a two-digit integer. On reversing this integer, the new integer is the age of her husband who is elder to her. The difference between their ages is one-eleventh of their sum. What is the difference between their ages?

A. 8 years B. 9 years

C. 10 years D. 11 years

40. A passenger train and a goods train are running in the same direction on parallel railway tracks. If the passenger train now takes three times as long to pass the goods train, as when they are running in opposite directions, then what is the ratio of the speed of the passenger train to that of the goods train?

(Assume that the trains nm at uniform speeds)

A. 2 :1 B. 3 : 2

C. 4 :3 D. 1 : 1

41. All odd prime numbers upto 110 are multiplied together. What is the unit digit in this product?

A. 0

B. 3

C. 5

D. None of the above

42. An alloy A contains two elements, copper and tin in the ratio of 2 : 3, whereas an alloy B contains the same elements in the ratio of 3 : 4. If 20 kg of alloy A, 28 kg of alloy B and some more pure copper are mixed to form a third alloy C which now contains copper and tin in the ratio of 6 ; 7, then what is the quantity of pure copper mixed in the alloy C?

A. 3 kg B. 4 kg

C. 5 kg D. 7 kg

43. A quadratic polynomial $ax^2 + bx + c$ is such that when it is divided by x, (x - 1) and (x + 1), the remainders are 3, 6 and 4 respectively. What is the value of (a + b)?

A. 3 B. 2

C. 1 D. - 1

44. If the average of 9 consecutive positive integers is 55, then what is the largest integer?

A. 57 B. 58

C. 59 D. 60

45. The average of the ages of 15 students in a class is 19 years. When 5 new students are admitted to the class, the average age of the class becomes 18-5 years. What is the average age of the 5 newly admitted students?
A. 17 years B. 17.5 years
C. 18 years D. 18.5 years

46. A»man can row at a speed of x km/hr in still water. If in a stream which is flowing at a speed of y km/hr it takes him z hours to row to a place and back, then what is the distance between the two places?
A. $\frac{z(x^2 - y^2)}{2y}$ B. $\frac{z(x^2 - y^2)}{2x}$
C. $\frac{z(x^2 - y^2)}{2zx}$ D. $\frac{z(x^2 - y^2)}{x}$

47. A water tank has been fitted with two taps P and Q and a drain pipe R. Taps P and Q fill at the rate of 12 litres per minute and 10 litres per minute respectively.
Consider the following statements SI, S2 and S3 :
S1 : Pipe R drains out at the rate of 6 litres per minute.
S2 : If both the taps and the drain pipe are opened simultaneously, then the tank is filled in 5 hours 45 minutes.
S3 : Pipe R drains out (fully) the filled tank in 15 hours 20 minutes.
To know what is the capacity of the tank, which one of the following is correct?
A. S2 is only sufficient
B. S1, S2 and S3 are necessary
C. Any two out of SI, S2 and S3 are sufficient
D. None of the above

48. A car has an average speed of 60 km per hour while going from Delhi to Agra and has an average speed of y km per hour while returning to Delhi from Agra (by travelling the same distance). If the average speed of the car for the whole journey is 48 km per hour, then what is the value of y?
A. 30 km per hour
B. 35 km per hour
C. 40 km per hour
D. 45 km per hour

49. An article is sold at a profit of 32%. If the cost price is increased by 20% and the sale price remains the same, then the profit percentage becomes
A. 10% B. 12%
C. 15% D. 20%

50. A, B, C, D and E start a partnership firm. Capital contributed by A is three times that contributed by D. E contributes half of A's contribution, B contributes one-third of E's contribution and C contributes two-third of A's contribution. If the difference between the combined shares of A, D and E and the combined shares of B and C in the total profit of the firm is ₹ 13,500, what is the combined share of B, C and E? (The shares are supposed to be proportional to the contributions)
A. ₹ 13,500 B. ₹ 18,000
C. ₹ 19,750 D. ₹ 20,250

51. A Pie Chart is drawn for the following data :

Sector	Percentage
Agriculture and Rural Development	12.9
Irrigation	12.5
Energy	27.2
Industry and Minerals	15.4
Transport and Communication	15.9
Social Services	16.1

What is the angle (approximately) subtended by the Social Services Sector at the centre of the circle?
A. 45° B. 46°
C. 58° D. 98°

52. The arithmetic mean of two numbers is 10 and their geometric mean is 8. What are the two numbers?
A. 15,5 B. 12,8
C. 16,4 D. 18,2

53. The arithmetic mean of 11 observations is 11. The arithmetic mean of the first 6 observ9.tions is 10-5 and the arithmetic mean of the last 6 observations is 11.5. What is the sixth observation?
A. 10.0 B. 10.5
C. 11.0 D. 11.5

54. What is $\sin^4\theta - \cos^4\theta$ equal to for any real number θ?

A. 1 B. $1 - 2\sin^2\theta$

C. $2\cos^2\theta + 1$ D. $1 - 2\cos^2\theta$

55. What is cot 1° cot 23° cot 45° cot 67° cot 89° equal to?

A. 0 B. 1

C. $\frac{1}{2}$ D. $\frac{1}{3}$

56. What angle does the hour hand, of a clock describe in 10 minutes of time?

A. 1° B. 5°

C. 6° D. 10°

57. Consider the following statements :

1. $\left(\sec^2\theta - 1\right)\left(1 - \text{cosec}^2\theta\right) = 1$

2. $\sin\theta\left(1 + \cos\theta\right)^{-1} + \left(1 + \cos\theta\right)\left(\sin\theta^{-1}\right) =$ 2 cosec θ

Which of the above is/are correct?

A. 1 only B. 2 only

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

58. Each side of a square subtends an angle of 60° at the tip of a tower of height h metres standing at the centre of the square. If I is the length of each side of the square, then what is h^2 equal to?

A. $2l^2$ B. $\frac{l^2}{2}$

C. $\frac{3l^2}{2}$ D. $\frac{2l^2}{3}$

59. From a height of h units, a man observes the angle of elevation as α and angle of depression as p of the top and the bottom respectively of a tower of height H (> 4h). To what further height should he climb so that the values of angle of elevation and angle of depression get interchanged for the top and bottom of the tower?

A. H – h units B. H – 2h units

C. H – 3h units D. H – 4h units

60. If $\sec x \text{ cosec } x = 2$, then what is $\tan^n x + \cot^n x$ equal to?

A. 2 B. 2^{n+1}

C. 2^n D. 2^{n-1}

61. If $\cos x + \cos^2 x = 1$, then what is $\sin^2 x + \sin^4 x$ equal to?

A. 1 B. 1.5

C. 2 D. 3

62. If $\sin A + \cos A = p$ and $\sin^3 A + \cos^3 A = q$, then which one of the following is correct?

A. $p^3 - 3p + q = 0$

B. $q^3 - 3p + 2q = 0$

C. $p^3 - 3p + 2q = 0$

D. $p^3 + 3p + 2q = 0$

63. If $x = \frac{\sec^2\theta - \tan\theta}{\sec^2\theta + \tan\theta}$ then which one of the following is correct?

A. $\frac{1}{3} < x < 3$ B. $x \notin \left[\frac{1}{3}, 3\right]$

C. $-3 < x < -\frac{1}{3}$ D. $\frac{1}{3} \le x \le 3$

64. ABC is a right angled triangle with base BC and height AB. The hypotenuse AC is four times the length of the perpendicular drawn to it from the opposite vertex. What is tan C equal to?

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

C. $2 + \sqrt{3}$ D. $\sqrt{3} + 1$

65. ABC is a triangle right angled at C with BC = a and AC = b. If p is the length of the perpendicular from C on AB, then which one of the following is correct?

A. $a^2b^2 = p^2\left(a^2 + b^2\right)$

B. $a^2b^2 = p^2\left(b^2 - a^2\right)$

C. $2a^2b^2 = p^2\left(a^2 + b^2\right)$

D. $a^2b^2 = 2p^2\left(a^2 + b^2\right)$

66. The radius and slant height of a right circular cone are 5 cm and 13 cm respectively. What is the volume of the cone?

A. 100π cm^3 B. 50π cm^3

C. 65π cm^3 D. 169π cm^3

67. Two equal circular regions of greatest possible area are cut off from a given circular sheet of area A. What is the remaining area of the sheet?

A. A/2 B. A/3

C. 3A/5 D. 2A/5

68. If the ratio of the radius of the base of a right circular cone to its slant height is 1 : 3, what is the ratio of the total surface area to the curved surface area?

A. 5 : 3 B. 3 : 1

C. 4 : 1 D. 4 : 3

69. A right circular cone is sliced into a smaller cone and a frustum of a cone by a plane perpendicular to its axis. The volume of the smaller cone and the frustum of the cone are in the ratio 64 : 61. Then their curved surface areas are in the ratio

A. 4 :1 B. 16 : 9

C. 64 : 61 D. 81: 64

70. In a room whose floor is a square of side 10 m, an equilateral triangular table of side 2 m is placed. Four book-shelves of size
4 m x 1 m x 9 m are also placed in the room. If half of the rest of the area in the room is to be carpeted at the rate of ₹ 100 per square metre, what is the cost of carpeting (approximately)?

A. ₹ 7,600 B. ₹ 5,635

C. ₹ 4,113 D. ₹ 3,200

71. A region of area A bounded by a circle C is divided into n regions, each of area A/n, by drawing circles of radii $r_1, r_2, r_3, ...r_{n-1}$ such that $r_1 < r_2 < r_3 < ....r_{n-1}$ concentric with the circle C. If $p_m = \frac{r_{m+1}}{r_m}$ where m = 1, 2, 3, ... (n - 2), then which one of the following is correct?

A. p increases as m increases

B. p decreases as m increases

C. p remains constant as m increases

D. p increases for some values of m as m increases and then decreases thereafter

72. What is the volume of a cone of maximum volume cut out from a cube of edge 2a such that their bases are on the same plane?

A. πa^2 B. $\frac{\pi a^3}{3}$

C. $\frac{2\pi a^3}{3}$ D. $\frac{3\pi a^3}{4}$

73. The radii of two circles are 4.5 cm and 3.5 cm respectively. The distance between the centres of the circles is 10 cm. What is the length of the transverse common tangent?

A. 4 cm B. 5 cm

C. 6 cm D. 7 cm

74. There are as many square centimetres in the surface area of a sphere as there are cubic centimetres in its volume. What is the radius of the sphere?

A. 4 cm B. 3 cm

C. 2 cm D. 1 cm

75. The length of a line segment AB is 2 cm. It is divided into two parts at a point C such that $AC^2 = AB \times CB$. What is the length of CB?

A. $3\sqrt{5}$ cm B. $3 - \sqrt{5}$ cm

C. $5\sqrt{3}$ cm D. $\sqrt{5} - 1$ cm

76. The locus of the mid-points of the radii of length 16 cm of a circle is

A. A concentric circle of radius 8 cm

B. A concentric circle of radius 16 cm

C. The diameter of the circle

D. A straight line passing through the centre of the circle

77. The curved surface area of a right circular cone is 1-76 m^2 and its base diameter is 140 cm. What is the height of the cone?

A. 10 cm B. $10\sqrt{2}$ cm

C. $20\sqrt{2}$ cm D. $10\sqrt{15}$ cm

78. Consider the following statements :

1. The orthocentre of a triangle always lies inside the triangle.
2. The centroid of a triangle always lies inside the triangle.
3. The orthocentre of a right angled triangle lies on the triangle.
4. The centroid of a right angled triangle lies on the triangle.

Which of the above statements are correct?

A. 1 and 2

B. 1 and 4

C. 2 and 3

D. 2 and 4

79. The locus of a point equidistant from two intersecting lines is

A. A straight line

B. A circle

C. A pair of straight lines

D. None of the above

80. Consider the following statements :

Two triangles are said to be congruent, if

1. Three angles of one triangle are equal to the corresponding three angles of the other triangle.
2. Three sides of one triangle are equal to the corresponding three sides of the other triangle,
3. Two sides and the included angle of one triangle are equal to the corresponding two sides and the included angle of the other triangle.
4. Two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle.

Which of the above statements are correct?

A. 1, 2 and 3 B. 1, 3 and 4
C. 1, 2 and 4 D. 2, 3 and 4

81. Given that the angles of a polygon are all equal and each angle is a right angle.

Statement-1 : The polygon has exactly four sides.

Statement-2: The sum of the angles of a polygon having n sides is (3n - 8) right angles.

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

A. Both Statement-1 and Statement-2 are true and Statement-2 is the correct explanation of Statement-1
B. Both Statement-1 and Statement-2 are true but Statement-2 is not the correct explanation of Statement-1
C. Statement-1 is true but Statement-2 is false
D. Statement-1 is false but Statement-2 is true

82. If the length of a side of a square is increased by 8 cm, its area increases by 120 square cm. What is the length of a side of the square?

A. 2.5 cm B. 3.5 cm
C. 4.5 cm D. 5.5 cm

83. What is the largest power of 10 that divides the product 1 x 2 x 3 x 4 . . . x 23 x 24 x 25?

A. 2
B. 4
C. 5
D. None of the above

84. Walls (excluding their 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. Paints are available only in cans of 1 L and one litre of paint can be used for painting 20 square metres. What is the number of cans required for painting?

A. 10 B. 12
C. 13 D. 14

85. A rectangular pathway having width 4.5 m and length 10 m will have to be tiled using square tiles of side 50 cm. Each packet of such tiles contains 20 pieces and costs ₹ 100. What will be the total cost of tiles for the pathway?

A. ₹ 1,200 B. ₹ 1,100
C. ₹ 1,000 D. ₹ 900

86. A cube of maximum volume (each corner touching the surface from inside) is cut from a sphere. What is the ratio of the volume of the cube to that of the sphere?

A. $3:4\pi$ B. $\sqrt{3}:2\pi$
C. $2:\sqrt{3}\pi$ D. $4:3\pi$

87. If the ratio of the circumference of the base of a right circular cone of radius r to its height is 3 : 1, then what is the area of the curved surface of the cone?

A. $3\pi r^2$ B. $\frac{2\pi r^2\sqrt{4\pi^2+9}}{3}$
C. $\frac{\pi r^2\sqrt{\pi^2+1}}{3}$ D. $\frac{\pi r^2\sqrt{4\pi^2+9}}{3}$

88. A wire is in the form of a circle of radius 98 cm. A square is formed out of the wire. What is the length of a side of the square? (Use $\pi = 22/7$)

A. 146 cm B. 152 cm
C. 154 cm D. 156 cm

Consider the following for the next two (02) questions:

In a triangle ABC, a, b and c are the lengths of the sides and p, q and r are the lengths of its medians.

89. Which one of the following is correct?

A. $2(p+q+r)=(a+b+c)$
B. $2(p+q+r)>3(a+b+c)$
C. $2(p+q+r)<3(a+b+c)$
D. $11(p+q+r)>10(a+b+c)$

90. Which one of the following is correct?

A. $(a+b+c)<(p+q+r)$

B. $3(a+b+c)<4(p+q+r)$

C. $2(a+b+c)>3(p+q+r)$

D. $3(a+b+c)>4(p+q+r)$

91. What is the area of the largest circular disc cut from a square of side $\frac{2}{\sqrt{\pi}}$ units?

A. π square units

B. 1 square units

C. π^2 square units

D. 2 square units

92. The product of the lengths of the diagonals of a square is 50 square units. What is the length of a side of the square?

A. $5\sqrt{2}$ units B. 5 units

C. 10 units D. $2\sqrt{5}$ units

93. The surface area of a closed cylindrical box is 352 square cm. If its height is 10 cm, then what is its diameter?

$\left(\text{Use } \pi=\frac{22}{7}\right)$

A. 4 cm B. 8 cm

C. 9.12 cm D. 19.26 cm

94. A square and an equilateral triangle have the same perimeter. If the diagonal of the square is $6\sqrt{2}$ cm, then what is the area of the triangle?

A. $12\sqrt{2}$ cm^2 B. $12\sqrt{3}$ cm^2

C. $16\sqrt{2}$ cm^2 D. $16\sqrt{3}$ cm^2

95. What is the area of the region bounded internally by a square of side of length 'a' and externally by a circle passing through the four comers of the square?

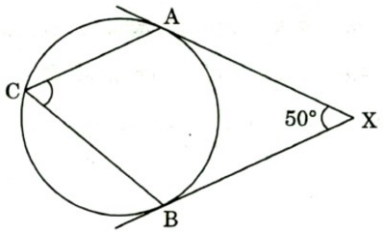
A. $(\pi-1)a^2$ square units.

B. $\frac{(\pi-1)a^2}{2}$ square units.

C. $(\pi-2)a^2$ square units.

D. $\frac{(\pi-2)a^2}{2}$ square units.

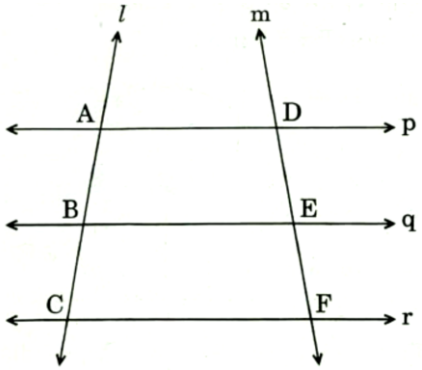
96. In the figure given below, XA and XB are two tangents to a circle, If $\angle AXB=50^o$ and AC is parallel to XB, then what is $\angle ACB$ equal to?



A. 70° B. 65°

C. 60° D. 55°

97. In the figure given below, p, q, r are parallel lines; I and m are two transversals.



1. AB : AC = DE : DF
2. AB × EF = BC × DE

Which of the above is/are correct?

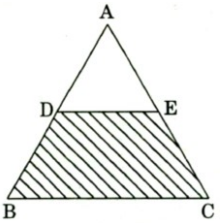
A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

98. In the equilateral triangle ABC given below, AD = DB and AE = EC. If I is the length of a side of the triangle, then what is the area of the shaded region?



A. $\frac{3\sqrt{3}\,I^2}{16}$ B. $\frac{3\,I^2}{16}$

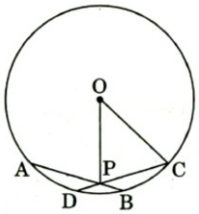
C. $\frac{3\sqrt{3}\,I^2}{32}$ D. $\frac{3\,I^2}{32}$

99. In the figure given below, SPT is a tangent to the circle at P and O is the centre of the circle. If $\angle QPT = \alpha$, then what is $\angle POQ$ equal to?

A. α B. 2α

C. $90^\circ - \alpha$ D. $180^\circ - 2\alpha$

100. In the figure given below, two equal chords cut at point P. If AB = CD = 10 cm, OC = 13 cm (O is the centre of the circle) and PB = 3 cm, then what is the length of OP?



A. 5 cm B. 6 cm

C. $6\sqrt{29}$ cm D. $2\sqrt{37}$ cm

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SOLUTIONS

1. Ans. (d)
$5^{17} + 5^{18} + 5^{19} + 5^{20}$
$= 5^{17}(1 + 5 + 5^2 + 5^3)$
$= 5^{17}(156)$
156 is divisible by 13, and not by 7, 9 or 11. Hence the correct option is 13.
2. Ans. (c)
Given equation: a + b = 2c
Let the values of a =0, b= 1, c =1/2 to satisfy the above equation
Now, putting the value of a, b, c in the equation given in question
a/(a-c) + c/(b-c)
= 0/ (0-1/2) + ½/ (1-1/2)
= 0 + ½/ (1/2)
= 1
3. Ans. (b)
$X = y^{1/a}$, $y = z^{1/b}$, $z = x^{1/c}$
Taking log in the above given equations;
Log x = 1/a log y, logy = 1/b log z, log z=1/c log x
Calculating the values of a, b and c
a = log y/ log x
b= log z/ log y
c= log x/ log z
Now, a*b*c = 1
4. Ans. (c)
2b = a + c and $y^2 = xz$
Let the value of a. b and c to satisfy the equation be a = b = c = 1
Also, let the values of x, y and z
x = y = z = 2
$X^{b-c}\ y^{c-a}\ z^{a-b}$
$= 2^{1-1}\ 2^{1-1}\ 2^{1-1}$
$= 2^0\ 2^0\ 2^0$
= 1*1*1
=1
5. Ans. (d)
Decimal expansion of an irrational number is non-terminating and non-repeating.
6. Ans. (b)
Let the roots be x and 1/x.
Use the property of quadratic equations
{x+y = -b/a , xy = c/a};
x*1/x = r/p
1 = r/p; r = p
7. Ans. (a)
65x -33y = 97 => equation 1
33x – 65y = 1 => equation 2
We have 2 equations and 2 variables, solve them to evaluate the values of x & y. Multiplying equation 1 by 33 & equation 2 by 65.
(65x -33y = 97) *33 i.e. 2145x – 1089y = 3201 => equation 1
(33x – 65y = 1) *65 i.e. 2145x – 4225y = 65 => equation 2
Subtracting equation 2 from equation 1:
(2145x – 1089y) – (2145x – 4225y) = 3201 – 65

- ⇨ 3136y = 3136
- ⇨ y = 1
- ⇨ Substitute value of y in any one equation to evaluate the value of x:
- ⇨ 33x – 65*1 = 1
  Or, 33x = 66
  or x = 2
- ⇨ Thus, xy = 1*2 = 2

8. Ans. (a)
From eq 1
b/y + z/c = 1
z/c = 1- b/y
z/c = (y-b)/y …..(i)
from eq 2
c/z =1-x/a
z/c =a/ a-x…… (ii)
equating equations (i) & (ii)
(y-b)/y =a/(a-x)
Cross-multiplying
(ay – ab – xy + xb) = ay
Xb = ab + xy
(ab+xy)/xb = 1
9. Ans. (c)
$(a^2-1)/a = 5$
a -1/a = 5 …..(i)
cube both the sides
$a^3 - 1/a^3 - 3*a*1/a*(a-1/a) = 125$
$a^3 - 1/a^3 - 3*5 = 125$ (using equation (i))
$a^3 - 1/a^3 = 140$
or, $(a^6 - 1)/a^3 = 140$
10. Ans. (d)
x + y + z = 0
From this,
y + z = -x
z + x = -y
x + y = -z
Putting these values on eq
$(y + z - x)^3 + (z + x - y)^3 + (x + y - z)^3$
$=(-x-x)^3+(-y-y)^3 +(-z-z)^3$
$= (-2x)^3+(-2y)^3+(-2z)^3$
$= -8(x^3+y^3+z^3)$ {using identity for $(x + y + z)^3$ when (x + y + z) =0}
=-8*3xyz
= -24xyz

11. Ans. (a)
If (x+3) is a factor of $x^3 + 3x^2 + 4x + k$
So, equation will be completely divided by (x+3)
x+3) x^3+3x^2+4x+k (x^2+4
x^3+3x^2
4x+k
4x+12 if k =12 so equation completely divided by x+3
0
From this we find that k = 12
12. Ans. (b)
$32^2 = 1024$
13. Ans. (b)
$3x^3 +4x^2-7$
Putting x =1;
3+4-7 = 0
Hence the correct answer is 1.
14. Ans. (a)
Let the numbers be x and y
x*y = LCM *HCF
xy = 21*3003
xy = 21* 273*11
According to the question both the numbers are greater than 21, hence the two numbers are:
xy = 231*(21*11), i.e. xy = 231*273
x + y = (231+273) = 504
15. Ans. (c)
$ax^2+ bx +c = 0$; roots of this equation are α and β
Thus, α + β = -b/a and α β = c/a
Now, (α+1)(β+1) = α β+ α +β+1
Putting the values;
= c/a –b/a +1
= (c – b + a)/ a
16. Ans. (d)
$3x^3 + kx^2 + 5x - 6$ divided by (x+1)
x+1) $3x^3+kx^2+5x-6$ ($3x^2+(k-3)$ x+(8-k)
$3x^3+3x^2$
$(k-3)x^2+5x$
$(k-3)x^2 +(k-3)x$
(8-k)x -6
(8-k)x+(8-k)
If remainder is -7 so,
-6 - 8 – k = -7
Thus, K = 7
17. Ans. (a)
Greater than min (p, q)
18. Ans. (a)
{(√5-√3)/ √5+√3} – {(√5+√3)/ √5-√3}
= {$(√5-√3)^2$ – $(√5+√3)^2$}/5-3
=-4√5*√3/2
= -2√15
19. Ans. (c)
$1/(1+x^{b-a}+x^{c-a}) + 1/(1+x^{a-b}+x^{c-b}) + 1/(1+x^{a-c}+x^{b-c})$
Assume the value of x=1
=1/3 + 1/3+1/3
=3/3
=1
20. Ans. (a)
Let the numbers are x and x^2
$x^2 + x = 20$
$x^2 +x - 20 = 0$
Solving this quadratic equation;
x= -5 and 4
21. Ans. (b)
Old price x and new price 1.25x
x * y = k (where y is the total consumption and 'k' is the budget)
1.25x * y' = k (y' is the new consumption)
Equating both the equations:
y' = 100/125 y
y' = 4/5 y
i.e. the new consumption of 4/5 of the original consumption. If original consumption was 100, new consumption = 4/5 of 100 i.e. 80. So, the consumption must be reduced by 20%.
22. Ans. (b)
Total registered students = 2000
Students who did not appear = 2000/25 = 80
Total students who appeared = 2000 - 80 = 1920
Total students who passed = 1920*11/20 = 1056
23. Ans. (b)
0.9999 - 0.9 = .099
24. Ans. (c)
A:B = 1:2 → 3:6
B:C = 3:4 → 6:8
C:D = 2:3 → 8:12
D:E = 3:4 → 12:16
B:E = 6:16
B:E = 3:8
25. Ans. (c)
10W * 12
= 8 * 5M
M = 3W
Let total days required to complete the complete work by 6 women and 3 men be 'y'.
(6W+3M) y = 10W*12
(10W*12 is equal to the total work)
(6W+9W) y = 10W *12
15Wy = 10W *12
Y = 8 days
26. Ans. (c)
Let total work = X
200M *150 = X
After 50 days
200M *50 = X/4
Remaining work = 3X/4
After 50 days, let 'y' workers be added to complete the work on time.
(200+y) M*100= 3X/4
(200+y) M *100 = 3 *200M *50
200+y = 300
Y = 100 men

27. Ans. (c)
Speed =60 km/hr = 60*5/18 m/sec
Time = Distance / Speed (distance is a length of train)
30 = L/ 60*5/18
L = 500m
28. Ans. (c)
A + B + C = 120
According to the question
B = A – 20
C = A + 20
Also, A+B+C = 120
Solving the above 3 equations;
A + A – 20 + A + 20 = 120
3A = 120
A = 40
Thus, B = 20
And C = 60
29. Ans. (a)
$M \propto 1/N$
MN = K (CONSTANT)
15*-4 = -6*A
6A = 60
A = 10
Similarly,
-6*10 = 2B
B = -30
Similarly,
2*-30 = C*60
C = -1
30. Ans. (b)
Total gain by the person
= {5000*2 * 5.5 / 100} – {5000*2*5/100}
= {5000*2/100} * {5.5-5}
= 5000*2 *5/1000
= Rs. 50
31. Ans. (c)
Total age of father and son = 25*2 = 50
After 7 years,
Son's age = s+7 = 17
Present age of son = 10
Present age of father = 40
After 10 years, Age of father = 50 years (40 + 10)
32. Ans. (c)
M *D/W = M'*D'/W'
5*5/5 = M'*50/100
M' = 10 tractors
33. (a)
Let the certain capital = x
x * 125/100 *125/100 *125/100 = 10000
x * 5/4 *5/4 *5/4 = 10000
x = 10000*4*4*4/125
x = 5120
34. (a)
0.459459459……
= 459/999
= 51/111
= 17/37
35. Ans. (c)
Let the annual income = x
As per the conditions given in the question,
(x*1*4/100) – (x *1*3.75/100) = 64
x/100 *(4-3.75) = 64
x= 64*100/.25
x = Rs. 25600
36. Ans. (a)
If m's value lies between 0 and 1
Let the value of m = ½
$m^2 = 1/4$
$m^{-1} = 2$
log1/2 =-3010
now taking the value of m =1/4\
$m^2 = 1/16$
$m^{-1} = 4$
log1/4 = -6020
so, option a is true
log $m < m^2 < m < m^{-1}$
37. Ans. (a)
Total sum = Rs. 39000
Let the share of wife = x
So, share of each daughter = 2x
Share of each son = 6x
As per question,
5(6x) + 4(2x) + x = 39000
30x + 8x + x = 3900
39x = 39000
X = Rs. 1000
38. Ans. (d)
Let the numbers be = p, q and r
Now, p*q = 286 = 2 *13 * 11 (After factorization)
q*r = 770 = 11 * 7 *5 *2
Since the numbers are co-prime, so,
q = 2*11 = 22
p = 13
r = 35
Sum of the three numbers = 22 + 13 + 35 = 70
39. Ans. (b)
Let the age of women = 10x + y
The age of husband = 10y +x
According to question
(10y+x) – (10x +y) = 1/11 (10x+y+10y+x)
9y-9x = 1/11 (11x+11y)
9y - 9x = x + y ……(a)
8y = 10x
x = 8y/10
x= 4/5 y
Difference of their ages
9y - 9x = 4y/5 +y
9y - 9x = 9y/5
So, the difference of their ages is multiple of 9.
Hence, option (b) is correct.
40. Ans. (a)
Let the length of train A be l_1 and the length of train B be l_2. Let their respective speeds be U_a & U_b
Now, according to the question,
$3\{(l_1+l_2)/(U_a+U_b)\} = (l_1+l_2)/U_a-U_b$

On solving the above equation,
$2U_a = 4U_b$
$U_a/U_b = 2/1$
41. Ans. (c)
In all odd prime numbers, the unit digits are 1, 3, 5, 7, 9
So after multiplying these numbers, we get = 945
Hence, the unit's digit is 5.
42. Ans. (b)
Ratio of copper and tin in alloy A = 2:3
Ratio of copper and tin in alloy B = 3:4
20 kg taken from A:
Copper = 8 kg and tin = 12 kg
28 kg taken from B:
Copper = 12 kg and tin =16 kg
This is mixed with some pure cooper = x kg
Ratio of copper and tin in alloy C = 6:7
Total copper in alloy C/ total tin in alloy C = 6/7
(8 + 12 + x)/ (12 + 16) = 6/7
(20 + x)/ 28 = 6/7
x = 4 kg
43. Ans. (a)
$ax^2 + bx + c$
When divided by x, dividend=ax + b & reminder=c
So, the value of c = 3
When divided by (x-1), dividend = ax + b + a & reminder => c + a + b = 6
Thus, a + b = 3 (since c = 3)
44. Ans. (c)
Let the integers be x, x+1, x+2, x+3, x+4, x+5, x+6, x+7, x+8
Now, as per question,
(x + x+1+ x+2 + x+3 + x+4 + x+5 + x+6 + x+7 + x+8)/ 9 = 55
9x + 36 = 55*9
x = 51
Largest integer = x+8 = 59
45. Ans. (a)
Total age of 15 students = 19*15 = 285
After 5 new students added, total age
= 20*18.5 = 370
Sum of the ages of 5 new students
= 370 -285 = 85
Average age of the 5 new students = (85/5) = 17
46. Ans. (b)
Speed in still water, $V_b = x$
Speed in flowing water, $V_s = y$
Total time taken by the man to row to & fro = z
Thus, z = d/ (x + y) + d/ (x - y) (where d is the distance between the two places)
$z = d \{x - y + x + y\} / x^2-y^2$
$d = z (x^2-y^2)/ 2x$
47. Ans. (c)
P= 12
Q =10
R= -6
Taking S1 or S2
P + Q – R = 12 + 10 - 6 = 16lt/min
5 hours 45 min = 345 min
Volume of tank = 16*345 = 5520 liters
Now taking S1 and S3
15 hrs. 20 min = 920 min
Volume of tank = 6*920 = 5520 liters
Now taking S2, S3
Let the volume of tank v
v= [10+12 – v/920] *345
v = 22 * 345 – 345v/920
v + 69v/184 = 22*345
253v/184 = 22*345
V = 22*345*184/253
V = 5520 liters
Thus, any two of S1, S2 and S3 are sufficient.
48. Ans. (c)
Total distance = 2d
So according to the question
2d/48 = d/60 + d/y
1/24 = 1/60 + 1/y
1/24 = (y+60)/60y
5y = 2y +120
3y = 120
y = 40 km per hour
49. Ans. (a)
Let CP of the article = Rs. 100
Then, SP = 100 * 132/100 = 132
According to question,
CP is increased by 20% and SP remains same
New CP = 100 *120/100 = 120
Profit % = (132 – 120)/ 120 * 100 = 12/120*100 = 10%
50. Ans. (b)
Let D's share = x
E = 3x/2
B= x/2
C= 2x
A=3x
Shares of A+D+E = 3x + x + 3x/2 = 11x/2
Shares of B+C = 2x +x/2 = 5x/2
Difference = 3x = 13500
x= 4500
Shares of B+C+E = 4x = 4 * 4500 = 18000
51. Ans. (c)
100% corresponds to 360^0
16.1% corresponds to $360^0/100* 16.1 = 57.96^0 = 58^0$
52. Ans. (c)
Let the two numbers be a and b
(a + b)/2 = 10
a + b = 20
Also, √ab= 8
ab = 64
a=64/b

Solving the above 2 equations,
a = 16 and b = 4

53. Ans. (c)
Sum of 11 observation = 11*11 = 121
Sum of first 6 observation = 10.5*6 = 63
Sum of last 6 observation = 11.5 *6 = 69
Sum of first 6 & last 6 observations = 63 + 69 = 132
Thus, Sixth observation = 132-121 = 11

54. Ans. (d)
$Sin^4\theta - cos^4\theta$
$= (sin^2\theta - cos^2\theta) * (sin^2\theta + cos^2\theta)$
$= -cos2\theta * 1$
$= 1 - 2cos^2\theta$

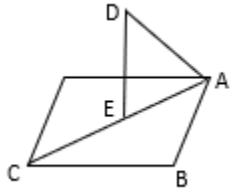
55. Ans. (b)
cot 1® cot 23° cot 45® cot 67° cot 89°
$cot1^0\ cot89^0 = 1$
$cot23^0\ cot67^0 = 1$
$cot45^0 = 1$
Thus, cot 1® cot 23° cot 45® cot 67° cot 89° = 1

56. Ans. (b)
The hour hand completes 360^0 in (60*12) i.e. 720 minutes
Thus, it completes $½^0$ in a minute.
So, in 10 minutes it covers 5^0

57. Ans. (b)
Taking statement 1:
$(Sec^2\theta - 1) * (1 - cosec^2\theta) = 1$
$(1+tan^2\theta - 1) * (-cot^2\theta) = 1$
$tan^2\theta * (-cot^2\theta) = 1$
-1 = 1 is not possible, Hence, statement 1 is wrong.

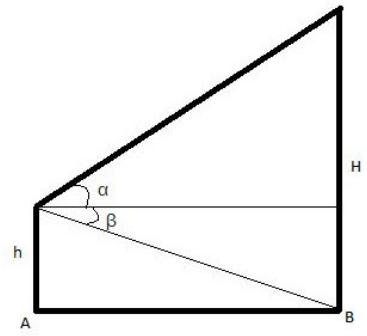
Taking statement 2,
$sin\ \theta\ (1 + cos\ \theta)^{-1} + (1+cos\ \theta)\ (sin\ \theta)^{-1} = 2\ cosec\ \theta$
$sin\ \theta/ (1 + cos\ \theta) + (1 + cos\ \theta)/sin\ \theta$
$= (sin^2\theta + 1 + cos^2\theta + 2cos\theta)/ (sin\ \theta + sin\ \theta\ cos\ \theta)$
$= 2\ (1+cos\theta)/ sin\ \theta\ (1+cos\theta)$
$= 2\ cosec\ \theta$
So, statement 2 is true

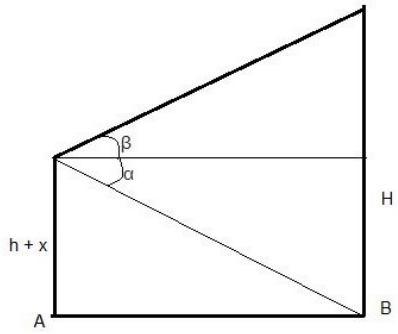
58. Ans. (c)
Diagonal of the square => $AC^2 = 2l^2$ (where l is the side of the square)
$AC = \sqrt{2}l$



AE (Base of the triangle formed by the vertex of the square with the tip of the tower) = ½AC = $\sqrt{2}l/2$
Also, angle DAE = 60^o
In triangle ADE, $\tan 60 = h/(\sqrt{2}l/2)$
$h = \sqrt{2}/2 * \sqrt{3} * l$
$h^2 = 3/2\ l^2$

59. Ans. (b)





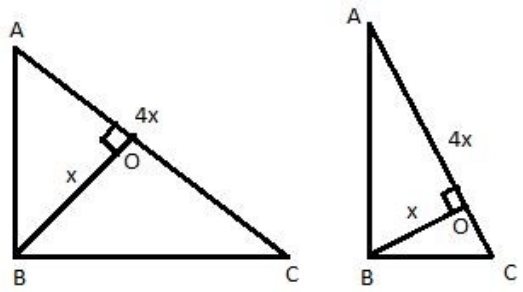
In the initial figure, $\tan \alpha = (H - h)/AB$, $\tan \beta = h/AB$
From 2nd figure
$\tan \alpha = (h + x)/AB$
Equating both the values of $\tan \alpha$
$(H - h)/AB = (h + x)/AB$
$x = H - 2h$

60. Ans. (a)
sec x cosec x = 2
let the value of $x = 45^0$
Putting this value in the above equation,
$\sqrt{2} * \sqrt{2} = 2$
$Tan^n x + Cot^n x$
$Tan^n 45 + Cot^n 45$
$= 1^n + 1^n$
=2

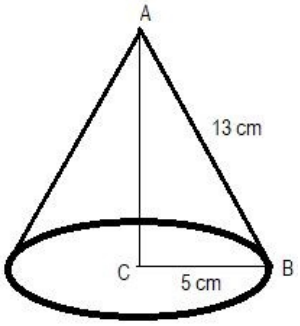
61. Ans. (a)
$Cos\ x + Cos^2x = 1$.....(a)
$Sin^2x + Cos^2x = 1$
From both equations
$Cos\ x = Sin^2x$
Putting this value in equation
$Cos\ x + Cos^2x = 1$
$Sin^2x + Sin^4x = 1$

62. Ans. (c)
Sin A + Cos A = p
Squaring both sides
$Sin^2A + Cos^2A + 2\ sin\ A\ cos\ A = p^2$
$1 + 2\ sin\ A\ cos\ A = p^2$
$sin\ A\ Cos\ A = (p^2 - 1)/2$
Sin A + Cos A = p
Cubing both sides;
$(Sin\ A + Cos\ A)^3 = Sin^3A + Cos^3A + 3\ Sin\ A\ Cos\ A\ (Sin\ A + Cos\ A)$

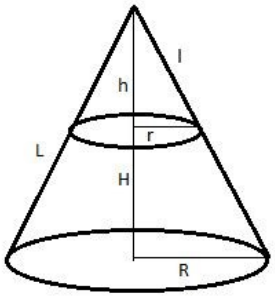
$P^3 = q + 3(p^2-1)/2 *p$
$P^3 = q + 3p^2/2 -3p/2$
$2p^3 - 3p^3 + 3p - 2q = 0$
$P^3 - 3p + 2q = 0$
63. Ans.
If $x = (\sec^2\theta - \tan\theta)/ (\sec^2\theta + \tan\theta)$
Let the values of $\theta = 45$
So, $x = (2-1)/ (2+1) = 1/3$
Since this holds true only for option 4, hence, it's the correct answer.
(1^{st} in incorrect since it states that the value of x lies between 1/3 & 3, excluding 1/3, hence it is not correct)
64. Ans. (a) or (c)



Let AB = a and BC = b. Now, 2 cases may be possible in this question
Case I: a>b
Case II: a<b
In triangle ABC, Area = ½ AB*BC = ½ * OB*AC
=> ½ ab = ½ x*4x
=> $ab = 4x^2$ => $2ab = 8x^2$
Applying Pythagoras theorem in this triangle,
$a^2 + b^2 = (4x)^2 = 16x^2$
Now, $(a + b)^2 = a^2 + b^2 + 2ab$ => $(a + b)^2 = 16x^2 + 4x^2 = 26x^2$
Thus, $(a + b) = 2\sqrt{6}\ x$
Similarly, $(a - b)^2 = a^2 + b^2 - 2ab$
Thus, $(a - b) = 2\sqrt{2}\ x$ and $-2\sqrt{2}\ x$ (Considering Case I & II mentioned above)
Now,
Case I: $(a + b) + (a - b) = 2\sqrt{6}\ x + 2\sqrt{2}\ x$ & $(a + b) - (a - b) = 2\sqrt{6}\ x - 2\sqrt{2}\ x$
=> $a = (\sqrt{6} + \sqrt{2})\ x$ & $b = (\sqrt{6} - \sqrt{2})\ x$
Case II: $(a + b) + (a - b) = 2\sqrt{6}\ x - 2\sqrt{2}\ x$ & $(a + b) - (a - b) = 2\sqrt{6}\ x + 2\sqrt{2}\ x$
=> $a = (\sqrt{6} - \sqrt{2})\ x$ & $b = (\sqrt{6} + \sqrt{2})\ x$
Now, Tan C = a/b
So, Tan c = $(\sqrt{6} - \sqrt{2})\ x/ (\sqrt{6} - \sqrt{2})\ x$ (Case I)
On rationalizing, Tan C = $2 + \sqrt{3}$
For Case II, Tan C = $2 - \sqrt{3}$
Thus, both options (a) & (c) are correct.
65. Ans. (a)
Area of △ABC = ½ * a*b
Also Area of △ABC = 1/2* p*√ (a^2+b^2) , AB =√ (a^2+b^2)
$1/2ab = ½ * p * \sqrt{(a^2+b^2)}$
$a^2b^2 = p^2(a^2+b^2)$
66. Ans. (a)

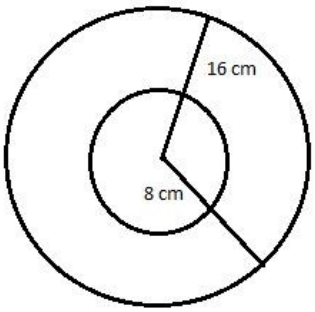


Height of cone = √ (169-25) =12
Volume of cone = 1/3 **π** r^3 * h
=1/3*22/7*125*12
=100 **π**
67. Ans. (a)
Area of a circle A = **π**r^2
Area of greatest possible circle A' = **π**$r^2/4$
A-2A' = **π**$r^2/2$ = A/2
68. Ans. (d)
r =1
l =3
Ratio of total surface area to curved surface rea = $(\pi r^2 + \pi rl)/ \pi rl = \pi r^2/ \pi rl + 1$
= r/l +1
= 1/3 + 1
= 4/3
Required ratio = 4:3
69. Ans. (b)

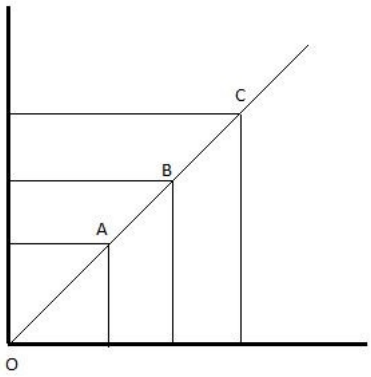


For small cone,
radius = r, height = h, slant height = l
For big cone,
radius = R, height = H, slant height = L
The triangles formed in the smaller and bigger cones are similar, hence,
r/R = h/H = l/L --- eq (1)
Now, (Volume of small cone/ Volume of Frustum) = 64/61 = k(constant)
Thus, volume of big cone = 64k + 61k = 125k
Volume of small come; V_1/ Volume of big cone, V_2 = $(1/3\ \pi r^2h)/ (1/3\ \pi R^2H)$
Also, V_1/ V_2 = 64m/125m = 64/125
So, r^2h/ R^2H = 64/125
From eq (1), r^3/ R^3 = 64/125; r/R = 4/5
Now, Ratio of curved surface area of small cone/ Ratio of curved surface area of big cone = πrl/ πRL
= (4/5)*(4/5) (from eq 1) = 16/25 = k constant

So, Curved surface area of frustum=25k – 16k=9k
Thus, Ratio of curved surface area of small cone/ Ratio of curved surface area of frustum
=16k/9k=16:9
70. Ans. (c)
Total area of room = 100 m^2
Area of triangular table = $\sqrt{3}$
Area of 4 book shelves = 4*4*1 = 16
Area of rest of room = 100 – ($\sqrt{3}$ - 16) = 82.268
Half of this area = 41.134
Cost of carpeting = 41.134 *100 = Rs. 4113
71. Ans. (b)
$p_m = (r_m + 1)/r_m = 1 + 1/r_m$
For m=1, $p_1 = 1 + 1/r_1$
For m=2, $p_1 = 1 + 1/r_2$
For m=3, $p_1 = 1 + 1/r_3$
Also, $r_3 > r_2 > r_1$
Thus, $1/r_1 > 1/r_2 > 1/r_2$
or, $1 + 1/r_1 > 1 + 1/r_2 > 1 + 1/r_2$
or, $p_1 > p_2 > p_3$
Thus, when m increases, value of p decreases.
Hence, Option b is correct
72. Ans. (c)
Edge of cube = 2a
So, height of cone = 2a
Radius of cone = a (for maximum volume)
Volume of cone = $1/3\ \pi a^2 * 2a = 2\pi a^3/3$
73. Ans. (c)
Length of transverse common tangent = $\sqrt{}$ {center distance^2 – $(r_1 + r_2)^2$}
= $\sqrt{}$ (100 - 64) = $\sqrt{}$36 = 6 cm
74. Ans. (b)
According to question
$4\pi r^2 = 4/3\ \pi r^3$
r = 3 cm
75. Ans. (d)
AB line segment is divided into two parts at point C, let AC = x
BC = 2-x
As per equation given in the statement
(AC^2 = AB * CB)
$x^2 = 2 * (2-x)$
$x^2 = 4-2x$
$x^2 + 2x - 4 = 0$
on solving this equation; $x = -1 + \sqrt{5}$
76. Ans. (a)

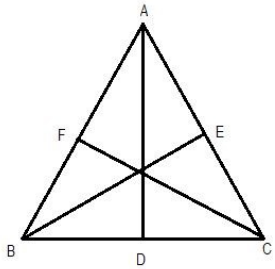


The locus of the mid-points of the radii of length 16 cm of a circle is a concentric circle of radius 8 cm
Hence Option 'a' is correct.
77. Ans. (d)
$\pi rl = 1.76 * 10^4\ cm^2$
$22/7 * 70*l = 1.76 * 10^4$
l = 80 cm
$l^2 = 6400$
Also, $l^2 = r^2 + h^2$
$h^2 = 6400 - 4900 = 1500$
$h = 10\sqrt{15}$
78. Ans. (c)
Among the given statements, Sentence 2 (The centroid of a triangle always lies inside the triangle) and statement 3 (The orthocenter of a right-angled triangle lies on the triangle) are correct. Hence, Option (c) is correct.
79. Ans. (a)

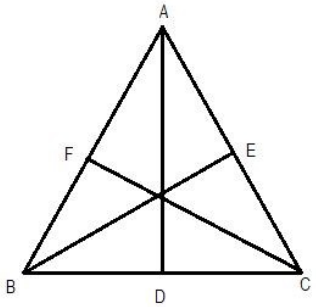


The locus of a point equidistant from two intersecting lines is a straight line. Hence, option (a) is correct
80. Ans. (d)
There are three conditions of congruency. These are:
(a) Side-Angle-Side
(b) Angle-Side-Angle
(c) Side-Side-Side
Statement 1 says Angle-Angle-Angle property, which is not true. Statements 2,3,4 are correct.
Hence the answer is option (d).
81. Ans. (c)
The given statement is; The angles of the polygon are all equal and each angle is 90^o.
This means that it is either a rectangle or a square. This makes statement 1 correct (i.e. the polygon has exactly 4 sides).
Sum of interior angles of a polygon having 'n' sides is $(n – 2) * 180^o = (n-2) * 2 * 90^o$
i.e. sum of interior angles of a polygon having n sides is (2n – 4) right angles.
Hence only statement 1 is correct
82. Ans. (b)
Let side of square = x
Area = x^2
After increasing; $(X+8)^2 = x^2 + 120$
On solving this equation, we get, x = 3.5 cm

83. Ans. (d)
The highest power of 10 which would divide 25! Is greater than 5, hence, option (d) is correct.
84. Ans. (c)
Area of one room to be painted
= 2(bh + hl) = 2((4*2.5) + (2.5*6)) = 50 m^2
Area of 5 rooms = 50*5 = 250m^2
For painting 20m^2 = 1 can is used
So, for painting 250m^2, number of cans used:
= 250/20 = 12, i.e., approximately 13 cans
85. Ans. (d)
Side of tiles = 50cm
Area of each tile = 50*50 = 2500 cm^2
Area of rectangular pathway = (1000*450) cm^2
Total tiles required for the pathway = 450000/2500 = 180 tiles.
Cost of 20 tiles = Rs. 100
Cost of 18- tiles = 100 * 180 / 20 = Rs. 900.
86. Ans. (c)
For cube to be of maximum volume, Diagonal of cube = Diameter of sphere
$\sqrt{3}a$ = 2r
r = $\sqrt{3}a$/2
According to question,
Volume of Cube / Volume of sphere = $a^3/(4/3\ \pi r^3)$
Putting the value of r;
= a^3 / (4/3 π($\sqrt{3}a$/2)^3)
On solving this ratio, we get 2/$\sqrt{}$ 3π
87. Ans. (d)
According to question
2 πr/h = 3/1
h = 2/3 πr
Curved surface area of cone = πrl = πr $\sqrt{}$(h^2+r^2)
= πr $\sqrt{}$ (4/9*π^2 r^2+ r^2)
= {$\pi r^2\sqrt{4}$ π^2+9}/3
88. Ans. (c)
2πr = 4a
πr = 2a
22/7 *98 = 2a
a = 154 cm
89. Ans. (c)

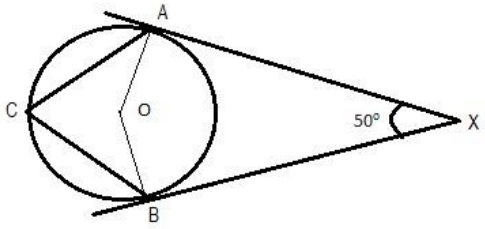


As per question, AB = a; BC = b; CA = c; AD = p; BE = q and CF = r
AB+BD > AD
BC + CE > BE
CA +AF > CF
Adding the above 3 equations:
AB + BC + CA + (BC/2 +AC/2 +AB/2) > AD + BE + CF
3/2(AB + BC + CA) > (AD + BE + CF)
3(a + b + c) > 2(p + q + r)
90. Ans. (b)



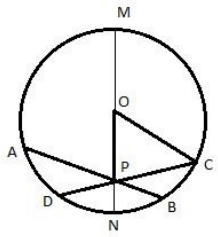
As per question, AB = a; BC = b; CA = c; AD = p; BE = q and CF = r. Let G be the mid-point/ intersection point of the 3 medians.
Now, in triangle AGC, using the triangle inequality property:
2/3r + 2/3p > c ---- eq (1)
In triangle BGC; 2/3q + 2/3 r > b ----- eq (2)
In triangle AGB, 2/3p + 2/3q > a ----- eq (3)
Adding (1), (2) & (3):
2/3r + 2/3p + 2/3q + 2/3 r + 2/3p + 2/3q > a + b + c
4 (p + q + r) > 3 (a + b + c)
Hence option (b) is correct.
91. Ans. (b)
Side of square; a = 2/$\sqrt{}$ π
For largest circular disc; Side of square = Diameter of disc
i.e., a = 2r
Area of circle; πr^2 = $\pi(a/2)^2$
= π*1/ π = 1
92. Ans. (b)
D_1 *D_2 = 50
Area of square = a^2 = ½ D_1*D_2 (where 'a' is the side of the square)
a^2 = ½ * 50 = 25
a = 5 units
93. Ans. (b)
Surface area of Cylindrical box = 2πrh + 2πr^2
= 2* π/4 *d^2 + πdh =352 (where d is the diameter = 2r)
d^2 +2d *10 = 352/ π * 2
d^2 +20d = 352/22 *7 *2 = 224
d^2 + 20d - 224 = 0
d = 8 cm
94. Ans. (d)
Let Side of triangle = a & Side of Square = b
According to question,
3a =4b (Since their perimeters are same)
Diagonal of square = b$\sqrt{}$**2 =** 6$\sqrt{}$**2**
Hence, b= 6
So, a = 8
Area of triangle = $\sqrt{}$**3/4 a²**

= √3/4 * 64
=16 √3
95. Ans. (d)
In this case, Diagonal of square = Diameter of circle
√**2**a = 2r
Area of required region = $\pi r^2 - a^2$
$= \pi(\sqrt{2}a/2)^2 - a^2$
$= \pi a^2/2 - a^2$
$= (\pi-2)\, a^2/2$
96. Ans. (b)



Let O be the center of the circle.
Now, angle OAX = angle OBX = 90°
In polygon AOBX,
Angles (AOB + OBX + BXA + XAO) = 360°
Thus, angle AOB = 360 – (90 + 90 + 50) = 130°
angle ACB = ½ angle AOB = ½ of 130 = 65°
97. Ans. (c)

Both the given properties of lines are correct.
Hence, option (c) is correct.
98. Ans. (a)
AD =DB = l/2 (since AB = l, given in the question)
Area of shaded region = Area of triangle (ABC – ADE) \
$= (\sqrt{3}l^2/4) - (\sqrt{3}/4 * (l/2)^2)$
$= 3\sqrt{3}l^2/16$
99. Ans. (b)
∠ QPT = α, ∠ OPT = 90°
∠ OPQ = ∠OQP = 90 - α (isosceles triangle)
∠ POQ = 180 – (90- α + 90 - α) (Sum of all the angles of triangle OPQ is 180°)
= 2 α
Hence, option (b) is correct
100. Ans. (d)



AB = CD = 10 cm, PB = 3 cm; AP = (10-3) = 7 cm, OC = 13 cm
Extending line MN, such that it is the diameter of the circle.
Since MN is the diameter; MN
= 2OC = 2*13 = 26 cm
As per theorem of chords intersecting each other in a circle:
AP*PB = MP*PN
$\Rightarrow 7*3 = (MN - PN) * PN$
$\Rightarrow 21 = (26 - PN) * PN$
$\Rightarrow PN^2 - 26\, PN + 21 = 0$
Applying formula,
$PN = \{-(-26) (+/-) \sqrt{(-26)^2 + (4*21)}\}/ 2$
(Discarding the negative root)
$PN = 13 + 2\sqrt{37}$ or $13 - 2\sqrt{37}$
Now, OP = ON – PN = 13 – (13 + 2√37) or 13 – (13 - 2√37)
Since the first case will yield a negative value, so we will discard it.
Thus, OP = 2√37

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