

MUPPADI TRAINING ACADEMY – VELLORE

PREVIOUS YEAR QUESTIONS - 2018

CDS – MATHEMATICS

- $5^{17} + 5^{18} + 5^{19} + 5^{20}$ is divisible by
A) 7
B) 9
C) 11
D) 13
- 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
- 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
- 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
- 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.
- 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) $p = 4r$
- If $65x - 33y = 97$ and $33x - 65y = 1$, then what is xy equal to?
A) 2
B) 3
C) -2
D) -3
- 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

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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 α and β 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 polynomials of degree p and q respectively, then the degree of $\{f(x) \pm g(x)\}$ (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 $\min(p, q)$

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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 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, -30, -1
B) 10, -1, 30
C) -30, 10, -1
D) -1, -30, 10

30. A person borrowed $\text{Rs } 5,000$ 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

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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 different 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) 2 : 3
C) 4 : 3
D) 1 : 1

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41. All odd prime numbers up to 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
B) 17.5
C) 18
D) 18.5
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) $\frac{(x^2 - y^2)}{2Zx}$
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 S1, 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 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 S1, S2 and S3 are sufficient
D) None of the above

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55. What is $\cot 1^\circ \cot 23^\circ \cot 45^\circ \cot 67^\circ \cot 89^\circ$ 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. $(\sec^2 \theta - 1)(\operatorname{cosec}^2 \theta) = 1$
2. $\sin \theta (1 + \cos \theta)^{-1} + (1 + \cos \theta)(\sin \theta)^{-1} = 2 \operatorname{cosec} \theta$
Which of the above is/are correct ?
A) 1 only
B) 2 only
C) Both 1 and 2
D) Neither 1 and 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 l 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 β 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 $\sec X \operatorname{cosec} x = 2$, 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) $P^3 - 3p + 2q = 0$
C) $q^3 - 3p + 2q = 0$
D) $q^3 + 3p + 2q = 0$
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) $x \notin [\frac{1}{3}, 3]$
C) $-3 < X < \frac{1}{3}$
D) $\frac{1}{3} < x < 3$
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) $a^2 b^2 = p^2 (a^2 + b^2)$
B) $a^2 b^2 = p^2 (a^2 - b^2)$
C) $2 a^2 b^2 = p^2 (a^2 + b^2)$
D) $a^2 b^2 = 2p^2 (a^2 + b^2)$

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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) $100 \pi \text{ cm}^2$ B) $50 \pi \text{ cm}^2$
C) $65 \pi \text{ cm}^2$ D) $169 \pi \text{ cm}^2$
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 Rs 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 $r_1, r_2, r_3, \dots, r_{n-1}$ such that $r_1 < r_2 < r_3 < \dots < r_{n-1}$ concentric with the circle C. If $p_m \frac{r_m + 1}{r_m}$ where $m = 1, 2, 3, \dots (n - 2)$, 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) $\frac{\pi a^3}{4}$ B) $\frac{\pi a^3}{5}$ 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

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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) $3\sqrt{5}$
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 176π m² 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 line
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) 1,2 and 4
C) 1,2, and 4
D) 2,3 and 4

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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 $1 \times 2 \times 3 \times 4 \dots \times 23 \times 24 \times 25$?
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 $\text{Rs } 100$. 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 $\sqrt{71} = 22/7$)
A) 146 cm
B) 152 cm
C) 154 cm
D) 156 cm

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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 unit B) 1 square unit
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 ? (Use $\pi \frac{22}{7}$)

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 ?

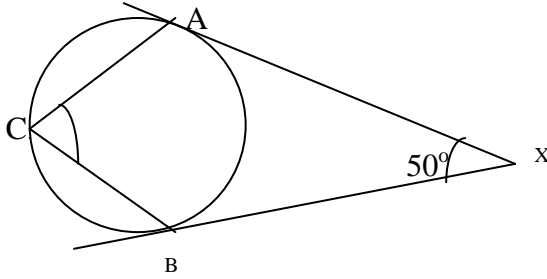
- A) $12\sqrt{2}$ cm² B) $12\sqrt{3}$ cm²
C) $16\sqrt{2}$ cm² D) $16\sqrt{3}$ cm²

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 corners 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

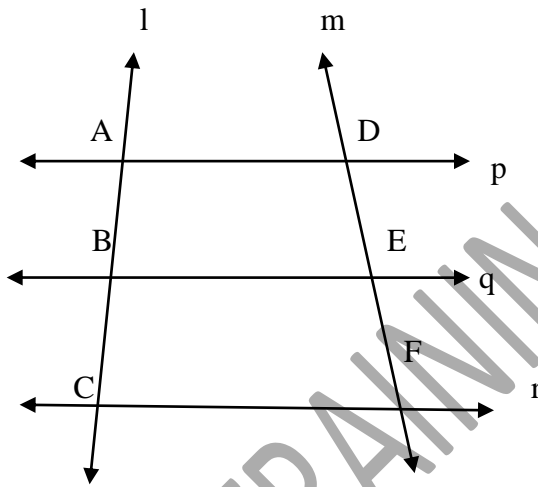
96. In the figure given below, XA and XB are two tangents to a circle. If $\angle AXB = 50^\circ$ and AC is parallel to XB, then what is $\angle ACB$ equal to ?

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- A) 70° B) 65°
 C) 60° D) 55°

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



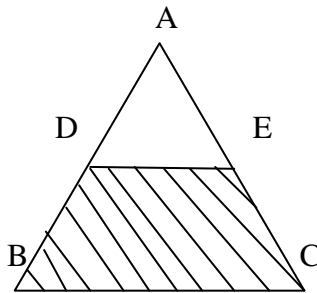
Consider for the following:

1. $AB : AC = DE : DF$ 2. $AB \times EF = BC \times DE$

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 l is the length of a side of the triangle, then what is the area of the shaded region ?



- A) $\frac{3\sqrt{3} l^2}{16}$ B) $\frac{3 l^2}{16}$ C) $\frac{3\sqrt{3} l^2}{32}$ D) $\frac{3 l^2}{32}$

