VNR10M

Virudhunagar District

Common Half Yearly Examination - December 2024

Standard 10

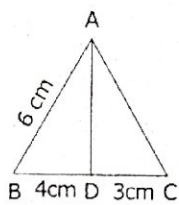
Time: 3.00 Hrs. **MATHEMATICS** Marks: 100

I. Choose the best answer: **14×1=14**

1) If there are 1024 relations from a set A = {1, 2, 3, 4, 5} to a set B, then the number of elements in B is
   a) 3 b) 2 c) 4 d) 8
2) If {(a, 8), (6, b)} represents an identify function, then the value of a and b are respectively
   a) (8, 6) b) (8, 8) c) (6, 8) d) (6, 6)
3) The value of $(1^3+2^3+3^3+.....+15^3) - (1+2+3+.....+15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
4) The HCF of numbers form 2^m and 3^n is
   a) 1 b) 2 c) 3 d) 6
5) For the given matrix $A = \begin{bmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{bmatrix}$ the order of the matrix A^T is
   a) 2×3 b) 3×2 c) 3×4 d) 4×3
6) If ΔABC is an isosceles triangle with $\angle C = 90^\circ$ and AC = 5 cm, then AB is
   a) 2.5 cm b) 5 cm c) 10 cm d) $5\sqrt{2}$ cm
7) A tangent is perpendicular to the radius at the
   a) centre b) point of contact c) infinity d) chord
8) If (5, 7) (3, p) and (6, 6) are collinear, then the value of p is
   a) 3 b) 6 c) 9 d) 12
9) The slope of the line which is perpendicular to a line joining the points (0, 0) and (−8, 8) is
   a) −1 b) 1 c) 1/3 d) −8
10) If $\tan\theta+\cot\theta = 2$ then $\tan^2\theta+\cot^2\theta$ is
   a) 0 b) 1 c) 2 d) 4
11) The total surface area of a hemisphere is how much time the square of its radius
   a) π b) 4π c) 3π d) 2π
12) How many times the new volume of the cylinder formed by doubling the radius of a cylinder is the volume of the given cylinder?
   a) equal b) 3 c) 4 d) 2
13) The range of the data 8, 8, 8, 8, 8, ...8 is
   a) 0 b) 1 c) 8 d) 3
14) Which of the given values cannot be the probability of an event?
   a) 0 b) 0.5 c) 1.05 d) 1

II. Answer any 10 questions: [Q.No. 28 is compulsory] **10×2=20**

15) If A = {−2, −1, 0, 1, 2} and f : A→B is an onto function defined by $f(x) = x^2+x+1$ then find B.
16) If $f(x) = x^2-1$, $g(x) = x-2$ find a, if gof(a) = 1.
17) Find the 4-digit pin number 'pqrs' of an ATM card such that $p^3\times q^2\times r^4\times s^1 = 75600$ is?
18) If 1+2+3+.....+n = 666 then find n.
19) Find the square root of the following rational expressions: $\dfrac{400\,x^4y^{12}z^{16}}{100\,x^8y^4z^4}$
20) If $A = \begin{bmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & 5/2 \\ 8 & 3 & 1 \end{bmatrix}$ then verify $(A^T)^T = A$.
21) In the figure, AD is the bisector of $\angle A$. If BD = 4 cm, DC = 3 cm and AB = 6 cm, find AC.



22) Find the slope of a line joining the points $(5, \sqrt{5})$ with the origin.

23) If the straight lines $5x-2y-9 = 0$ and $ay+2x-11 = 0$ are perpendicular to each other then the value of a is?

24) Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$.

25) From the top of a rock $50\sqrt{3}$ m high, the angle of depression of a car on the ground is observed to be 30°. Find the distance of the car from the rock.

26) If the total surface area of a cone of radius 7 cm is 704 cm^2, then find its slant height?

27) Find the range and coefficient of range of the following data:
25, 67, 48, 53, 18, 39, 44

28) What is the probability that a leap year selected at random will contain 53 saturdays?

III. Answer any 10 questions: [Q.No. 42 is compulsory] **10×5=50**

29) Let $A = \{x \in W / x<3\}$, $B = \{x \in N / 1<x\leq 5\}$ and $C = \{3, 5, 7\}$ verify that $A\times(B\cup C) = (A\times B) \cup (A\times C)$.

30) Let $f : A\to B$ be a function defined by $f(x) = \frac{x}{2} - 1$, where $A = \{2, 4, 6, 10, 12\}$, $B = \{0, 1, 2, 4, 5, 9\}$. Represent f by (i) set of ordered pairs (ii) a table (iii) an arrow diagram (iv) a graph.

31) Determine the general term of an A.P. whose 7^{th} term is -1 and 16^{th} term is 17.

32) Find the sum to n terms of the series 5+55+555+.....

33) If $A = \frac{2x+1}{2x-1}$, $B = \frac{2x-1}{2x+1}$ find $\frac{1}{A-B} - \frac{2B}{A^2-B^2}$.

34) If $A = \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix}$, $B = \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix}$ then show that $A^2+B^2 = I$.

35) State and prove Angle Bisector theorem.

36) Find the area of the quadrilateral formed by the points (8, 6) (5, 11) (-5, 12) and (-4, 3).

37) Find the equation of a line passing through (6, -2) and perpendicular to the line joining the points (6, 7) and (2, -3).

38) From the top of a light house, the angle of depression of two ships on the opposite sides of it are observed to be 30° and 60°. If the height of the light house is h metres and the line joining the ships passes through the foot of the light house, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m.

39) If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.

40) A capsule is in the shape of a cylinder with two hemisphere stuck to each of its ends. If the length of the entire capsule is 12 mm and the diameter of the capsule is 3 mm, how much medicine it can hold?

41) The runs scored by the cricket player in a 7 test match are given below. Find the standard deviation of his runs: 70, 80, 60, 50, 40, 90, 93

42) Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.

IV. Answer the following: **2×8=16**

43) Draw a triangle ABC of base BC = 8 cm, $\angle A = 60°$ and the bisector of $\angle A$ meets BC at D such that BD = 6 cm.

(OR)

Draw the two tangents from a point which is 5 cm away from the centre of a circle of diameter 6 cm. Also, mesure the lengths of the tangents.

44) Graph the following linear function $y = \frac{1}{2}x$. Identify the constant of variation and verify it with the graph. Also (i) find y when x = 9 (ii) find x when y = 7.5

(OR)

Draw the graph of $y = x^2+3x-4$ and hence use it to solve $x^2+3x-4 = 0$.
