



Krishnagiri

COMMON HALF YEARLY EXAMINATION – 2022

Standard X

Reg.No. :

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MATHEMATICS

Time: 3.00 hrs.

Part - I

Marks: 100

14 x 1 = 14

I. Choose the correct answer:

1. $A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$, then $n[(A \cup C) \times B]$ is

- a) 8
- b) 20
- c) 12
- d) 16

2. Given $f(x) = (-1)^x$ is a function from N to Z . then the range of f is

- a) $\{1\}$
- b) N
- c) $\{1, -1\}$
- d) Z

3. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is

- a) 4
- b) 2
- c) 1
- d) 3

4. Sum of first 'n' terms of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \dots$ is

- a) $\frac{n(n+1)}{2}$
- b) \sqrt{n}
- c) $\frac{n(n+1)}{\sqrt{2}}$
- d) 1

5. $x + y - 3z = -6$, $-7y + 7z = 7$, $3z = 9$. Find the solution of the system is

- a) $x = 1, y = 2, z = 3$
- b) $x = -1, y = 2, z = 3$
- c) $x = -1, y = -2, z = 3$
- d) $x = 1, y = -2, z = 3$

6. Which of the following can be calculated from the given matrices

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

- i) A^2
- ii) B^2
- iii) AB
- iv) BA

- a) (i) and (ii) only
- c) (ii) and (iv) only

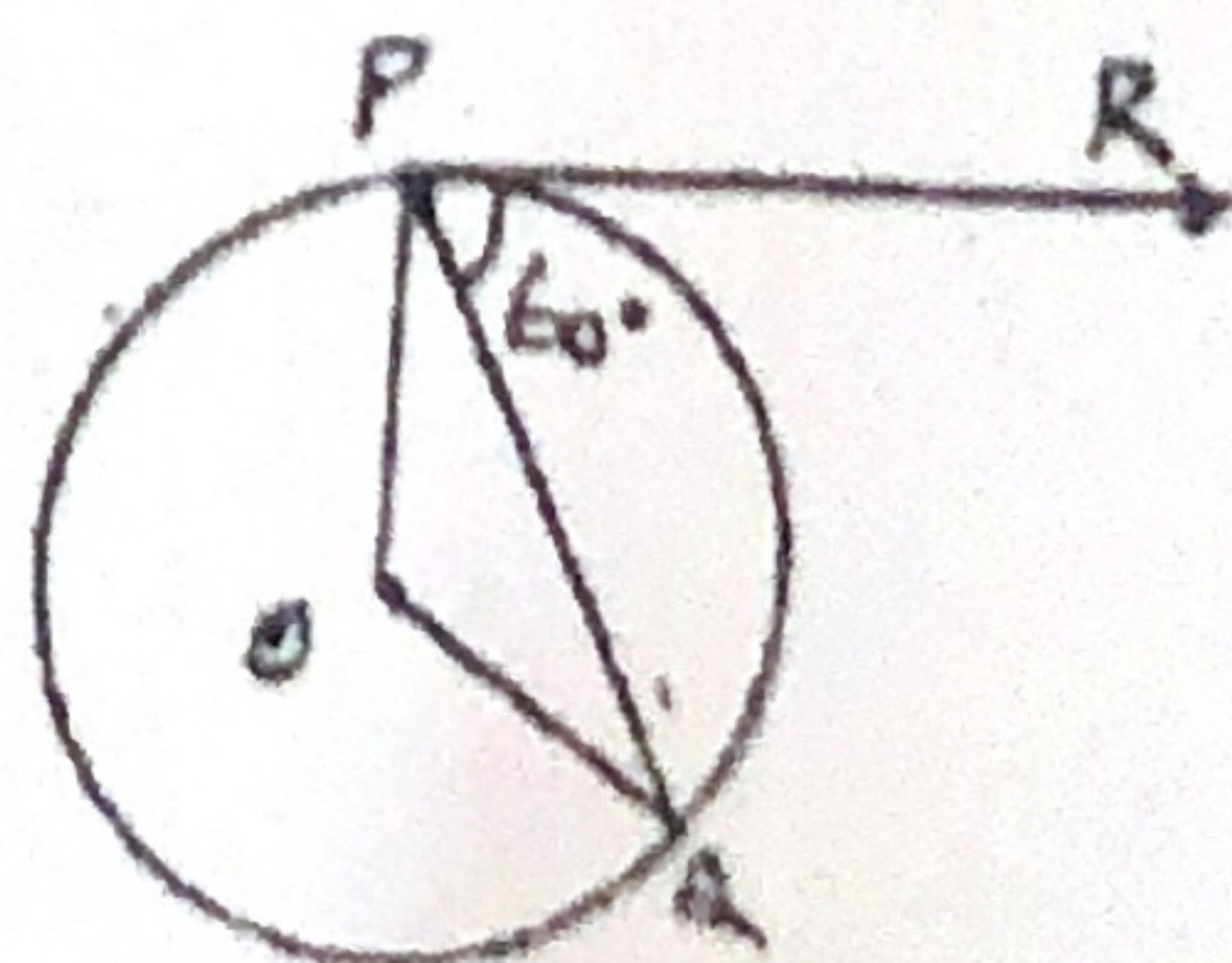
- b) (ii) and (iii) only
- d) all of these

7. In a ΔABC , AD is the bisector of $\angle BAC$. If $AB = 8$ cm, $BD = 6$ cm and $DC = 3$ cm, the length of the side AC is

- a) 6 cm
- b) 4 cm
- c) 3 cm
- d) 8 cm

8. In the figure if PR is tangent to the circle at P and O is the centre of the circle, then $\angle POQ$ is

- a) 120°
- b) 100°
- c) 110°
- d) 90°



9. $(2, 1)$ is the point of intersection of two lines

- a) $x - y - 3 = 0$; $3x - y - 7 = 0$
- b) $x + y = 3$; $3x + y = 7$
- c) $3x + y = 3$; $x + y = 7$
- d) $x + 3y - 3 = 0$; $x - y - 7 = 0$

10. If the distance between the points $(4, p)$ and $(1, 0)$ is 5, then $p =$

- a) ± 4
- b) 4
- c) -4
- d) 0

11. If $\sin\theta = \cos\theta$, then $2 \tan^2\theta + \sin^2\theta - 1$ is equal to

- a) $-\frac{3}{7}$
- b) $\frac{3}{7}$
- c) $\frac{2}{3}$
- d) $-\frac{2}{3}$

12. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be
 a) 12 cm b) 10 cm c) 13 cm d) 5 cm
13. The curved surface area of a hemi-sphere is how much times the square of its radius?
 a) π b) 2π c) 3π d) 4π
14. Which of the following is incorrect?
 a) $P(A) > 1$ b) $0 \leq P(A) \leq 1$ c) $P(\phi) = 1$ d) $P(A) + P(\bar{A}) = 1$

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) 10 x 2 = 20

15. A Relation R is given by the set $\{(x,y) / y = x + 3, x \in \{0,1,2,3,4,5\}\}$. Determine its domain and range.
16. If m, n are natural numbers, for what values of m, does $2^n \times 5^m$ ends in 5?
17. If $1^3 + 2^3 + 3^3 + \dots + k^3 = 16900$ then find $1 + 2 + 3 + \dots + k$

18. If $A = \begin{pmatrix} 5 & 4 & 2 \\ 1 & -7 & 9 \\ 3 & 8 & 2 \end{pmatrix}$, then find the transpose of A.

19. Find the zeros of the quadratic expression $x^2 + 8x + 12$
20. If ΔABC is similar to ΔDEF such that $BC = 3$ cm, $EF = 4$ cm and area of $\Delta ABC = 54$ cm², find the area of ΔDEF .
21. Show that the points $P(-1.5, 3)$, $Q(6, -2)$, $R(-3, 4)$ are collinear.
22. Show that the straight lines $3x + 4y = 7$ and $9x + 12y - 3 = 0$ are parallel.
23. Prove that $\sqrt{\frac{1 + \cos \theta}{1 - \cos \theta}} = \operatorname{cosec} \theta + \cot \theta$
24. Find the angle of elevation of the top a tower from a point on the ground, which is 30 m away from the foot of a tower of height $10\sqrt{3}$ m.
25. The radius and height of a cylinder are in the ratio 5:7 and its curved surface area is 5500 sq.cm. Find its radius and height.
26. Find the diameter of a sphere whose surface area is 154 m².
27. A coin is tossed thrice. What is the probability of getting two consecutive tails?
28. Let f be a function from R to R defined by $f(x) = 3x - 2$. Find the value of a and b given that (a, 4) and (1, b) belong to f.

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory) 10 x 5 = 50

29. Let $A = \{x \in W / 0 < x < 5\}$, $B = \{x \in W / 0 \leq x \leq 2\}$, $C = \{x \in W / x < 3\}$ then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$
30. A function $f: [-5, 9] \rightarrow R$ is defined as follows
- $$f(x) = \begin{cases} 6x + 1 & ; -5 \leq x < 2 \\ 5x^2 - 1 & ; 2 \leq x < 6 \\ 3x - 4 & ; 6 \leq x \leq 9 \end{cases}$$
- Find i) $2f(4) + f(8)$ ii) $\frac{2f(-2) - f(6)}{f(4) + f(-2)}$



31. The sum of first n , $2n$ and $3n$ terms of an A.P. are S_1 , S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$ (3)
32. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b .
33. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ are real and equal, prove that either $a = 0$ (or) $a^3 + b^3 + c^3 = 3abc$
34. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$, show that $A^2 - 4A + 5I_2 = 0$
35. State and Prove Thales theorem.
36. Prove analytically that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and is equal to half of its length.
37. The vertices ΔABC are $A(2, 1)$, $B(6, -1)$ and $C(4, 11)$. Find the equation of straight line along that altitude from the vertex A .
38. The top of a 15 m high tower makes an angle of elevation of 60° with the bottom of an electronic pole and angle of elevation of 30° with the top of the pole. What is the height of the electric pole?
39. 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?
40. Find the coefficient of variation of 24, 26, 33, 37, 29, 31
41. Two dice are rolled together, find the probability of getting a doublet or sum of faces as 4.
42. An organization plans to plant saplings in 25 streets in a town in such a way that one sapling for the first street, three for the second, nine for the third and so on. How many saplings are need to complete the work?

Part - IV

IV. Answer all the questions.

43. a) Construct a ΔABC such that $AB = 5.5$ cm, $\angle C = 25^\circ$ and the altitude from C to AB is 4 cm. (OR) $2 \times 8 = 16$
- b) Draw a circle of diameter 6 cm from a point P , which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.
44. a) A government shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the marked price and discount. Hence find
- The marked price when a customer gets a discount of ₹3250 (from graph)
 - The discount when the marked price is ₹2500
- (OR)
- b) Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$
