

10 P

PG Asst. In Maths.

Register No.

HALF YEARLY EXAMINATION - 2025

Time : 3.00 Hours

MATHS

Marks : 100

PART-I

14x1=14

I) Choose the best answer

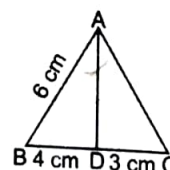
- If $f: A \rightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to
(A) 7 (B) 49 (C) 1 (D) 14
- Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are (A) 0, 1, 8 (B) 1, 4, 8 (C) 0, 1, 3 (D) 1, 3, 5
- The next term of the sequence $\frac{1}{2}, \frac{1}{6}, \frac{1}{10}, \frac{1}{14}, \dots$ is (A) $\frac{1}{15}$ (B) $\frac{1}{16}$ (C) $\frac{1}{18}$ (D) $\frac{1}{20}$
- $\frac{x}{x^2-25} - \frac{8}{x^2+6x+5}$ gives
(A) $\frac{x^2-7x+40}{(x-5)(x+5)}$ (B) $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$ (C) $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (D) $\frac{x^2+10}{(x^2-25)(x+1)}$
- If A is a 2×3 matrix and B is a 3×4 matrix, how many columns does AB have?
(A) 3 (B) 4 (C) 2 (D) 5
- In the adjacent figure $\angle BAC = 90^\circ$ and $AD \perp BC$ then
(A) $BD \cdot CD = BC^2$ (B) $AB \cdot AC = BC^2$
(C) $BD \cdot CD = AD^2$ (D) $AB \cdot AC = AD^2$
- How many tangents can be drawn to the circle from an exterior point?
(A) One (B) Two (C) Infinite (D) Zero
- The point of intersection of $3x - y = 4$ and $x + y = 8$ is
(A) (5, 3) (B) (2, 4) (C) (3, 5) (D) (4, 4)
- (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) $x + 3y - 3 = 0, x - y - 7 = 0$
- If the ratio of the height of the tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the Sun has measure (A) 45° (B) 30° (C) 90° (D) 60°
- The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is
 $\frac{9\pi h^2}{2}$ (A) 8 sq. units (B) $24\pi h^2$ sq. units (C) $\frac{8\pi h^2}{2}$ (D) $\frac{56\pi h^2}{9}$ sq. units.
- When Athira divided the surface area of a sphere by its volume, he got the answer as $\frac{1}{3}$. What is the radius of the sphere? (A) 24 cm (B) 6 cm (C) 54 cm (D) 4.5 cm.
- Variance of the first 20 natural numbers is (A) 32.25 (B) 44.25 (C) 33.25 (D) 30
- If the probability of getting a job for a person is $\frac{x}{3}$, then the probability of not getting the job is $\frac{2}{3}$ then the value of x is (A) 2 (B) 1 (C) 3 (D) 1.5

PART-II

II. Answer any 10 questions. Question No. 28 is compulsory.

10x2=20

- If $B \times A = \{(-2, 3), (-2, 4), (0, 3), (0, 4), (3, 3), (3, 4)\}$, find A and B.
- Let f be a function from R to R defined by $f(x) = 3x - 5$. Find the values of a and b given that (a, 4) and (1, b) belong to f.
- "a" and "b" are two positive integers such that $a^b \times b^a = 800$. Find "a" and "b".
- Find the sum of the first six terms of the G.P. 5, 15, 45, ...
- Determine the nature of the roots are the quadratic equation $15x^2 + 11x + 2 = 0$.
- From the figure, AD is the bisector of $\angle A$. If $BD = 4$ cm, $CD = 3$ cm, and $AB = 6$ cm, find AC.



21. Calculate the slope and y-intercept of the straight line. $8x-7y+6=0$
22. Find the equation of a straight line which is parallel to the line $3x-7y=12$ and passing through the point (6,4).
23. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower of height $10\sqrt{3}$ m.
24. If the total surface area of a cone of radius is 7 cm is 704 cm^2 , then find its slant height.
25. If the ratio of x radii of two spheres is 4:7, find the ratio of their volumes.
26. Find the standard deviation of the first 21 natural numbers.
27. A coin is tossed thrice. What is the probability of getting two consecutive tails?
28. Given $A = \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 0 \\ 1 & 3 \end{pmatrix}$ find AB and BA. Verify if $AB = BA$.

PART - III

0 x 5 = 50

III. Answer any 10 questions. Question No. 42 is compulsory. 1

29. Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 5, 8, 11, 14\}$ be two sets. Let $f: A \rightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function: (i) by an arrow diagram (ii) in a table form (iii) as a set of ordered pairs (iv) in graphical form.
30. If $f(x) = x-1$, $g(x)=3x+1$, and $h(x) = x^2$, prove that $fo(goh) = (fog)oh$.
31. The ratio of 6th and 8th term of an AP is 7:9. Find the ratio of 9th term to the 13th term.
32. Find the sum of $9^3+10^3+11^3 + \dots +21^3$.
33. Simplify: $\frac{1}{x^2-5x+6} + \frac{1}{x^2-3x+2} - \frac{1}{x^2-8x+15}$
34. If $36x^4-60x^3+61x^2 - mx+n$ is a perfect square, find the values of 'm' and 'n'
35. If $A=\begin{pmatrix} 1 & -1 & 2 \end{pmatrix}$, $B=\begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix}$ and $C=\begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$ show that $(AB)C=A(BC)$
36. State and prove Pythagoras theorem.
37. Find the equation of a straight line through the intersection of lines $7x+3y=10$, $5x-4y=1$, and parallel to the line $13x+5y+12=0$.
38. From the top of a 50m high tower, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree. ($\sqrt{3}=1.732$)
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. Find the coefficient of variation of 24, 26, 33, 37, 29, 31.
41. Three fair coins are tossed together. Find the probability of getting (i) all heads, (ii) at least one tail, (iii) at most two tails.
42. If the vertices of a quadrilateral are at $A(-5,7)$, $B(-4,K)$, $C(-1,-6)$, and $D(4,5)$ and its area is 72 sq. units, find the value of K.

PART IV

2x8=16

IV. Answer all the questions:-

- 43) Construct a triangle ΔPQR such that $QR = 5\text{cm}$, $\angle P = 30^\circ$ and the altitude from P to QR is of length 4.2cm (OR) Take a point which is 11 cm away from the centre of a circle of radius 4cm and draw the two tangents to the circle from the point.
- 44) Varshika draw 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference (approximately related) of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6 cm.

Diameter (a) xm	1	2	3	4	5
Circumference (y) cm	3.1	6.2	9.3	12.4	15.5

(OR)

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