

MAHARISHI VIDYA MANDIR GROUP OF SCHOOLS
QUARTERLY EXAMINATION - 2025
MATHEMATICS (SET - 1)

CLASS: XI
DATE: 15.09.25
ROLL NO:

MARKS: 80
TIME: 03.00 HRS

GENERAL INSTRUCTIONS:

- This Question paper contains 38 questions. All questions are compulsory.
- This Question paper is divided into five Sections - A, B, C, D and E.
- In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
- In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
- In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
- In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
- In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
- There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.
- Use of calculators is not allowed.

SECTION-A

(This section comprises of multiple-choice questions (MCQs) of 1 mark each)

1. Which of the following two sets are equal?

- (a). $A = \{1, 2\}$ and $B = \{1\}$
- (b). $A = \{1, 2\}$ and $B = \{1, 2, 3\}$
- (c). $A = \{1, 2, 3\}$ and $B = \{2, 1, 3\}$
- (d). $A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$

2. If $A = \{1, 2, 3, 4, 5\}$ then the number of proper subsets of A is

- (a) 120 (b) 30 (c) 31 (d) 32

3. The range of the function $f(x) = \frac{x^2 - x}{x^2 + 2x}$ is

- (a) $\mathbb{R}$ (b) $\mathbb{R} - \{1\}$ (c) $\mathbb{R} - \left\{-\frac{1}{2}, 1\right\}$ (d) none of these

4. If $\tan x = -\frac{1}{\sqrt{3}}$ and x lies in the 4th quadrant, then the value of $\cos x$ is

- (a) $\frac{\sqrt{5}}{\sqrt{6}}$ (b) $\frac{2}{\sqrt{6}}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{6}}$

5. If $A = \{1, 3, 5, B\}$ and $B = \{2, 4\}$ then

- (a) $4 \in A$ (b) $\{4\} \subset A$ (c) $B \subset A$ (d) none of these

6. The domain of the function $f(x) = \log|x|$ is

- (a) $\mathbb{R}$ (b) $(-\infty, 0)$ (c) $(0, \infty)$ (d) $\mathbb{R} - \{0\}$

7. If $-3x+17 < -13$ then

- (a) $x \in (10, \infty)$ (b) $x \in [10, \infty)$ (c) $x \in (-\infty, 10]$ (d) $x \in [-10, 10)$

8. If $x < 7$, then

- (a) $-x < -7$ (b) $-x \leq -7$ (c) $-x > -7$ (d) $-x \geq -7$

9. The equation of the line passing through (1,5) and perpendicular to the line

$$3x-5y+7=0 \text{ is}$$

- (a) $5x+3y-20=0$ (b) $3x-5y+7=0$ (c) $3x-5y+6=0$ (d) $5x+3y+7=0$

10. What is the distance of (5, 12) from the origin?

- (a) 5 units (b) 8 units (c) 12 units (d) 13 units

11. The slope of a line $ax+by+c=0$ is

- (a) a/b (b) $-a/b$ (c) c/b (d) $-c/b$

12. The equation of a line that passes through the points (1, 5) and (2, 3) is:

- (a) $2x + y - 7 = 0$ (b) $2x - y - 7 = 0$ (c) $x + 2y - 7 = 0$ (d) $2x + y + 7 = 0$

13. The centre of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$ is

- (a) (-2, 3) (b) (1, -3/2) (c) (-4, 6) (d) (4, -6)

14. For the ellipse $3x^2+4y^2 = 12$, the length of the latus rectum is:

- (a) 2/5 (b) 3/5 (c) 3 (d) 4

15. The eccentricity of hyperbola is

- (a) $e = 1$ (b) $e > 1$ (c) $e < 1$ (d) $0 < e < 1$

16. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $P = \{1, 2, 5\}$, $Q = \{6, 7\}$. Then $P \cap Q'$ is :

- (a) P (b) Q (c) Q' (d) None

17. The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160 cm, then

- (a) breadth > 20 cm (b) length < 20 cm (c) breadth $\times \geq 20$ cm (d) length ≤ 20 cm

18. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to

- (a) 1 (b) 0 (c) $\frac{1}{2}$ (d) 2

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Assertion(A): Let $A = \{1, 2\}$ and $B = \{3, 4\}$ then the number of relations from A to B is 16

Reason(R): If $n(A) = p$ and $n(B) = q$ then number of relations is 2^{pq}

20. Assertion (A): The domain of the function $f(x) = \frac{x^2 - 4}{x^2 - 8x + 12}$ is $\mathbb{R}$.

Reason (R): The domain of the function $f(x)$ is the set of values of x for which $f(x)$ is defined.

SECTION- B

(This section comprises of very short answer type-questions (VSA) of 2 marks each)

21. Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set builder form.

22. If the ordered pairs $(x, -1)$ and $(5, y)$ belong to the set $\{(a, b) : b = 2a - 3\}$ find the values of x and y .

OR

Find the domain of $f(x) = \frac{1}{\sqrt{1-x}}$

23. Find the value of $\tan \frac{13\pi}{12}$.

OR

Find the value of $\tan \frac{19\pi}{3}$

24. Find the angle between the X axis and the line joining the points $(3, -1)$ and $(4, -2)$.

25. Find the centre and radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$.

OR

Find the centre and radius of the circle $x^2 + y^2 - 4x - 8y - 45 = 0$.

SECTION- C

(This section comprises of short answer type-questions (SA) of 3 marks each)

26. Find the equation of the line passing through the point $(2, 2)$ and cutting off intercepts on the axes whose sum is 9.

27. Find all pairs of consecutive odd natural numbers, both of which are larger than 10 such that their sum is less than 40.

OR

The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm find the minimum length of the shortest side.

28. Find the coordinates of the focus, axis, the equation of the directrix and latus rectum of the parabola $y^2 = 8x$.

29. Find the domain and range of the function $f(x) = \frac{1}{2 - \sin 3x}$.

OR

Find the domain and range of the function $f(x) = \frac{4-x}{x-4}$.

30. For any three sets A, B, C prove that $A \times (B - C) = (A \times B) - (A \times C)$

31. Solve the following system of inequations: $2(2x+3)-10 < 6(x-2)$,

$$\frac{2x-3}{4} + 6 \geq 2 + \frac{4x}{3}, x \in R$$

SECTION - D

This section comprises of long answer (LA) type questions of 5 marks each.

32. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$ and $D = \{15, 17\}$ find

i) $A \cap B$ (ii) $A \cap C \cap D$ (iii) $A \cap (B \cup C)$ (iv) $(A \cap B) \cap (B \cup C)$ (v) $B \cap D$.

33. If $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$, find the values of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$.

OR

Prove that $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$

34. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

OR

A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%.

35. If p and q are the lengths of perpendiculars from the origin to the lines $x \cos \theta - y \sin \theta = k \cos 2\theta$ and $x \sec \theta + y \csc \theta = k$ respectively prove that $p^2 + 4q^2 = k^2$.

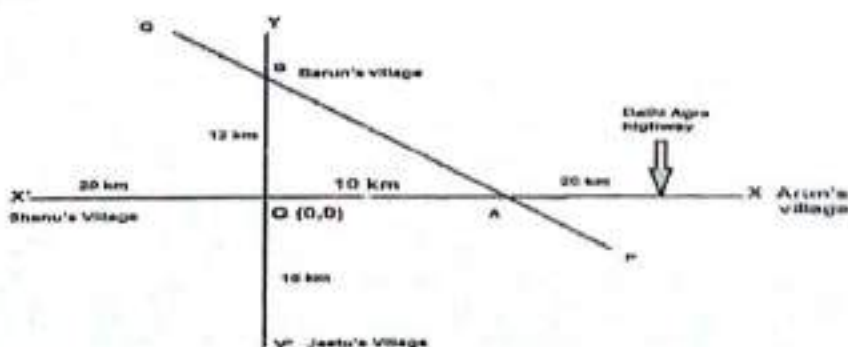
OR

Assuming that straight lines work as the plane mirror for a point, find the image of the point $(1, 2)$ in the line $x - 3y + 4 = 0$

SECTION - E

This section comprises of Case based questions (CBQs) of 4 marks each.

36. Villages of Shanu and Arun's are 50km apart and are situated on Delhi Agra highway as shown in the following picture. Another highway YY' crosses Agra Delhi highway at $O(0,0)$. A small local road PQ crosses both the highways at points A and B such that $OA = 10$ km and $OB = 12$ km. Also, the villages of Barun and Jeetu are on the smaller high way YY'. Barun's village B is 12km from O and that of Jeetu is 15 km from O.



i) What are the coordinates of A? [1]

ii) What is the equation of line AB? [1]

iii) What is the distance of AB from $O(0, 0)$? [2]

(OR)

What is the slope of line AB? [2]

37. A school is assigning students to two different project topics: Science (S) and humanities (H). The set of students is $A = \{1, 2, 3\}$. The project topics are $B = \{S, H\}$. The relation R from A to B is defined as: $R = \{(1, S), (1, H), (2, S), (2, H)\}$.

- i) Write the relation R as an arrow diagram. [1]
- ii) Find the number of relations from A to B. [1]
- iii) Is this relation a function? Give reason. [2]

(OR)

Find the domain and range of R. [2]

38. In a class test of class 11, a teacher asked the students to consider $A+B=\frac{\pi}{4}$ where A and B are acute angles. Based on the above information answer the following questions.

- (i) Find the value of $(1+\tan A)(1+\tan B)$? [1]
- (ii) Find the value of $(\cot A - 1)(\cot B - 1)$? [1]
- (iii) Find the value of $\sin(A+B) - \cos(A+B) + \tan(A+B)$ [2]

(OR)

Find the value of $\cos 2(A+B) - \sin 2(A+B)$ [2]
