Vidya Mandir Public School

Pre-Board Examination 2026-27

Date: 10 Feb 2027 | **Class XII · Mathematics** | Duration: 180 Minutes | Max. Marks: 80

Section A — 1 Mark Questions

Q1. The area of the region enclosed by $\frac{x^2}{25} + \frac{y^2}{9} = 1$ in the first quadrant is

(A) 15π **(B)** $\frac{15\pi}{2}$
(C) $\frac{15\pi}{4}$ **(D)** 2π

Q2. The absolute maximum of $f(x) = x^2$ on $[-1, 2]$ is

(A) 1 **(B)** 4
(C) 0 **(D)** 2

Q3. [CBSE 2026] If $|\vec{a}| = 5$ and $-2 \leq \lambda \leq 1$, then the sum of greatest and the smallest value of $|\lambda\vec{a}|$ is

(A) –5 **(B)** 5
(C) 10 **(D)** 15

Q4. A matrix having 3 rows and 4 columns is of order

(A) 4×3 **(B)** 3×4
(C) 12×1 **(D)** 7

Q5. The number of arbitrary constants in a particular solution of a differential equation is

(A) 1 **(B)** equal to the order
(C) 0 **(D)** equal to the degree

Q6. The principal value of $\sec^{-1}(1)$ is

(A) π **(B)** 0
(C) $\frac{\pi}{2}$ **(D)** $-\frac{\pi}{2}$

Q7. $P(A \mid A)$, for $P(A) > 0$, equals

(A) 0 **(B)** $P(A)$
(C) 1 **(D)** $P(A)^2$

Q8. The value of $\sin\left(2\sin^{-1}\frac{3}{5}\right)$ is

(A) $\frac{6}{5}$ **(B)** $\frac{24}{25}$
(C) $\frac{7}{25}$ **(D)** $\frac{12}{25}$

Q9. Let $A = \{1, 2\}$, $B = \{a, b, c\}$ and $f : A \to B$, $f = \{(1, a), (2, b)\}$. Then f is

(A) bijective
(B) onto but not one-one
(C) one-one but not onto
(D) neither one-one nor onto

Q10. The principal value of $\cos^{-1}(-1)$ is

(A) 0
(B) π
(C) $-\frac{\pi}{2}$
(D) 2π

Q11. A die is rolled. The probability of getting 6, given that the number is even, is

(A) $\frac{1}{6}$
(B) $\frac{1}{2}$
(C) $\frac{2}{3}$
(D) $\frac{1}{3}$

Q12. [CBSE 2026] Which of the following expressions will give the area of region bounded by the curve $y = x^2$ and line $y = 16$?

(A) $\int_0^4 x^2\,dx$
(B) $2\int_0^4 x^2\,dx$
(C) $\int_0^{16} \sqrt{y}\,dy$
(D) $2\int_0^{16} \sqrt{y}\,dy$

Q13. If $R(x) = 20x - x^2$ is the revenue from x units, the marginal revenue at $x = 5$ is

(A) ₹75
(B) ₹15
(C) ₹10
(D) ₹20

Q14. The expected number of heads in two tosses of a fair coin is

(A) 1
(B) 0.5
(C) 2
(D) 1.5

Q15. The area under $y = \frac{1}{x}$ from $x = 1$ to $x = e$ is

(A) e sq units
(B) $e - 1$ sq units
(C) 1 sq unit
(D) 0

Q16. The number of relations on a set with 5 elements is

(A) 2^{25}
(B) 32
(C) 25
(D) 2^{24}

Q17. The value of $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3}$ is

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{6}$
(D) $\frac{\pi}{2}$

Q18. The range of $f(x) = \sin^{-1} x + \cos^{-1} x + \tan^{-1} x$ is

(A) $[0, \pi]$ **(B)** $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$

(C) $\left[0, \frac{\pi}{2}\right]$ **(D)** $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$

Q19. Assertion (A): The objective function $Z = x^2 + y$ is suitable for a linear programming problem.

Reason (R): In an LPP, the objective function must be linear.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

Q20. Assertion (A): The integrating factor of $\frac{dy}{dx} + \frac{2y}{x} = x\ (x > 0)$ is x^2.

Reason (R): IF $= e^{\int P\,dx}$.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

Section B — 2 Marks Questions

Q1. (i) Show that the matrix $A = \begin{bmatrix} 1 & -1 & 5 \\ -1 & 2 & 1 \\ 5 & 1 & 3 \end{bmatrix}$ is a symmetric matrix. (ii) Show that the matrix $A = \begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is a skew symmetric matrix.

Q2. Find the area of the semicircular region $x^2 + y^2 \leq 64, y \geq 0$.

Q3. [CBSE 2018] Prove that : $3\sin^{-1} x = \sin^{-1}(3x - 4x^3), x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$

Q4. Find the number of relations on a set with 4 elements that are both reflexive and symmetric.

Q5. Find the position vector of the point dividing the join of $A(-\hat{i} + 4\hat{j} + 2\hat{k})$ and $B(\hat{i} + 5\hat{j})$ externally in the ratio $1 : 3$.

Section C — 3 Marks Questions

Q1. Find the particular solution of $\frac{dy}{dx} + 3y = 3$ given $y(0) = 0$.

Q2. Using vectors, find the area of the triangle with vertices $A(3, 1, -4)$, $B(4, -1, -4)$, $C(1, -4, 5)$.

Q3. Write $\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$, $x \neq 0$ in the simplest form.

Q4. Solve graphically: maximise $Z = 2x + y$ subject to $2x + 5y \leq 30$, $x + 2y \leq 13$, $x \geq 0$, $y \geq 0$.

Q5. Minimise and Maximise Z = x + 2y subject to x + 2y ≥ 100, 2x – y ≤ 0, 2x + y ≤ 200; x, y ≥ 0.

Q6. Bag I contains 4 red and 1 white balls; bag II contains 1 red and 4 white balls. One bag is chosen at random and a ball is drawn from it. It is red. Find the probability that it came from bag I.

Section D — 4 Marks Questions

Q1. A farmer has 400 m of fencing to enclose a rectangular field along a straight river. No fence is needed along the river. Let y be each side perpendicular to the river and x the side parallel to it.

(a) Write the area A in terms of y.

(b) Find y for maximum area.

(c) Find the maximum area.

Q2. Oil leaking from a tanker spreads in a circle whose radius increases at 0.5 m/s.

(a) Find the rate of increase of the area when the radius is 10 m.

(b) Find the rate of increase of the circumference.

(c) At what radius is the area increasing at 20π m²/s?

Q3. A dealer sells two kinds of fans: table fans (cost ₹360 each) and ceiling fans (cost ₹240 each). He can invest at most ₹5760 and store at most 20 fans. Profit is ₹22 on a table fan and ₹18 on a ceiling fan. Let x and y be the numbers of table and ceiling fans.

(a) Write the constraints.

(b) Find the corner points of the feasible region.

(c) Find the maximum profit.

Section E — 5 Marks Questions

Q1. Show that the lines $\frac{x-4}{-1} = \frac{y+4}{3} = \frac{z-6}{-1}$ and $\frac{x-4}{2} = \frac{y-1}{-1} = \frac{z-6}{2}$ intersect, and find their point of intersection.

Q2. Express $A = \begin{bmatrix} 0 & 0 & 3 \\ 3 & 6 & -3 \\ 2 & 5 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

Q3. Solve graphically: minimise $Z = x + 6y$ subject to $3x + 3y \geq 27$, $3x + y \geq 19$, $x \geq 0$, $y \geq 0$.

Q4. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect, and find their point of intersection.

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Question Paper Blueprint

Section	No. of Questions	Total Marks
Section A — 1 Mark	20	20
Section B — 2 Marks	5	10
Section C — 3 Marks	6	18
Section D — 4 Marks	3	12
Section E — 5 Marks	4	20
Total	**38**	**80**

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