Roll No. ☐☐☐☐☐☐☐☐

Q.P. Code 65/1/1

MATHEMATICS

CBSE Class XII Board Examination 2026

Time allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. The paper has 38 questions in five sections (A to E); all of them must be answered.
2. Section A: Q1–18 are multiple choice and Q19–20 are Assertion-Reason questions, 1 mark each.
3. Section B: Q21–25, very short answer (VSA), 2 marks each.
4. Section C: Q26–31, short answer (SA), 3 marks each.
5. Section D: Q32–35, long answer (LA), 5 marks each.
6. Section E: Q36–38, case-study based, 4 marks each.
7. There is no overall choice, but some questions in Sections B to E offer an internal choice (OR). Calculators are not allowed.

SECTION A

Q1–20 carry 1 mark each (MCQ; Q19–20 are Assertion-Reason).

1. Given $2\cos^{-1} x = y$, the values that y can take lie in **1**

(A) $0 \le y \le \pi$ **(B)** $-\pi \le y \le \pi$

(C) $0 \le y \le 2\pi$ **(D)** $-\pi \le y \le 0$

2. Which one of these can NOT be the order of a row matrix? **1**

(A) 2 × 1 **(B)** 1 × 2

(C) 1 × 1 **(D)** 1 × n

3. For matrices A and B of suitable orders, which of these properties hold? **1**

(i) (A + B)′ = A′ + B′

(ii) (A − B)′ = B′ − A′

(iii) (AB)′ = A′B′

(iv) (kAB)′ = kB′A′, k a scalar

(A) (i) only **(B)** (i), (ii) and (iii)

(C) (i) and (ii) **(D)** (i) and (iv)

4. Let $\Delta_1 = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} 0 & 2 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 6 \end{vmatrix}$. Then **1**

(A) $\Delta_1 = 2\Delta_2$ **(B)** $\Delta_2 = -2\Delta_1$

(C) $\Delta_1 = \Delta_2$ **(D)** $\Delta_2 = -\Delta_1$

5. One value of x satisfying $\begin{vmatrix} \cos x & \sin x \\ -\cos x & \sin x \end{vmatrix} = 1$ is **1**

(A) 0 **(B)** $\frac{\pi}{4}$

(C) $\frac{\pi}{3}$ **(D)** $\frac{\pi}{2}$

6. A and B are skew-symmetric matrices of the same order. Which of the following is also skew-symmetric? **1**

(A) AB **(B)** AB + BA

(C) $(A+B)^2$ **(D)** A − B

7. On the interval [0, 3], the smallest value of $f(x) = x^3 - 12x$ is **1**

(A) −16 **(B)** −9

(C) 0 **(D)** 16

8. If $\int \frac{3ax}{b^2+c^2x^2}\,dx = A\log|b^2+c^2x^2| + K$, then A equals **1**

(A) 3a **(B)** $\frac{3a}{2b^2}$

(C) $\frac{3a}{b^2c^2}$ **(D)** $\frac{3a}{2c^2}$

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9. Evaluate $\int_{-1}^{1} \frac{x^3}{x^2+2|x|+1}\,dx$. **1**

(A) 0 **(B)** log 2

(C) 2 log 2 **(D)** $\frac{1}{2}\log 2$

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10. Find the area enclosed by the curve y = x|x|, the x-axis and the lines x = −1 and x = 1. **1**

(A) 0 **(B)** $\frac{1}{3}$

(C) $\frac{2}{3}$ **(D)** $\frac{4}{3}$

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11. For the differential equation $R\frac{dx}{dy} + Px = Q$, where P, Q, R are functions of y only, the integrating factor is **1**

(A) $e^{\int \frac{P}{Q}dy}$ **(B)** $e^{\int P\,dy}$

(C) $e^{\int \frac{P}{R}dy}$ **(D)** $e^{\int \frac{P}{R}dx}$

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12. Give the order and the degree (in that order) of the differential equation $\frac{d}{dx}(e^y) = 0$. **1**

(A) 0, 1 **(B)** 1, 1

(C) 2, 1 **(D)** 1, not defined

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13. For what value of p are the vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $2\hat{i} - p\hat{j} + \hat{k}$ perpendicular? **1**

(A) 0 **(B)** 1

(C) $\frac{5}{2}$ **(D)** $-\frac{5}{2}$

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14. Points with position vectors $-\hat{i} - \hat{j} + 2\hat{k}$, $2\hat{i} + m\hat{j} + 5\hat{k}$ and $3\hat{i} + 11\hat{j} + 6\hat{k}$ lie on one line. Find m. **1**

(A) 8 **(B)** −8

(C) 2 **(D)** $\frac{5}{2}$

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15. Given $|\vec{a}| = 8$, $|\vec{b}| = 3$ and $|\vec{a} \times \vec{b}| = 12$, find $|\vec{a} \cdot \vec{b}|$. **1**

(A) $6\sqrt{3}$ **(B)** $8\sqrt{3}$

(C) $12\sqrt{3}$ **(D)** $3\sqrt{12}$

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16. Find the length of the perpendicular from the point (2, 5, 7) to the line $\frac{x}{1} = \frac{y}{0} = \frac{z}{0}$. **1**

(A) 2 **(B)** 5

(C) $\sqrt{74}$ **(D)** $\sqrt{78}$

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17. An LPP has objective function Z = 5x + 7y. Its feasible region (shown in a figure) is the quadrilateral with corners O(0, 0), (0, 2), (3, 4) and (7, 0). Find (maximum value of Z) − (minimum value of Z). **1**

(A) 8 **(B)** 29

(C) 35 **(D)** 43

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18. What is the degree of the objective function of a linear programming problem? **1**

(A) 0 **(B)** 1

(C) 2 **(D)** Any natural number

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19. Assertion (A): When a fair die is thrown, the probability of getting a prime number, given that the number shown is odd, is $\frac{2}{3}$. **1**
Reason (R): For any two events A and B, $P(A|B) = \frac{P(A \cup B)}{P(B)}$.

(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

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20. Assertion (A): The lines x = py + q, z = ry + s and x = p′y + q′, z = r′y + s′ are perpendicular when pp′ + rr′ = 1. **1**
Reason (R): The lines $\vec{r} = \vec{a}_1 + \lambda\vec{b}_1$ and $\vec{r} = \vec{a}_2 + \mu\vec{b}_2$ are perpendicular if $\vec{b}_1 \cdot \vec{b}_2 = 0$.

(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

SECTION B

Q21–25 are very short answer (VSA) questions of 2 marks each.

21. A function is defined by $f(x) = \frac{|x-3|}{2(x-3)}$ for x < 3 and $f(x) = \frac{x-6}{6}$ for x ≥ 3. Is f continuous at x = 3? **2**

OR

Given $\sqrt{3}\,(x^2 + y^2) = 4xy$, find $\frac{dy}{dx}$ at the point $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$.

22. A room-freshener bottle is an inverted cone with semi-vertical angle $\frac{\pi}{6}$. The volume of perfume in it falls steadily at 1 mm³/min. How fast is the perfume level falling when the level (height of liquid) is 10 mm? **2**

23. P and Q are the points (1, 3, 2) and (−1, 0, 8). Find the vector of magnitude 14 along $\overrightarrow{QP}$. **2**

24. The vectors $\vec{a} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{k}$ are adjacent sides of a parallelogram. Find vectors along its diagonals and their lengths. **2**

25. Write in simplest form: $\tan^{-1}\left(\frac{\cos 2x - \sin 2x}{\cos 2x + \sin 2x}\right)$, where $0 < x < \frac{\pi}{4}$. **2**

OR

Find the value of $\tan\left(\sin^{-1} 1 - \cos^{-1}\left(-\frac{1}{2}\right)\right)$.

SECTION C

Q26–31 are short answer (SA) questions of 3 marks each.

26. Evaluate $\int_0^1 x \tan^{-1} x \, dx$. **3**

27. Find $\int \sqrt{\dfrac{x+2}{x-2}}\, dx$. **3**

OR

Find $\int \dfrac{x^2}{(x^2+9)(x^2+16)}\, dx$.

28. Let $I_1 = \int_{-\pi/4}^{\pi/4} \dfrac{dx}{1+\cos 2x}$ and $I_2 = \int_{-1/2}^{1/2} |x|\, dx$. Show that $I_1 - 4I_2 = 0$. **3**

29. Solve (general solution): $x^2 \frac{dy}{dx} = x^2 + xy + y^2$. **3**

OR

Find the particular solution of $xy\frac{dy}{dx} = (x+2)(y+2)$ given that y(1) = −1.

30. Solve graphically: minimise Z = 13x − 15y subject to x + y ≤ 7, 2x − 3y + 6 ≥ 0, x ≥ 0, y ≥ 0. **3**

31. Bag I has 3 red and 4 white balls; bag II has 8 red and 6 white balls. A die is rolled: if it shows a number less than 3, a ball is drawn from bag I, otherwise from bag II. Find the probability that the ball drawn is red. **3**

OR

For two events X and Y, the probability that at least one of them happens is a, and the probability that exactly one of them happens is b. Prove that P(X′) + P(Y′) = 2 − 2a + b.

SECTION D

Q32–35 are long answer (LA) questions of 5 marks each.

32. On the set Z of integers, a relation is defined by R = {(x, y) : |x − y| is divisible by a fixed prime p}. Determine whether R is an equivalence relation. **5**

OR

A function $f : \mathbb{R} - \{\frac{3}{5}\} \to \mathbb{R} - \{\frac{3}{5}\}$ is given by $f(x) = \frac{3x+2}{5x-3}$. Prove that f is both one-one and onto.

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33. Let $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & -1 & -2 \\ 1 & -1 & 0 \end{bmatrix}$. Find A^{-1} and use it to solve: −2y + z = 7, 2x − y − z = 8, x − 2y = 10. **5**

OR

The matrix $\begin{bmatrix} 3 & -1 & \sin 3x \\ -7 & 4 & \cos 2x \\ -11 & 7 & 2 \end{bmatrix}$ is singular. Find all x in $\left[0, \frac{\pi}{2}\right]$.

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34. Given x = cos t and y = cos mt, prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$. **5**

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35. Are the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ parallel? If they are, find the distance between them; if not, find where they meet (if they intersect). **5**

SECTION E

Q36–38 are case-study based questions of 4 marks each.

36. An online delivery company has 5000 subscribers, each paying ₹300 a year for unlimited free deliveries. It plans to raise the annual fee; for every ₹1 increase, 10 subscribers are expected to leave. Suppose the fee is raised by ₹x. **4**

(i) How many subscribers leave after a rise of ₹x? (1 mark)

(ii) Write the total revenue R(x) after the rise as a function of x. (1 mark)

(iii)(a) Find the value of x for which R(x) is maximum. (2 marks)

OR

(iii) Find the sub-intervals of (0, 5000) on which R(x) is increasing and on which it is

(b) decreasing.

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37. An online jackpot has one first prize of ₹3,00,000, two second prizes of ₹2,00,000 each and three third prizes of ₹50,000 each. In all 1,00,000 tickets were sold at ₹100 each. Rohan buys one ticket. **4**

(i) What amounts can he possibly win? (1 mark)

(ii)(a) Find the probability that he wins at least ₹2,00,000. (2 marks)

(iii) Rohan also buys a ticket in another jackpot with a single prize of ₹5,00,000, where the chance of winning is 1 in 1,00,000. Find the probability that he wins on exactly one of his two tickets. (1 mark)

OR

(ii) Find the probability that he does not win any amount.

(b)

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38. A roundabout on a busy road has its outer boundary along the circle C_1: $x^2 + y^2 = 64$; a circular pond with a fountain at its centre is C_2: $x^2 + y^2 = 4$. **4**

(i) Draw C_1 and C_2 in one diagram. (1 mark)

(ii) Write y as a function of x for C_1 and for C_2. (1 mark)

(iii)(a) Using integration, find the area covered by the roundabout (region inside C_1). (2 marks)

OR

(iii) Using integration, find the area of the circular pond.

(b)

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Questions restated from the CBSE Class XII Board Examination 2026 (set 65/1/1) for practice. Reading passages and map items are described, not reproduced.