Series MC-XII-SP **Q.P. Code MC/SP/06**

SET ~ 1

Roll No. | | | | | | | |

Candidates must write the Q.P. Code on the title page of the answer-book.

MATHEMATICS

Sample Paper 06 • Class XII • Session 2026–27

(Based on the CBSE Sample Question Paper 2026–27 design and the latest CBSE syllabus)

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

NOTE

(i) Please check that this question paper contains 6 printed pages.
(ii) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
(iii) Please check that this question paper contains 38 questions.
(iv) Please write down the serial number of the question in the answer-book before attempting it.
(v) 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) This question paper contains 38 questions. All questions are compulsory.
(ii) This question paper is divided into five Sections – A, B, C, D and E.
(iii) 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.
(iv) In Section B, Questions no. 21 to 25 are Very Short Answer (VSA) type questions, carrying 2 marks each.
(v) In Section C, Questions no. 26 to 31 are Short Answer (SA) type questions, carrying 3 marks each.
(vi) In Section D, Questions no. 32 to 35 are Long Answer (LA) type questions, carrying 5 marks each.
(vii) In Section E, Questions no. 36 to 38 are Case Study based questions, carrying 4 marks each.
(viii) 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.
(ix) Use of calculators is not allowed.

SECTION A

This section comprises 20 multiple choice questions (MCQs) of 1 mark each.

1. The principal value of $\sec^{-1}\left(sec\ \frac{5\pi}{4}\right)$ is: **1**

(A) $\frac{5\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $-\frac{\pi}{4}$

2. The value of $2\sec^{-1}2 + \sin^{-1}\left(\frac{1}{2}\right)$ is: **1**

(A) $\frac{\pi}{6}$ (B) $\frac{5\pi}{6}$ (C) $\frac{7\pi}{6}$ (D) 1

3. If $y = \cos^{-1}x$ and $-1 \le x \le 0$, then y lies in the interval: **1**

(A) $\left[0, \frac{\pi}{2}\right]$ (B) $[0, \pi]$

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

4. The number of all possible orders of a matrix having 24 elements is: **1**

(A) 8 (B) 6 (C) 4 (D) 24

5. If A is a non-singular square matrix of order 3 such that $A^2 = 2A$, then $|A|$ is equal to: **1**

(A) 2 (B) 4 (C) 0 (D) 8

6. If A and B are square matrices of the same order, then $(A + B)(A - B) = A^2 - B^2$ holds if and only if: **1**

(A) A = B (B) A or B is a zero matrix

(C) AB = BA (D) A and B are symmetric

7. The function $f(x) = x \sin \frac{1}{x}$ for $x \neq 0$ and $f(0) = 0$ is, at x = 0: **1**

(A) discontinuous (B) continuous

(C) not defined (D) such that its limit does not exist

8. If $y = \sqrt{\sin x + y}$, then $\frac{dy}{dx}$ is equal to: **1**

(A) $\frac{\cos x}{2y - 1}$ (B) $\frac{\cos x}{1 - 2y}$

(C) $\frac{\sin x}{1 - 2y}$ (D) $\frac{\sin x}{2y - 1}$

9. The side of a square is increasing at the rate of 0.2 cm/s. The rate of increase of its perimeter is: **1**

(A) 0.8 cm/s (B) 0.4 cm/s (C) 0.6 cm/s (D) 0.2 cm/s

10. The function $f(x) = x^x$, $x > 0$, has a stationary point at: **1**

(A) x = e (B) $x = \frac{1}{e}$ (C) x = 1 (D) $x = \sqrt{e}$

11. The order of the differential equation of the family of all circles with centre at the origin is: **1**

(A) 0 (B) 2 (C) 3 (D) 1

12. $\int \frac{x^3 - x^2 + x - 1}{x - 1}$ dx is equal to: **1**

(A) $x^2 + 1 + C$ (B) $\frac{x^3}{3} - x + C$

(C) $\frac{x^3}{3} + x + C$ (D) $\frac{x^3}{3} + C$

13. The value of $|\hat{i} \times \hat{j} + \hat{j} \times \hat{k} + \hat{k} \times \hat{i}|$ is: **1**

(A) 0 (B) 1 (C) 3 (D) $\sqrt{3}$

14. If $\vec{a}$ and $\vec{b}$ are two non-zero vectors such that $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then: **1**

(A) $\vec{a} \perp \vec{b}$ (B) $\vec{a} \parallel \vec{b}$

(C) $|\vec{a}| = |\vec{b}|$ (D) $\vec{a} = \vec{b}$

15. The lines $x/1 = y/2 = z/3$ and $(x - 1)/(-2) = (y - 2)/(-4) = (z - 3)/(-6)$ are: **1**

(A) intersecting (B) skew

(C) coincident (D) perpendicular

16. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then $P(A|B)$ is equal to: **1**

(A) P(A) (B) $\frac{P(A)}{P(B)}$

(C) P(B) (D) 1

17. Three fair coins are tossed. The probability of getting exactly two heads, given that at least one head appears, is: **1**

(A) $\frac{3}{8}$ (B) $\frac{3}{7}$ (C) $\frac{1}{2}$ (D) $\frac{4}{7}$

18. Two fair dice are thrown. If X denotes the number of sixes obtained, then P(X = 1) is: **1**

(A) $\frac{1}{6}$ (B) $\frac{5}{36}$ (C) $\frac{1}{36}$ (D) $\frac{5}{18}$

Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below.

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

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

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

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

19. Assertion (A): $\int x \sin x \, dx = -x \cos x + \sin x + C$. **1**

Reason (R): $\int u \, v \, dx = u \int v \, dx - \int [u' \int v \, dx] \, dx$ (integration by parts).

20. Assertion (A): The differential equation $\frac{dy}{dx} = x^2y + y$ is in variables separable form. **1**

Reason (R): A differential equation of the form $\frac{dy}{dx} = g(x)\,h(y)$ can be solved by separating the variables.

SECTION B

This section comprises 5 very short answer (VSA) type questions of 2 marks each.

21. Find $\int \frac{dx}{x(x^4+1)}$. **2**

OR

Find $\int \frac{1 - \sin x}{x + \cos x} \, dx$.

22. Find $\frac{dy}{dx}$ if y = x^(sin x), x > 0. **2**

23. (A) Find the direction cosines of the line passing through the points A(1, −2, 3) and B(3, 1, −3). **2**

OR

(B) Find $|\vec{a}|$ and $|\vec{b}|$ if $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b}) = 8$ and $|\vec{a}| = 8|\vec{b}|$.

24. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$. **2**

25. The corner points of the feasible region of an LPP are (0, 0), (7, 0), (6, 3), (4, 5) and (0, 6). Find the maximum value of Z = 2x + 5y and the point at which it occurs. **2**

SECTION C

This section comprises 6 short answer (SA) type questions of 3 marks each.

26. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, show that $A^{-1} = (1/19)A$. Hence solve the system of equations 2x + 3y = 8, 5x − 2y = 1. **3**

27. The length x of a rectangle is decreasing at the rate of 5 cm/min and the width y is increasing at the rate of 4 cm/min. When x = 8 cm and y = 6 cm, find the rates of change of (a) the perimeter and (b) the area of the rectangle. **3**

28. If $x = a\left(\cos t + \log \tan \frac{t}{2}\right)$ and y = a sin t, find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{3}$. **3**

OR

If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x - y)$, prove that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$.

29. Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x + y^2 + xy^2$, given that y = 0 when x = 0. **3**

OR

Find the general solution of the differential equation $\cos^2 x \frac{dy}{dx} + y = \tan x \left(0 \le x < \frac{\pi}{2}\right)$.

30. Find the image of the point (1, 2, 3) in the line (x − 6)/3 = (y − 7)/2 = (z − 7)/(−2). **3**

OR

Find the angle between the lines whose direction ratios are a, b, c and b − c, c − a, a − b.

31. Solve the following linear programming problem graphically: Maximise Z = x + y subject to x − y ≤ −1, −x + y ≤ 0, x ≥ 0, y ≥ 0. **3**

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SECTION D

This section comprises 4 long answer (LA) type questions of 5 marks each.

32. Show that the relation R defined in the set A of all polygons as R = {(P_1, P_2) : P_1 and P_2 have the same number of sides} is an equivalence relation. What is the set of all elements in A related to the right-angled triangle T with sides 3, 4 and 5? **5**

OR

Show that the function f : R → {x ∈ R : −1 < x < 1} defined by $f(x) = \frac{x}{1+|x|}$, x ∈ R, is one-one and onto.

33. Evaluate $\int_0^{\frac{\pi}{4}} \frac{\sin x+\cos x}{9+16\sin 2x}\,dx$. **5**

34. Using integration, find the area of the region bounded by the curve $x^2 = 4y$, the x-axis and the line x = 4. **5**

OR

Using integration, find the area of the region bounded by the line x = 2y + 3, the y-axis and the lines y = −1 and y = 1.

35. In a nursery, three varieties of seeds A_1, A_2 and A_3 are mixed in the ratio 4 : 4 : 2. The germination rates of the three varieties are 45%, 60% and 35% respectively. A seed is chosen at random from the mixture.

(a) Find the probability that the chosen seed will germinate. **2**

(b) Given that the chosen seed germinated, find the probability that it is of variety A_2. **2**

(c) Find the probability that the chosen seed will not germinate. **1**

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SECTION E

This section comprises 3 case study based questions of 4 marks each.

36. At a wedding, two camera drones are used for aerial photography. Drone 1 flies along the straight line L_1 passing through the points A(1, 2, 3) and B(3, 5, 9). Drone 2 flies along the line $L_2 : (x - 4)/1 = (y - 3)/(-2) = (z - 11)/2$.

Based on the above information, answer the following questions:

(i) Write the vector equation of the line L_1. **1**

(ii) Write the direction cosines of the line L_1. **1**

(iii) (a) Find the angle between the paths of the two drones. **2**

OR

(iii) (b) Show that the paths of the two drones intersect, and find the point of intersection. **2**

37. A solar power plant starts generating power at 7 am. The power P (in kW) generated t hours after 7 am is modelled by $P(t) = 9t^2 - t^3$, $0 \le t \le 9$.

Based on the above information, answer the following questions:

(i) Find P′(t). **1**

(ii) Find the rate at which the power output is changing at 10 am. **1**

(iii) (a) At what time is the power output maximum? Also find the maximum power. **2**

OR

(iii) (b) Find the intervals of time in which the power output is increasing and decreasing. **2**

38. A school buys sports equipment from a store. Order I: 2 footballs, 1 basketball and 1 volleyball for ₹1500. Order II: 1 football, 2 basketballs and 1 volleyball for ₹1700. Order III: 1 football, 1 basketball and 2 volleyballs for ₹1600. Let the prices of a football, a basketball and a volleyball be ₹x, ₹y and ₹z respectively.

Based on the above information, answer the following questions:

(i) Write the given information as a matrix equation AX = B and find |A|. **2**

(ii) Given that adj $A = \begin{bmatrix} 3 & -1 & -1 \\ -1 & 3 & -1 \\ -1 & -1 & 3 \end{bmatrix}$, find the price of each item. **2**

• • • End of Question Paper • • •

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