Class XII | Session 2026-27

Subject - Mathematics

Sample Question Paper - Set 2

General Instructions:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. 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.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
8. 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.
9. Use of calculators is not allowed.

Section A

1. If $|A| = 2$, where A is a 2×2 matrix, then $|4A^{-1}|$ equals: **[1]**

a) 2 b) 4

c) 8 d) $\frac{1}{32}$

2. Let A be a 3×3 matrix such that $|\text{adj } A| = 64$. Then $|A|$ is equal to: **[1]**

a) 8 only b) 64

c) 8 or -8 d) -8 only

3. Let A be the area of a triangle having vertices (x_1, y_1), (x_2, y_2) and (x_3, y_3). Which of the following is correct? **[1]**

a) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = A^2$

b) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm 2A$

c) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm \frac{A}{2}$

d) $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm A$

4. If $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 2 \end{bmatrix}$, then the value of $(2x + y - z)$ is: **[1]**

a) 2 b) 5

c) 1 d) 3

5. The equation of a line passing through point (2, -1, 0) and parallel to the line $\frac{x}{1} = \frac{y-1}{2} = \frac{2-z}{2}$ is: **[1]**

a) $\frac{x-2}{1} = \frac{y-1}{2} = \frac{z}{2}$ b) $\frac{x-2}{1} = \frac{y+1}{2} = \frac{z}{-2}$

c) $\frac{x+2}{1} = \frac{y-1}{2} = \frac{z}{-2}$ d) $\frac{x+2}{1} = \frac{y-1}{2} = \frac{z}{2}$

6. The solution of the DE cos x(1 + cos y)dx - sin y(1 + sin x)dy = 0 is **[1]**

a) 1 + sin x cos y = C b) 2sin x cos y - cos x = C

c) sin x cos y + cos x = C d) (1 + sin x)(1 + cos y) = C

7. A linear programming problem deals with the optimization of a/an: **[1]**

a) linear function b) logarithmic function

c) quadratic function d) exponential function

8. The value of p for which the vectors $2\hat{i} + p\hat{j} + \hat{k}$ and $-4\hat{i} - 6\hat{j} + 26\hat{k}$ are perpendicular to each other, is: **[1]**

a) 3 b) -3

c) $-\frac{17}{3}$ d) $\frac{17}{3}$

9. $\int x^2 e^{x^3} dx$ equals **[1]**

a) $\frac{1}{2}e^{x^2} + C$ b) $\frac{1}{2}e^{x^3} + C$

c) $\frac{1}{3}e^{x^3} + C$ d) $\frac{1}{3}e^{x^2} + C$

10. Find the value of x and y are respectively, if $\begin{bmatrix} x & y \\ 3y & x \end{bmatrix}\begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$. **[1]**

a) 3, 2 b) 4, 3

c) 2, 1 d) 1, 1

11. Corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5). Let F = 4x + 6y be the objective function. Maximum of F – Minimum of F = **[1]**

a) 18 b) 60

c) 42 d) 48

12. For any two vectors $\vec{a}$ and $\vec{b}$ which of the following statements is always true? **[1]**

a) $\vec{a} \cdot \vec{b} < |\vec{a}||\vec{b}|$ b) $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}|$

c) $\vec{a} \cdot \vec{b} \leq |\vec{a}||\vec{b}|$ d) $\vec{a} \cdot \vec{b} \geq |\vec{a}||\vec{b}|$

13. An ordered pair (α, β) for which the system of linear equations **[1]**

$(1 + \alpha)x + \beta y + z = 2$

$\alpha x + (1 + \beta)y + z = 3$

$\alpha x + \beta y + 2z = 2$

has a unique solution is

a) (2, 4) b) (-4, 2)

c) (-3, 1) d) (1, -3)

14. If for two events A and B, P(A - B) = $\frac{1}{5}$ and P(A) = $\frac{3}{5}$, then P$\left(\frac{B}{A}\right)$ is equal to **[1]**

a) $\frac{2}{5}$

b) $\frac{1}{2}$

c) $\frac{3}{5}$

d) $\frac{2}{3}$

15. Integrating factor of the differential equation $\frac{dy}{dx}$ + y tan x - sec x = 0 is: **[1]**

a) $e^{\sec x}$

b) $e^{\cos x}$

c) sec x

d) cos x

16. If $|\overrightarrow{a}|$ = 4 and -3 $\leq \lambda \leq$ 2, then $|\lambda \overrightarrow{a}|$ lies in **[1]**

a) [0, 12]

b) [8, 12]

c) [2, 3]

d) [-12, 8]

17. For what value of k may the function f(x) = $\begin{cases} k\left(3x^2 - 5x\right), & x \leq 0 \\ \cos x, & x > 0 \end{cases}$ become continuous? **[1]**

a) 1

b) $-\frac{1}{2}$

c) 0

d) No value

18. Direction cosines of a line perpendicular to both x-axis and z-axis are: **[1]**

a) 0, 0, 1

b) 1, 1, 1

c) 1, 0, 1

d) 0, 1, 0

19. **Assertion (A):** If the circumference of the circle is changing at the rate of 10 cm/s, then the area of the circle changes at the rate 30 cm^2/s, if radius is 3 cm. **[1]**

Reason (R): If A and r are the area and radius of the circle, respectively, then rate of change of area of the circle is given by $\frac{dA}{dt} = 2\pi r\frac{dr}{dt}$.

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.

20. **Assertion (A):** If R is the relation defined in set {1, 2, 3, 4, 5, 6} as R = {{a, b) : b = a + 1), then R is reflexive. **[1]**

Reason (R): The relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} is symmetric.

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

21. Find the value of $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \cot^{-1}\left(\frac{1}{\sqrt{3}}\right) + \tan^{-1}\left[\sin\left(\frac{-\pi}{2}\right)\right]$. **[2]**

OR

Find the principal value of $\text{cosec}^{-1}(-1)$.

22. The total cost C(x) associated with provision of free mid-day meals to x students of a school in primary classes is given by C(x) = $0.005x^3 - 0.02x^2 + 30x + 50$. **[2]**

If the marginal cost is given by rate of change $\frac{dC}{dx}$ of total cost, then write the marginal cost of food for 300 students. What value is shown here?

23. Find the value(s) of 'a' for which f(x) = x^3 - ax is an increasing function on R. **[2]**

OR

The length x of a rectangle is decreasing at the rate of 5 cm/min and the width y increasing at the rate of 4 cm/min, find the rate of change its area when x = 5 cm and y = 8 cm.

24. Evaluate $\int \frac{x^3+x}{x^4-9} dx$ **[2]**

25. Find the absolute maximum and minimum values of the function f given by f(x) = $\cos^2$ x + sin x, x $\in$ [0, π] **[2]**

Section C

26. By using the properties of definite integrals, evaluate the integral $\int_0^{\frac{\pi}{4}} \log(1+\tan x)dx$ **[3]**

27. A bag contains 5 red and 3 black balls and another bag contains 2 red and 6 black balls. Two balls are drawn at random (without replacement) from one of the bags and both are found to be red. Find the probability that balls are drawn from the first bag. **[3]**

28. Evaluate $\int \frac{\sin(x-a)}{\sin(x+a)} dx.$ **[3]**

OR

Evaluate the integral: $\int(2x+5)\sqrt{10-4x-3x^2}\,dx$

29. Solve the initial value problem: tan $x\frac{dy}{dx}$ = 2x tan x + x^2 - y; tan x $\neq$ 0 given that y = 0 when x = $\frac{\pi}{2}$ **[3]**

OR

Find the particular solution of the differential equation x $\cos\left(\frac{y}{x}\right) \frac{dy}{dx}$ = y $\cos\left(\frac{y}{x}\right)$ + x, given that when x = 1, y = $\frac{\pi}{4}$

30. Solved the linear programming problem graphically: **[3]**

Maximize Z = 60x + 15y

Subject to constraints

x + y $\leq$ 50

3x + y $\leq$ 90

x, y $\geq$ 0

OR

Solve the following LPP by graphical method:

Minimize Z = 20x + 10y

Subject to

x + 2y $\leq$ 40

3x + y $\geq$ 30

4x + 3y $\geq$ 60

and x, y $\geq$ 0

31. Differentiate $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ w.r.t $\cos^{-1}\left(2x\sqrt{1-x^2}\right)$, when x $\neq$ 0. **[3]**

Section D

32. Using integration, find the area of the triangle formed by positive X-axis and tangent and normal to the circle x^2 + y^2 = 4 at (1, $\sqrt{3}$). **[5]**

33. Let A = {1, 2, 3} and R = {(a, b):a, b $\in$ A and $\left|a^2-b^2\right| \leq 5$. Write R as set of ordered pairs. Mention whether R is **[5]**

i. reflexive
ii. symmetric
iii. transitive

Give reason in each case.

OR

Show that the function f: $R_0 \to R_0$, defined as f (x) = $\frac{1}{x}$, is one-one onto, where R_0 is the set non-zero real numbers. Is the result true, if the domain R_0 is replaced by N with co-domain being same as R_0?

34. Solve the system of equations **[5]**

$$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4$$
$$\frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1$$
$$\frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$$

35. Find the image of the point (0, 2, 3) in the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$ **[5]**

OR

By computing the shortest distance determine whether the pairs of lines intersect or not:

$\vec{r}=(\hat{i}-\hat{j})+\lambda(2\hat{i}+\hat{k})$ and $\vec{r}=(2\hat{i}-\hat{j})+\mu(\hat{i}+\hat{j}-\hat{k})$

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

A shopkeeper sells three types of flower seeds A_1, A_2, A_3. They are sold in the form of a mixture, where the proportions of these seeds are 4 : 4 : 2 respectively. The germination rates of the three types of seeds are 45%, 60% and 35% respectively.

Based on the above information:

i. Calculate the probability that a randomly chosen seed will germinate. (1)

ii. Calculate the probability that the seed is of type A2, given that a randomly chosen seed germinates. (1)

iii. A die is throw and a card is selected at random from a deck of 52 playing cards. Then find the probability of getting an even number on the die and a spade card. (2)

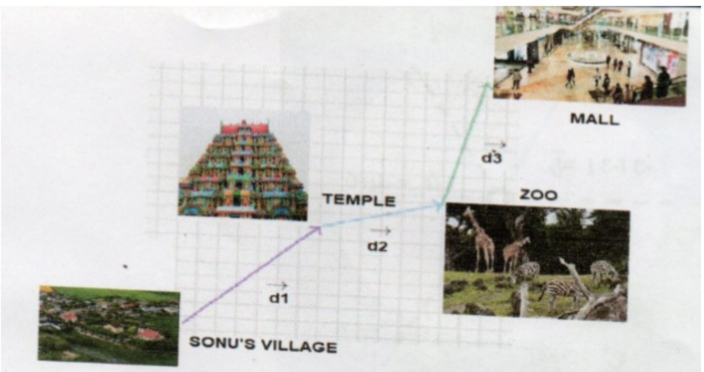
OR

If A and B are any two events such that P(A) + P(B) - P(A and B) = P(A), then find P(A|B). (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

Sonu left from his village on weekend. First, he travelled d_1 displacement up to a temple. After this, he left for the zoo and travelled d_2 displacement. After this he left for shopping in a mall - Total driving time of Deepal from village to Mall was 1.5 hr.

If d_1 = (6, 8) d_2 = (3, 4) and d_3 = (7, 12) km



i. What is the total displacement from village to Mall? (1)

ii. What is the speed of Sonu from Village to Mall? (1)

iii. What is the Displacement from Village to Zoo? (2)

OR

What is the displacement from temple to Mall? (2)

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Mrs. Maya is the owner of a high-rise residential society having 50 apartments. When he set rent at ₹10000/month, all apartments are rented. If he increases rent by ₹250/ month, one fewer apartment is rented. The maintenance cost for each occupied unit is ₹500/month.

i. If P is the rent price per apartment and N is the number of rented apartments, then find the profit. (1)

ii. If x represents the number of apartments which are not rented, then express profit as a function of x. (1)

iii. Find the number of apartments which are not rented so that profit is maximum. (2)

OR

Verify that profit is maximum at critical value of x by second derivative test. (2)