Series P/PB2/1

SET 1

CLAS XII PRE-BOARD EXAMINATION – 2025-26

Q.P. Code: 041/2/1

Roll No. | | | | | | | | |

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

- Please check that this question paper contains 10 printed pages.
- Please check that this question paper contains 38 questions.
- 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.
- **Please write down the serial number of the question in the answer-book before attempting it.**
- 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.

MATHEMATICS

Time allowed : 3 hours *Maximum Marks : 80*

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 number 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 2 questions in Section E.

(ix) Use of calculators are not allowed.

SECTION A (20x1=20)

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

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

(A) R (B) $R - \{0\}$ (C) $R - \{1, 2\}$ (D) $R - \{-1, -2\}$

2.If $A = \begin{bmatrix} Cosx & Sinx \\ -Sinx & Cosx \end{bmatrix}$ and $A.AdjA = K \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the value of K is

(A) sinx. cosx (B) 1 (C)2 (D)0

3. If $x^y = e^{x-y}$ then $\frac{dy}{dx}$ is

$(A)\ \frac{1}{(1 + log\ x)}$ $(B)\ \frac{logx}{(1 + \log x)^2}$ $(C)\ \frac{1}{(1 + \log x)^2}$ $(D)\ \frac{x}{(1 + lox)^2}$

4. If $\hat{a}$ and $\hat{b}$ are two unit vectors and $|\hat{a} + \hat{b}| = 1$, then $|\hat{a} - \hat{b}|$ is

(A) 1 $(B)\ \sqrt{3}$ $(C)\sqrt{2}$ (D) 0

5. $\int_1^{\sqrt{3}} \frac{1}{1 + x^2}\ dx$ is

$(A)\ \frac{2\pi}{3}$ $(B)\ \frac{\pi}{12}$ $(C)\ \frac{\pi}{6}$ $(D)\ \frac{\pi}{2}$

6. The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \frac{dy}{dx} = sin\frac{dy}{dx}$

(A) 2 , 1 (B) 2 , 2 (C) 2, $not\ defined$ (D) $not\ defined$, 2

7. A speaks truth 60% of the cases and B in 40% .In what percentage of cases are they likely to contradict each other while narrating the same incident is

(A) 52 % (B) 54 % (C) 53% (D) 56 %

8. $\int \frac{\cos x + x \sin x}{x\,(\,x+\cos x\,)}\ dx\ =$

$(A)\ \log[\,x\,(x+cosx\,)] + c$ $(B)\ \log(\frac{x}{(\,x+\ cosx)}) + c$

$(C)\ lox\ (\frac{x+cosx}{x}) + c$ (D) $\log(\frac{sinx}{(\,x+\ cosx)}) + c$

9. The area of a parallelogram whose diagonals are given by $\vec{a} = 3\hat{\imath}\ +\ 4\hat{\jmath}\ ,\ \ \vec{b} = \hat{\imath}\ +\ \hat{\jmath}\ +\ \hat{k}$

$(A)\ \frac{\sqrt{26}}{2}\ sq.unit$ $(B)\frac{27}{2}\ \ sq.unit$ $(C)\ \sqrt{26}\ \ sq.unit$ $(D)\sqrt{13}\ sq.unit$

10. The angles which the vector $\vec{a}\ = \hat{\imath} - \hat{\jmath}\ + \sqrt{2}\,\hat{k}$ makes with the co-ordinate axes are

$(A)\ \frac{\pi}{3}\ ,\ \frac{\pi}{3}\ ,\ \frac{\pi}{3}$ $(B)\ \ \frac{\pi}{3}\ , -\frac{\pi}{3}\ ,\ \frac{\pi}{3}$

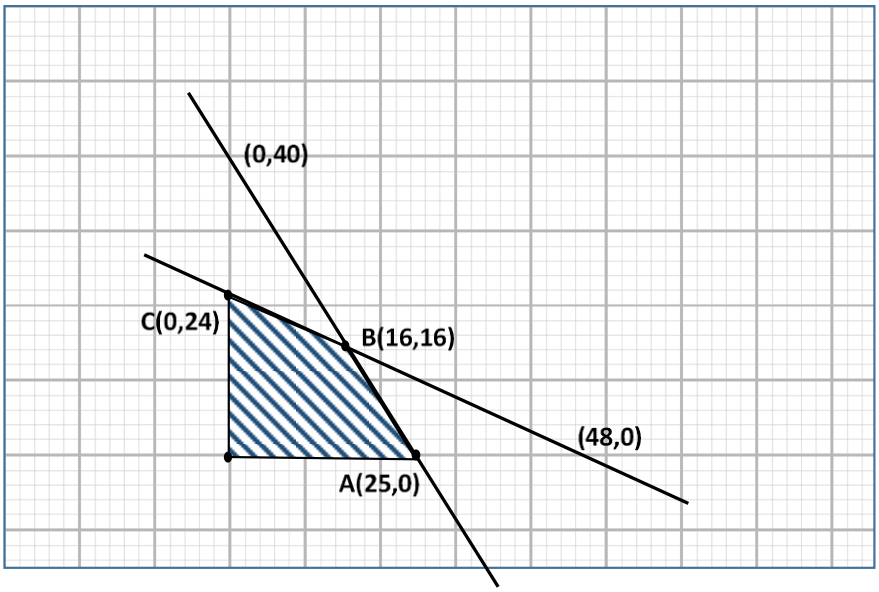
$(C)\ \frac{\pi}{3}\ ,\ -\frac{\pi}{3}\ \ ,\ \frac{\pi}{4}$ $(D) -\frac{\pi}{3}\ , -\frac{\pi}{3}\ ,\ \frac{\pi}{6}$

11. Let $f(x)\ \ = \begin{cases} \frac{x-5}{|x-5|} + a & if\ \ x < 5 \\ a\ +\ b & if\ \ x = 5 \\ \frac{x-5}{|x-5|} + b & if\ x > 5 \end{cases}$

and f(x) is continuous at x = 5 then the value of a and b

$(A)\ \ a = 0\ , b = 0$ $(B)\ a = 1\ , b = 1$ $(C)\ a = -1\ , b = 1$ $(D)\ \ a = 1,\ b = -1$

12. For an LPP the objective function is $Z = 4x\ + 3y$ and the feasible region is shown in the graph. Which of the following statement is true?



$(A)\quad Maximum\ value\ of\ Z\ is\ at\ B$ $(B)\ \ Maximum\ value\ of\ Z\ is\ at\ A$

$(C) The\ value\ of\ Z\ at\ B\ is\ less\ than\ at\ A$ $(D) The\ value\ of\ Z\ \ at\ C\ \ is\ \ greater\ than\ at\ B$

13. If the matrix $A = \begin{bmatrix} 5 & x & -1 \\ 4 & -2 & -3 \\ 7 & 2 & 2 \end{bmatrix}$ is a singular matrix then the value of x is

$(A)\ \frac{-12}{19}$ $(B)\ \frac{12}{19}$ $(C)\ \frac{12}{29}$ $(D)\ \frac{-12}{29}$

14. The lines $x = ay + b$, $z = cy + d$ and $x = a_1 y + b_1$, $z = c_1 y + d_1 a$ are perpendicular if

$(A)\ bb_1 + c\,c_1 + 1 = 0$ $(B)\ aa_1 + c\,c_1 + 1 = 0$

$(C)\ aa_1 + bb_1 + 1 = 0$ $(D)\ aa_1 + bb_1 + c\,c_1 = 0$

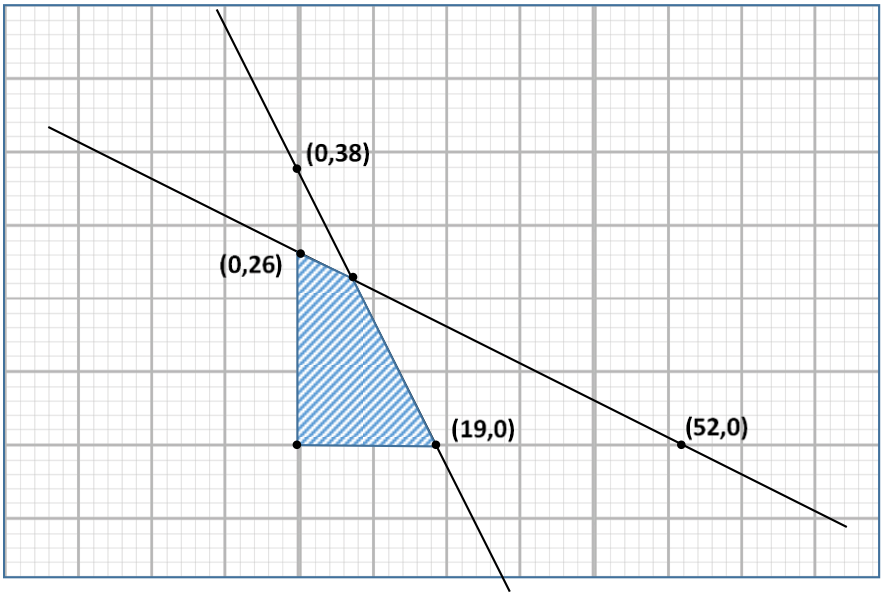
15. Which of the differential equation has $y = c_1 e^x + c_2 e^{-x}$ as the general solution

$(A)\ \frac{d^2y}{dx^2} + y = 0$ $(B)\ \frac{d^2y}{dx^2} - 1 = 0$ $(C)\ \frac{d^2y}{dx^2} + 1 = 0$ $(D)\ \frac{d^2y}{dx^2} - y = 0$

16. If A is a square matrix then $Adj\,(A^T) - (Adj\,A)^T$ is

$(A)\ 2|A|$ $(B)\ |A|\,I$ $(C)\ Null\ Matrix$ $(D)\ I$

17. The feasible region of a Linear Programming Problem is given below. The corresponding constraints are



$(A)\ 2x + y \le 52,\quad x + 2y \le 38\quad x \ge 0,\quad y \ge 0$

$(B)\ 2x + y \ge 52,\quad x + 2y \le 38\quad x \ge 0,\quad y \ge 0$

$(C)\ x + 2y \le 52, 2\ x + y \le 38,\quad x \ge 0,\quad y \ge 0$

$(D)\ 2x + y \le 52,\quad x + 2y \le 38,\quad x \ge 0,\quad y \ge 0$

18. If $A = \begin{bmatrix} x & -2 \\ 3 & 7 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} \frac{7}{34} & \frac{1}{17} \\ \frac{-3}{34} & \frac{2}{17} \end{bmatrix}$, then the value of x is

(A) 7 (B) 2 (C) -4 (D) 4

ASSERTION – REASON BASED QUESTIONS

(Question numbers 19 and 20 are Assertion –Reason based questions carrying 1 mark each.)

Two Statements are given, one labelled Assertion (A) and the other labelled Reason (R).

Select the Correct answer from the options (A) (B) (C) and (D) as given below

(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.

19. Assertion A: The value of $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$ is $-\frac{\pi}{2}$

Reason R: The principal branch of $\tan^{-1}x$ is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ and

$\cot^{-1}(-x) = \pi - \cot^{-1}x$

20. Assertion A: If A is a square matrix of order 3 and $|A| = 4$ then $|2\,Adj\,A| = 128$

Reason R: If *A* is a square matrix of order *n* then $|kA| = k^n|A|$

SECTION B (2X5=10)

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

21. Evaluate: $\tan^{-1}[\,2\cos(2\,\sin^{-1}(\frac{1}{2})\,]$

22. Find $\frac{dy}{dx}$ if $y = \tan^{-1}(\frac{\sin x}{1 + cosx})$

23. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 2$, $|\vec{b}| = 3, |\vec{c}| = 5$, evaluate $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$

24. Find $\int [\log(logx) + \frac{1}{(logx)^2}] \, dx$

OR

$$\int \frac{2^x}{\sqrt{1-4^x}} \, dx$$

25. Let $f(x + y) = f(x).f(y)$ and $f(x) = 1 + \sin(2x).g(x)$ where $g(x)$ is continuous, find $f'(x)$

OR

If $y = e^{\tan^{-1}x}$, prove that $(1 + x^2) \frac{d^2y}{dx^2} + (2x - 1) \frac{dy}{dx} = 0$

SECTION C (6x3=18)

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

26. Find the shortest distance between the lines through the point A (1 ,2 ,3) and having direction ratio 2 ,3 ,4 and the line through the point B(2 ,4 ,5) and having direction ratio 3 ,4 ,5 .

OR

Find λ in order that the line joining the points *A (3 ,2 ,1)* and *B (4 ,λ ,5)* will intersect the line joining the points *C(4 ,2 ,-2)* and *D (6 ,5 ,-1)*

27. The probabilities of A, B and C are solving a problem independently are $\frac{1}{3}$ $\frac{2}{7}$ and $\frac{3}{8}$ respectively. If all the 3 try to solve the problem simultaneously, find the probability that exactly one of them solve the problem.

28. Solve the following LPP graphically Maximize *Z= 3x + 2y* subject to the constraints,

x+2y ≤ 10 , 3 x + y ≤15 , x ≥0 y ≥0

29. Find the particular solution of the differential equation

$(1 + e^{2x})\,dy + (1 + y^2)e^x\,dx = 0$ given that $y = 1$ when $x = 0$

OR

$Solve(1 + x^2)\,\frac{dy}{dx} + y = \tan^{-1} x$

30. If $x\sqrt{1 + y} + y\sqrt{1 + x} = 0$ for $-1 < x < 1$,

prove that $\frac{dy}{dx} = \frac{-1}{(1 + x^2)}$

OR

Find $\frac{dy}{dx}$, if $y = sin^{-1}[\frac{5x + 12\sqrt{1 - x^2}}{13}]$

31. Find the intervals in which the function $f(x) = sinx + \cos x$, $0 \leq x \leq 2\pi$ is increasing or decreasing.

SECTION D (4x5=20)

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

32. Compute A^{-1} for the following matrix A $= \begin{bmatrix} 5 & -1 & 1 \\ 3 & 2 & -5 \\ 1 & 3 & -2 \end{bmatrix}$

And hence solve the following system of equations

5x – y + z = 4

3x + 2y - 5z = 2

x + 3y -2z = 5

33. Sketch the graph and find the area of the region enclosed between the curve $x^2 + y^2 = 25$ and the lines $x = 1$ and $x = 4$ *and* $x -$ *axis* using integration.

34. Evaluate: $\int_0^1 \cot^{-1}(1 - x + x^2)\,dx$

OR

Evaluate: $\int_0^{\frac{\pi}{2}} \frac{x\,dx}{sinx + \cos x}$

35. Find the foot of the perpendicular from the point (1 ,6 ,3) on the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$

Also find the length and equation of the perpendicular.

OR

Find the equation of the line of shortest distance between the lines

$\frac{x-6}{1} = \frac{y-2}{-2} = \frac{z-2}{2}$ and $\frac{x+4}{3} = \frac{y}{-2} = \frac{z+1}{-2}$

SECTION E (3x4=12)

(This section comprises of 3 case-study/ passage- based questions of 4 marks each with subparts. The first two case study questions have three subparts (I) ,(II) (III) respectively. The third case Study question has two subparts of 2 marks each.)

36.



An organization conducted Bike race under two different categories, Boys and girls. In all there are 250 participants, (150 boys and 100 girls) Among all of them finally 3 from boys category and 2 from girls category were selected for final race. Akshay for his project work form 2 sets B and G for final selected boys and girls as $B = \{b_1, b_2, b_3\}$ and $G = \{g_1, g_2\}$. Akshay explore these sets for various type of relations and functions.

On the basis of the above information answer the following questions:

(1) How many relations from B to G is possible (1)

(2) What is the smallest equivalence relation on G (1)

(3) Akshay defines a relation from B to B as $R_1 = \{(b_1, b_1), (b_2, b_1)\}$

What is the minimum number of ordered pairs to be added so that R_1 becomes an equivalence relation?

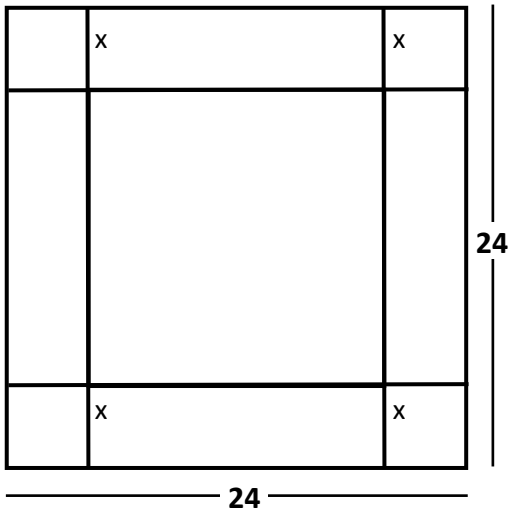
OR

(3) Again Akshay defines a relation from B to B as

$R_2 = \{ (b_1, b_2) \ (b_2, b_1) \ (b_1, b_3) \}$

What is the minimum ordered pairs to be added so that R_2 is reflexive but not symmetric? (2)

37. A factory makes open fibre box for a Jewellery shop from a square sheet of side 24 cm by cutting off squares from each corner and folding up. Assume x is the side length of each square cut from the corners. Based on the given information answer the following questions





(1)What is the volume V of the open box (1)

(2) Find the expression for $\frac{dV}{dx}$ (1)

(3) What should be the side of square to be cut off so that the volume is maximum

OR

(3) What is the length of the square base of the box when the volume is maximum (2)

38.



In an exporting company Three employees Vinay, Sophia and Sajil process the incoming letters. Vinay process 50%, Sophia 30% and Sajil 20% of the letters. While processing Vinay has an error rate of 0.05, Sophia has 0.04 and Sajil has 0.03. Let E be the event that error has happened while processing the letter and A, B and C be the events that the letter processed by Vinay ,Sophia and Sajil respectively.

Use the given data, answer the following questions

(1) Find the total probability of committing an error in processing the letter

(2)

(2) A processed letter has chosen at random is found be error, what is the probability that it was processed by Vinay? (2)

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