

KENDRIYA VIDYALAYA SANGATHAN TINSUKIA REGION

PRE-BOARDS EXAMINATION 2025-26

CLASS: XII

SUBJECT: Mathematics (041)

Time Allowed 3 Hours

Maximum Marks: 80

General Instructions:

1. This Question Paper contains -five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQs and 02 Assertion -Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

	SECTION A (Multiple Choice Questions- Each question carries 1 mark)
Q1.	If A is a square matrix of order 3, $ A = -3$, then $ AA' =$ (a) -9 (b) -27 (c) 9 (d) 27
Q2.	$\tan^{-1}(-1) + \cos^{-1}(-1)$ is equal to (a) π (b) $\frac{3\pi}{4}$ (c) $-\frac{\pi}{4}$ (d) $-\frac{5\pi}{4}$
Q3.	If A is symmetric matrix of order 3×3 , then $B'AB$ is a (a) Skew-symmetric matrix (b) Symmetric matrix (c) Zero matrix (d) Identity matrix
Q4.	If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is (a) I (b) $2A$ (c) $3I$ (d) A
Q5.	Let A be a square matrix of order 3×3 such that $ A = 4$, then $ 3A $ is equal to (a) 192 (b) 128 (c) 108 (d) 36
Q6.	If $A = \begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}$ then value of $ (\text{adj } A) $ is (a) 1 (b) 9 (c) 3 (d) 0
Q7.	If $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is equals to: (a) $\frac{1}{(1+\log x)}$ (b) $\frac{\log x}{(1+\log x)^2}$ (c) $\frac{1}{(1+\log x)^2}$ (d) $\frac{x}{(1+\log x)}$

Q8.	The function $f(x) = e^{x- x }$ is: (a) continuous everywhere but not differentiable at $x=0$ (b) continuous and differentiable everywhere (c) not continuous at $x = 0$ (d) None of these.
Q9.	$\int \frac{1}{\sin^2 x \cos^2 x}$ is (a) $\sin^2 x - \cos^2 x + C$ (b) -1 (c) $\tan x + \cot x + C$ (d) $\tan x - \cot x + C$
Q10.	For what value of p, $\vec{a} = 3\hat{i} - 5\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + \hat{k}$ are orthogonal vectors? (a) 2 (b) 1 (c) 3 (d) -3
Q11.	What is the product of order and degree of differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + 4y = 0.$ (a) 2 (b) 4 (c) 3 (d) 6
Q12.	Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if (a) $\theta = \frac{\pi}{4}$ (b) $\theta = \frac{\pi}{3}$ (c) $\theta = \frac{\pi}{2}$ (d) $\theta = \frac{2\pi}{3}$
Q13.	$\int \frac{\cos\sqrt{x}}{\sqrt{x}} dx$ (a) $2\cos\sqrt{x}$ (b) $2\sin\sqrt{x}$ (c) $-2\cos\sqrt{x}$ (d) $-2\sin\sqrt{x}$
Q14.	The direction cosines of the line segment joining the points A (5,-3,8) and B (7, -5,9) are (a) $(2, -2, 1)$ (b) $(\frac{1}{2}, \frac{-1}{2}, 1)$ (c) $(\frac{2}{3}, \frac{-2}{3}, \frac{1}{3})$ (d) None of these
Q15.	The point which does not lie in the half plane $3x + 4y \leq 12$ is (a) (1,2) (b) (2,1) (c) (2,3) (d) (-3,2)
Q16.	If A and B are any two events such that $A \subseteq B$, then (a) $P(B/A) = 1$ (b) $P(A/B) = 1$ (c) $P(B/A) = 0$ (d) $P(A/B) = 0$
Q17.	$f(x) = x^2 - 6x + 7$ is decreasing function in interval (a) R (b) $(-\infty, 2)$ (c) $(-\infty, 3)$ (d) None of these
Q18.	Corner point of the feasible region for an LPP are: (0,2), (1,1), (3,0), (2,1) and (0,5). Let $Z=4x+6y$ the objective function. The minimum value of Z occurs at (a) (0,2) only (b) (1,1) only (c) the mid-point of the line segment joining the points (0,2) and (3,0) only (d) any point on the line segment joining the points (1,1) and (2,1)

	ASSERTION-REASON BASED QUESTIONS In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (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.
Q19.	Assertion (A): The value of $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) = \frac{7\pi}{6}$ Reason (R): $\cos^{-1}(-x) = \pi - x$
Q20.	Assertion (A): The value of $k = 7$ where $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = k\hat{i} - 6\hat{j} + \hat{k}$ are perpendicular. Reason (R): If two vectors are perpendicular then $\vec{a} \cdot \vec{b} = 0$
	<u>SECTION –B</u> This section comprises of very short answer type-questions (VSA) of 2 marks each
Q21	Find the value of k for which the function $f(x) = \begin{cases} 5, & \text{if } x = \frac{\pi}{2} \\ \frac{k \cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \end{cases} \text{ is continuous at } x = \frac{\pi}{2}$
Q22.	Find the principal value of $\cos^{-1}\left(\cos \frac{11\pi}{6}\right)$ OR Let the function $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = x$. Show that f is neither one one nor onto.
Q23.	Find $\int \frac{dx}{(x+2)(x+3)}$ OR Find $\int \frac{dx}{x(x^4+1)}$
Q24.	If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -1\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$ then find the value of 'λ'. OR Find the angle between the lines $\vec{r} = 3\hat{i} + \hat{j} - 2\hat{k} + \lambda(\hat{i} - \hat{j} - 2\hat{k})$ and $\vec{r} = 2\hat{i} - \hat{j} - 5\hat{k} + \mu(3\hat{i} - 5\hat{j} - 4\hat{k})$
Q25.	If $x = \cos t$ and $y = \sin t$ then find $\frac{d^2y}{dx^2}$

	SECTION C (This section comprises of short answer type questions (SA) of 3 marks each)
Q26.	There are three coins. One is a two – headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the times and third is also a biased coin that comes up tails 40% of the times. One of the three coins is chosen at random and tossed, and it shows head. What is the probability that it was the two – headed coin? OR Find the probability distribution of number of doublets in three throws of a pair of dice
Q27.	Solve the following problem graphically: Minimise and Maximise $Z = 3x + 9y$ subject to the constraints: $x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x \geq 0$, $y \geq 0$
Q28.	If $y = (\tan^{-1}x)^2$ then show that $(1 + x^2)^2 y'' + 2x(1 + x^2)y' = 2$ OR If $x^y = y^x$ then find $\frac{dy}{dx}$
Q29.	Find the Equation of line passing through points (1,2,3) and (3,2,1).
Q30.	Find the Area of the region bounded by $x^2 = 4y$, $y = 2$, $y = 4$ and the y- axis in the first quadrant.
Q31.	A man 1.6 m tall walks at the rate of 0.3 m/sec away from a street light that is 4 m above the ground. How fast is the man's shadow lengthening?
	SECTION D (This section comprises of long answer-type questions (LA) of 5 marks each)
Q32.	If $A = \begin{bmatrix} 2 & 3 & 1 \\ -3 & 2 & 1 \\ 5 & -4 & -2 \end{bmatrix}$, find A^{-1} and hence solve the given equations: $2x - 3y + 5z = 11$, $3x + 2y - 4z = -5$, $x + y - 2z = -3$
Q33.	$\int \frac{(\tan x - 5)\sec^2 x}{1 + \sec^2 x - 4\tan x} dx$ OR $\int_0^3 x^2 - 3x + 2 dx$
Q34.	Find equation of line (both vector and Cartesian equation) which passes through Point (1,1,1) and perpendicular to the given lines $\vec{r} = \hat{i} + \hat{j} + t(2\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + s(3\hat{i} - 5\hat{j} + 2\hat{k})$ OR Find the coordinates of the foot of the perpendicular drawn from the point A (1, 8, 4) to the line joining the points B (0, 1, 3) and C(2, 3, 1). Also, find the perpendicular length.

Q35.	Solve the Differential equation $xdy - ydx = \sqrt{x^2 + y^2}dx$ where $y(1) = 0$
	SECTION E (This section comprises 3 case study-based questions of 4 marks each)
Q36.	A school has various clubs. Class 12th students want to join various club. If class 12th is denoted by $M = \{m_1, m_2, m_3, \dots, m_n\}$. A relation R is defined on M such that $(m_i, m_j) \in R$ if students m_i and m_j are members of at least one common club.  Based on above information answer the following - Is the relation R reflexive? - If Monu and Sonu are member of Maths club then can we say that Monu is related to Sonu? - Show that R is Symmetric. OR By counter example show that R is not transitive relation.
Q37.	For three persons A , B and C the chances of being selected as a Manager for a firm are in the ratio 4 : 1 : 2 respectively. The respective probabilities for them to introduce new products are 0.3, 0.8 and 0.5



Based on above information answer the following

- (i) What is the probability that A will be selected as Manager?
- (ii) What is the probability that new product is introduced ?
- (iii) What is the probability of B for introducing new product?

OR

What is the probability of A for introducing new product?

Q38. Case Study -3: Read the following passage and answer the questions given below:



The temperature of a person during an intestinal illness is given by $f(x) = -0.2x^2 + kx + 47.5$, $0 \leq x \leq 12$ m being a constant, where $f(x)$ is the temperature in $^{\circ}\text{C}$ at x days.

- (i) If 10, is the critical point of the function then find the value of the constant k .
- (ii) Find the intervals in which the function is strictly increasing/strictly decreasing.