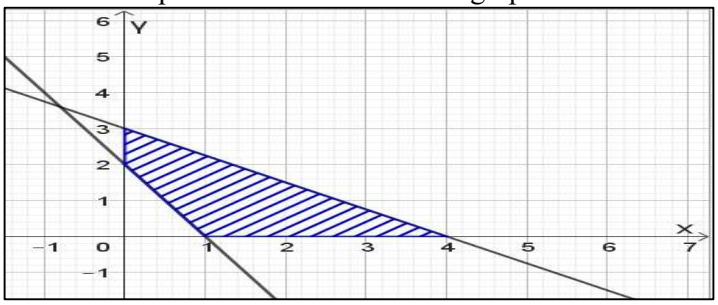
KENDRIYA VIDYALAYA SANGATHAN TINSUKIA REGION
PRE-BOARDS EXAMINATION 2025-26
CLASS: XII
SUBJECT: Mathematics (041)

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

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) with only one correct option 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.

	Section – A (Multiple Choice Question)	
1.	If $\sec^{-1}x = \operatorname{cosec}^{-1}y$, then $\{\cos^{-1}(\frac{1}{x}) + \cos^{-1}(\frac{1}{y})\} = ?$ (A) 0 (B) 1 (C) $\pi/2$ (D) none of these.	1
2.	If for three matrices $A = [a_{ij}]_{m\times 3}$, $B = [b_{ij}]_{n\times 4}$ and $C = [c_{ij}]_{p\times q}$ products AB and AC both are defined and are square matrices of same order, then value of m, n, p and q are: (A) $m = q = 3$ and $n = p = 4$ (B) $m = 2$, $q = 3$ and $n = p = 4$ (C) $m = q = 4$ and $n = p = 3$ (D) none of these.	1
3.	If A & B are symmetric matrices of same order Square Matrix, then AB-BA is (A) symmetric (B) skew-symmetric (C) Identity Matrix (D) None of these.	1
4.	If for a square matrix A, $\boldsymbol{A}.(\boldsymbol{adjA}) = \begin{bmatrix} 2025 & 0 & 0 \\ 0 & 2025 & 0 \\ 0 & 0 & 2025 \end{bmatrix}$, then the value of $\lvert A\rvert + \lvert \text{adj } A\rvert$ is : (A) 1 (B) 2025 + 1 (C) $2025^2 + 45$ (D) $2025 + (2025)^2$	1
5.	If A is a matrix of order 3×3 and $\lvert A\rvert$= det (A), k is a scalar quantity, then $\lvert kA\rvert$ =? (A) k $\lvert A\rvert$ (B) $k^3\lvert A\rvert$ (C) $k^2\lvert A\rvert$ (D) none of these.	1
6	If $\begin{vmatrix} 2x & 8 \\ 5 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then the value of x is (A) 3 (B) ±3 (C) ±6 (D) 6	1
7.	The function $f(x) = \lvert x + 1\rvert$ is (A) discontinuous for all Real values of x (B) discontinuous only for all integer values of x (C) not continuous at x=-1 (D) is nowhere discontinuous.	1

8.	Box function or Greatest Integer Function (G.I.F) [x] is: (A) Continuous for all real values of x (B) Continuous for all non-integer values (C) Discontinuous everywhere (D) Differentiable for all Real numbers.	1
9.	Which of the following functions are decreasing on (0, π/2) ? (A) sin 2x (B) cos 2x (C) cos 3x (D) tan x	1
10.	$\int_{-1}^{1} x\|x\| = ?$ (A) 0 (B) 1 (C) 2 (D) none of these.	1
11.	$\int (3\text{-}4x)^{5/2} dx$ = ? (A) $\frac{\left[(3-4\ )^{\frac{7}{2}}\right]}{7/2} + C$ (B) $-\frac{\left[(3-4x)^{\frac{7}{2}}\right]}{7/2} + C$ (C) $\frac{\left[(3-4x)^{\frac{7}{2}}\right]}{14} + C$ (D) $-\frac{\left[(3-4x)^{\frac{7}{2}}\right]}{14} + C$	1
12.	The product of the order and degree of the differential equation $axy + b\left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} = 1$ (a, b, are arbitrary constants) is: (A) 2 (B) 3 (C) 1 (D) 6.	1
13.	If a = $2\vec{\imath} - 3\vec{\jmath} - 2\vec{k}$,b = $-3\vec{\imath}$+q$\vec{\jmath}$+$3\vec{k}$ are perpendicular vectors then which of the following is correct? (A) q = −1 (B) q = 4 (C) q = −3 (D) None of these.	1
14.	If a line has direction ratios 2, −3, 7 then find the direction cosines. (A) $l = \frac{2}{\sqrt{62}}, m = -\frac{7}{\sqrt{62}}, n = \frac{7}{\sqrt{62}}$ (B) $l = \frac{2}{\sqrt{6}}, m = -\frac{3}{\sqrt{6}}, n = \frac{7}{\sqrt{6}}$ (C) $l = -\frac{2}{\sqrt{62}}, m = -\frac{3}{\sqrt{62}}, n = -\frac{7}{\sqrt{62}}$ (D) $l = \frac{2}{\sqrt{62}}, m = -\frac{3}{\sqrt{62}}, n = \frac{7}{\sqrt{62}}$.	1
15.	A student of class XII studying Mathematics comes across an incomplete question in a book. Maximise $Z = 3x + 2y + 1$ Subject to the constraints $x \geq 0, y \geq 0, 3x + 4y \leq 12$, He/ She notices the below shown graph for the said LPP problem, and finds that a constraint is missing in it: Help him/her choose the required constraint from the graph. 	1

	The missing constraint is (A) $x + 2y \leq 2$ (B) $2x + y \geq 2$ (C) $2x + y \leq 2$ (D) $x + 2y \geq 2$	
16.	Given the LPP Max z = x + y Subject to the constraints x + 2y ≤ 4 x + 2y ≥ 6 & x, y ≥ 0 The given LPP has (A)unique feasible solution (B) infinite number of feasible solutions. (C) no feasible solution (D) none of these.	1
17.	If $\vec{a}$ and $\vec{b}$ are two vectors such that $\lvert\vec{a}+\vec{b}\rvert=\lvert\vec{a}-\vec{b}\rvert$, then the angle between $\vec{a}$ and $\vec{b}$ is (A) 45° (B) 30° (C) 90° (D) 0°	1
18.	If A & B be two events such that $2P(A) = P(B) = \frac{5}{13}$, $P(A/B) = \frac{2}{3}$, then P(A∩B)=? (A) $\frac{2}{13}$ (B) $\frac{25}{78}$ (C) $\frac{11}{78}$ (D) none of these.	1
	Assertion-Reason Based Question Each question consists of two statements, namely, Assertion (A) and Reason (R). For selecting the correct answer , use the following code : (a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A). (c) Assertion (A) is true and Reason (R) is false. (d) Assertion (A) is false and Reason (R) is true.	
19.	**Assertion(A):** $cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$ is equal to 7π /6. **Reason (R):** Principal value branch of $\cos^{-1}$ x is [0, π] .	1
20.	**Assertion(A) :** A null or zero vector has zero magnitude. **Reason (R) :** If the dot product and cross product of two vectors $\vec{a}$ and $\vec{b}$ are zero (i.e. $\vec{a} \cdot \vec{b} = 0 = \vec{a} \times \vec{b}$) , then it implies one of the vectors $\vec{a}$ and $\vec{b}$must be zero.	1
	Section – B (Very Short Answer Type)	
21.	Prove that , $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right) = \frac{\pi}{4} - \frac{1}{2}\cos^{-1}x$. $-\frac{1}{\sqrt{2}} \leq x \leq 1$ **OR ,** Find the domain & range of $\sin^{-1}(2x-1)$.	2 2
22.	If a function defined by $f(x) = \begin{cases} kx+1, & x \leq \pi \\ \cos x, & x > \pi \end{cases}$ is continuous at x = π , then find the value of k.	2
23.	Consider function $f(x) = \lvert x-1\rvert$, check the continuity & differentiability of the function at x=1.	2

24.	Find $\int_{-5}^{5} \|x-2\|\ dx$ **OR,** $\int \frac{1}{sinx+cosx} dx$	2
25.	If $\vec{a}, \vec{b}, \vec{c}$ denote the position vector of three vertices of a triangle, then show that the area of the triangle is $\frac{1}{2}\|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}\|$ sq. unit.	2
	Section – C (Short Answer Type)	
26.	$\sqrt{1-x^2}+\sqrt{1-y^2} = a(x-y)$, then show that $\frac{dy}{dx}=\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$ **OR** Given $\sin y = x\sin(a+y)$, *then show that* $\frac{dy}{dx}=\frac{\sin a}{1-2x\cos a+x^2}$.	3 3
27.	A spherical ball of ice melts in such a way that the rate at which its volume decreases at any instant is directly proportional to its surface area. Prove that the radius of the ice ball decreases at a constant rate.	3
28.	Using integration find the area of the region $\{(x, y) : y^2 - 4x \leq 0, y - x \geq 0\}$ **OR,** Find the area bounded by the Graph : $x^2+4y^2=16$ & x-axis.	3 3
29.	Find the shortest distance between the straight lines $\vec{r} = (\hat{\imath}+2\hat{\jmath}-4\hat{k})+\mu(2\hat{\imath}+3\hat{\jmath}+6\hat{k})$ & $\vec{r}=(3\hat{\imath}+3\hat{\jmath}-5\hat{k})+\lambda(2\hat{\imath}+3\hat{\jmath}+6\hat{k})$. **OR,** Find the values of p so that the lines $\frac{1-x}{3}=\frac{7y-14}{2p}=\frac{z-3}{2}$ & $\frac{7-7x}{3p}=\frac{y+2}{-5}=\frac{z}{1}$ are at perpendicular to each other.	3 3
30.	Solve graphically: Maximise $Z = 2x + y$ subject to $2x + 3y \leq 240$ $x + y \geq 100$ $x \geq 0,\ y \geq 0$.	3
31.	Bag I contains 4 red and 5 black balls while another Bag II contains 6 red and 4 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.	3
	Section – D (Long Type Answer)	
32.	Given A= $\begin{bmatrix} 2 & 8 & 5 \\ 1 & 1 & 1 \\ 1 & 2 & -1 \end{bmatrix}$, Find A^{-1}. Hence Solve $2x+y+z=-5, 8x+y+2z=-24, 5x+y-z+12=0$.	5

33.	$\int_0^1 \frac{\log(1+x)}{1+x^2}\,dx = \frac{\pi}{8}\log 2.$ **OR,** $\int_0^{\pi} \frac{x\,dx}{a^2\cos^2 x + b^2\sin^2 x} = \frac{\pi^2}{2ab}.$	5 5
34.	$(\tan^{-1}y - x)dy = (1 + y^2)\,dx$ **OR,** $(1 + 3e^{y/x})dy + 3e^{y/x}(1 - y/x)dx = 0$	5 5
35.	Find the Image of the point P(1,6,3) with respect to the straight line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Hence find the equation between P & Q (the image of P) .Also find the distance of PQ.	5
	Section - E (Case Study-Based questions)	
36.	Sherlin and Danju are playing Ludo at home during Covid-19. While rolling the dice, Sherlin's sister Raji observed and noted the possible outcomes of the throw every time belongs to set {1,2,3,4,5,6}. Let A be the set of players while B be the set of all possible outcomes. A = {S, D}, B = {1,2,3,4,5,6} **Note: Don't just write answers, give proper justification** 	
(i)	Let $R : B \to B$ be defined by R = $\{(x, y)$: y *is divisible by* $x\}$ is (A) Reflexive and transitive but not symmetric (B) Reflexive and symmetric and not transitive (C) Not reflexive but symmetric and transitive (D) Equivalence	1
(ii)	Raji wants to know the number of relations possible from A to B. How many numbers of relations are possible? (A) 6^2 (B) 2^6 (C) 6! (D) 2^{12}	1
(iii)	Let R be a relation on B defined by R = {(1,2), (2,2), (1,3), (3,4), (3,1), (4,3), (5,5)}. Then R is (A) Symmetric (B) Reflexive (C) Transitive (D) None of these three	1
(iv)	Let R: $B \to B$ be defined by R={(1,1),(1,2), (2,2), (3,3), (4,4), (5,5),(6,6)}, then R is (A) Symmetric (B)Reflexive and Transitive (C) Transitive and symmetric (D) Equivalence	1

37.	The Relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the following equation $y = 4x - 1/2\ x^2$ where x is the number of days exposed to sunlight. **Note: Don't just write answers, give proper justification** 	
(i)	The rate of growth of the plant with respect to sunlight is _____ (A) $\frac{4x-1}{2x^2}$ (B) 4 – x (C) x – 4. (D) $\frac{x-1}{2x^2}$	1
(ii)	What is the number of days it will take for the plant to grow to the maximum height? (A) 4 (B) 6 (C) 7 (D) 10	1
(iii)	What is the maximum height of the plant? (A) 12 cm (B) 10 cm (C) 8 cm (D) 6 cm	1
(iv)	What will be the height of the plant after 2 days? (A)4cm (B) 6 cm (C) 8cm (D) 10cm	1
38.	A coach is training 3 players. He observes that the player A can hit a target 4 times in 5 shots, player B can hit 3 times in 4 shots and the player C can hit 2 times in 3 shots.  From this situation answer the following: (**Note: Don't just write answers, give proper justification)**	
(i)	Find the probability that A, B and, C all will hit is (A) 4/5 (B) 3/5 (C) 2/5 (D) 1/5	1
(ii)	What is the probability that 'any two of A, B and C will hit? (A) 1/30 (B) 11/30 (C) 17/30 (D) 13/30	2
(iii)	What is the probability that 'none of them will hit the target'? (A)1/30 (B) 1/60 (C) 1/15 (D) 2/15 OR, what is the probability that B, C will hit and A will lose? (A)1/10 (B) 3/10 (C) 7/10 (D) 4/10	1 1