

KENDRIYA VIDYALAYA SANGATHAN REGIONAL OFFICE JABALPUR
PRE-BOARD-SET-A (2025 - 26)
CLASS - XII

MATHEMATICS (041)

Time allowed 3 Hours

Maximum Marks: 80



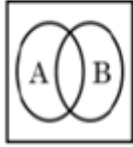
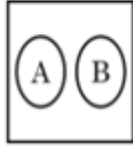
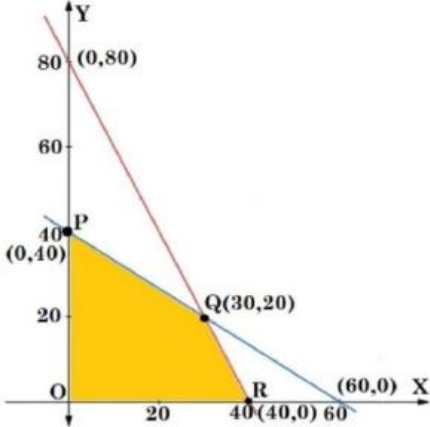
General Instructions:

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 MCQ's and 2 Assertion-Reason based questions of 1 marks 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 3 Long Answer type Questions of 5 marks each.
 Section E has 3 sources based/case based/passage based/integrated units of assessment (4marks each) with sub parts.

SECTION – A

Direction (Q.1 - Q.18) - There are multiple choice type questions. Choose the correct answer:

Q. NO.	QUESTIONS	MARKS
1	Given that A is a square matrix of order 3 and $ A = -2$, then $ adj(2A) $ is equal to (a) -64 (b) 128 (c) -512 (d) 512	1
2	The graph of trigonometric function is as shown. Which of the following will represent graph of its inverse? <div style="text-align: center;"> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> (A) </div> <div style="text-align: center;"> (B) </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> (C) </div> <div style="text-align: center;"> (D) </div> </div>	1
3	If $\begin{bmatrix} 1 & 12 & 4y \\ 6x & 5 & 2x \\ 8x & 4 & 6 \end{bmatrix}$ is symmetric matrix, then $(2x+y)$ is (a) -8 (b) 0 (c) 6 (d) 8	1
4	A denotes the set of continuous functions and B denotes the set of differentiable functions, which of the following depicts the correct relation between A and B?	1

	<div><div>(A) </div><div>(B) </div><div>(C) </div><div>(D) </div></div>													
5	<p>Function $f(x) = \begin{cases} \frac{x^2 + 3x - 10}{x - 2}, & x \neq 2 \\ k, & x = 2 \end{cases}$ is continuous when the value of k is</p> <p>(a) 5 (b) 6 (c) 7 (d) 8</p>	1												
6	<p>The value of 'n' such that the differential equation $x^n \frac{dy}{dx} = y(\log y - \log x + 1)$ is homogeneous, is</p> <p>(a) 0 (b) 2 (c) 1 (d) 3</p>													
7	<p>If $\vec{a} = (3\hat{i} + 2\hat{j} + 4\hat{k})$, $\vec{b} = (\hat{i} + \hat{j} - 3\hat{k})$ and $\vec{c} = (6\hat{i} - \hat{j} + 2\hat{k})$ are three given vectors, then $(2\vec{a} \cdot \hat{i})\hat{i} - (\vec{b} \cdot \hat{j})\hat{j} + (\vec{c} \cdot \hat{k})\hat{k}$ is same as the vector</p> <p>(a) \vec{a} (b) $\vec{a} + \vec{b}$ (c) $\vec{a} - \vec{b}$ (d) \vec{c}</p>													
8	<p>For a L.P.P the objective function is $Z = 4x + 3y$, and the feasible region determined by a set of constraints (linear inequalities) is shown in the graph</p> <p>Which one of the following is true</p> <p>(a) Maximum value of Z is at R. (b) Maximum value of Z is at Q. (c) Value of Z at R is less than the value at P. (d) Value of Z at Q is less than the value at R.</p> 													
9	<p>If 'θ' is the angle between two vectors \vec{a} and \vec{b}, then $\vec{a} \cdot \vec{b} = \vec{a} \times \vec{b}$ when 'θ' is equal to</p> <p>(a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) π</p>													
10	<p>A random variable has the probability distribution as</p> <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>P(X)</td><td>0</td><td>k</td><td>4k</td><td>2k</td><td>3k</td></tr></table> <p>Then, $P(X=2)$ is</p> <p>(a) $\frac{1}{12}$ (b) $\frac{1}{10}$ (c) $\frac{1}{5}$ (d) $\frac{2}{5}$</p>	X	0	1	2	3	4	P(X)	0	k	4k	2k	3k	
X	0	1	2	3	4									
P(X)	0	k	4k	2k	3k									
11	<p>The direction ratios of the line $4x - 12 = 2y + 4 = 3z - 3$ are</p> <p>(a) 4,6,3 (b) 6,3,4 (c) 4,6,3 (d) 3,6,4</p>													

12	$\int \frac{dx}{\sin^2 x \cos^2 x}$ equals (a) $\tan x + \cot x + C$ (b) $\tan x - \cot x + C$ (c) $(\tan x - \cot x)^2 + C$ (d) $(\tan x + \cot x)^2 + C$	
13	The value of $\int_1^{\sqrt{3}} \frac{1}{1+x^2} dx$ is (a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{12}$	
14	Maximum value of the function $f(x) = - x + 1 + 3$ is (a) 2 (b) 3 (c) 4 (d) not defined	
15	If $A = \begin{bmatrix} k & 10 \\ 7 & k-3 \end{bmatrix}$ is a singular matrix, then value of k is/are (a) -10, 7 (b) 10 (c) 10, -7 (d) 7	
16	The inverse of the matrix $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is (a) $\begin{bmatrix} 0 & 0 & 3 \\ 0 & 2 & 0 \\ 5 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{3} & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ (c) $\begin{bmatrix} -\frac{1}{3} & 0 & 0 \\ 0 & -\frac{1}{2} & 0 \\ 0 & 0 & -\frac{1}{5} \end{bmatrix}$ (d) $\begin{bmatrix} -3 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -5 \end{bmatrix}$	
17	The corner points of the feasible region determined by the system of linear constraints are (0,3), (1,1) and (3,0). Let $Z = px + qy$, where $p, q > 0$. Conditions on p and q so that the minimum of z occurs at (3,0) and (1,1). (a) $p = 3q$ (b) $2p = q$ (c) $p = 3q$ (d) $p = q$	
18	Value of determinant $\begin{vmatrix} \cos 67^\circ & \sin 67^\circ \\ \sin 23^\circ & \cos 23^\circ \end{vmatrix}$ is (a) 0 (b) $\frac{1}{2}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1	

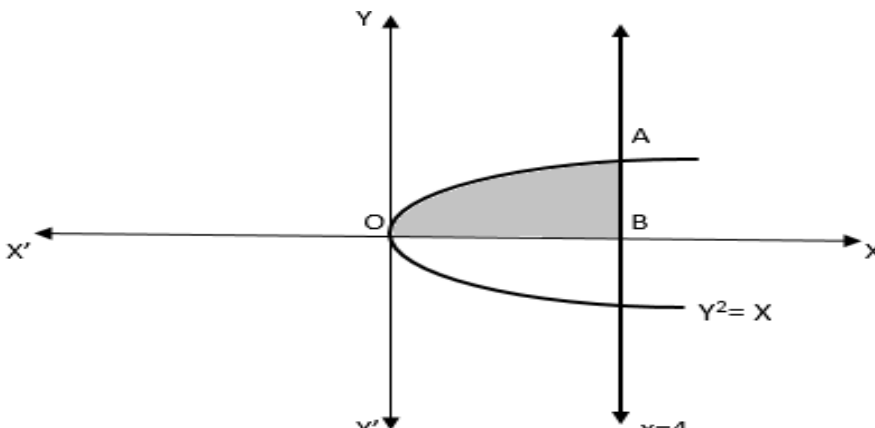
ASSERTION - REASON BASED QUESTIONS

Direction (Q.19 - Q.20) -

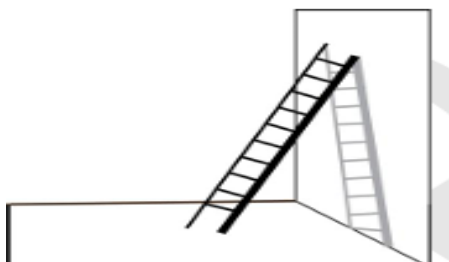
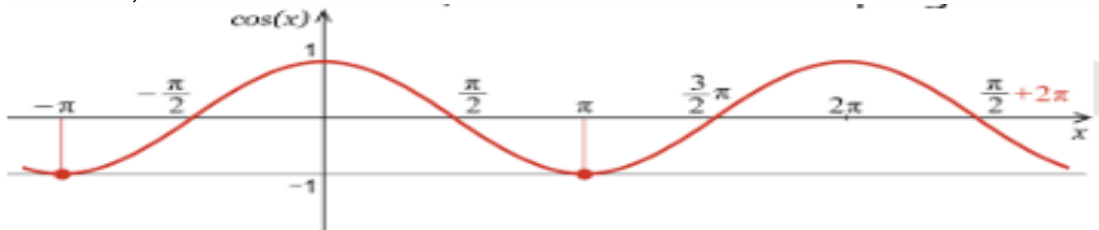
In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices:

- (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.

Q. NO.	QUESTIONS	MARKS
19	Assertion (A): In set $B = \{1, 2, 3\}$ a relation f defined as $f = \{(1, 1), (2, 2)\}$ is reflexive. Reason (R): A relation R is reflexive in set A if $(a, a) \in R$ for all $a \in A$	1
20	Assertion (A): The projection of $(\hat{i} + \hat{j} + 2\hat{k})$ on vector \hat{i} is 1 Reason (R): The projection of \vec{a} on \vec{b} is $\frac{\vec{a} \cdot \vec{b}}{ \vec{b} }$	1

SECTION – B		
Direction (Q.21 - Q.25) - This section comprises of very short answer type-questions (VSA) of 2 marks each.		
Q. NO.	QUESTIONS	MARKS
21	Find the domain of the function $\cos^{-1}(2x - 3)$. OR Find the principal value of $\tan^{-1}\left(\tan \frac{9\pi}{8}\right)$.	2
22	If, $y = Ae^{7x} + Be^{-7x}$ then show that $\frac{d^2y}{dx^2} = 49y$.	2
23A 23B	Evaluate : $\int \frac{dx}{e^x + e^{-x}}$ OR Find the area of the shaded region in the enclosed figure. 	2
24	Find the area of parallelogram whose one side and one diagonal are $\hat{i} + 2\hat{j} - \hat{k}$ and $2\hat{j} + 5\hat{k}$ respectively.	2
25	If $x = e^{\frac{x}{y}}$, then prove that $\frac{dy}{dx} = \frac{x-y}{x \log x}$	2

SECTION – C		
Direction (Q.26 - Q.31) - This section comprises of short answer type-questions (SA) of 3 marks each.		
Q. NO.	QUESTIONS	MAR KS
26A 26B	If $x = a(\cos t + t \sin t)$ and $y = a(\sin t - t \cos t)$ find $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{3}$. OR Find $\frac{dy}{dx}$, if $y = x^{\sin x} + (\sin x)^{\cos x}$.	3


27	<p>Solve graphically:</p> <p>Maximize: $Z = x + 2y$ subject to the conditions:</p> $x + 2y \geq 100,$ $2x - y \leq 0,$ $2x + y \leq 200,$ $x \geq 0, \quad y \geq 0$	3
28A	<p>Find the shortest distance between the lines whose vector equations are:</p> $\vec{r} = (\hat{i} + \hat{j}) + t(2\hat{i} - \hat{j} + \hat{k}) \text{ and } \vec{r} = 2\hat{i} + \hat{j} - \hat{k} + s(3\hat{i} - 5\hat{j} + 2\hat{k})$	3
28B	<p>Determine the value of λ if the following lines are perpendicular to each other:</p> $\frac{1-x}{-3} = \frac{3y-2}{2\lambda} = \frac{z-3}{3} \text{ and } \frac{x-1}{3\lambda} = \frac{1-y}{1} = \frac{2z-5}{3}$	
29	<p>A ladder 13 meters long is leaning against a wall. The bottom of the ladder is sliding away from the wall at a rate of 2 m/s. How fast is the top of the ladder sliding down the wall when the bottom of the ladder is 5 meters from the wall?</p> 	3
30A	<p>In a classroom, the teacher explains the properties of a particular curve by saying that this particular curve has beautiful ups and downs. It starts at 1 and heads down until π radian, and then heads up again as shown in the figure. Then find the area enclosed by the curve, $x = -\pi$ and $x = \pi$.</p> 	3
30B	<p>Using integration, find the area of the region bounded by curve:</p> $4x^2 = y \text{ and the line } y = 8x + 12.$	
31	<p>A die marked 1,2,3 in red and 4,5,6 in green is tossed. Let A be the event "numbers even" and B be the event "numbers are marked red". Find whether the event A and B are independent or not.</p>	3


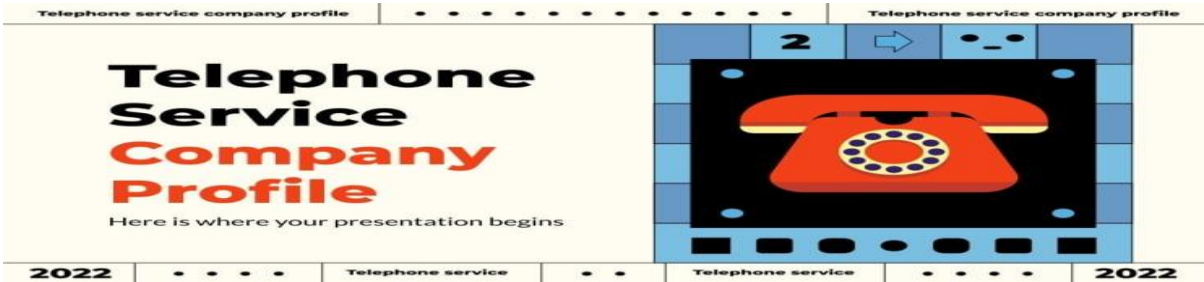
SECTION – D		
Direction (Q.32- Q.35) - This section comprises of long answer type-questions (LA) of 5 marks each.		
Q. NO.	QUESTIONS	MARKS

32	<p>Given $A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$, find BA and use this to solve the system of equations:</p> $x - y = 3, \quad 2x + 3y + 4z = 17, \quad y + 2z = 7$	5
33	<p>Find the image of the point $(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Also, find the length of the perpendicular from the point $P(1, 6, 3)$ to the line.</p>	5
34A	<p>In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it worth after 10 years ($e^{0.5} = 1.648$)</p>	5
34B	<p>OR Find the particular solution of given differential equation:</p> $(1 + x^2) \frac{dy}{dx} + 2xy = \frac{1}{(1 + x^2)}; y = 0 \text{ when } x = 1$	
35	<p>Evaluate: $\int_0^1 \frac{\log(1+x)}{(1+x^2)} dx$</p> <p>OR</p> <p>Evaluate: $\int \frac{x+3}{\sqrt{5-4x-x^2}} dx$</p>	

SECTION – E

Direction (Q.36 - Q.38) - This section comprises of 3 case-study / passage-based questions of 4 marks each.

Q. NO.	QUESTIONS	MARKS
36	<p>Case-Study 1: Read the following passage and answer the questions given below:</p> <p>A city's traffic management department is planning to optimize traffic flow by analyzing the connectivity between various traffic signals. The city has five major spots labelled A,,, E.</p>  <p>The department has collected the following data regarding one-way traffic flow between spots:</p> <ol style="list-style-type: none"> 1. Traffic flows from A to B, to C, and A to D. 2. Traffic flows from B to C and B to E. 	

	<p>3. Traffic flows from C to E.</p> <p>4. Traffic flows from D to E and D to C.</p> <p>The department wants to represent and analyze this data using relations and functions. Use the given data to answer the following questions:</p> <ol style="list-style-type: none"> 1. Is the traffic flow reflexive? Justify. 2. Is the traffic flow transitive? Justify. <p>3A. Represent the relation describing the traffic flow as a set of ordered pairs. Also state the domain and range of the relation.</p> <p style="text-align: center;">OR</p> <p>3B. Does the traffic flow represent a function? Justify your answer.</p>	<p>1</p> <p>1</p> <p>2</p>
37	<p>Case-Study 2: Read the following passage and answer the questions given below:</p> <p>Read the following passage and answer the questions given below</p>  <p>A shopkeeper sells three types of flowers seeds A_1, A_2 and A_3. These are sold as mixture, where their proportions are 4:4:2 respectively. Also their germination rates are 45%, 60% and 35% respectively. Let A_1: seed A_1 is chosen, A_2: seed A_2 is chosen and A_3: seed A_3 is chosen.</p> <p>Also let E: seed germinates.</p> <ol style="list-style-type: none"> (i) Find $P(A_1)$, $P(A_2)$ and $P(A_3)$ (ii) Write: $P(E A_1) + P(E A_2) + P(E A_3)$. (iii) Calculate the probability of a randomly chosen seed to germinate. Express the answer in %. <p style="text-align: center;">OR</p> <p>Calculate the probability that seed is of the type A_2 given that a randomly chosen seed germinate.</p>	<p>1</p> <p>1</p> <p>2</p>
38	<p>Case-Study 3: Read the following passage and answer the questions given below:</p> <p>A telephone company in a town has 500 subscribers on its list and collect fixed charge of Rs 300/- per subscriber. The company proposes to increase the annual subscription and it is believed that every increase of Rs 1, one subscribers will discontinue the service.</p>  <p>Answer the following questions using the above information:</p> <ol style="list-style-type: none"> 1. How much amount can be increased for maximum Revenue? 2. Find the Maximum revenue received by Telephone Company. 	<p>2</p> <p>2</p>