



BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

PRE-BOARD EXAMINATION -1 (2025 – 2026)

GRADE XII

Date: 12.12.2025

SET – 2

Max Marks: 80

Subject: Mathematics (041)

Time: 3 hours

GENERAL INSTRUCTIONS:

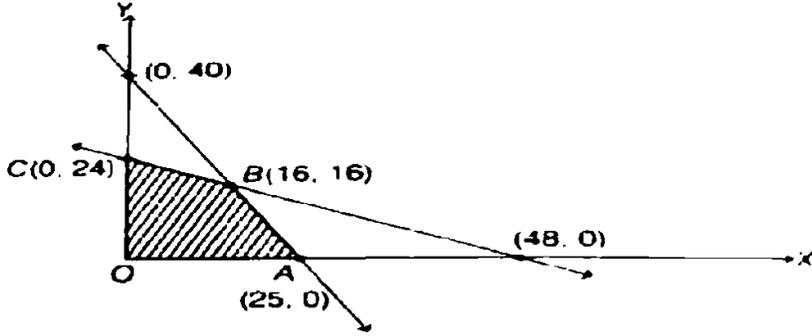
1. This Question paper contains - five sections A, B, C, D and E. Each section is Compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
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 of 4 marks each with sub-parts

SECTION A

This section comprises of multiple choice questions.

(1X 20=20)

1)	The distance moved by a particle travelling in a straight line in t seconds is given by $s = 45t + 11t^2 - t^3$. The time taken by the particle to come to rest is a) 9 sec b) $\frac{5}{3}$ sec c) $\frac{3}{5}$ sec d) 2 sec	(1)
2)	$\int \frac{1}{1 - \cos x - \sin x} dx =$ a) $\log \left 1 + \cot \frac{x}{2} \right + C$ b) $\log \left 1 - \tan x \frac{x}{2} \right + C$ c) $\log \left 1 - \cot \frac{x}{2} \right + C$ d) $\log \left 1 + \tan x \frac{x}{2} \right + C$	(1)
3)	One branch of $\cos^{-1}(x)$ other than the principal value branch corresponds to a) $[2\pi, 3\pi]$ b) $[\pi, 2\pi] - \{3\pi/2\}$ c) $(0, \pi)$ d) $[\pi/2, 3\pi/2]$	(1)
4)	If $\int_0^a \frac{1}{1+x^2} dx = \frac{\pi}{8}$, then $a =$ a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) 1 d) $\frac{1}{2}$	(1)
5)	If $\begin{bmatrix} a & c & 0 \\ b & d & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is a scalar matrix, then the value of $a + 2b + 3c + 4d$ is a) 0 b) 25 c) 10 d) 5	(1)

6)	If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $A^2 + 7I = kA$, then the value of k is a) 1 b) 2 c) 5 d) 7	(1)
7)	If A is a square matrix of order 3 and $ adj A = 64$, then $ A $ is a) 64 b) 8 c) -8 d) ± 8	(1)
8)	If the determinant of $\begin{bmatrix} 1-x & 2 & 3 \\ 0 & x & 0 \\ 0 & 0 & x \end{bmatrix}$ is 0, then its roots are a) 0 b) 1 c) 0,1 d) 0,1,-1	(1)
9)	Area (in square units) lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ and the lines $x=0$ and $x=2$ is a) π b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{4}$	(1)
10)	If $x = at^2, y = 2at$, then $\frac{d^2y}{dx^2}$ is a) $\frac{1}{t}$ b) $\frac{1}{t^2}$ c) $\frac{-1}{2at^2}$ d) $\frac{-1}{2at^3}$	(1)
11)	Integrating factor of $x \frac{dy}{dx} - y = x^4 - 3x$ is a) x b) $\log x$ c) $1/x$ d) $-x$	(1)
12)	Two dice are thrown. If it is known that the sum of the numbers on the dice was less than 6, the probability of getting a sum 3, is a) $\frac{1}{18}$ b) $\frac{5}{18}$ c) $\frac{1}{5}$ d) $\frac{2}{5}$	(1)
13)	The maximum value of $Z = 4x + 3y$, if the feasible region for an LPP is as shown below is  a) 100 b) 112 c) 72 d) 110	(1)
14)	The order and degree of the differential equation $\left(1 + 3 \frac{dy}{dx}\right)^2 = 4 \frac{d^3y}{dx^3}$ a) $1, \frac{1}{3}$ b) 3,1 c) 3,3 d) 1,2	(1)

15)	If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then A^{10} is a) 10A b) 9A c) 2^9A d) $2^{10}A$	(1)
16)	If $f(x) = \begin{cases} \frac{\log x}{x-1}, & \text{if } x \neq 1 \\ k, & \text{if } x = 1 \end{cases}$ is continuous at $x = 1$, then the value of k is a) 0 b) -1 c) 1 d) e	(1)
17)	If $y = 3ax^3 + 5b^2$, then $\frac{dy}{dx}$ at $x=2$ is a) 36 b) $24a + 10b$ c) $36a$ d) $36a + 10b$	(1)
18)	The number of arbitrary constants in the general solution of differential equation of fourth order is a) 0 b) 2 c) 3 d) 4	(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.

19)	Assertion: The order of the matrix A is 3×5 and that of B is 2×3 . Then the matrix AB is not possible. Reason : The order of the matrix A is $m \times n$ and that of B is $n \times p$. Then the order of the matrix AB is $m \times p$	(1)
20)	Assertion: Let $y = t^{10} + 1$ and $x = t^8 + 1$ then $\frac{d^2y}{dx^2} = 20t^8$ Reason : $\frac{d^2y}{dx^2} = \frac{d}{dt} \left(\frac{dy}{dx} \right) \frac{dt}{dx}$	(1)

SECTION B

This section comprises of very short answer type-questions

(2 X 5=10)

21)	Prove that $\sin^{-1} \frac{8}{17} + \sin^{-1} \frac{3}{5} = \tan^{-1} \frac{77}{36}$	(2)
22)	If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ prove that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$	(2)
23)	a) Find the intervals on which the function $f(x) = (x-1)^3(x-2)^2$ is strictly increasing. OR b) Show that of all the rectangles with a given perimeter, the square has the largest area.	(2)

24)	A person standing at $O(0,0,0)$ is watching an aeroplane which is at the coordinate point $A(4,0,3)$. At the same time he saw a bird at the coordinate point $B(0,0,1)$. Find the angles which \vec{BA} makes with the x , y and z axes.	(2)
25)	Find the values of λ for which the angle between the vectors $\vec{a} = 2\lambda^2 \hat{i} + 4\lambda \hat{j} + \hat{k}$ and $\vec{b} = 7\hat{i} - 2\hat{j} + \lambda \hat{k}$ is obtuse.	(2)

SECTION C

This section comprises of short answer type-questions

(3 X 6=18)

26)	Evaluate $\int \frac{x^2+1}{(x^2+2)(2x^2+1)} dx$	(3)
27)	Evaluate $\int \sqrt{\frac{\sin(x-a)}{\sin(x+a)}} dx$	(3)
28)	a) Evaluate $\int_0^\pi \frac{x}{1+\sin x} dx$ OR b) Evaluate $\int_{-a}^a \sqrt{\frac{a-x}{a+x}} dx$	(3)
29)	(a) Find the particular solution of the differential equation $\frac{dx}{dy} + \sec^2 x \cdot y = \tan x \cdot \sec^2 x$, given that $y(0) = 0$. OR (b) Solve the differential equation given by $x dy - y dx - \sqrt{x^2 + y^2} dx = 0$	(3)
30)	Show that the minimum of Z occurs at more than two points. Minimise and Maximise $Z = x + 2y$ subject to $x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$; $x, y \geq 0$.	(3)
31)	a) Three groups of children contain 3 girls and 1 boy, 2 girls and 2 boys and 1 girls and 3 boys. One child is selected at random from each group. Find the chance that the three children selected comprise 1 girl and 2 boys.	(3)

SECTION D

This section comprises of long answer type-questions

(5 X 4=20)

32)	Let $A = R - \{3\}, B = R - \{1\}$. If $f: A \rightarrow B$ be defined by $f(x) = \frac{x-2}{x-3} \forall x \in A$. Then, show that f is bijective. Find the value/s of 'a' for which $(a) = \frac{7}{6}$.	(5)
33)	If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ then show that $A^3 - 6A^2 + 7A + 2I = 0$. Using this equation find A^{-1} . OR Solve the following system of the equations: $3x + 2y - 2z = 3, \quad x + 2y + 3z = 6, \quad 2x - y + z = 2$	(5)
34)	Using integration, find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $\frac{x}{3} + \frac{y}{2} = 1$.	(5)

35) Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect. Also, find their point intersection (5)

Section –E

This section comprises of 3 case- study/passage based questions of 4 marks each with sub parts

36) A building contractor undertakes a job to construct 4 flats on a plot along with parking area. Due to strike the probability of many construction workers not being present for the job is 0.65. The probability that many are not present and still the work gets completed on time is 0.35. The probability that work will be completed on time when all workers are present is 0.80.

Let : E 1 : represent the event when many workers were not present for the job;

E 2 : represent the event when all workers were present; and

E : represent completing the construction work on time.

Based on the above information, answer the following questions :

i) What is the probability that all the workers are present for the job? (1)

ii) What is the probability that construction will be completed on time? (1)

iii) a) What is the probability that many workers are not present given that the construction work is completed on time? (2)

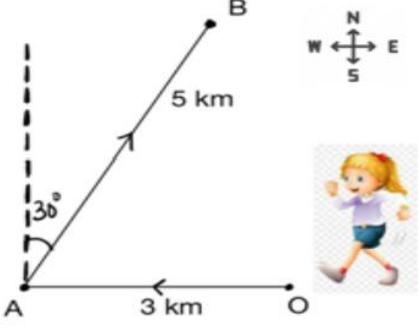
OR

b) What is the probability that all workers were present given that the construction job was completed on time ?

37) Sonam wants to prepare a sweet box for Diwali at home. For making lower part of box, she takes a square piece of cardboard of side 18 cm. Now, x cm be the length of each side of the square cardboard which is to be cut off from corner of the square piece of side 18 cm.



Based on the above information, answer the following questions :

	<p>(i) Express Volume of the open box formed by folding up the cutting corner in terms of x and find the value of x for which $\frac{dV}{dx} = 0$.</p> <p>(ii) Sonam is interested in maximising the volume of the box. So, what should be the side of the square to be cut off so that the volume of the box is maximum?</p>	<p>(2)</p> <p>(2)</p>
<p>38)</p>	<p>A girl walks 3 km towards west to reach point A and then walks 5 km in a direction 30° east of north and stops at point B. Let the girl starts from O (origin) and take \hat{i} along east and \hat{j} along north.</p>  <p>Based on the above information, answer the following questions.</p>	
	<p>a) Find the scalar components of \vec{AB}.</p> <p>b) Find the unit vector along \vec{AB}.</p> <p>c) Find the position vector of point B.</p>	<p>(1)</p> <p>(1)</p> <p>(2)</p>
