



Roll No.

--	--	--	--	--

INDIAN SCHOOL SALALAH**FIRST TERM EXAMINATION – SEPTEMBER 2026****Class: XII****MATHEMATICS (041)****Date: 20/09/2026****Duration: 3 hours****Maximum Marks: 80****General Instructions:**

- This Question Paper has 5 Sections A, B, C, D and E.
- Section A has 20 MCQs carrying 1 mark each
- Section B has 5 questions carrying 02 marks each.
- Section C has 6 questions carrying 03 marks each.
- Section D has 4 questions carrying 05 marks each.
- Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 1 and 2 marks each respectively.
- All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 3 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
- Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

NO	SECTION A	MARKS
1	Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x^3$ then (a) f is one -one and onto (b) f is many one and onto (c) f is one-one but not onto (d) f is neither one-one nor onto	1
2	If R is a relation on the set $A = \{1, 2, 3\}$ given by $R = \{(1, 1), (2, 2), (3, 3)\}$, then R is (a) Only reflexive (b) Only symmetric (c) Transitive and symmetric but not reflexive (d) Equivalence relation	1
3	The rate of change of area of a circle with respect to its radius r when $r = 6$ cm is: (a) 10π (b) 12π (c) 8π (d) 11π	1

4	The matrix $A = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is a symmetric matrix. Then the value of a and b respectively are: (a) $\frac{-2}{3}, \frac{3}{2}$ (b) $\frac{-1}{2}, \frac{1}{2}$ (c) $-2, 2$ (d) $\frac{3}{2}, \frac{1}{2}$	1
5	If matrix $\begin{bmatrix} 2 & 3 & -1 \\ x+4 & -1 & 2 \\ 3x & 2 & -1 \end{bmatrix}$ is a singular matrix, then the value of x is (a) $\frac{-3}{16}$ (b) $\frac{1}{8}$ (c) $\frac{4}{13}$ (d) $\frac{8}{10}$	1
6	Let $f(x) = x + x - 1$ then: (a) $f(x)$ is continuous at $x=0$ as well as at $x=1$ (b) $f(x)$ is continuous at $x=0$ as but not at $x=1$ (c) $f(x)$ is continuous at $x=1$ but not at $x=0$ (d) None of these	1
7	The function $f(x) = \sin x$ is strictly decreasing in: (a) $\left(\frac{\pi}{2}, \pi\right)$ (b) $(0, 2\pi)$ (c) $(0, \pi)$ (d) $\left(0, \frac{\pi}{2}\right)$	1
8	The value of the integral $\int \frac{\sin x + \cos x}{\cos x - \sin x} dx$ is (a) $\log \sin x + \cos x + c$ (b) $\log \sin x - \cos x + c$ (c) $\log \cos x - \sin x + c$ (d) $-\log \cos x - \sin x + c$	1
9	The domain of $\tan^{-1}(x)$ is (a) $[-1, 1]$ (b) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (c) R (d) $R - \{-1, 1\}$	1
10	The principal value of $\cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (a) π (b) $\frac{2\pi}{3}$ (c) $\frac{4\pi}{3}$ (d) $\frac{\pi}{3}$	1

11	If matrix $A = [a_{ij}]_{3 \times 4}$ has elements given by $a_{ij} = \frac{1}{2} - 3i + j$, then the element a_{32} is equal to (a) 0 (b) $\frac{7}{2}$ (c) $\frac{5}{2}$ (d) 4	1
12	If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then $2A$ is equal to (a) $2 A$ (b) A (c) $4 A$ (d) $8 A$	1
13	The value of k for which $f(x) = \begin{cases} kx + 1, & x \leq 5 \\ 3x - 5, & x > 5 \end{cases}$ is continuous at $x = 5$ (a) $\frac{9}{5}$ (b) $\frac{14}{5}$ (c) 2 (d) 5	1
14	The integral $\int e^x (\sec x + \sec x \tan x) dx$ is equal to: (a) $e^x \sec x + C$ (b) $e^x \tan x + C$ (c) $e^x \cos x + C$ (d) $e^x \sin x + C$	1
15	If A is a square matrix of order 3×3 such that $A = 5$, then the value of $\text{adj}A$ is (a) 5 (b) 125 (c) 25 (d) $\frac{1}{5}$	1
16	If $f(x) = x$, then at $x = 0$, the function $f(x)$ is (a) Continuous and differentiable (b) Neither continuous nor differentiable (c) Continuous but not differentiable (d) Differentiable but not continuous	1
17	The interval in which the function $f(x) = x^2 - 4x + 6$ is strictly increasing is (a) $(-\infty, 2)$ (b) $(2, \infty)$ (c) $(-\infty, \infty)$ (d) $(-2, 2)$	1

18	The anti-derivative of $(\sqrt{x} + \frac{1}{\sqrt{x}})$ equals: (a) $\left(\frac{1}{3}\right)x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + C$ (b) $\left(\frac{2}{3}\right)x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + C$ (c) $\left(\frac{3}{2}\right)x^{\frac{3}{2}} + \left(\frac{1}{2}\right)x^{\frac{1}{2}} + C$ (d) $\left(\frac{2}{3}\right)x^{\frac{3}{2}} + x^{\frac{1}{2}} + C$	1
19	Assertion (A): If A and B are symmetric matrices of same order, then $AB - BA$ is a skew-symmetric matrix. Reason (R): $(AB)' = B' A'$ for any square matrices A and B. (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.	1
20	Assertion (A): The domain of $\sin^{-1}(2x)$ is $[-1/2, 1/2]$. Reason (R): The domain of principal value branch of $\sin^{-1}(x)$ is $[-1, 1]$. (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.	1
SECTION B		
21	Find the principal value of $\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2)$.	2
22	If A is a square matrix of order 3 such that $ A = 5$, find the value of $ 3 A A^T $.	2
23	a) Check the differentiability of the function $f(x) = x - 1$ at $x = 1$. OR b) Find the value of 'k' so that the function $f(x) = \begin{cases} \frac{1 - \cos 2x}{2x^2}, & x \neq 0 \\ k, & x = 0 \end{cases} \text{ is continuous at } x = 0.$	2
24	Find the value of x and y from the matrix equation: $2 \begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$	2
25	a) Evaluate: $\int \sqrt{9 - x^2} dx$ OR	2

	b) Evaluate: $\int x \cos x \, dx$	
	SECTION C	
26	a) If $y = (\sin x)^x + \sin^{-1}(\sqrt{x})$, find $\frac{dy}{dx}$. OR b) If $x = a(\theta + \sin \theta)$ and $y = a(1 - \cos \theta)$, find $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$.	3
27	Express the matrix $A = \begin{bmatrix} 2 & -2 & 4 \\ 1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.	3
28	Find the area of the triangle whose vertices are (2, 7), (1, 1), and (10, 8) using determinants. Check whether these points are collinear.	3
29	a) Show that the relation R in the set of integers given by $R = \{(a, b) : a - b \text{ is a multiple of } 4\}$ is an equivalence relation. OR b) Check the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{x}{1+x^2}$ is one-one, onto or bijective.	3
30	a) Evaluate: $\int \frac{e^x}{\sqrt{e^{2x} + 2e^x - 3}} \, dx$ OR b) Evaluate: $\int \frac{e^{2x}(1+\sin 2x)}{(1+\cos 2x)} \, dx$	3
31	Prove that: $\tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$	3
	SECTION D	
32	If $y = e^{a \cos^{-1} x}$, $-1 \leq x \leq 1$, show that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - a^2 y = 0$.	5
33	a) Three friends Rashid, Rohit, and Robert go to a store. Rashid buys 3 notebooks, 2 pens, and 1 eraser for Rs 110. Rohit buys 2 notebooks, 1 pen, and 3 erasers for Rs 85. Robert buys 1 notebook, 2 pens, and 2 erasers for Rs 70. Find the cost of each notebook, pen and eraser. OR b) If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ find A^{-1}. Using A^{-1}, solve the system of equations: $2x - 3y + 5z = 11$, $3x + 2y - 4z = -5$, $x + y - 2z = -3$.	5

September Sales (in ₹): $A = \begin{bmatrix} 10,000 & 20,000 & 30,000 \\ 50,000 & 30,000 & 10,000 \end{bmatrix}$ Ramkishan
Gurcharan Singh

October Sales (in ₹): $B = \begin{bmatrix} 5,000 & 10,000 & 6,000 \\ 20,000 & 10,000 & 10,000 \end{bmatrix}$ Ramkishan
Gurcharan Singh



Based on the above information, answer the following questions

- Find the combined sales matrix in September and October for each farmer in each variety.
- Find the decrease in sales matrix from September to October.
- If both farmers receive 2% profit on gross sales in October, compute the profit matrix for each farmer and for each variety sold in October.

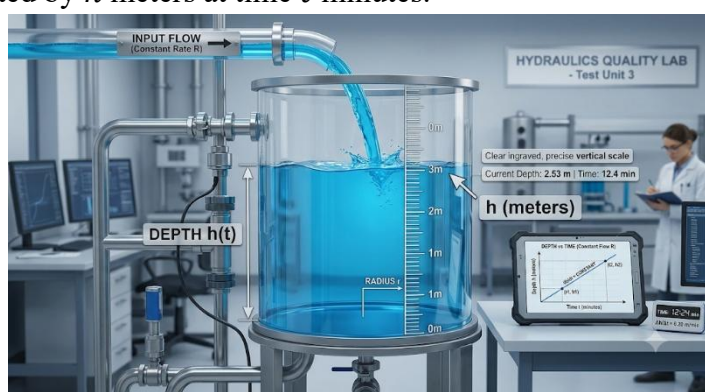
1
1
2

OR

- If farmer Ramkishan sells all his October stock at a discounted rate of 10% on gross sale value, calculate his total revenue generated from October sales.

38 Case Study.3

During a quality testing experiment, liquid is flowing into a vertical cylindrical tank of radius 2m at a constant rate of $22 \text{ m}^3/\text{min}$. The depth of the liquid in the tank is denoted by h meters at time t minutes.



	Based on the above information, answer the following questions:	
(a)	Write the formula for the volume V of the cylindrical liquid column in terms of height h .	1
(b)	Find the rate at which the depth of the liquid h is increasing. (use $\pi = \frac{22}{7}$)	1
(c)	i) If the height of the tank is 175m, find the time taken to fill the tank completely in seconds.	2
	OR	
	ii) If the radius of the tank were doubled while keeping the inflow rate same ($22\text{m}^3/\text{min}$), calculate the new rate of increase of the depth h in terms of π .	
