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INDIAN SCHOOL SALALAH

FIRST TERM EXAMINATION – SEPTEMBER 2025



Class: XI

MATHEMATICS (041)

Date: 28/09/2025

Time: 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.
- 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.

NO	SECTION A	MARKS
1	If $n(A \cup B) = 18$, $n(A - B) = 5$, $n(B - A) = 3$ then $n(A \cap B)$ is (a) 8 (b) 10 (c) 18 (d) None of these.	1
2	If $A = \{1, 2, 4\}$, $B = \{2, 4, 5\}$, $C = \{2, 5\}$ then $(A - B) \times (B - C)$ (a) $\{(1, 2), (1, 5), (2, 5)\}$ (b) $\{(1, 4)\}$ (c) $\{1, 4\}$ (d) None of these.	1
3	The value of $\tan 1^\circ \times \tan 2^\circ \times \tan 3^\circ \dots \dots \dots \tan 89^\circ$ is (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) Not defined.	1
4	The value of $i + i^{10} + i^{20} + i^{30}$ is (a) i (b) 1 (c) $-1 + i$ (d) $1 + i$	1
5	Solution set for inequality $5x - 3 < 3x + 1$, $x \in \mathbb{N}$ is (a) $(-\infty, 2)$ (b) $\{0, 1, 2\}$ (c) $\{1\}$ (d) ϕ .	1
6	How many possible two digits numbers can be formed by using the digits 3,5 and 7? (If repetition of the digit is allowed). (a) 10 (b) 9 (c) 7 (d) 8	1

7	If the 10th term of a G.P. is 9 and 4th term is 4, then what is its 7th term. (a) 6 (b) 14 (c) $\frac{27}{14}$ (d) $\frac{56}{15}$	1
8	If A and B are two given sets, then $A \cap (A \cap B)'$ is equal to (a) A (b) B' (c) ϕ (d) $A - B$.	1
9	Domain of the function $f(x) = \frac{x}{x+2}$ is (a) R (b) $R - \{2\}$ (c) $R - \{1\}$ (d) $R - \{-2\}$	1
10	Number of terms in the expansion of $\{(2x + y^3)^4\}^7$ is (a) 28 (b) 84 (c) 29 (d) 30	1
11	The modulus of $\frac{1+i}{1-i}$ (a) 1 (b) 4 (c) 2 (d) 3	1
12	Solution set for inequality $-8 \leq 5x - 3 < 7$ is (a) $(-1, 2)$ (b) $[2, 3)$ (c) $[-1, 2)$ (d) $[2, 3]$.	1
13	Find the number of words which can be formed from the letters of the word MAXIMUM. (a) $4!$ (b) $3! \times 4!$ (c) $\frac{7!}{3!}$ (d) None of these	1
14	If the arithmetic and geometric means of two numbers are 10 and 8 respectively, then one number exceeds the other number by (a) 8 (b) 10 (c) 12 (d) 16.	1
15	If $a \in \{-1, 1, 2, 3, 4, 5\}$ and $b \in \{0, 3, 6\}$ then find the number of ordered pairs (a, b) such that $a + b = 5$. (a) 3 (b) 5 (c) 6 (d) 8	1
16	If $z_1 = a + ib$ and $z_2 = c + id$ are two complex numbers, then the product $z_1 z_2$ is defined as (a) $ac + bd$ (b) $ac + i(bd)$ (c) $(ac - bd) + i(ad + bc)$ (d) none of these	1
17	Number of terms in simplification of $(x + y)^5 + (x - y)^5$ is (a) 10 (b) 4 (c) 12 (d) 3	1
18	10 students are participating in a competition. In how many different ways can the first, second, and third prizes be awarded? (There are 3 prizes). (a) 720 (b) 60 (c) 30 (d) 120	1

19	Assertion: $A = \{a, b\}$ and $B = \{a, b, c\}$ then A is a subset of B. Reason: All subsets are finite sets. (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: $\frac{\cos(\pi+x) \cdot \cos(-x)}{\sin(\pi-x) \cdot \cos\left(\frac{\pi}{2}+x\right)} = \cot^2 x$ Reason: $\cos(\pi + \theta) = -\cos \theta$ and $\cos(-\theta) = \cos \theta$. Also, $\sin(\pi - \theta) = \sin \theta$ and $\sin(-\theta) = -\sin \theta$. (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 value of $\cos 510^\circ \cos 330^\circ + \sin 390^\circ \cos 120^\circ$.	2
OR		
21	If $\sin A = \frac{3}{5}$ and $0 < A < \frac{\pi}{2}$, find $\cos A$, $\sin 2A$.	
22	In how many ways can the letters of the word "PENCIL" be arranged so that I is always next to L. OR If ${}^nC_{12} = {}^nC_{13}$ find ${}^nC_{25}$	2
23	If a, b, c, d are in G.P. then prove that, a + b, b + c, c + d are also in G.P.	2
24	Express $i^{15} + i^{100} - i^{17} + 5i^3$ in the form $(a + ib)$	2
25	Find domain and range of the function $\frac{ x-4 }{x-4}$	2
SECTION C		
26	On the Real axis, If $A = [0, 3]$ and $B = [2, 6]$ then find the following (i) A' (ii) $A \cup B$ (iii) $A \cap B$	3
27	Solve the system of inequalities: $5(2x - 7) - 3(2x + 3) \leq 0$; $2x + 19 \leq 6x + 47$	3

28	By using binomial theorem show that $9^{n+1} - 8n - 9$ is divisible by 64, $n \in \mathbb{N}$. OR Expand $(1 + x^2)^6$ using binomial theorem.	3
29	Find the sum of 'n' terms of the series : $7 + 77 + 777 + \dots$ n terms. OR The product of first three terms of a G.P. is 1000. If 6 is added to its second term and 7 is added to its third term, we get A.P. Find the G.P.	3
30	A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if a team has (i) at least 3 girls (ii) at most 3 girls	3
31	Prove that $\tan 13x = \tan 4x + \tan 9x + \tan 4x \tan 9x \tan 13x$. OR Prove $\frac{\sin(x+y) - 2\sin x + \sin(x-y)}{\cos(x+y) - 2\cos x + \cos(x-y)} = \tan x$	3
SECTION D		
32	Expand $(x + y)^6 + (x - y)^6$ using binomial theorem and hence evaluate $(\sqrt{3} + \sqrt{2})^6 + (\sqrt{3} - \sqrt{2})^6$	5
33	(a) If $\frac{(x+i)^2}{2x^2+1} = a + ib$, then prove that $\frac{(x^2+1)^2}{(2x^2+1)^2} = a^2 + b^2$ (b) If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$	5
34	How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content? OR (a) While drilling a hole in the earth, it was found that the temperature ($T^\circ\text{C}$) at x km below the surface of the earth was given by $T = 30 + 25(x - 3)$, when $3 \leq x \leq 15$. Between which depths will the temperature be between 200°C and 300°C ? (b) Solve the inequality: $\frac{x}{2} < \frac{5x-2}{3} - \frac{7x-3}{5}$	5
35	(a) If f is a real function defined by $f(x) = \frac{x-1}{x+1}$, then prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$	5

	(b) Let R be the relation on the set N of natural numbers defined by $R = \{(a, b) : a + 3b = 12, a, b \in N\}$. Find (i) R (ii) Domain of R (iii) Range of R OR (a) If $f(x) = \begin{cases} 3x - 2, & x < 0 \\ 1, & x = 0 \\ 4x + 1, & x > 0 \end{cases}$ then find $f(1), f(-1), f(0), f(2)$. (b) If $f(x) = \frac{1}{2x+1}$, $x \neq \frac{-1}{2}$ then show that $f(f(x)) = \frac{2x+1}{2x+3}$, $x \neq \frac{-3}{2}$.	
	SECTION E	
36	Case Study.1 Nitish is playing with a Pinwheel toy which he bought from a village fair. He noticed that the pinwheel toy revolves as fast as he blows it. Consider the Pinwheel toy that makes 360 revolutions per minute.  (a) Find the number of revolutions made by Pinwheel toy in 120 second. 1 (b) Find the number of revolutions made by Pinwheel toy in 1 sec. 1 (c) (i) Find the angle made by Pinwheel toy in 6 revolutions both in degrees and radians. 2 OR (c) (ii) Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4 cm (use $\pi = \frac{22}{7}$).	
37	Case Study.2 Riya and her 5 friends went for a trip to Shimla. They stayed in a hotel. There were 4 vacant rooms A, B, C and D. Out of these 4 vacant rooms, two rooms A	

and B were double share rooms and two rooms C and D can contain one person each.



Based on the given information answer the following questions.

- (a) Find the number of ways in which room A can be filled.
- (b) If room A and B are already filled, then find the number of ways in which room C can be filled.
- (c) (i) If room C and D are already filled, then find the number of ways in which room A and B can be filled.

OR

- (c) (ii) If room A is filled with 2 persons, then find the number of ways in which rooms C and D can be filled.

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1
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38 **Case Study.3**

Rahul, being a plant lover, decides to open a nursery and he bought few plants and pots. He wants to place pots in such a way that the number of pots in the first row is 2, in second row is 4 and in the third row is 8 and so on.....



- (a) Find the difference in the number of pots placed in 7th row and 5th row.
- (b) If Rahul wants to place 510 pots in total, then find the total number of rows formed in this arrangement.

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2