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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:

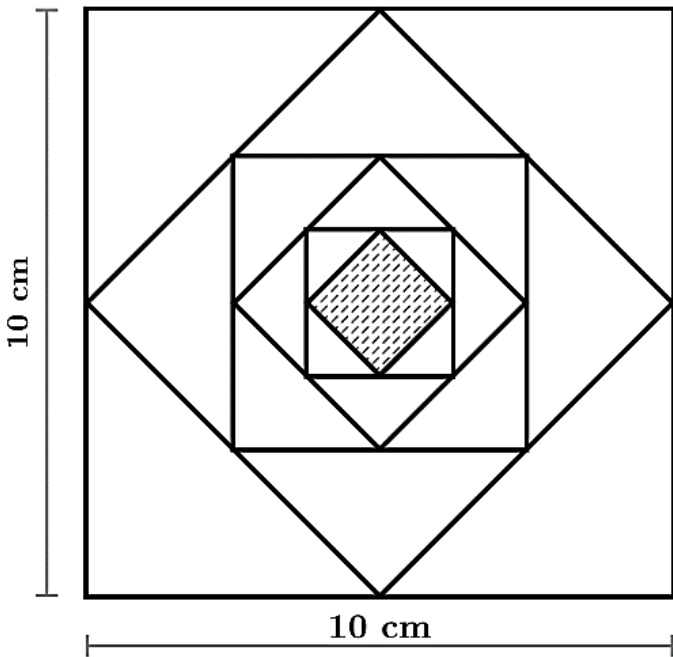
- This Question Paper has 5 Sections A, B, C, D and E.
- Section A has 20 MCQs carrying 1 mark each.
- Section B has 5 questions carrying 02 marks each.
- Section C has 6 questions carrying 03 marks each.
- Section D has 4 questions carrying 05 marks each.
- Section E has 3 case based integrated units 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 Qs of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.

NO	SECTION A	MARKS
1	Which of the following is a null set ? a) $\{0\}$ c) $\{x: x^2 = 4 \text{ or } x = 3\}$ b) $\{x: x > 0 \text{ or } x < 0\}$ d) $\{x: x^2 + 1 = 0, x \in R\}$	1
2	Domain of $\sqrt{a^2 - x^2}$, ($a > 0$) a) $(-a, a)$ b) $[-a, a]$ c) $[0, a]$ d) $(-a, 0]$	1
3	The value of $\tan^2\theta \sec^2\theta(\cot^2\theta - \cos^2\theta)$ is a) 0 b) 1 c) -1 d) $\frac{1}{2}$	1
4	Multiplicative inverse of $(-1 + \sqrt{3}i)$ is a) $-\frac{1}{4} - \frac{\sqrt{3}}{4}i$ b) $-\frac{1}{4} + \frac{\sqrt{3}}{4}i$ c) $\frac{1}{4} - \frac{\sqrt{3}}{4}i$ d) $\frac{1}{4} + \frac{\sqrt{3}}{4}i$	1
5	If $-3x + 17 < -13$, then a) $x \in (10, \infty)$ b) $x \in [10, \infty)$ c) $x \in (-\infty, 10]$ d) $x \in [-10, 10]$	1
6	10 students are participating in a competition. In how many different ways can be won the first 3 prizes? a) 30 b) 60 c) 720 d) 120	1

7	In a G.P, the 3 rd term is 24 and the 6 th term is 192, then the 10 th term is: a) 1084 b) 3290 c) 3072 d) 2340	1
8	The number of elements in $P[P(P(\emptyset))]$ is a) 2 b) 3 c) 5 d) 4	1
9	If $n(X) = 5$ and $n(Y) = 7$, then the number of relations on $X \times Y$ is 2^{5m} . The value of 'm' is a) 5 b) 7 c) 6 d) 8	1
10	The total number of terms in the expansion of $(x + a)^{51} - (x - a)^{51}$ after the simplification is a) 102 b) 25 c) 26 d) none of these	1
11	Conjugate of the complex number $i^3 - 4$ is a) $i^3 + 4$ b) $4 - i$ c) $-4 + i$ d) $-4 - i$	1
12	If $\frac{x+3}{x+5} > 1$, then a) $x \in (-3, 5)$ b) $x \in (-\infty, -5)$ c) $x \in (-5, \infty)$ d) $x \in (-5, -3)$	1
13	The number of triangles that are formed by choosing the vertices from a set of 12 points, seven of which lie on the same line is a) 105 b) 15 c) 175 d) 185	1
14	The 5th term from the end of the sequence 16, 8, 4, 2 ... 1/16 is: a) 1 b) 1/2 c) 3 d) 1/4	1
15	The range of the function f given by $f(x) = 2 - x - 5 $ is a) $(-\infty, 1]$ b) $(-\infty, 2]$ c) $(2, \infty)$ d) $(-\infty, 2)$	1
16	The value of $i^{25} + i^{75} - i^{98}$ is: a) i b) 1 c) $-i$ d) -1	1
17	Find the number of terms in the expansion of the following: $(1 + 2x + x^2)^{20}$ a) 41 b) 42 c) 43 d) 44	1
18	Total number of words formed by 2 vowels and 3 consonants taken from 4 vowels and 5 consonants is equal to a) 60 b) 120 c) 7200 d) 720	1
	For Q19 and Q20, 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 number of non-empty subsets of the set {a, b, c, d} is 15. Reason: Number of non-empty subsets of a set having n elements is $2^n - 1$.	1
20	Assertion (A): The ratio of the radii of two circles at the centres of which two equal arcs subtend angles of 30° and 70° is 21:10. Reason (R): Number of radians in an angle subtended at the centre of a circle by an arc is equal to the ratio of the length of the arc to the radius of the circle.	1
	SECTION B	
21	A wheel makes 270 revolutions in one minute. Through how many radians does it turn in one second? OR If $\alpha + \beta = \frac{\pi}{4}$, then find the value of $(1 + \tan \alpha)(1 + \tan \beta)$.	2
22	Find the number of arrangements of the letters of the word 'INDEPENDENCE' if all the vowels always occur together. OR What is the number of ways of choosing 4 cards from a pack of 52 playing cards if all the cards are of the same colour?	2
23	Which term of the G.P., 2, 8, 32, ... up to n terms is 131072?	2
24	Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$ in a+ib form.	2
25	Find the domain and range of the real function $f(x) = \sqrt{x^2 - 4}$.	2
	SECTION C	
26	If $A = \{x: x^2 - 6x + 8 = 0\}$, $B = \{2, 4\}$ and $C = \{2, 5\}$ then find the followings: a) $A \times (B \cap C)$ b) $(A - B) \times C$ c) $(A \times B) \cap (A \times C)$	3
27	Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.	3
28	By using binomial theorem find $(98)^5$. OR Using binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.	3
29	The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms. OR	3

	If A and G be A.M. and G.M., respectively between two positive numbers, prove that the numbers are $A \pm \sqrt{A^2 - G^2}$.	
30	Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that (i) all consonants occur together (ii) all vowels do not occur together.	3
31	If $\tan \alpha = \frac{m}{m+1}$ and $\tan \beta = \frac{1}{2m+1}$, then find the value of $\alpha + \beta$. OR Prove that $\frac{\sin 8x \cos x - \sin 6x \cos 3x}{\cos 2x \cos x - \sin 4x \sin 3x} = \tan 2x$	3
	SECTION D	
32	Find the value of $(a^2 + \sqrt{a^2 - 1})^4 + (a^2 - \sqrt{a^2 - 1})^4$.	5
33	a) If $\frac{(1+i)^2}{2-i} = x + iy$, then find the value of $x + y$. b) If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = x + iy$, then find (x, y) .	5
34	A solution of 10% boric acid is to be diluted by adding a 4% boric acid solution to it. The resulting mixture is to be more than 6% but less than 8% boric acid. If we have 840 litres of the 10% solution, how many litres of the 4% solution will have to be added? OR a) Solve: $5(2x - 7) - 3(2x + 3) \leq 0$; $2x + 19 \leq 6x + 47$. Also represent the solution graphically on number line. b) In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$, where C and F represent temperature in degree Celsius and degree Fahrenheit, respectively?	5
35	a) If $U = \{1,2,3,4,5,6,7,8,9\}$, $A = \{x : x \in W, x < 2\}$, $B = \{x : x \in N, 1 < x < 5\}$ and $C = \{3, 5\}$. Then find (i) $A - (B' \cap C)$ (ii) $[A \cap (B - C')]'$ b) Relation R is defined on the set Z of integers as follows: $\{(x, y) \in R \Leftrightarrow x^2 + y^2 = 25\}$ Find i) R ii) Domain of R iii) Range of R OR	5

	a) Determine the domain and range of the function $f(x) = \frac{1}{\sqrt{x-6}}$ b) If $U = \{1,2,3,4,5,6,7,8,9,10\}$, $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$ and $C = \{5, 6, 7, 8\}$. Then show that $A \cap (B' \cup C') = A \cap (B \cap C)'$	
	SECTION E	
36	Case Study.1 A student of class XI draws a square of side 10 cm. Another student joins the mid-point of this square to form new square. Again, the mid-points of the sides of this new square are joined to form another square by another student. This process is continued indefinitely.  Based on above information, answer the following questions. a) Find the side of the second square. b) Find the area of the 4th square. c) (i) Find the sum of areas of first 5 squares formed. OR c) (ii) Find the difference of areas of 5th square and 8th square.	1 1 2
37	Case Study.2 Raj works at a bookstore. While arranging books on a bookshelf, he observed that there are 5 different History books, 3 different Mathematics books, and 4 different Science books to be arranged.	



Based on the given information answer the flowing questions.

- In how many ways can he select either a History book or a Maths book?
- If he selects 1 History books, 1 Maths book and 1 Science book to arrange them, then find the number of ways in which selection can be made.
- (i) In how many ways the arrangement can be done, if the books of same subject are put together.

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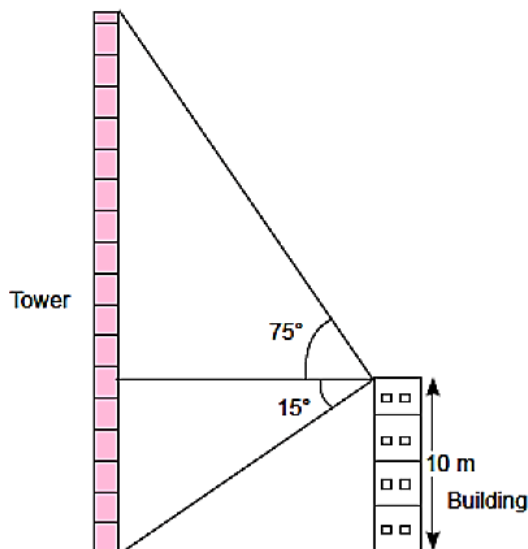
OR

- (ii) Find the number of arrangements, if he selects 3 History books, 2 Maths Books and 1 Science books.

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Case Study.3

From the top of a tower of 10 m high building the angle of elevation of top of a tower is 75° and the angle of depression of foot of the tower is 15° . If the tower and building are on the same horizontal surfaces.



- Find the value of $\tan 15^\circ$.
- Find the value of $\cos 75^\circ$.

2

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