



INDIAN SCHOOL SALALAH

FIRST TERM EXAMINATION – SEPTEMBER 2026



Roll No.

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Class: XI

MATHEMATICS (041)

Date: 14-09-2026

Time: 3 hours

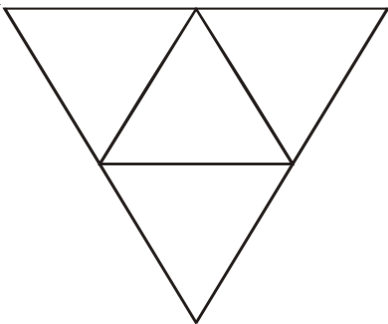
Maximum Marks: 80

General Instructions:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) with only one correct option and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.
9. Use of calculator is not allowed.

NO	SECTION A	MARKS
1	The number of non-empty subsets of a set, containing n elements, is (a) n (b) n^2 (c) 2^n (d) $2^n - 1$	1
2	The smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is (a) $\{3, 5, 9\}$ (b) $\{1, 2, 3, 5, 9\}$ (c) $\{1, 2, 5, 9\}$ (d) $\{5, 9\}$	1
3	Let $A = \{x: x \in \mathbb{R}, x > 4\}$ and $B = \{x: x \in \mathbb{R}, x < 5\}$. Then $A \cap B =$ (a) $(4, 5]$ (b) $(4, 5)$ (c) $[4, 5)$ (d) $[4, 5]$	1
4	Let R be a relation on $\mathbb{N}$ defined by $R = \{(x, y): x + 2y = 8, x, y \in \mathbb{N}\}$. Then domain of R is (a) $\{2, 4, 8\}$ (b) $\{2, 4, 6, 8\}$ (c) $\{2, 4, 6\}$ (d) $\{1, 2, 3, 4\}$	1
5	If $f(x) = ax + b$, where a and b are integers, such that $f(-1) = -5$ and $f(3) = 3$, then a and b are equal to (a) $-3, -1$ (b) $2, -3$ (c) $0, 2$ (d) $2, 3$	1

6	The value of $\tan 75^\circ - \cot 75^\circ$ is (a) $2\sqrt{3}$ (b) 4 (c) 1 (d) 0	1
7	The radius of the circle whose arc of length 15π cm makes an angle of $3\pi/4$ radians at the centre is (a) 10 cm (b) 20 cm (c) $11\frac{1}{4}$ cm (d) $22\frac{1}{2}$ cm	1
8	The nth term of a GP is 128 and the sum of its n terms is 255. If its common ratio is 2, then its first term (a) 1 (b) 3 (c) 8 (d) 5	1
9	The value of i^{2026} is (a) $-i$ (b) i (c) -1 (d) 1	1
10	If $z = \frac{1+7i}{(2-i)^2}$, then $ z $ equals (a) $\frac{1}{2}$ (b) 2 (c) $1/\sqrt{2}$ (d) $\sqrt{2}$	1
11	If $\left(\frac{1-i}{1+i}\right)^{100} = a + ib$ then $a^2 + b^2$ is (a) 0 (b) 4 (c) 16 (d) 1	1
12	Solve: $5x - 3 < 3x + 1$ when x is an integer. (a) $\{..., -1, 0, 1\}$ (b) $\{..., -1, 0, 1, 2\}$ (c) $\{1, 2, 3, ...\}$ (d) $\{0, 1\}$	1
13	If $ x + 2 \leq 9$, then (a) $x \in (-7, 11)$ (b) $x \in [-11, 7]$ (c) $x \in (-\infty, -7) \cup (11, \infty)$ (d) $x \in (-\infty, -7) \cup [11, \infty)$	1
14	The number of word from the letter of the word 'BHARAT' in which B and H will never come together is (a) 360 (b) 240 (c) 120 (d) 320	1
15	What is the value of the expression ${}^{10}C_4 + {}^{10}C_3$? (a) ${}^{20}C_7$ (b) ${}^{11}C_4$ (c) ${}^{10}C_7$ (d) ${}^{11}C_7$	1
16	How many distinct four-digit numbers can be formed using the digits 0, 2, 3 and 5 exactly once (without repetition)? (a) 18 (b) 24 (c) 4^4 (d) 25	1
17	The total number of terms in expansion of $(x + a)^{51} - (x - a)^{51}$ after simplification is (a) 102 (b) 26 (c) 25 (d) 52	1
18	In the expansion of $(1 + x)^n$ coefficient of third term in increasing order of x is (a) ${}^nC_2$ (b) ${}^nC_1$ (c) ${}^nC_3$ (d) ${}^nC_n$	1

	ASSERTION-REASON BASED QUESTIONS (Question numbers 19 and 20 are Assertion-Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.) (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 (A) : Value of $\sin(-270^\circ)$ is 1. Reason(R) : $\sin(180^\circ + \theta) = -\sin\theta$	1
20	Assertion (A): The value of k for which $\frac{3}{4}, k, \frac{4}{3}$ are in G.P. is 1 only. Reason (R): If x, y, z are in G.P., then $y^2 = xz$	1
	SECTION B	
21	a) Write the set $A = \{x \in \mathbb{R}: x^2 - 5x + 6 = 0\}$ in roster form and find its power set $P(A)$. (OR) b) Write the following sets in the roster form. (i) $A = \{x: x \text{ is a positive integer less than } 10 \text{ and } 2^x - 1 \text{ is an odd number}\}$ (ii) $C = \{x: x^2 + 7x - 8 = 0, x \in \mathbb{R}\}$	2
22	Prove that: $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$.	2
23	If $x + iy = \frac{a+ib}{a-ib}$, prove that $x^2 + y^2 = 1$.	2
24	a) In how many ways can this diagram be coloured subject to the following two conditions? (i) Each of the smaller triangle is to be painted with one of three colours: red, blue or green. (ii) No two adjacent regions have the same colour. 	2

	(OR)	
	b) In how many ways can 5 children be arranged in a line such that (i) two particular children of them are always together (ii) two particular children of them are never together.	
25	A person has 2 parents, 4 grandparents, 8 great grandparents and so on. Find the number of his ancestors during the 10 generations preceding his own.	2
	SECTION C	
26	Given the sets $A = \{1,2,3,4\}$, $B = \{3,4,5\}$, and $C = \{4,5,6\}$, verify the following set identities: (i) $A - (B \cup C) = (A - B) \cap (A - C)$ (ii) $A - (B \cap C) = (A - B) \cup (A - C)$	3
27	Let $A = \{1, 2, 3, \dots, 14\}$. Define a relation R from A to A by $R = \{(x, y): 3x - y = 0; \text{ where } x, y \in A\}$. Write the relation R in roster form. Also write its domain and range.	3
28	a) If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$ (OR) b) Find the multiplicative inverse of $\frac{(i+1)(i+2)}{(i-1)(i-2)}$.	3
29	Draw the graphical solution of the following system of inequalities: $\frac{4x}{3} - \frac{9}{4} < x + \frac{3}{4}, \quad \frac{7x-1}{3} - \frac{7x+2}{6} > x$. (OR) Two farmers, Jack and Oliver, are harvesting baskets of oranges from their groves. They each harvest an even number of baskets, and Oliver collects exactly 2 more baskets than Jack. To meet their market target, both farmers collect more than 10 baskets. Together, the total number of baskets they collect is more than 30, but less than 44. How many baskets of oranges could Jack and Oliver each have collected?	3
30	Determine n if ${}^{2n}C_3 : {}^nC_3 = 12:1$	3
31	Using binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25. (OR) Using binomial theorem, evaluate $(98)^4$	3

	SECTION D	
32	If $\tan x = \frac{3}{4}$ and $\pi < x < \frac{3\pi}{2}$, find the values of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$. (OR) Prove that $\sin 5A = 5 \sin A - 20 \sin^3 A + 16 \sin^5 A$.	5
33	A chemist has 400 litres of a 15% acid solution. How many litres of a 45% acid solution must be added to it so that the acid content in the resulting mixture will be more than 20% but less than 25%?	5
34	Find $(a + b)^6 - (a - b)^6$. Hence, evaluate: $(\sqrt{5} + \sqrt{3})^6 - (\sqrt{5} - \sqrt{3})^6$.	5
35	Let S be the sum, P the product and R the sum of reciprocal of n terms in a G.P. Prove that $P^2 R^n = S^n$. (OR) The sum of three numbers in G.P. is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an arithmetic progression. Find the numbers.	5
	SECTION E	
36	Case Study:1 The Airport Baggage Tracking System At a major international airport, thousands of checked bags pass through an automated conveyor sorting system every hour. • Domain (Set A): The set of unique 10-digit luggage tags attached to suitcases at check-in counters. • Codomain (Set B): The specific aircraft cargo hold destination where the baggage is routed. 	

	To avoid lost luggage disasters, this automated sorting system works strictly as a function: every scanned luggage tag must map to one and only one specific cargo container. If a single luggage tag mapped to two different flights, or if a tagged suitcase had no designated route, the airport's sorting system would break down completely. Based on the above informations answer the following questions: (i) Find the domain of the real function defined by $f(x) = \sqrt{x-1}$. (ii) Let $f, g: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = x + 1$ and $g(x) = 2x - 1$. Find $(f - g)(x)$. (iii) (a) Let $f = \{(1,5), (2,8), (0,2), (-1, -1)\}$ be a linear function from $\mathbb{Z}$ into $\mathbb{Z}$. Find $f(x)$. (OR) (iii) (b) Let $A = \{110, 121, 143, 144, 145\}$ and let $f: A \rightarrow \mathbb{N}$ be defined by $f(n) =$ the highest prime factor of n. Find the domain and range of f.	1 1 2
37	Case Study: 2 The Ferris Wheel Motion Tracking System An amusement park operates a giant Ferris wheel of radius $r = 14$ m. During a safety tracking check, the following parameters were recorded:  • Wheel Radius: $r = 14$ m • Rotation Angle: $\theta = 135^\circ$ • Main Cabin Angle (x): Located in Quadrant III with $\cos x = -\frac{3}{5}$. • Secondary Cabin Angle (y): Located in Quadrant I with $\sin y = \frac{5}{13}$ and $\cos y = \frac{12}{13}$.	

	(i) Convert $\theta = 135^\circ$ into radians and find the arc length l. (ii) Find the values of $\sin x$ and $\tan x$ for angle x in Quadrant III. (iii) (a) Calculate the value of $\cos(x + y)$. (OR) (iii) (b) Calculate the value of $\sin 2x$.	1 1 2
38	Case Study.3 The School Science Exhibition Delegation A Class 11 science teacher has to select 5 students for a school science exhibition. There are: • 5 Physics students • 6 Chemistry students • 5 students have to be selected. The order of selecting students does not matter, so we use combinations.  (i) Find the number of ways to select 5 students such that there is at least one Physics student and at least one Chemistry student. (ii) Find the number of ways to select 5 students such that there are at least 3 Physics students.	2 2
