



MAHARISHI VIDYA MANDIR GROUP OF SCHOOLS
I UNIT TEST
MATHEMATICS-41/SET I

STD: XI
 DATE: 16/07/25
 ROLL.NO: _____

MAX.MARKS:40
 TIME: 1½ HRS

General Instructions:

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains 19 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 8 are multiple choice questions (MCQs) and Questions no. 9 and 10 are Assertion - Reason based questions of 1 mark each.
4. In Section B, Questions no. 11 to 13 are Very Short Answer (VSA) - type questions, carrying 2 marks each.
5. In Section C, Questions no. 14 and 15 are Short Answer(SA)- type questions, each carries 3 marks.
6. In Section D, Questions no. 16 and 17 are Long Answer(LA)- type questions, each carries 5 marks.
7. In Section E, Questions no. 18 and 19 are case study-based questions carrying 4 marks each.

There is no overall choice. However, an internal choice has been provided in 1 question in Section B, 1 question in Section C, 1 question in Section D and one sub-part in 1 question of Section E.

Q.No	Section-A (10 X 1m = 10m)	Marks
1.	If A and B are two sets, then $A \cap (A \cup B)$ equals a) B b) ϕ c) A d) $A \cap B$	[1]
2.	If $A \cap B = B$ then a) $A = \phi$ b) $B \subseteq A$ c) $B \neq \phi$ d) $B = \phi$	[1]
3.	Which of the following is a null set? a) $A = \{x : x > 1 \text{ and } x < 3\}$ b) $B = \{x : x + 3 = 3\}$ c) $D = \{0\}$ d) $C = \phi$	[1]
4.	If $A = \{1, 3, 5, B\}$ and $B = \{2, 4\}$, then a) $\{4\} \subset A$ b) $4 \in A$ c) None of these d) $B \subset A$	[1]
5.	The range of the function $f(x) = \cos\left(\frac{\pi}{2}\right)$ is a) $[-1, 1]$ b) $[3, -3]$ c) $[-3, 3]$ d) $\left[-\frac{1}{3}, \frac{1}{3}\right]$	[1]
6.	The domain of the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \sqrt{x^2 - 4}$ is a) $[-2, 2]$ b) $(-\infty, -2] \cup [2, \infty)$ c) $(-\infty, \infty)$ d) $(-2, 2)$	[1]
7.	If f is a real valued function given by $f(x) = 27x^3 + \frac{1}{x^3}$ and α, β are roots of $3x + \frac{1}{x} = 2$. Then, a) $f(\beta) = 10$ b) $f(\alpha) \neq f(\beta)$ c) $f(\beta) = -10$ d) $f(\alpha) = 10$	[1]
8.	Let $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, then which of the following is a function from A to B? a) $\{(1,3), (2,2), (3,3)\}$ b) $\{(1,2), (2,3), (3,2), (3,4)\}$ c) $\{(1,3), (1,4)\}$ d) $\{(1,2), (1,3), (2,3), (3,3)\}$	[1]
	Q9 and Q10 are Assertion(A) and Reason(R) based questions. Mark the correct choice as: (a) Both A and R are true and R is the correct explanation for A (b) Both A and R are true and R is not the correct explanation for A (c) A is True but R is False (d) A is False but R is True	

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9.	Assertion (A): The relation R on the set $A = \{1, 2, 3, 4, 5, 6\}$ is given by $R = \{(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3), (3, 4), (4, 3), (4, 4), (5, 5), (6, 6)\}$ Reason (R): The relation R is defined on $A = \{1, 2, 3, 4, 5, 6\}$ as $\{(a, b) : a^2 - b^2 < 9\}$	[1]
10.	Assertion (A): Let $R = \{(a, a^3) : a \text{ is a prime number less than } 9\}$, then the range of $R = \{8, 27, 125, 343\}$. Reason (R): Here, $R = \{(1, 1), (2, 8), (3, 27), (4, 64), (5, 125), (6, 216), (7, 343), (8, 512)\}$.	[1]
SECTION - B (3 X 2m = 6m)		
11.	Write down all possible subsets of $A = \{1, (2, 3)\}$ (OR) Let A, B, and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that $B = C$.	[2]
12.	Let $A = \{a, b, c, d\}$, $B = \{a, b, c\}$ and $C = \{b, d\}$. Find all sets X such that: $X \subset C$ and $X \subset B$	[2]
13.	Find the range of the function $f(x) = \frac{x}{1+x^2}, x \in \mathbb{R}$	[2]
Section-C (2 X 3m = 6m)		
14.	If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 24\}$ $A = \{x : x \text{ is prime and } x \leq 10\}$ $B = \{x : x \text{ is a factor of } 24\}$ Verify the following result. (i) $A - B = A \cap B'$ (ii) $(A \cup B)' = A' \cap B'$	[3]
15.	Let $A = \{1, 2\}$ and $B = \{2, 4, 6\}$. Let $f = \{(x, y) : x \in A, y \in B \text{ and } y > 2x + 1\}$. Write f as a set of ordered pairs. Show that f is a relation but not a function from A to B. (OR) Let R be a relation from Q to Q defined by $R = \{(a, b) : a, b \in \mathbb{Q} \text{ and } a - b \in \mathbb{Z}\}$. Show that (i) $(a, a) \in R$ for all $a \in \mathbb{Q}$ (ii) $(a, b) \in R$ implies that $(b, a) \in R$ (iii) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$	[3]
Section-D (2 X 5m = 10m)		
16.	If $A = \{a, d\}$, $B = \{b, c, e\}$ and $C = \{b, c, f\}$, then verify that (i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$ (ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$ (OR) Prove by Venn diagram: $A - (B \cap C) = (A - B) \cup (A - C)$	[5]
17.	Define the greatest integer function. Find its domain, range. Also draw the graph of the greatest integer function. (OR) Define the signum function. Find its domain, range. Also draw the graph of the signum function.	[5]

Section-E (2 X 4m = 8m)
(CASE BASED PROBLEMS)

18.	Read the following text carefully and answer the questions that follow: A class teacher Mamta Sharma of class XI write three sets A, B and C are such that $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8\}$ and $C = \{2, 3, 5, 7, 11\}$. (a) Write the intersection of two sets A and C? (b) Write the condition for two sets A and B to be disjoint? (c) Find $(A \times B) \cap (B \times C)$. (OR) Find $(A \cap B) \times (B \cap C)$	[1] [1] [2]
19.	Read the following text carefully and answer the questions that follow: Ordered Pairs The ordered pair of two elements a and b is denoted by (a, b): a is first element (or first component) and b is second element (or second component). Two ordered pairs are equal if their corresponding elements are equal. i.e. $(a, b) = (c, d) \Rightarrow a = c$ and $b = d$ Cartesian Product of Two Sets For two non empty sets A and B, the cartesian product $A \times B$ is the set of all ordered pairs of elements from sets A to B. In symbolic form, it can be written as $A \times B = \{(a, b) : a \in A, b \in B\}$ (a) Let A and B be two sets such that <u>$A \times B$ consists of 6 elements</u>. If three elements of $A \times B$ are $(1, 4)$, $(2, 6)$ and $(3, 6)$, then find $A \times B$ and $B \times A$. (b) If $(x + 2, 4) = (5, 2x + y)$, then find the value of x and y. (c) If $(x + 6, y - 2) = (0, 6)$, then find the value of x and y. OR If $(a - 3, b + 7) = (3, 7)$, then find the value of a and b.	[1] [1] [2]

*****ALL THE BEST*****