ULTIMATE MATHEMATICS

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CHAPTER: SETS

(·) Symbol = { }

(·) denoted by A, B, C, ...

(·) eg A = { 2, -3, 0, a, b } → elements

(·) OR A = { -3, 0, 2, b, a }

(·) has no of elements = 5

(·) n(A) = 5
↓
no of elements

(·) Cardinal number of a set = no of elements in that set

(·) A = { 2, 3, 4 } n(A) = 3

A = { 2, 3, 2, 3, 3, 4 } n(A) = 3

(·) ∈ belongs to

eg A = { 2, 3, 4 }

2 ∈ A

5 ∉ A

(·) : such that

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(·) Fixed Sets

(1) $N \rightarrow$ Set of all natural numbers

$N = \{1, 2, 3, \ldots\}$

(2) $Z \rightarrow$ Set of all integers

$Z = \{\ldots -2, -1, 0, 1, 2, 3, \ldots\}$

(3) $R \rightarrow$ Set of all Real numbers

(4) $Q \rightarrow$ Set of Rational numbers

(5) $Z^+ \rightarrow$ Set of all positive Integers.

(6) $R^+ \rightarrow$ Set of all +ve real numbers

(·) Different forms of sets :-

(1) Roster form
(2) Set-builder form

Ex 1 $A = \{2, 4, 6, 8, 10\}$ Roster

$A = \{x : x = 2n, n \in N, n < 6\}$ (Set builder)

or $A = \{x : x$ is an even natural number less than $11\}$

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eg 2 $A = \{2, 4, 8, 16, 32, 64, 128\}$

$A = \{x : x = 2^n ; n \in N, n \leq 7\}$

eg 3 $A = \{1, 4, 9, 16, 25, \ldots\ldots 100\}$

$A = \{x : x = n^2 ; n \in N ; n \leq 10\}$

eg 4 $A = \left\{\frac{1}{2}, \frac{2}{5}, \frac{3}{10}, \frac{4}{17}, \ldots \frac{100}{101}\right\}$

$A = \left\{x : x = \frac{n}{n^2+1} ; n \in N ; n \leq 10\right\}$

Types of sets

(1) Empty Set / void Set / Null Set

ϕ = phi

$\phi = \{\ \}$

eg $A = \{x : x < 2 \text{ and } x > 5\}$

$A = \phi$

(2) Equal Sets

$A = \{2, 3, 4\}$ $n(A) = 3$

$B = \{3, 2, 4\}$ $n(B) = 3$

$A = B$

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(3) Equivalent sets

$A = \{2, 3, 4\}$ $\quad n(A) = 3$

$B = \{2, 9, C\}$ $\quad n(B) = 3$

(4) Finite Set

(5) Infinite Set

(6) **Subsets**

$A = \{1, 2, 3\}$

Subsets $\{1\}, \{2\}, \{3\}, \{1,2\}, \{2,3\}, \{1,3\}, \{1,2,3\}, \phi$

$\phi \rightarrow$ is always a subset of any set.

- demand $\subset$

eg $A = \{1, 2, 3\}$

$B = \{1, 2, 3, 4, 5\}$

$A \subset B \quad ; \quad B \not\subset A$

(.) No of Subsets $= 2^n$

$n \rightarrow$ No of elements in the given set

eg $A = \{2, 3, 5, 6\}$

no of subsets $= 2^4 = 16$

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$A = \{1, 3, 4, 5\}$

no of Subsets $= 2^4 = 16$

Subsets $\{2\}, \{3\}, \{4\}, \{5\}, \{2,3\}, \{2,4\}, \{2,5\}, \{3,4\}, \{3,5\}, \{4,5\}, \{2,3,4\}, \{2,4,5\}, \{3,4,5\}, \{2,3,4,5\}, \{2,3,5\}, \phi$

(·) Power Set → Set of all Subsets denoted by $P(A)$

eg $A = \{1, 2\}$

Subsets $= 2^2 = 4$

$P(A) = \{\{1\}, \{2\}, \{1,2\}, \phi\}$

eg $A = \{1, 2\}$

$1 \in A$ ✓

$3 \in A$ ✗

$\{1\} \subset A$ ✓

$1 \subset A$ ✗

$\phi \subset A$ ✓

$\phi \in A$ ✗

$\{1\} \in A$ ✗

$\{1\} \in P(A)$

IMP

$1 \in A$

$\{1\} \subset A$

$\{1\} \in P(A)$

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Q No: 1 → Which of the following are null sets

(1) $A = \{x : x \in N, x < 2 \text{ and } x > 9\}$

(2) $A = \{x : x$ is a point common to two parallel lines$\}$

(3) $A = \{$set of even prime numbers$\}$

(4) $A = \{x : x \in N, x^2 + 5x + 6 = 0\}$

(5) $A = \{x : x \in N, x^2 - 25 = 0\}$

Q No 2 → Convert in to set builder form

(1) $A = \{5, 25, 125, 625\}$

(2) $A = \{3, 6, 9, 12, \dots\}$

(3) $A = \{-3, -2, -1, 0, 1, 2, 3\}$

(4) $A = \{-1, 1\}$

(5) $A = \{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}\}$

(6) $A = \{4, 9, 16, 25, \dots 81\}$

(7) $A = \{\frac{1}{2}, \frac{2}{9}, \frac{3}{28}, \frac{4}{65}, \frac{5}{126}, \frac{6}{217}\}$

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(8) $A = \{$ set of all letters of the word TRIGONOMETRY $\}$

(9) $A = \{1, 3, 5, 7, 9, 11, \ldots\}$

(10) $A = \{1, 2, 3, 6, 9, 18\}$

Ques 3 → Convert in to Roster form

(1) $A = \{x : x \in N \; ; \; -\frac{1}{2} < x < \frac{9}{2}\}$

(2) $A = \{x : x \in Z \; ; \; -4 < x \leq 6\}$

(3) $A = \{x : x \in Z \; , \; x^2 \leq 4\}$

(4) $A = \{x : x$ is a month of a year not having 31 days$\}$

(5) $A = \{x : x = \frac{n+1}{2n+3} \; ; \; n \in N, \; n < 4\}$

(6) $A = \{x : x$ is a two digit number such that sum of digits is 8$\}$

(7) $A = \{x : x$ is a prime number divisor of 60$\}$

(8) $A = \{x : x \in R \; ; \; x^2 + 25 = 0\}$

(9) $A = \{x : x \in Z \; ; \; |x| = 5\}$

(10) $A = \{x : x = 0\}$

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Q.N. 4 → State true of False

Given $A = \{1, 2, \{3,4\}, 4\}$

(1) $1 \subset A$

(2) $2 \in A$

(3) $\{4\} \subset A$

(4) $\{3\} \subset A$

(5) $\{3\} \in A$

(6) $\phi \in A$

(7) $\phi \subset A$

(8) $\{2,3\} \subset A$

(9) $3 \in A$

(10) $\{1\} \in A$