e-Class notes

Subject Name: Mathematic IInd
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Topic: Set Theory

By

Dr. RITESH AGRWAL
Department of Computer Application
UIET, CSJM University, Kanpur

Set Theory

Definition. A well defined collection or class of objects is called a set. Every object, included in the set, is called an element of the set. By the well defined collection of objects we mean that "if A is a set and 'a' is any element then either 'a' is an element of A (denoted by $a \in A$) definitely or 'a' is not an element of A (denoted by $a \notin A$) definitely

Examples

(i) $A = \{a, b, c, d\}$ is a set consisting of four element a, b, c and d

(ii) N = the set of natural numbers = $\{1, 2, 3, 4.....\}$

Representation of set

Tabular form or Roster form. In this form, all the elements of the set are listed within braces {} and separated by commas

Ex. A = Set of all factors of 12

{1, 2, 3, 4, 6, 12}

MATHEMATICS

C= {M, A, T, H, E, I, C, S}

Set Builder Form

In this form, we list the property satisfied by all the elements of the set

It is written as $\{x : x \, satisfied \, the \, property\}$

Example. The set $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ in set-builder form is described as

$A = \{x : x \in N \text{ and } x < 9\}$

Different types of Sets

Null set or Void set. The set which contains no elements at all is called the empty set or null set or void set. The empty set is denoted by {} or ϕ.

Singleton set. The set which contains only one element is called singleton set

Examples (i) $A = \{x : x \in N \text{ and } 7 < x < 9\}$ *or* {8}

(ii) $A = \{x : x + 5 = 8\}$ *or* {3}

Finite set. The set which contains finite number of elements is called a finite set.

Examples (i) $A = \{x : x \in N \text{ and } 1 < x < 7\}$ *or* {2, 3, 4, 5, 6}

(ii) $A = \{a, e, i, o, u\}$

Infinite set A set which is not finite is called an infinite set e.g. N, I, Q, R, C etc.

Subset Let A and B be two sets. If every element of A is also an element of B, then A is called a subset of B and it is denoted by the symbol $A \subseteq B$ and is read as 'A subset B'

$A \subseteq B \Rightarrow \{x \in A \Rightarrow x \in B\}$

Examples If $A = \{2, 4, 6\}$, $B = \{2, 4, 6, 8\}$ than $A \subseteq B$ since every element of A is also element of B.

Order (or Cardinal Number) of a set – Let A be a finite set. The number of distinct element in the set A is called the order (or Cardinal number) or cardinality of A and is denoted by O (A) or n (A) or by |A|.

Example1. If A = {a, e, 1, 2, 5, 7}, then n(A) = 6.

2. If |A| = n then the set A has n distinct elements.

Equal set – Two sets A and B are called equal if

(i) Every element of A is also an element of B. i.e. $A \subseteq B$

and (ii) Every element of B is also an element of A i.e. $B \subseteq A$.

This fact is denoted by 'A = B'

Power Set Let A be a set. The set of all subsets of A is called the power set of A. It is denoted by the symbol P (A).

P(A) = Power set of A = Set of all subsets of A

Example If A = {a, b, c}, find P (A)

Solution P (A) = {ϕ, {a}, {b}, {c}, {a, b},{a, c}, {b, c},{a, b, c}}