20/1/2023

Types of Sets

1) Null Set:

⇒ A set having no element is called a null set or an empty set or void set.

⇒ It is denoted by $\{\}$ or Greek ϕ

Eg: (i) The set of all woman Presidents in India till 2006. That is $\{\}$

(ii) Set of all persons who's height is greater than 20 feet.

$A = \{x \mid x \in N$ (belongs to), x is a perfect square such that and $25 < x < 35\}$ That is $\{\}$

Note :- A Null Set is a finate.

2) Singleton Set

A Set having only one element is called a singleton set.

Eg: (i) A set of all rules of the equation $x - 3 = 0$

i.e. $x = 3$

(ii) $A = \{2\}$

(iii) $A = \{x / x$ is a straight line passing given points)

3) Subset $\boxed{\overset{S}{\underset{A \subseteq S}{DA}}}$

The set A is called a subset of the S if every element of A is also an element of S. Thus, A is a subset of S

ii) $A \subseteq S$

We say that A is contained in S.

Sometimes this relationship is return as $S \supseteq A$ and we say that S is a Superset of A or S contains A

Eg: (i) A set of students of Commerce Department is a subset of the set of all Students in a College.

$A = \{x / x$ is a student in C.P.A$\}$

$B = \{x / x$ is a Commerce student in C.P.A.C$\}$

$B \subseteq A$ ($\because B = A$)

(ii) $A = \{1, 2, 3, 4\}$; $B = \{5, 8, 1, 4, 6, 2, 7, 3\}$

then, $A \subseteq B$

4) Properties of Subset.

i) The empty is a subset of every set.

ii) Every set is a subset of itself.

ii) $A \subseteq A$

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

iii) $A \subseteq B$ and $B \subseteq C \Rightarrow A \subseteq C$

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

$C = \{1, 2, 3, 4, 5, 6\}$.

Eg: (i) When $A = \{2, 7, 9, 15\}$

$B = \{20, 17, 2, 9, 5, 1\}$ and

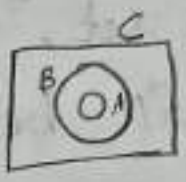
$C = \{30, 19, 1, 15, 22, 17, 9, 20, 2, 7\}$

Whether $A \subseteq C$?

Soln:

Gn: $A = \{2, 7, 9, 15\}$

$B = \{20, 17, 2, 9, 5, 1\}$



$\therefore A \subseteq B \longrightarrow (1)$

Given $B = \{20, 17, 2, 9, 5, 1\}$

$C = \{30, 19, 1, 15, 22, 17, 9, 20, 2, 7\}$

$\therefore B \subseteq C \longrightarrow (2)$

Comparing equ (1) & (2) we get,

$\Rightarrow A \subseteq B$ and $B \subseteq C \Rightarrow A \subseteq C$

$\therefore A \subseteq C$ is Correct.

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Remark:

An element x of a Set A cannot be a Subset of A but singleton set $\{x\}$ is a Subset of A.

i.e) $x \notin A$ but $\{x\} \subseteq A$.

Number of Subsets of a Set:

If there are n elements in a Set, there will be 2^n Subsets for the sets.

For eg:- If there are two elements in a set, the total number of Subsets will be

i.e) $2^n - 2^2 = 4$

Put $n = 3$

i.e) $2^n = 2^3 = 8$

Write down the Subsets of the sets $\{5, 6, 7,\}$

Soln:-

The subsets of the sets $A = \{5, 6, 7\}$ are:

$\{5, 6, 7\}$, $\{5, 6\}$, $\{5, 7\}$, $\{6, 7\}$, $\{5\}$, $\{6\}$, $\{7\}$, $\emptyset$

Definition: Power Set

Power

The set of all Distinct subset of a set is called a power set.

It is denoted by $P(A)$ Read as Row

Power set of A $P(A) = \{\{5,6,7\}, \{5,6\}, \{5,7\}, \{6,7\}, \{5\}, \{6\}, \{7\}, \phi\}$.

Proper Subsets: C

A set S is called a Proper Subset of B. If S is a subset of B and B has atleast one element which is not in S. It is denoted by $S \subset B$

Ex:1 $S = \{1,2,3,5\}$

$B = \{1,2,3,5,9\}$

Here $S \subset B$

Because the element 9 is not in S.

Ex:2

If $A = \{3,5,7\}$ and $B = \{x/2x=10\}$.

Which of the following is true?

a) $B \subset A$ b) $A = B$ c) $A \subset B$.

Soln: Gn:- $A = \{3,5,7\}$

$B = \{x/2x=10\}$ $= 2x = 10$

$\therefore x = 10/2 = 5 = \{5\}$

$\Rightarrow B \subset A$

Definition : Equality of Sets.

Two Sets A and B are said to be equal if $A \subseteq B$ and $B \subseteq A$

ie) Thus $A = B$ implies that both have same members.

Ex : 1

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

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

$\therefore \Rightarrow A = B$

Ex : 2

$A = \{3, 4\}$. $B = \{4, 3\}$ and

$C = \{x / x \text{ is an integer } 2 < x < 5\} = \{3, 4\}$

$\therefore A = B = C$

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Finite and Infinite Sets

(i) Finite Sets :-

A Set is said to be finite, if it has a finite number of elements.

Eg: 1) The set of students in a class is a finite set.

2) $A = \{4, 7, 9, 15, 22, 34\}$ is a finite set, for. A has 6 elements.

3) $A = \{x / x$ is an even positive integer $= 100\}$, is a finite set, is 50 elements.

Infinite Set:

A Set which is not finite set is called an infinite Set. Here, the numbers of elements of a Set cannot be definitely known.

Ex: 1) $A = \{1, 2, 3 \ldots\}$ ie) the set of all natural numbers.

$\therefore$ A is an Infinite Set.

2) $A = \{$The set all human want$\}$

$\therefore$ A is an Infinite Set.

3) $X = \{2, 4, 6, 8, 10\}$

4) $Y = \{2, 4, 6, 8, 10, \ldots\}$

5) State whether the following sets are finite, Infinite or empty.

i) $X = \{1, 2, 3 \ldots 500\}$

ii) $A = \{2^n / n$ is a positive integer$\}$ and

iii) $Y = \{y / y = a^2, a$ is an integer$\}$.

Since, there are only 500 elements in x set.

Therefore, x is finite set.

ii) $A = \{2^n / n \text{ is a positive integer}\}$

$= \{2^1, 2^2, 2^3, 2^4, \ldots\}$

$= \{2, 4, 8, 16, \ldots\}$

$\therefore$ A is an Infinite Set.

iii) $Y = \{y / y = a^2, a \text{ is an integer}\}$

$= \{0^2, 1^2, 2^2, 3^2, \ldots\}$

$= \{0, 1, 4, 9, 16, \ldots\}$

$\therefore$ Y is a Infinite Set.

Definition: Universal Set

The Set, which Contains all the sets under Consideration as Subsets is is called an Universal Set. It is actually denoted by U or X.

Eg: If we Considered the Set of Commerce Students, the Set of Maths Students and the Set of Economic Students in the college, then Universal set is the set of all students in the College.