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Sets

A set is a well defined collection of object or thing.

ex- $A = \{a, e, i, o, u\}$ set of vowels.

→ elements are written in curly bracket separated by comma

→ Sets are denoted by capital letters like A, B, X, Y, ...

Representation of Set :-

1) Roster Form or Tabular Method :-

In this form all the elements of set are listed, the elements being separated by commas and enclosed with curly bracket.

eg. $A = \{1, 2, 3, 4, 5\}$

2) Set builder Form :-

In this method elements of set are not listed but these are represented by some common property.

$A = \{x : 1 \leq x \leq 5 ; x \in N\}$

Types of Set :-

1) Empty Set :- A set having no elements is called empty set. It is denoted by ϕ or { }

also known as Null set

2) Singleton Set :- A set having only one element is called singleton set.

Finite Set :- A set having finite no. of element.

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

no. of elements = 5

Null set is a subset of every set.
Every set is a subset of itself.

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Infinite Set: A set having infinite no. of elements.

ex. A set of natural no.

$A = \{1, 2, 3, 4, 5, 6, \ldots\}$

Subset: A set A is called subset of set B if for all $x \in A \Rightarrow x \in B$.

It is expressed as $A \subseteq B$

ex. $B = \{a, e, i, o, u\}$

$A = \{a, i, u\}$, then $A \subseteq B$

Power Set: Family of all subsets of A is called power set of A.

ex. $A = \{a, b\}$

$P(A) = \{\phi, \{a\}, \{b\}, \{a, b\}\}$

$\Rightarrow n[P(A)] = 2^n$, where n = no. of elements.

Proper Subset: If $A \subseteq B$ but $A \neq B$ then $A \subset B$ i.e. there is at least one element in B not in A.

Equal Sets: Two sets A and B are said to be equal if the no. of elements in A & B are same and corresponding elements are also same.

ex. $A = \{a, b, c\}$, $B = \{b, c, a\}$

Equivalent Sets: Two sets A and B are said to be equivalent if the no. of elements in A & B is same.

ex. $A = \{a, b, c, d\}$, $B = \{1, 2, 3, 4\}$

no. of elements = 4 no. of elements = 4.

Universal Set → A set contain all the elements under consideration in a given problem. It is denoted by U. U = {Months of the year}
A = {March, April}

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Cardinality of Set :-

The no. of elements in the set is called cardinality of set.
It is denoted by $|A|$ or $n(A)$.

ex- $A = \{2, 4, 6, 8\}$, $B = \{2, 4, 8, 16\}$
$|A| = 4$ or $n(A) = 4$ $n(B) = 4$ or $|B| = 4$

Operation on Sets :-

1) Union of Sets :- If A and B are two sets then
$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$

ex. $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$
$A \cup B = \{1, 2, 3, 4, 5, 6\}$

2) Intersection of Sets :- If A and B are two sets then
$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$

ex- $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$
$A \cap B = \{3, 4\}$

3) Complement of a Set → If U is universal set and A be any subset of U. then
$A^C = \{x \mid x \in U \text{ \& } x \notin A\}$

ex- $U = \{1, 2, 3, 4, 5, 6\}$
$A = \{2, 4, 6\}$
then $A^C = \{1, 3, 5\}$

4) Difference of Sets :- If A & B are two sets then
$A - B = \{x \mid x \in A \text{ and } x \notin B\}$

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

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Ordered Set :- The ordered set is defined as ordered collection of distinct objects.

ex {Sun, Mon, Tue, Wed, Thu, Fri, Sat}

Cartesian Product of two sets

Let A & B are two sets then

$A \times B = \{(x,y) \mid x \in A, y \in B\}$

ex: Let $A = \{1,2\}$, $B = \{3,4\}$

then $A \times B = \{(1,3),(1,4),(2,3),(2,4)\}$

Ex= If $A = \{1,4\}$, $B = \{4,5\}$, $C = \{5,7\}$
then determine $(A\times B) \cap (A\times C)$

Soln

Ex= Let A, B, C, D be any ~~three~~ four sets then prove that $(A\cap B)\times(C\cap D) = (A\times C)\cap(B\times D)$

Soln

Ordered Pair :- An ordered pair of objects is a pair of objects arranged in some order. There in the set $\{a,b\}$ a is first member & b is second.

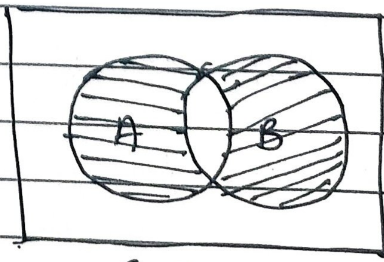
Ex- If A & B are any two sets then prove that
$A \cap (B-A) = \phi$

Symmetric Difference :- The symmetric difference of A & B denoted by $A \oplus B$ consists of those elements which belong to A or B but not to both, that is,

$A \oplus B = (A\cup B) - (A\cap B)$

also

$A \oplus B = (A-B) \cup (B-A)$



$A \oplus B$