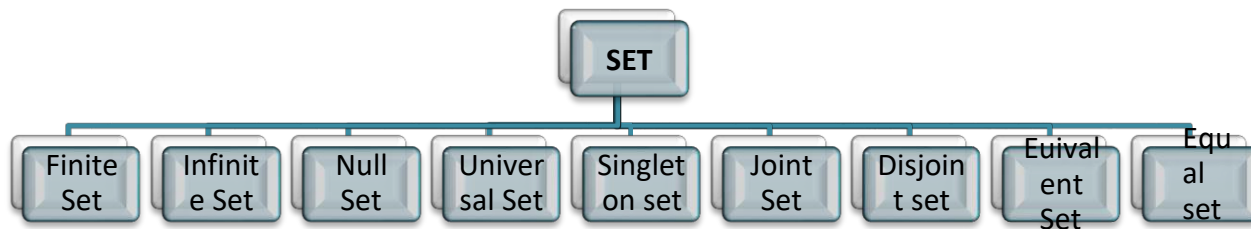


SETS

“A set is a collection of well defined objects”.



- (i) • The objects used to form a set are called elements or members of set.
- (ii) • If an element belongs to set A, we write as $x \in A$. and it does not belong to set A, we write as $x \notin A$
- (iii) • Representation of data
 - **a) Roster method** Ex: $A = \{a, e, i, o, u\}$
 - **b) Rule method** Ex: $A = \{x/x \text{ is set of vowels in English alphabet}\}$
- (iv) • The number of elements in a set is called its "**cardinal number**"

- ❖ A set with finite number of elements is called "**finite set**".
- ❖ A set with infinite number of elements is called "**infinite set**".
- ❖ A set which has only one element is called "**singleton or unit set**".
- ❖ A set which has no elements is called "**null or empty set**".
 - Denoted as $\{ \}$ or $\emptyset$
 - **Cardinal number of empty set is 0.**
 - The set $\{ 0 \}$ is not empty set because it contains element zero.
- ❖ Two sets are said to be "**joint or overlapping sets**" if they have at least one element in common.
- ❖ Two sets are said to be "**disjoint sets**" if they have no element in common.
- ❖ Two sets are said to be "**equivalent sets**" if they have contain same number of elements
- ❖ Two sets are said to be "**equal sets**" if both sets have same (identical) elements.

PROPERTIES ON SETS

- (i) Commutative Property
 - a) Union of sets....
 $A \cup B = B \cup A$
 - b) Intersection of sets....
 $A \cap B = B \cap A$
- (ii) Associative Property
 - a) Union of sets....
 $(A \cup B) \cup C = A \cup (B \cup C)$
 - b) Intersection of sets....
 $(A \cap B) \cap C = A \cap (B \cap C)$
- (iii) Distributive Property
 - a) Union of sets over intersection....
 $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
 - b) Intersection of sets over union of sets
 $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

DeMorgan's Law:

Let A and B be two sets, then

- (i) The complement of union of sets is equal to the intersection of their complement **$(A \cup B)' = A' \cap B'$**
- (ii) The complement of intersection of sets is equal to the union of their complement **$(A \cap B)' = A' \cup B'$**

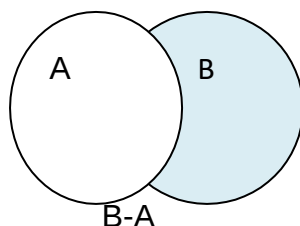
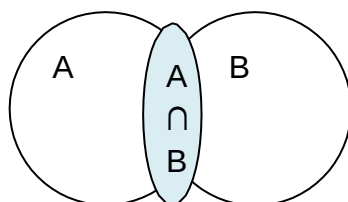
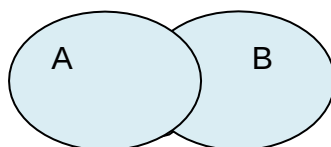
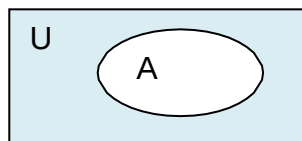
SETS

$(A^c \text{ or } A')$ Complement of set A is a set of elements of Universal set which are not in A . $U=\{1,2,3,4\}$
 $A=\{2,4\}$ **$A^c \text{ or } A'=U-A=\{1,3\}$**

(U) Union of sets: A and B gives the set of elements that belong to both sets. $U=\{1,2,3,4\}$ $A=\{1,3\}$ $B=\{2\}$
 $A \cup B=\{1,3\} \cup \{2\} = \{1,2,3\}$

$(\cap)$ Intersection of sets: A and B gives the set of elements that belong to both sets. $U=\{1,2,3,4\}$ $A=\{1,3\}$ $B=\{2\}$
 $A \cup B=\{1,3\} \cap \{2\} = \{1,2,3\}$

$(\setminus \text{ or } -)$ Difference of sets: A and B are given set $A=\{1\}$ $B=\{1,2,3\}$
 $B-A=B \setminus A=\{1,2,3\} - \{1\} = \{2,3\}$



- If all elements of set A belong to set B, the set **A is called subset of B**.
- If elements in set A belong to set B but not equal to set B, then set A is called **“proper subset”**.
- If A is subset of set B, then set B is called **“super set”**
- **Universal set** is the set that contains all the elements of its subsets, denoted as U

Cardinality properties of Sets

$$\begin{aligned} n(A \cup B) &= n(A) + n(B) - n(A \cap B) \\ n(A \cap B) &= n(A) + n(B) - n(A \cup B) \\ n(A \cup B) &= n(A \setminus B) + n(B \setminus A) - n(A \cap B) \\ n(A \setminus B) &= n(A) - n(A \cap B) \\ n(A \setminus B) &= n(A \cup B) - n(B) \end{aligned}$$

If A and B are disjoint sets then

$$\begin{aligned} n(A \cap B) &= 0, \text{ then } (A \cup B) = n(A) + n(B) \\ n(A \cup B) &= n(A \setminus B) + n(B \setminus A) \\ n(A \setminus B) &= n(A) \\ n(A \setminus B) &= n(B) \\ n(A') &= n(U) - n(A) \\ n(B') &= n(U) - n(B) \\ n(A \cup B)' &= n(U) - n(A \cup B) \\ n(A \cap B)' &= n(U) - n(A \cap B) \end{aligned}$$