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Basic operation of Sets

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List of topics
- ☑ Cardinality
- ☑ Subset/ Superset
- ☑ Union/ intersection / Complement

➢ Cardinality and empty set

Cardinality:

A set **A** is finite if it contains a finite number of elements

So, the number of elements in the set is called **cardinality**, written |A|.

If **A** contains infinitely many elements, it said to be an **infinite set.**

Examples.

Let A = {a, b, α, γ, 2},

then |A| = 5.

Empty set: (Φ)

A set **A** is empty set if it contains no element.

Example: $A = \{\} = \phi \Rightarrow |A| = 0$

➢ Subset and Super Set:

If A and B are sets such that every element of A is also an element of B, then we say that A is a subset of B and B is the Superset of A. Also if A is not equal to B then A is proper subset of B

write A ⊆ B

Examples.

(i) $\mathbb{N}$ is subset of $\mathbb{Z}$

$\mathbb{N} \subseteq \mathbb{Z}$

(ii) $\mathbb{Q}$ is subset of $\mathbb{R}$

$\mathbb{Q} \subseteq \mathbb{R}$

(iii) If $A = \{a, b, c\}$ and $B = \{a, b, c, d, e, f, g\}$

$A \subseteq B$

A is subset of B

(iv) If $A = \{1, 2, 3\}$ and $B = \{1, 2\}$, $C = \{1, 2, 3\}$

then $B \subseteq A$ and $C \subseteq A$

$A \subseteq B$

(A is subset of B and B is superset of A)

then $B \subseteq A$ and $C \subseteq A$

B = proper subset of

C = subset of A

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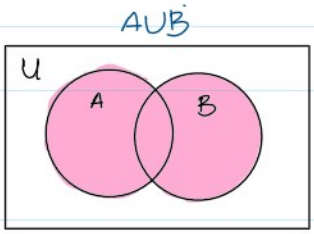
➢ Union, Intersection and Complements:

1. *Union*: $(\cup)$

The union of A and B is the set

$A \cup B = \{x \in U : x \in A \text{ or } x \in B\}$.

Where U= universal set



Example.

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

then

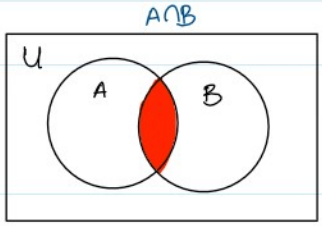
$A \cup B = \{1, 2, 3, 4\}$

2. *Intersection*: $(\cap)$

The intersection of A and B is the set

$A \cup B = \{x \in U : x \in A \text{ and } x \in B\}$.

Where U= universal set



Example.

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

then $A \cap B = \{3\}$

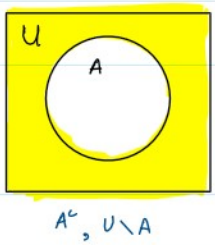
3. *Complement of a set*:

The Complement of A

$A^c = \{x \in U : x \notin A\}$.

Where U= universal set

This can also be written $U \setminus A$, $U - A$, A', or $\overline{A}$.



Example.

If $U = \{0, 1, 2, \ldots 50\}$

and $A = \{2, 3, \ldots 50\}$

then $A^c = U \setminus A = \{0, 1\}$

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