Index set -

Let there be a non-empty set 'T' such that to each $t \in T$, there correspond a set A_t. Then T is called index set and suffix '$t \in T$' of A_t is called an index.

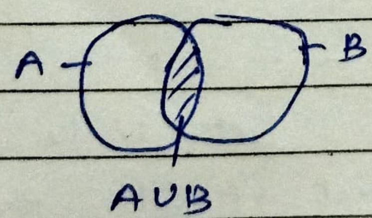
$A_1, A_2, A_3, ---, A_n, ---$ $\boxed{A_i, i \in N}$

union of sets -

The union of two sets A and B is a set whose elements are the elements of A or the elements of B or of both.

This set is denoted by $A \cup B$ which is read as "A union B".

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



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Ex -

Let $A = \{1,2,3,4\}$, $B = \{4,5\}$ then $A \cup B$ is

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

Properties -

$\forall$ (For all) A, B, C we have -

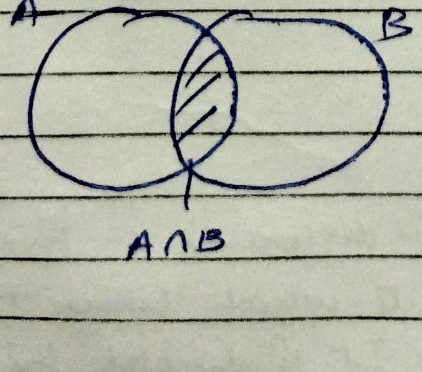
1) $A \cup \phi = A$
2) $A \cup A = A$ → Idempotent law
3) $A \cup B = B \cup A$ → Commutative law
4) $A \subseteq A \cup B$, $B \subseteq A \cup B$
5) $A \cup (B \cup C) = (A \cup B) \cup C$ → Associative law

Intersection of sets -

The intersection of sets A and B is the set of elements which are common to A and B. i.e. the set of those elements which belongs to A and which also belongs to B. It is denoted by $A \cap B$.

Thus,

$A \cap B = \{x : x \in A \text{ and } x \in B\}$



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Ex -

$A = \{1, 2, 3\}$ and $B = \{2, 3, 5, 6\}$

then, $A \cap B = \{2, 3\}$

Properties -

$\forall (A, B, C)$ we have -

I) $A \cap \phi = \phi$

II) $A \cap A = A$ → Idempotent law

III) $A \cap B = B \cap A$ → Commutative law

IV) $A \cap (B \cap C) = (A \cap B) \cap C$ → Associative law

V) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ → $\cap$ is distributive over $\cup$

VI) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ → $\cup$ is distributive over $\cap$.

Disjoints sets -

Two sets A and B are said to be disjoint if there is no element common in A and B.

Ex -

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

then $A \cap B = \phi$

i.e. A and B are disjoints sets.

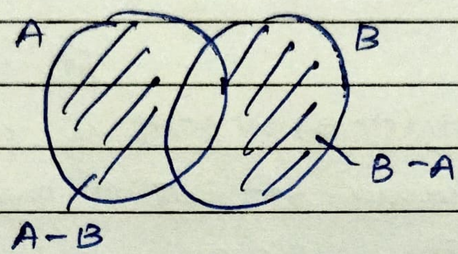
Difference of sets -

The difference of two sets A and B is the set of elements which belongs to A but which do not belong to B. It is denoted by $A - B$.

Note : $A - B \neq B - A$

$A - B = \{x : x \in A, x \notin B\}$

$B - A = \{x : x \in B, x \notin A\}$



Ex -

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

then $A - B = \{1, 4\}$ and $B - A = \{5\}$

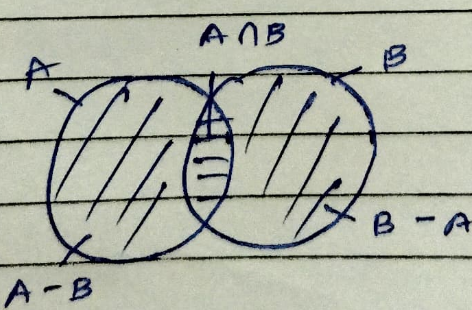
Properties -

$\forall A, B, C$, we have -

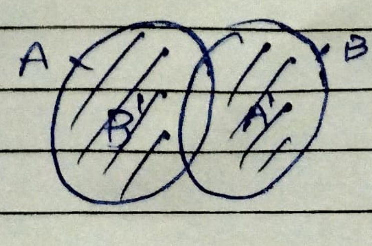
i) $A - \phi = A$, $\phi - A = A$

ii) $A - B \subset A$, $B - A \subset B$

iii) $A - B$, $A \cap B$ and $B - A$ are mutually disjoint sets



iv) $A - B = A \cap B' = B' - A'$



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v) $A-(B-C) \neq (A-B)-C$

vi) $A-(B \cup C) = (A-B) \cup (A-C)$

$A-(B \cap C) = (A-B) \cap (A-C)$