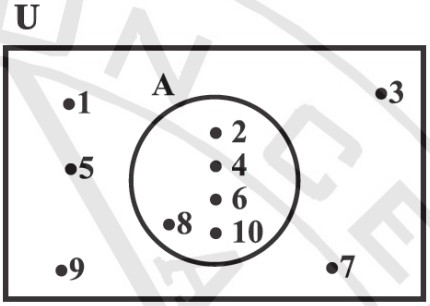
Class XI Mathematics – Notes
Chapter 1 - Sets

Venn Diagrams

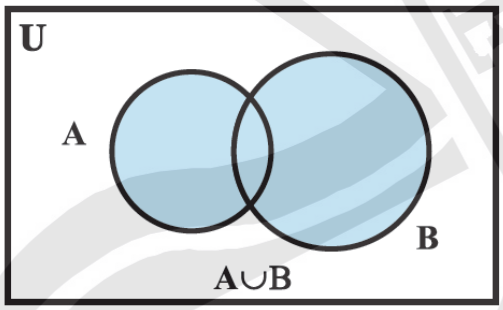
Most of the relationships between sets can be represented by means of diagrams which are known as *Venn diagrams,* named after the English logician, John Venn (1834-1883).



These diagrams consist of rectangles and closed curves usually circles. The universal set is represented u sually by a rectangle and its subsets by circles

Union of sets

For two sets A and B, the union of A and B is the set which consists of all the elements of A and all the elements of B, the common elements being taken only once. The symbol '$\cup$' is used to denote the *union*. *Symbolically, we write* A $\cup$ B *and usually read as 'A union B'*.



- The union of two sets A and B is the set C which consists of all those elements which are either in A or in B (including those which are in both). In symbols, we write

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

Consider the following example

Let A = { *a, e, i, o, u* } and B = { *a, i, u* }. Show that A $\cup$ B = A

We have, A $\cup$ B = { *a, e, i, o, u* } = A.

This example illustrates that union of sets A and its subset B is the set A itself, i.e., if B $\subset$ A, then A $\cup$ B = A.

Some Properties of the Operation of Union

i) A $\cup$ B = B $\cup$ A (Commutative law)

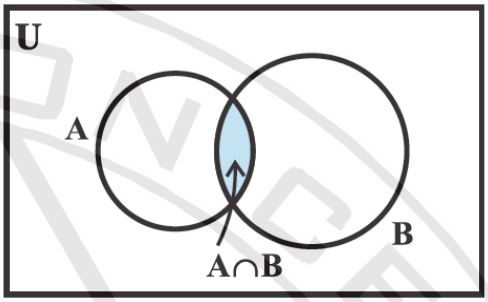
ii) (A $\cup$ B) $\cup$ C = A $\cup$ (B $\cup$ C) (Associative law)

iii) $A \cup \phi = A$ (Law of identity element, ϕ is the identity of $\cup$)

iv) $A \cup A = A$ (Idempotent law)

v) $U \cup A = U$ (Law of U)

Intersection of sets



The intersection of sets A and B is the set of all elements which are common to both A and B. The symbol '$\cap$' is used to denote the *intersection*.

The intersection of two sets A and B is the set of all those elements which belong to both A and B. Symbolically, we write

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

If A and B are two sets such that $A \cap B = \phi$ then A and B are called **disjoint sets**.

Some Properties of Operation of Intersection

i) $A \cap B = B \cap A$ (Commutative law).

ii) $(A \cap B) \cap C = A \cap (B \cap C)$ (Associative law).

iii) $\phi \cap A = \phi$, $U \cap A = A$ (Law of ϕ and U).

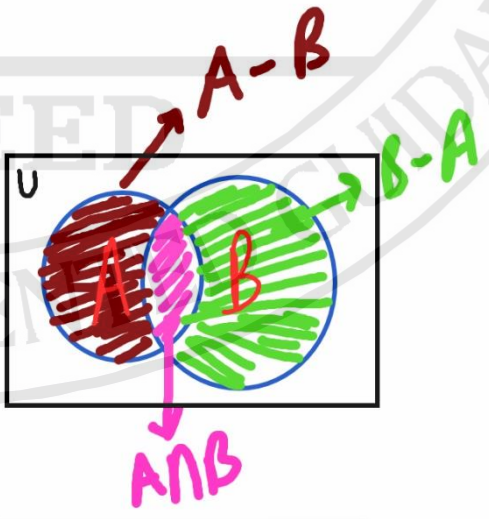
iv) $A \cap A = A$ (Idempotent law)

v) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (Distributive law) i. e., $\cap$ distributes over $\cup$

Difference of sets The difference of the sets A and B in this order is the set of elements which belong to A but not to B. Symbolically, we write A – B and read as " A minus B".

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

The sets A – B, $A \cap B$ and B – A are mutually disjoint sets, i.e., the intersection of any of these two sets is the null set as shown in the Venn diagram



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