2. Universal set, empty set:

Def: the number of all sets under investigation usually belong to some fixed large set called "Universal set". we will let the symbol (U) denoted (Universal set).

Def: the set with no element is called "empty set" or null set and denoted by $\emptyset$.

$\{x: 3x = 2, x \text{ is an integer}\}\ \emptyset.$

$\{\ x: x^2 + 1 = 0\ , x \text{ is real}\}\ \emptyset.$

3. Subset

Def: if every element in a sat A is also an element in a set B, then A is called subset of B.

We also say that A contained in B or B contains A, this relationship is written $A \subset B \quad or\ B \supset A$.

If A is not subset of B (at least one element of A does not belong to B we write $A \not\subset B \quad or\ B \not\supset A$.

Ex: Concede the set A= {1,3,5,7,9}, B= {1,2,3,5}, C= {1,5} then $C \subset A$, $C \subset B$ but $B \not\subset A$.

Def: where $A \subset B$ but $A \neq B$ we say A is proper subset of B.

Ex: if A= {1,3}, B= {1,2,3}, C= {1,3,2} then A and B are subset of C. but A proper subset of C. whereas B is not proper subset of C.

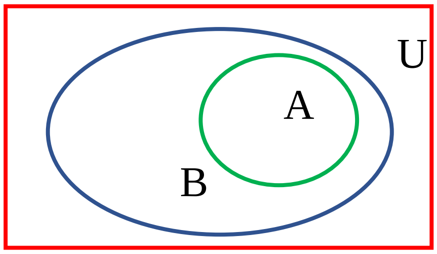
Theorem:

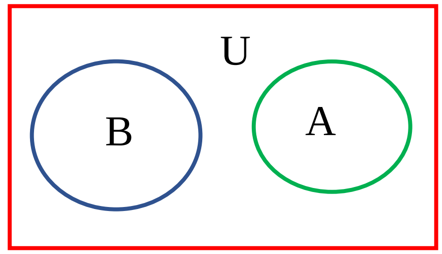
- For every set, we have $\emptyset \subset A \subset U$.
- For every set, we have A is a subset of A.
- If $A \subset B$ and $B \subset C$ then $A \subset C$.
- $A = B$ if and only if $A \subset B$ and $B \subset A$.

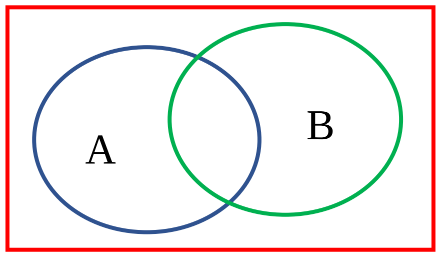
Ex: if A= {1,3}, B= {1,2,3}, C= {1,3,2} then A and B are subset of C whereas B is not proper subset of C.

4. Veen Diagram

a veen diagram is a pictorial representation of sets by set of points in a plan.







5. Set operator

1. The union of two sets A and B denoted by $(A \cup B)$ is the set of all elements which belong to A or belong to B

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

2. The intersection of two sets A and B denoted by $(A \cap B)$ is the set of elements which belong to both A and

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

- If $A \cap B = \emptyset$ then we say A and B are disjoint

3. The relative complement of a set B with respect to A or simply the difference of A and B denoted by $(A \setminus B)$ is the set of elements which belong to A but which do not belong to B.

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

4. The complement of a set A denoted by A^c is the set of elements which belong to U but which do not belong to A.

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

Ex:

Let A= {1,2,3,4}, B= {3,4,5,6}, where U= {1,2, 3,…}

Then

$A \cap B = \{3,4\}$

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

$A \setminus B = \{1,2\}$

$A^c = \{5,6,7, \dots\}$

$B \setminus A = \{5,6\}$

$(A \setminus B)^c \cap (B \setminus A)$= {5,6}

$(A \setminus B)^c \setminus (B \cap A)^c$= ???