Mathematics: Relations Functions Sets: Venn Diagram, Different of Sets and Complement of a Set

Venn Diagram

- British mathematician John Venn $(1834 - 1883\ AD)$ introduced the concept of diagrams to represent sets. According to him universal set is represented by the interior of a rectangle and other sets are represented by interior of circles.
- Diagrammatical representation of sets is known as a Venn diagram.

Example:

If $U = \{1, 2, 3, 4, 5\}$, $A = \{2, 4\}$ and $B = \{1, 3\}$, then these sets can be represented as the Venn diagram.

Solution:

Difference of Sets

Consider the sets

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

A new set having those elements which are in A but not in B is said to be the difference of sets A and B and it is denoted by $A - B$. $\therefore A - B = \{1, 3, 5\}$

Similarly, a set of those elements which are in B but not in A is said to be the difference of B and A and it is devoted by $B - A$. $\therefore B - A = \{6\}$

In general, if A and B are two sets then

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

Difference of two sets can be represented using Venn diagram as:

Complement of a Set

Let X denote the universal set and Y, Z its subsets where

$X = \{x : x$ is any member of a family

$Y = \{x : x$ is a male member of the family

$Z = \{x : x$ is a female member of the family

- $X - Y$ is a set having female members of the family.
- $X - Z$ is a set having male members of the family.
- $X - Y$ is said to be the complement of Y and is usally denoted by Y' or Y^c .
- $X - Z$ is said to be complement of Z and denoted by Z' or Z^c .

Example:

Let U be the universal set and A its subset where

$$U = \{x : x \in N and x \leqslant 10\}$$

$$A = \{y : y is a prime\ \text{number less than}10\}$$

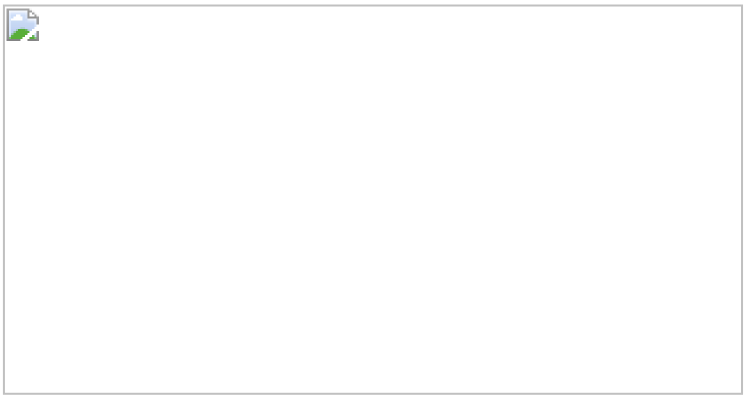
Find (i) A^c (ii) Represent A^c in Venn diagram.

Solution:

It is given

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. and $A = \{2, 3, 5, 7\}$

i. $A^c = U - A = \{1, 4, 6, 8, 9, 10\}$



Note:

- Difference of two sets can be found even if none is a subset of the other but complement of a set can be found only when the set is a subset of some universal set.

- $\psi^{C} = U$
- $U^{C} = \psi$