Basic concepts of Set Theory

Set theory is the branch of mathematics that studies sets, which are collections of objects. Although any type of objects can be collected into a set, set theory is applied most often to objects that are relevant to mathematics.

Georg Cantor
(1845-1918)

- The theory of sets was developed by German mathematician ***Georg Cantor*** (1845-1918).
- He first encountered sets while working on "problems on trigonometric series".
- *Studying sets helps us categorize information. It allows us to make sense of a large amount of information by breaking it down into smaller groups.*

DEFINING A SET

A **set** is a collection of well defined entities, objects or elements.

OR

A **set** is a group of one or more elements with common characteristics.

OR

A **set** is a collection of distinct, unordered objects. Sets are typically collection of numbers. So, a set may contain any type of data (including other sets).

DESCRIBING A SET

A set is described by listing elements, separated by commas, within brackets.

For example:

A set of vowels of English Alphabet may be described as:

{a, e, i, o, u}

A set of even natural numbers can be described as:

{2, 4, 6, 8,...}

Note: The order in which the elements are written makes no difference. Also, repetition of an element has no effect. For example {1, 2, 3, 2} is the same set as {1, 2, 3}.

Set size

- Called *cardinality*
- Number of elements in set
- Denoted |A| is the size of set A
- If A = {2,3,5,7,8}, then |A| = 5

Empty set

- Set with no elements
- { } or Ø.

FINITE AND INFINITE SETS

Finite set: A set is called a finite set, if its elements can be counted and the process of counting terminates at a certain natural number say, 'n'.

Example: {1, 2, 3, 4, 5} , {1, 2, 3, 4,.....up to 100}

Infinite Set: A set which is not finite or in other words, a set in which the process of counting does not terminate is an infinite set.

Example: Set of natural numbers,

or {2, 4, 6, 8, 10,..... } set of even numbers

or {1, 3, 5, 7, 9,.....} set of odd numbers

EQUAL SETS

Two sets A and B are said to be equal, if every element of A is a member of B, and every element of B is a member of A. If sets A and B are equal, we write $A = B$.

Similarly, Unequal sets: When they are not equal or there exists at least one distinct element between these two sets.

We write: $A \neq B$, when A and B are not equal.

Let $A = \{1, 2, 5, 6\}$ and $B = \{5, 6, 2, 1\}$. Then $A = B$ because each element of A is an element of B and vice – versa.