

# ARTS, SCIENCE AND COMMERCE COLLEGE, KOLHAR

## Mathematics Paper-I (Algebra)

### Chapter 1: Sets, Relations and Functions

Topic : Sets & Subsets

Miss Tambe S.S.

# Sets

- Definition of set :

A set is a collection of objects known as elements or members. Elements of a set can be any well defined object, such as numbers , lines , alphabets or even sets.

Usually, capital letters are used to label sets, and small letters are use to label elements in a set. Let  $A$  be a set and  $x$  an object. Then ,we write  $x \in A$  (read as  $x$  belong to  $A$  or  $x$  is in  $A$  ) if  $x$  is an element of  $A$  .If  $x$  is not an element of  $A$  , then we write  $x \notin A$  (read as  $x$  dose not belong to  $A$  ).

**Note :**

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- Some standard notations to represent sets:

$\mathbb{N}$ : the set of natural numbers

$\mathbb{R}$ : the set of real numbers

$\mathbb{Z}$  : the set of integers

$\mathbb{W}$ : the set of whole numbers

$\mathbb{Q}$ : the set of rational numbers

$\mathbb{C}$ : the set of complex numbers

The set of Natural numbers in roster form as  $\mathbb{N}=\{1,2,3,\dots\}$ .

The set of integers in roster form as  $\mathbb{Z}=\{\dots,-2,-1,0,1,2,\dots\}$

The set of rational numbers can be written as

$\mathbb{Q}=\{p/q: p,q \in \mathbb{Z}, p \text{ and } q \text{ have no common factors}\}$

The set of real number can be written as  $\mathbb{R}=\{x: x \text{ is real number}\}$

## Empty Set :

The set that has no element is called the empty set (or null set ). It is denoted  $\phi$  or  $\{\}$ .

For example the set of real numbers whose square is negative is an empty set.

A set B is said to be nonempty, if B has at least one element.

# Subset

- Definition of subset :

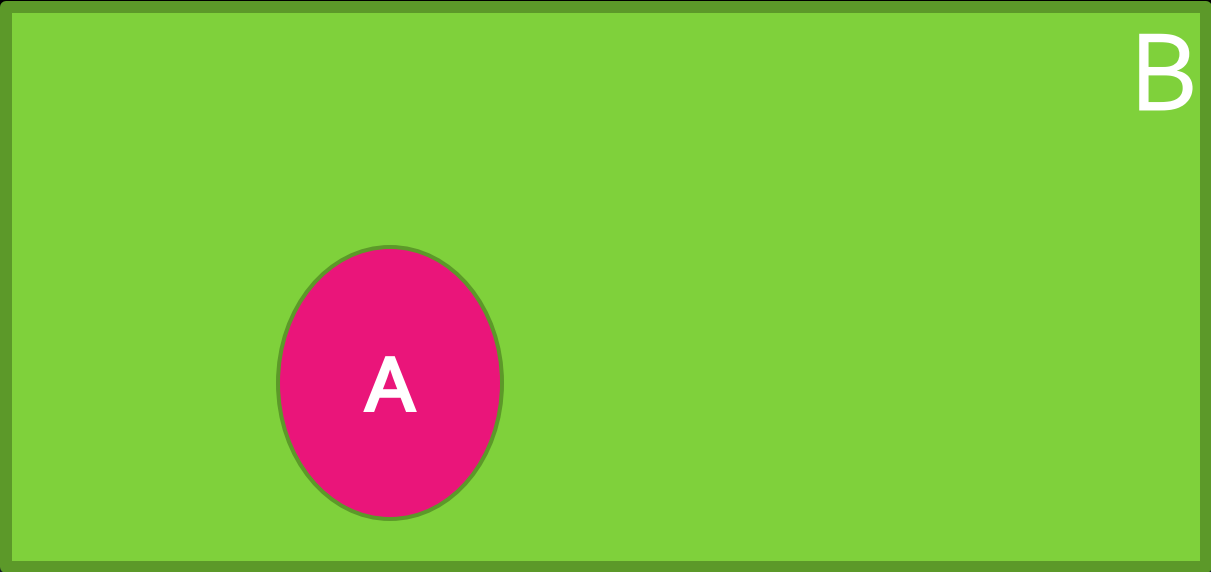
Suppose  $A, B$  are two sets .We say that  $A$  is subset of  $B$  , if every element of  $A$  is also an element of  $B$

In that case , we write  $A \subseteq B$

Note that :1)  $A \subseteq B$  if and only if  $x \in A$  implies  $x \in B$  or

$A \subseteq B$  if and only if  $x \notin B$  implies  $x \notin A$

2) If  $A$  is a subset of  $B$  ,then  $B$  is called a superset of  $A$  and we write  $B \supseteq A$



# Equality of Sets

- Two sets  $A$  and  $B$  are said to be equal if they have the same elements. In other words,  
 $A = B$  if and only if  $A \subseteq B$  and  $B \subseteq A$ .
- **Note that** : If  $A \subseteq B$  and  $A \neq B$  then we say that  $A$  is a proper subset of  $B$  and we write  $A \subset B$  or  $A \subsetneq B$
- **Note That** – In this case every element of  $A$  is in  $B$  and there is an element of  $B$  which is not in  $A$ .