# Group

A non-empty set G of some elements (a, b, c, etc.), with one or more operations is known as a group.

## A set needed to be satisfied following properties to become a group:

1) Closure Property:
a.b ∈ G , ∀ a, b ∈ G

2) Associative Property:
(a . b) . c = a . (b . c), ∀ a, b, c ∈ G

3) Existence of Identity:
e → identity element
e.a = a = a.e, ∀ a ∈ G

4) Existence of Inverse:
a-1→ inverse of a
a.a-1 = e = a-1.a , ∀ a ∈ G

## Abelian or Commutative Group

### A set needed to be satisfied following properties to become an abelian group:

1) Closure Property:
a.b ∈ G , ∀ a, b ∈ G

2) Associative Property:
$(a . b) . c = a . (b . c), \forall a, b, c \in G$

3) Existence of Identity:
e → identity element
$e.a = a = a.e, \forall a \in G$

4) Existence of Inverse:
a-1 → inverse of a
a.a-1 = e = a-1.a , $\forall a \in G$

5) Commutativity:
$a.b = b.a , \forall a , b \in G$

## Subgroup

A subgroup is a subset H of group elements of a group G that satisfies all the four properties of a group.

" H is a subgroup of G" can be written as $H \subseteq G$

A subgroup H of a group G, where $H \neq G$, is known as proper subgroup of G.