1. **Binary Operation** A binary operation * on set X is a function $*: X \times X \to X$. It is denoted by $a * b$.
2. **Commutative Binary Operation** A binary operation * on set X is said to be commutative, if $a * b = b * a, \forall\, a, b \in X$.
3. **Associative Binary Operation** A binary operation * on set X is said to be associative, if $a * (b * c) = (a * b) * c, \forall\, a, b, c \in X$.

   NOTE For a binary operation, we can neglect the bracket in associative property. But in absence of associative property, we cannot neglect the bracket.

4. **Identity Element** An element $e \in X$ is said to be the identity element of a binary operation * on set X, if $a * e = e * a = a, \forall\, a \in X$. Identity element is unique.

NOTE Zero is an identity for the addition operation on R and one is an identity for the multiplication operation on R.

5. **Invertible Element or Inverse** Let $* : X \times X \to X$ be a binary operation and let $e \in X$ be its identity element. An element $a \in X$ is said to be invertible with respect to the operation *, if there exists an element $b \in X$ such that $a * b = b * a = e, \forall\, b \in X$. Element b is called inverse of element a and is denoted by a^{-1}.

NOTE Inverse of an element, if it exists, is unique.

6. **Operation Table** When number of elements in a set is small, then we can express a binary operation on the set through a table, called the operation table.