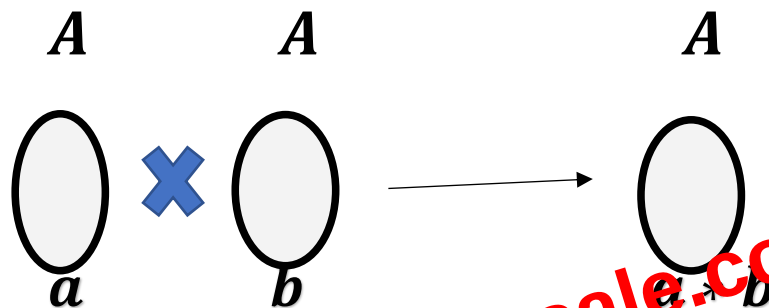


Binary Operation :- Let A be a non-empty set. A mapping $*$: $A \times A \rightarrow A$ is called a binary operation over the set A . It is denoted by $a*b$.

- A binary operation is a mapping associates with each ordered pair (a,b) of elements of A uniquely determined element $a*b \in A$. This operation is necessarily a closed operation.



Definition: A set ' A ' is said to be closed under the operation $*$ if $a*b \in A, \forall a, b \in A$.

Example: Addition of two integers is a binary operation $a+b \in \mathbb{Z} \forall a, b \in \mathbb{Z}$.

- $\Rightarrow$ E = Set of even integers is closed under addition.
- $\Rightarrow$ O = Set of odd integers is not closed since $O_1 + O_2 \notin O$.

Properties of Binary Operation:

- $\Rightarrow$ Associative: If for every $a, b, c \in A$.

$$a*(b*c) = (a*b)*c$$
- $\Rightarrow$ Commutative : $a*b = b*a$