Types of Binary Operation.

(1) **Commutative binary operation:**A binary operation * on a set S is said to be commutative if $a * b = b * a$ for all $a, b \in S$

Addition and multiplication are commutative binary operations on Z but the subtraction is not a commutative binary operation, since $2 - 3 \neq 3 - 2$.

(2) **Associative binary operation:**A binary operation * on a set S is said to be associative if $(a * b) * c = a * (b * c)$ for all $a, b, c \in S$

Addition and multiplication are associative binary operations on N, Z, Q, R and C. But subtraction is not an associative binary operation on Z, Q, R and C.

(3) **Distributive binary operation:**Let * and o be two binary operations on a set S. Then * is said to be

(i) Left distributive over o if $a * (b \circ c) = (a * b) \circ (a * c)$ for all $a, b, c \in S$;

(ii) Right distributive over o if $(b \circ c) * a = (b * a) \circ (c * a)$ for all $a, b, c \in S$.

If *is both left and right distributive over o, then * is said to be distributive over o.

Example**:** The multiplication (·) on Z is distributive over addition (+) on Z, since $a \cdot (b + c) = a \cdot b + a \cdot c$ and $(b + c) \cdot a = b \cdot a + c \cdot a$ for all $a, b, c \in Z$.

But addition is not distributive over multiplication.