



CLASS NOTES

Properties of Multiplication of Integers

Closure under Multiplication

Integers are closed under multiplication because the product of two integers is an integer.

**For all integers a and b ,
 $a \times b$ is an integer**

Example: Consider the integers -5 and 5

$(-5) \times 5 = -25$, is an integer.

Commutativity of Multiplication

Multiplication is commutative for integers.

**For any two integers a and b ,
 $a \times b = b \times a$**

Example: Consider the integers 5 and -2

$5 \times (-2) = -10$ and $(-2) \times 5 = -10$

$\therefore 5 \times (-2) = (-2) \times 5$

Multiplication by zero

Product of an integer and zero is zero.

**For any integer a ,
 $a \times 0 = 0 \times a = 0$**



Example: Let $a = 5$

$$5 \times 0 = 0$$

Multiplicative identity

1 is the multiplicative identity for integers.

$$\text{For any integer } a, \\ a \times 1 = 1 \times a = a$$

Example: Let $a = -4$

$$-4 \times 1 = 1 \times -4 = -4$$

Associativity for Multiplication

Product of three integers does not depend upon the grouping of integers and this is called the associative property for multiplication of integers.

$$\text{For any three integers } a, b \text{ and } c, \\ (a \times b) \times c = a \times (b \times c)$$

Example: Let $a = 5$, $b = 2$ and $c = -3$

$$(a \times b) \times c = (5 \times 2) \times (-3) = 10 \times -3 = -30$$

$$a \times (b \times c) = 5 \times (2 \times -3) = 5 \times -6 = -30$$

$$\therefore (a \times b) \times c = a \times (b \times c)$$

Distributive property

Distributivity of multiplication over addition



**For any three integers a, b and c,
 $a \times (b + c) = (a \times b) + (a \times c)$**

Example: Let $a = 3$, $b = -2$ and $c = 4$

$$a \times (b + c) = 3 \times (-2 + 4) = 3 \times 2 = 6$$

$$(a \times b) + (a \times c) = (3 \times -2) + (3 \times 4) = -6 + 12 = 6$$

$$\therefore a \times (b + c) = (a \times b) + (a \times c)$$

Distributivity of multiplication over subtraction

**For any three integers a, b and c,
 $a \times (b - c) = (a \times b) - (a \times c)$**

Example: Let $a = 3$, $b = -2$ and $c = 4$

$$a \times (b - c) = 3 \times (-2 - 4) = 3 \times -6 = -18$$

$$(a \times b) - (a \times c) = (3 \times -2) - (3 \times 4) = -6 - 12 = -18$$

$$\therefore a \times (b - c) = (a \times b) - (a \times c)$$