Properties of Addition and Subtraction

Properties of Addition

Closure Property: Let a and b be any two integers, then a + b will always be an integer. This is called the closure property of addition of integers.

Examples: 8 + 5 = 13, (-12) + 6 = -6, 9 + (-15) = -6

Commutative Property: If a and b are two integers, then **a + b = b + a**, i.e., on changing the order of integers, we get the same result. This is called the commutative property of addition of integers.

Example: 4 + 6 = 6 + 4 =10, (-3) + (12) = (12) + (-3) = 9

Associative Property: If a, b, and c are three integers, then **a + (b + c) = (a + b) + c**, i.e., on the addition of integers, we get the same result, even if the grouping is changed. This is called the associative property of addition of integers

Example: [(-3) + (-4)] + (8) = (-3) + [(-4) + 8]

Or (-7) + 8 = (-3) + 4

Or 1 = 1

Additive Identity: If zero is added to any integer, the value of the integer does not change. If a is an integer, then **a + 0 = a = 0 + a**

Hence, zero is called the additive identity of integers.

Examples: 12 + 0 = 12 = 0 + 12

(-3) + 0 = (-3) = 0 + (-3)

Additive Inverse: When an integer is added to its opposite, we get the result as zero (Additive identity). If a is an integer, then (-a) is its opposite (or vice versa) such that

$$a + (-a) = 0 = (-a) + a$$

Thus, an integer and its opposite are called the additive inverse of each Other.

Example: 9 + (-9) = 0 (-9) + 9, Here 9 and -9 are the additive inverse of each other.

Property of 1: Addition of 1 to any integer gives its successor.

Example: 12 + 1 =13. Hence, 13 is the successor of 12.

Properties of Subtraction

Closure Property: Let a and b be any two integers, then **a - b** will always be an integer. This is called the closure property of subtraction of integers.

Examples: 8 - 5 = 3, (-12) –(6) = -18

Commutative Property: If a and b are two integers, then **a – b ≠ b – a**, i.e., commutative property does not hold good for the subtraction of integers.

Example: 7 – (-8) = 15 but (-8) – 7 = -15

Hence, subtraction of integers is not commutative.

Associative Property: If a, b and c are three integers, then **(a – b) – c ≠ a – (b – c)**

i.e., the associative property does not hold good for the subtraction of integers.

Example: (8 – 4) – 2 ≠ 8 – (4 – 2)

Or 4 – 2 ≠ 8 – 2

Or 2 ≠ 6

Hence, subtraction of integers is not associative.

Property of Zero: When zero is subtracted from an integer, we get the same integer, i.e.,

a – 0 = a, where a is an integer

Example: 12 – 0 = 12

Property of 1: Subtraction of 1 from any integer gives its predecessor.

Example: 15 -1 = 14, Here 14 is the predecessor of 15.