Integers

As we recall the concept of a number line, let us see the

The ascending order of the given integers is as follows: -6, -5, -4........., 5, 6, 7

The descending order of the given integers is as follows: 7, 6, 5.......-5,-6

We have done addition and subtraction of integers in our previous class. The following are the basic concept of a number line.

- When we add a positive integer, we move to the right
- When we add a negative integer, we move to the left
- When we subtract a positive integer, we move to the left
- When we subtract a negative integer, we move to the right

Properties of addition and subtraction of integers

Closure property of integers under addition:

We can say the sum of two integers is always an integer, (a + b) is an integer.

If we consider two integers 2 and 3, (2 + 3) = 5 is also an integer.

Closure property of integers under subtraction:

We can say the difference of two integers is always an integer,(a – b) is an integer

If we consider two integers 2 and 1, (2 - 1) = 1 is also an integer.

Commutative property:

For addition,

If we consider addition of two integers 3 and 8,
(3 + 8) = 11
(8 + 3) = 11
Therefore, (3 + 8) = (8 + 3)
We can say addition is commutative for integers, a + b = b + a

For subtraction,

But if we consider subtraction of integers 3 and 4,
(4 – 3) = 1
(3 – 4) = -1
Therefore, (4 – 3) ≠ (3 – 4)
We can say subtractive is NOT commutative for integers

Associative property:

If we consider the integers 5, 3, 2,
(+5) + [(+3) + (+2)] = 10
[(+5) + (+2)] + (+3) = 10
Therefore, (+5) + [(+3) + (+2)] = [(+5) + (+2)] + (+3)
We can say addition is associative for integers, a + (b + c) = (a + b) + c

Additive property:

When we add zero to any integer, we get the same integer.
If we consider the integer -2,
(-2) + 0 = -2

We can say zero is an additive identity for integers, a + 0 = a = 0 + a

Multiplication of integers

Multiplication of two positive or negative integers:

If we consider the integers 4, 5,-10,-2
4 x 5 = 20
-10 x -2 = 20

If we multiply two positive integers or two negative integers, we get a positive integer.

Multiplication of a positive integer and negative integer:

If we consider the integers 4, -9, 7, -5
(4) X (-9) = -36
7 x (-5) = -35

If we multiply a positive integer and a negative integer, we get a negative integer.

Multiplication of three or more negative integers:

If we consider the integers -4, -3, -2, -1

(a) (– 4) × (–3) = 12

(b) $(-4) \times (-3) \times (-2) = [(-4) \times (-3)] \times (-2) = 12 \times (-2) = -24$

(c) $(-4) \times (-3) \times (-2) \times (-1) = [(-4) \times (-3) \times (-2)] \times (-1) = (-24) \times (-1)$

(d) $(-5) \times [(-4) \times (-3) \times (-2) \times (-1)] = (-5) \times 24 = -120$

We can say if the number of negative integers in a product is even, then the product is a positive integer; if the number of negative integers in a product is odd, then the product is a negative integer.

Properties of multiplication of integers

Closure property:

If we consider two integers 2 and 1, $(2 \times 1) = 2$ is also an integer.

We can say the product of two integers is always an integer; $(a \times b)$ is an integer

Commutative property:

If we consider addition of two integers 3 and 8,
$(3 \times 8) = 24$
$(8 \times 3) = 24$
Therefore, $(3 \times 8) = (8 \times 3)$

We can say addition is commutative for integers, $(a \times b) = (b \times a)$

Associative property:

If we consider the integers 5, 3, 2,
$(+5) \times [(+3) \times (+2)] = 30$
$[(+5) \times (+2)] \times (+3) = 30$
Therefore, $(+5) \times [(+3) \times (+2)] = [(+5) \times (+2)] \times (+3)$

We can say multiplication is associative for integers, $a \times (b \times c) = (a \times b) \times c$

Multiplicative property:

When we multiply one to any integer, we get the same integer.
If we consider the integer -2,
$(-2) \times 1 = -2$

We can say one is a multiplicative identity for integers, $a \times 1 = a = 1 \times a$

Multiplication by zero:

When we multiply zero with any integer, we get zero.
If we consider the integer -2,
$(-2) \times 0 = 0$

We can say multiplication with zero is zero for integers, $a \times 0 = 0 = 0 \times a$

Distributive property:

If we consider the integers -2, 3, 5,

$(-2) \times (3 + 5) = [(-2) \times 3] + [(-2) \times 5] = (-6) + (-10) = -16$

We can say multiplication is distributive for integers, $a \times (b + c) = (a \times b) + (a \times c)$

Division of integers

Division of two positive or negative integers:

If we consider the integers 4, -5, -10, 2
$-10 \div -5 = 2$
$4 \div 2 = 2$

If we divide two positive integers or two negative integers, we get a positive integer.

Division of a positive integer and negative integer:

If we consider the integers 3, -9, 7, -21
$(-9) \div (3) = -3$
$(-21) \div (7) = -3$

If we divide a positive integer and a negative integer, we get a negative integer.

Properties of multiplication of integers

Closure property:

If we consider two integers 2 and 1, $(2 \times 1) = 2$ is also an integer.
We can say the quotient of two integers is always an integer; (a b) is an integer

Commutative property:

If we consider addition of two integers 3 and 9,
$(3 \div 9) = 1/3$
$(9 \div 3) = 3$
Therefore, $(3 \div 9) \neq (9 \div 3)$

We can say division is NOT commutative for integers, $(a \div b) \neq (b \div a)$

Multiplicative property:

When we multiply one to any integer, we get the same integer.
If we consider the integer -2,
$(-2) \times 1 = -2$

We can say one is a multiplicative identity for integers, $a \times 1 = a = 1 \times a$

Division by zero:

When we divide zero with any integer, we get zero.

If we consider the integer -2,
$0 \div (-2) = 0$

But if we divide any integer by zero, it is undefined

We can say division with zero is zero for integers, $0 \div a = 0$

Division by 1:

If we consider the integers -2,
$(-2) \div 1 = (-2)$

We can say Division by 1 is the number itself, $a \div 1 = a$