Introduction to Integers

Operation on Integers

Integers:

Integers are the set of whole numbers and their opposites. {. . . -3, -2, -1, 0, 1, 2, 3 . . .} is the set of integers.

Following are some examples of integers: -12, 315, 733, 751, 10, and 121.

Positive Integer:

The numbers greater than zero are called **Positive integers**

Positive integers are represented towards right of zero (0) on a number line. In this collection, 1, 2, 3 … are said to be positive integers

Negative Integer:

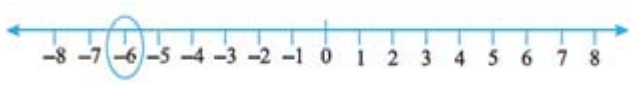
A number which is less than zero but not a fraction or a decimal is called a **Negative Integer**. It is represented by putting '-' sign before the number. It is shown to the left of zero on a number line. In this collection, – 1, – 2, – 3 ... are said to be negative integers.

Operation on Integers

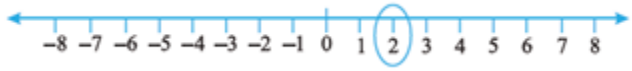
Representation of integers on a number line

Draw a line and mark some points at equal distance on it as shown in the figure.

Mark a point as zero on it. Points to the right of zero are positive integers and are marked + 1, + 2, + 3, etc. or simply 1, 2, 3 etc. Points to the left of zero are negative integers and are marked – 1, – 2, – 3 etc. In order to mark – 6 on this line, we move 6 points to the left of zero.

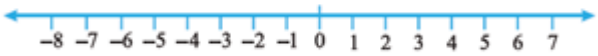


In order to mark + 2 on the number line, we move 2 points to the right of zero.



Ordering of integers:

Let us once again observe the integers which are represented on the number line.



We know that 7 > 4 and from the number line shown above, we observe that 7 is to the right of 4. Similarly, 4 > 0 and 4 is to the right of 0. Now, since 0 is to the right of –3 so, 0 > – 3. Again, – 3 is to the right of – 8 so, – 3 > – 8.

Thus, we see that on a number line the number increases as we move to the right and decreases as we move to the left.

Therefore, – 3 < – 2, – 2 < – 1, – 1 < 0, 0 < 1, 1 < 2, 2 < 3 so on. Hence, the collection of integers can be written as..., –5, –4, – 3, – 2, – 1,
0, 1, 2, 3, 4, 5...

Example 1:

Which integers lie between – 10 and – 4? Which is the largest integer and the smallest integer among them?

Solution:

Integers between – 10 and – 6 are – 9, – 8, – 7, -6, -5. The integer – 5 is the largest and – 9 is the smallest.

Addition of Integers:

Let us perform additions with the help of two positive integers.

You add When you have two positive integers like (+5) and (+7) then (+5) + (+7) = (+12) [=5+7]

Example:

Find the addition of
(a) (+ 10) + (+ 4)
(b) **(**+ 23) + (+ 40)

Solution:

(a) (+ 10) + (+ 4) = (10 + 4) = +14
(b) **(**+ 23) + (+ 40) = **(**23 + 40) = (+63)

Similarly, you also add when you have two negative integers, but remember that the answer will take a minus (-) sign like (-8) + (-2) = - (8+2) = -10.

Example:

Find the solution of the following:
(a) (– 11) + (– 12)
(b) (– 32) + (– 25)

Solution:

(a) (– 11) + (– 12) = - (11 + 12) = -23
(b) (– 32) + (– 25) = - (32 + 25) = -57

Now, when you have one positive and one negative integer, you must subtract, but answer will take the sign of the bigger integer.

Example: Fine the addition of

(a) (+12) + (– 7)
(b) (+ 7) + (– 10)

Solution:

(a) (+12) + (– 7) = (+12 -7) = (12– 7) = 5
(b) (+ 7) + (– 10) = (+ 7) + (– 10) = (+7 – 10) = (7 – 10) = -3

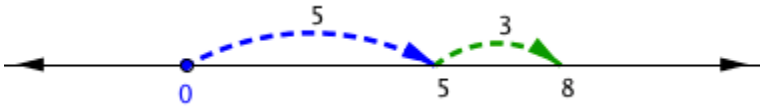
Addition of integers on a number line:

Example 1:

Let us add 5 and 3 on number line.

Solution:

On the number line, we first move 5 steps to the right from 0 reaching 5, and then we move 3 steps to the right of 5 and reach 8. Thus, we get 5 + 3 = 8

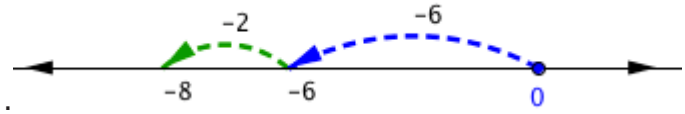


Example 2:

Let us add – 6 and – 2 on the number line.

Solution:

On the number line, we first move 6 steps to the left of 0 reaching – 6, then we move 2 steps to the left of – 6 and reach – 8. Thus, (– 6) + (– 2) = – 8



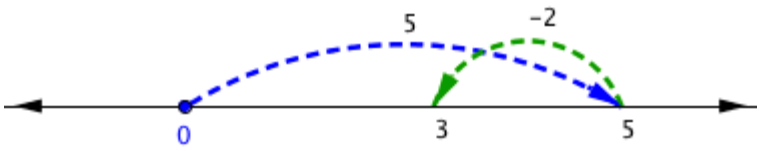
Note: We observe that when we add two positive integers, their sum is a positive integer. When we add two negative integers, their sum is a negative integer.

Example 3:

Find the sum of (+ 5) and (– 2) on the number line.

Solution:

First we move to the right of 0 by 5 steps reaching 5. Then we move 3 steps to the left of 5 reaching 3. Thus, (+ 5) + (– 2) = 3

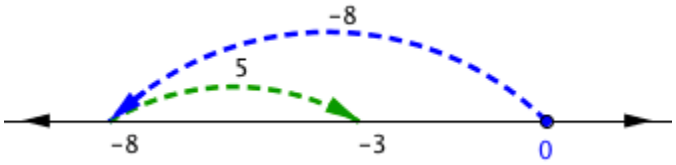


Example 4:

Let us find the sum of (– 8) and (+ 5) on the number line.

Solution:

First we move 8 steps to the left of 0 reaching – 8 and then from this point we move 5 steps to the right. We reach the point – 3. Thus, (– 8) + (+5) = – 3.



Additive Inverse:

The Additive Inverse of a number is the opposite of the number. A number and its opposite add up to give zero. They are called **additive inverse** of each other.

Example:

Find the additive inverse of
(a) 7
(b) -2?

Solution:

(a)The additive inverse of 7 is - 7.
7 + (- 7) = 0

(b)The additive inverse of - 2 is 2.
- 2 + 2 = 0

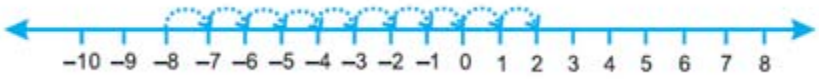
Subtraction of Integers with the help of a Number Line:

Example: 1

Find the value of – 8 – (–10) using number line.

Solution:

– 8 – (– 10) is equal to – 8 + 10 as additive inverse of –10 is 10.
On the number line, from – 8 we will move 10 steps towards right.



We reach at 2. Thus, –8 – (–10) = 2 Hence, to subtract an integer from another integer it is enough to add the additive inverse of the integer that is being subtracted, to the other integer.

Example: 2

Let us now find the value of –5 – (–4) using a number line.

Solution:

We can say that this is the same as –5 + (4), as the additive inverse of –4 is 4. We move 4 steps to the right on the number line starting from –5. We reach at –1 i.e. –5 + 4 = –1. Thus, –5 – (–4) = –1.

Some more examples of addition and subtraction:

Example 1:

Find the sum of (– 9) + (+ 4) + (– 6) + (+ 3)

Solution:

We have,

(– 9) + (+ 4) + (– 6) + (+ 3)

= (– 9) + (– 6) + (+ 4) + (+ 3)

= (– 15) + (+ 7)

= – 8

Example 2:

Find the value of (30) + (– 23) + (– 63) + (+ 55)

Solution:

(30) + (+ 55) + (– 23) + (– 63)

= 85 + (– 86)

= – 1

Example 3:

Find the sum of (– 10), (92), (84) and (– 15)

Solution:

(– 10) + (92) + (84) + (– 15)

= (– 10) + (– 15) + 92 + 84

= (– 25) + 176 = 151

Example 4:

Subtract (– 4) from (– 10)

Solution:

(– 10) – (– 4)

= (– 10) + (additive inverse of – 4)

= –10 + 4 = – 6

Example 5:

Subtract (+ 3) from (– 3)

Solution:

(– 3) – (+ 3)

= (– 3) + (additive inverse of + 3)

= (– 3) + (– 3) = – 6