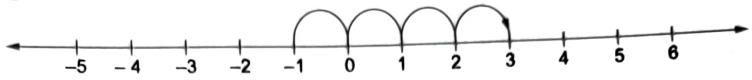
(ii) We want to know an integer 4 more than –1. So, we start from –1 and proceed 4 steps to the right to obtain 3, as shown below:

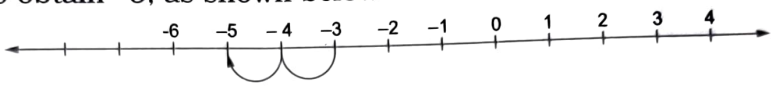


Hence, 4 more than –1 is 3.

(iii) We want to know an integer 5 less than 3. So, we start from 3 and go to the left by 5 steps to obtain –2, as shown below:

Hence, 5 less than 3 is –2.

(iv) We want to know an integer 2 less than –3. So, we start from –3 and go to the left by 2 steps to obtain –5, as shown below:



Hence, 2 less than –3 is –5.

EXAMPLE 2. *Fill in the blanks by the appropriate symbol '>' or '<' in each of the following cases:*

(i) 0 ..... 3 *(ii)* –4 ..... 0 *(iii)* –9 ..... –15

(iv) –37 ..... 17 *(v)* –10 ..... 10 *(vi)* –163 ..... –236

Solution

(i) We know that on the number line, 0 is to the left of 3. So, $0 < 3$.

(ii) Since zero is greater than every negative integer, so $-4 < 0$.

(iii) Since $9 < 15$, we have $-9 > -15$.

(iv) Since every positive integer is greater than every negative integer, we have $-37 < 17$.

(v) Every positive integer being greater than every negative integer, we have $-10 < 10$.

(vi) Since $163 < 236$, we have $-163 > -236$.

ABSOLUTE VALUE OF AN INTEGER *The absolute value of an integer is the numerical value of the integer regardless of its sign.*

The absolute value of –2, written as $|-2|$, is 2.

The absolute value of –5, written as $|-5|$, is 5.

The absolute value of 5, written as $|5|$, is 5.

The absolute value of 0, written as $|0|$, is 0.

Thus, we conclude that the absolute value of an integer is 0 in case of 0, and positive otherwise.

EXERCISE 4A

1. Write the opposite of each of the following:

(i) An increase of 8 (ii) A loss of ₹ 7

(iii) Gaining a weight of 5 kg (iv) 10 km above sea level

(v) 5°C below the freezing point (vi) A deposit of ₹ 100

(vii) Earning ₹ 500 (viii) Going 6 m to the east

(ix) 24 (x) –34

2. Indicate the following using '+' or '–' sign:

(i) A gain of ₹ 600 (ii) A loss of ₹ 800

(iii) 7°C below the freezing point (iv) Decrease of 9

(v) 2 km above sea level (vi) 3 km below sea level

(vii) A deposit of ₹ 200 (viii) A withdrawal of ₹ 300

3. Mark the following integers on a number line:
(i) –5 (ii) –2 (iii) 0
(iv) 7 (v) –13

4. Which number is larger in each of the following pairs?
(i) 0, –2 (ii) –3, – 5 (iii) –5, 2
(iv) –16, 8 (v) –365, – 913 (vi) –888, 8

5. Which number is smaller in each of the following pairs?
(i) 6, – 7 (ii) 0, – 1 (iii) –13, – 27
(iv) –26, 17 (v) –317, – 603 (vi) –777, 7

6. Write all integers between
(i) 0 and 6 (ii) –5 and 0 (iii) –3 and 3 (iv) –7 and –5

7. Fill in the blanks by appropriate symbol > or <:
(i) 0 ..... 7 (ii) 0 ..... –3 (iii) –5 ..... – 2
(iv) –15 ..... 13 (v) –231 ..... – 132 (vi) –6 6

8. Write the following integers in the increasing order:
(i) 5, – 7, – 2, 0, 8 (ii) –23, 12, 0, – 6, – 100, – 1
(iii) –17, 15, – 363, – 501, 165 (iv) 21, – 106, – 16, 16, 0, – 2, – 81

9. Write the following integers in the decreasing order:
(i) 0, 7, – 3, – 9, – 132, 36 (ii) 51, – 53, – 8, 0, – 2
(iii) –71, – 81, 36, 0, – 5 (iv) –365, – 515, 102, 413, – 7

10. Using the number line, write the integer which is
(i) 4 more than 6 (ii) 5 more than –6
(iii) 6 less than 2 (iv) 2 less than –3

11. For each of the following statements, write (T) for true and (F) for false:
(i) The smallest integer is zero.
(ii) Zero is not an integer.
(iii) The opposite of zero is zero.
(iv) –10 is greater than –6.
(v) The absolute value of an integer is always greater than the integer.
(vi) 0 is larger than every negative integer.
(vii) Every negative integer is less than every natural number.
(viii) The successor of –187 is –188.
(ix) The predecessor of –215 is –214.

12. Find the value of
(i) $|-9|$ (ii) $|-36|$ (iii) $|0|$ (iv) $|15|$
(v) $-|-3|$ (vi) $7+|-3|$ (vii) $|7-4|$ (viii) $8-|-7|$

13. (i) Write five negative integers greater than –7.
(ii) Write five negative integers less than –20.

OPERATIONS ON INTEGERS

ADDITION OF INTEGERS We have learnt how to add two whole numbers on the shall extend the same method for

(ii) $a + (-6) = 0$

$\Rightarrow [a + (-6)] + 6 = 0 + 6$ [adding 6 on both sides]

$\Rightarrow a + [(-6) + 6] = 6$ [by associative law of addition and property of 0]

$\Rightarrow a + 0 = 6 \quad [\because (-6) + 6 = 0]$

$\Rightarrow a = 6.$

Hence, $a = 6$.

EXERCISE 4B

1. Use the number line and add the following integers:

(i) $9 + (-6)$ (ii) $(-3) + 7$ (iii) $8 + (-8)$

(iv) $(-1) + (-3)$ (v) $(-4) + (-7)$ (vi) $(-2) + (-8)$

(vii) $3 + (-2) + (-4)$ (viii) $(-1) + (-2) + (-3)$ (ix) $5 + (-2) + (-6)$

2. Fill in the blanks:

(i) $(-3) + (-9) =$ ..... (ii) $(-7) + (-8) =$ ..... (iii) $(-9) + 16 =$ .....

(iv) $(-13) + 25 =$ ..... (v) $8 + (-17) =$ ..... (vi) $2 + (-12) =$ .....

3. Add:

(i) -365 / -87

(ii) -73 / -687

(iii) -1065 / -987

(iv) -3596 / -1089

4. Add:

(i) -206 / $+98$

(ii) $+178$ / -69

(iii) -103 / $+312$

(iv) -493 / $+289$

5. Find the sum of

(i) 137 and –354 (ii) 1001 and –13

(iii) –3057 and 199 (iv) –36 and 1027

(v) –389 and –1032 (vi) –36 and 100

(vii) 3002 and –888 (viii) –18, +25 and –37

(ix) –312, 39 and 192 (x) –51, – 203, 36 and –28

6. Find the additive inverse of

(i) –57 (ii) 183 (iii) 0

(iv) –1001 (v) 2054

7. Write the successor of each one of the following:

(i) 201 (ii) 70 (iii) –5

(iv) –99 (v) –500

8. Write the predecessor of each one of the following:

(i) 120 (ii) 79 (iii) –8

(iv) –141 (v) –300

9. Simplify:
   (i) $(-7) + (-9) + 12 + (-16)$ (ii) $37 + (-23) + (-65) + 9 + (-12)$
   (iii) $(-145) + 79 + (-265) + (-41) + 2$ (iv) $1056 + (-798) + (-38) + 44 + (-1)$
10. A car travelled 60 km to the north of Patna and then 90 km to the south from there. How far from Patna was the car finally?
11. A man bought some pencils for ₹ 30 and some pens for ₹ 90. The next day, he again bought some pencils for ₹ 25. Then, he sold all the pencils for ₹ 20 and the pens for ₹ 70. What was his net gain or loss?
12. For each of the following statements write (T) for true and (F) for false:
   (i) The sum of two negative integers is always a negative integer.
   (ii) The sum of a negative integer and a positive integer is always a negative integer.
   (iii) The sum of an integer and its negative is zero.
   (iv) The sum of three different integers can never be zero.
   (v) $|-5| < |-3|$
   (vi) $|8-5| = |8| + |-5|$
13. Find an integer a such that
   (i) $a + 6 = 0$ (ii) $5 + a = 0$ (iii) $a + (-4) = 0$ (iv) $-8 + a = 0$

Do all work in Maths copy

SUBTRACTION OF INTEGERS

We have learnt how to subtract two whole numbers.

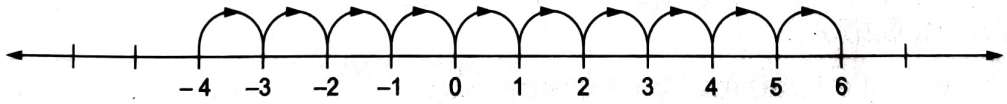
We defined subtraction as an inverse process of addition. For example, to subtract 4 from 9 is the same as to find a number which when added to 4 gives 9.

Clearly, the answer is 5.

Thus, $9 - 4 = 5$.

We extend the same idea to subtraction of integers. Suppose we want to subtract (–4) from 6. Clearly, we want a number which when added to (–4) gives 6.

Now, on the number line, find out how many steps should be taken from –4 to reach 6.



We see that the number of steps taken is 10.

$\therefore$ $6 - (-4) = 10$.

Also, we know that $6 + 4 = 10$.

Thus, $6 - (-4) = 6 + 4 = 10$.

RULE *To subtract one integer from another, we take the additive inverse of the integer to be subtracted and add it to the other integer.*
Thus, if a and b are two integers then $a - b = a + (-b)$.

SOLVED EXAMPLES

EXAMPLE 1. *Subtract:*
(i) 7 from 2 (ii) –8 from 5 (iii) 4 from –9 (iv) –7 from –5

Solution
(i) $2 - 7 = 2 +$ (negative of 7) $= 2 + (-7) = -5$.
(ii) $5 - (-8) = 5 +$ (negative of -8) $= 5 + 8 = 13$.
(iii) $-9 - 4 = -9 +$ (negative of 4) $= (-9) + (-4) = -13$.