INTRODUCTION

Have you ever been to Shimla during December to February ? It is a popular season of Shimla for people who look for snow fall. The average temperature during this time remains around 8°C to –2°C.

8°C means to 8°C **above** 0°C

–2°C means to 2°C **below** 0°C

In real world, we make use of these two kinds of numbers.

In mathematical terms,

(i) A **profit** of ₹ 50 and a **loss** of ₹ 50 are denoted by + ₹ 50 and – ₹ 50 respectively.

(ii) A **rise** of 1°C temperature and a **fall** of 1°C temperature are denoted by + 1°C and – 1°C respectively.

(iii) A movement of 8 km towards North and a movement of 8 km towards South are denoted by + 8 km and – 8 km respectively.

From the above example, you must get the idea that a number is tagged with two opposite signs of **+ (plus)** and – **(minus),** in order to deal with two opposite directional situations/concepts.

Some pairs of **opposites** are :

Profit --- Loss	East --- West	Increase --- Decrease
Above sea level --- Below sea level	Right --- Left	Rise --- Fall
Deposit --- Withdrawal	Going up --- Coming down	

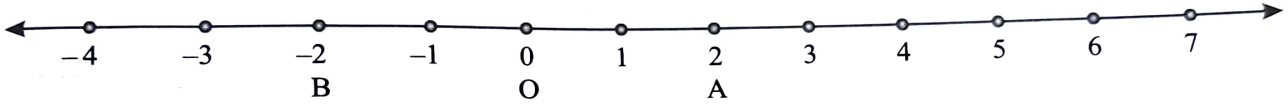
6.3 ABSOLUTE VALUE OF AN INTEGER

The absolute value of an integer is the numerical value of the integer, regardless of the sign tagged with it.

Thus, the **absolute value** of an integer is always positive.

Two vertical bars, one on either side of the integer, are used to denote the **absolute value** of the integer.

Look at the positions of A and B with reference to O, on the number line.



Both A and B, are 2 units away from O, i.e.

The distance of A from O is 2 units.

The distance of B from O is 2 units.

$|2| = 2$, and $|-2| = 2$

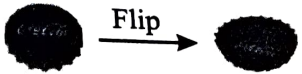
Example 1. We need to represent the following integers on a number line :

6.4 ADDITION OF INTEGERS

In earlier Classes, we have learnt how to add and subtract positive numbers. However, for subtraction, we have only learnt how to subtract a smaller positive number from a greater positive number. In this Section we will learn how to carry out addition and subtraction that involve negative numbers/integers, using bottle caps.'

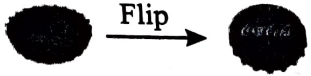
A bottle cap shown below has two sides – upper and lower sides. Let the upper side shows the positive integer + and the lower side shows the negative integer –1.

To obtain the *negative* of 1, we flip the upper side of the cap as shown :



We write – (1) = –1

To obtain the *negative* of –1, we flip the lower side of the cap as shown :



We write – (–1) = 1

What happens if we put two caps, one with upper side and other with lower side, together?

We write 1 + (–1) = 0

Rule 1. The sum of two positive integers is the sum of their absolute values, with positive sign.

Example : $(+5) + (+3) = +\{|+5| + |+3|\} = +(5 + 3) = +8$ or 8

Rule 2. The sum of two negative integers is the sum of their absolute values, with negative sign.

Example : $(-2) + (-9) = -\{|-2| + |-9|\} = -(2 + 9) = -11$

Rule 3. The sum of a positive integer and a negative integer is the difference of their absolute va the sign of integer of greater absolute value.

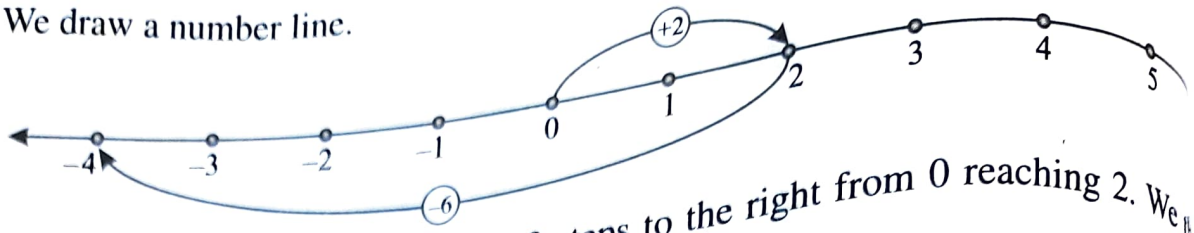
Example : $(-17) + (+8) + = -\{|-17| - |+8|\} = -(17 - 8) = -9$

$(11) + (-5) + = +\{|11| - |-5|\} = +(11 - 5) = +6$, or 6

Sample Problem 1. Subtract 6 from 2.

Solution : We need to work out $2 - 6$, i.e. $2 + (-6)$

We draw a number line.



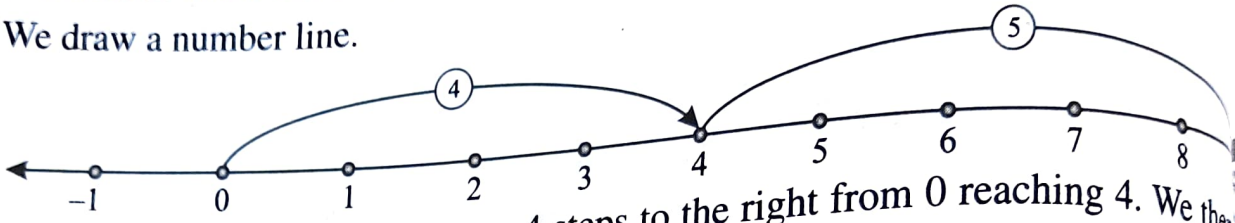
On the number line, we first move 2 steps to the right from 0 reaching 2. We th
6 steps to the left of 2 and reach –4.

Thus, we get $2 + (-6) = -4$, or $\mathbf{2 - 6 = -4}$

Sample Problem 2. Subtract –5 from 4.

Solution : We need to work out $4 - (-5)$, i.e. $4 + 5$

We draw a number line.



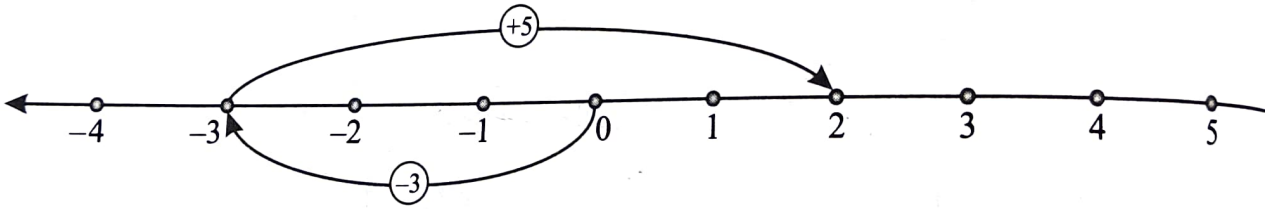
On the number line, we first move 4 steps to the right from 0 reaching 4. We then
steps to the right of 4 and reach 9.

Thus, we get $4 - (-5)$, i.e. $\mathbf{4 + 5 = 9}$

Sample Problem 3. Subtract –5 from –3.

Solution : As $-(-5) = 5$, we have $(-3) - (-5) = (-3) + 5$

We draw a number line.



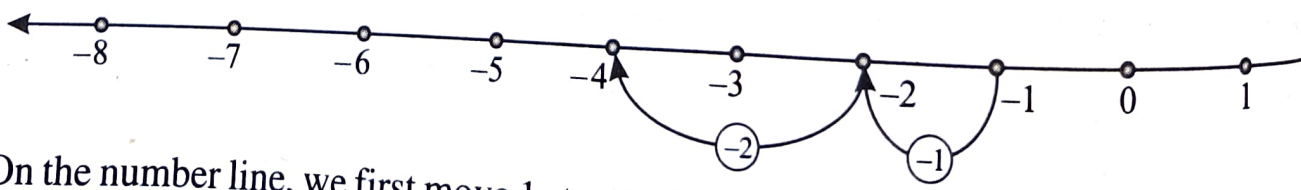
On the number line, we first move 3 steps to the left from 0 reaching –3. We then
steps to the right of –3 and reach 2.

Thus, we get $(-3) + 5 = 2$ or $\mathbf{(-3) - (-5) = 2}$

Sample Problem 4. Subtract 2 from –1.

Solution : We need to work out $(-1) - 2$, i.e. $(-1) + (-2)$

We draw a number line.



On the number line, we first move 1 step to the left from 0 reaching –1. We then mo
to the left of –1 and reach –3.

Thus, we get $(-1) + (-2) = -3$, or $\mathbf{(-1) - 2 = -3}$

1. An operation * is defined for integers as : $a * b = a - 2 - (-2b)$
   Find : (a) $4 * (-2)$ (b) $5 * 4$
2. If we multiply integers from –5 to 5, what is the product?
3. Observe the following : $1 + 2 - 3 + 4 + 5 - 6 - 7 + 8 - 9 = -5$
   Change one '–' sign as '+' sign to get the sum 9.
4. Write any five integers which are less than – 100 but greater than – 150.
5. Subtract – 5308 from the sum $\{(-2100) + (-2001)\}$.