

## Chapter

# 1

# Integers



### Learning Objectives

#### ➤ Addition of Integers

##### ■ Properties

#### ➤ Subtraction of Integers

##### ■ Properties

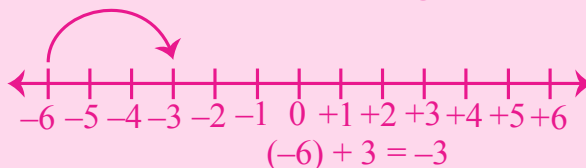
#### ➤ Multiplication of Integers

##### ■ Properties

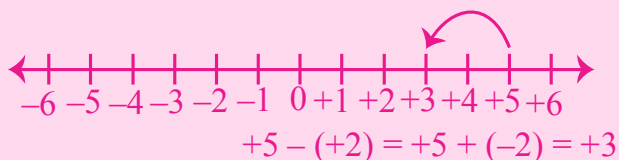
#### ➤ Division of Integers

##### ■ Properties

### Addition of Integers



### Subtraction of Integers



Sign of Integers	Operation to use	Answer Sign	Quick Example
$\oplus \times \oplus$	Multiply	Positive (+)	$5 \times 7 = 35$
$\ominus \times \ominus$	Multiply	Positive (+)	$(-6) \times (-4) = 24$
$\oplus \times \ominus$	Multiply	Negative (-)	$3 \times (-5) = -15$
$\ominus \times \oplus$	Multiply	Negative (-)	$(-4) \times (9) = -36$

$$(+)\div(+)=(+)$$

$$(-)\div(-)=(+)$$

$$(-)\div(+)=(+)\div(-)=(-)$$



### Critical Concepts

- ✦ Operations on integers.
- ✦ Properties of addition and multiplication.

## INTRODUCTION

We have already learnt about whole numbers, natural numbers and integers in the previous class. In this chapter, we will study more about integers, their properties and operations

## INTEGERS

### Various Types of Numbers

- Natural numbers:** All counting numbers from 1 to infinite ( $\infty$ ) are known as natural numbers. Thus, 1, 2, 3, .....  $\infty$  are natural numbers.
- Whole numbers:** All natural numbers including zero are known as whole numbers i.e., 0, 1, 2, 3, .....  $\infty$  are whole numbers  $0 + \text{natural numbers} = \text{whole numbers}$ .
- Integers:** All natural numbers, 0 and negative of natural numbers are called integers. Thus ..... -5, -4, -3, -2, -1, 0, 1, 2, 3, ..... etc., are all integers.
  - Positive integers:** All natural numbers are positive integers such as 1, 2, 3, 4, ....., etc.
  - Negative integers:** All negative of natural numbers are negative integers such as ..., -4, -3, -2, -1
  - Zero is neither negative nor positive integer.

### DID YOU KNOW?

*All natural numbers are whole number but zero is the only whole number which is not natural number.*



### DID YOU KNOW?

- Both the positive and negative integer are called directed numbers as they indicate direction. These are also known as signed numbers because of the + or - sign.*
- The sum of any integer and its negative integer is always zero i.e.,  $a + (-a) = 0$ .*



## ADDITION OF INTEGERS

Following are the rules for addition of integers

**Rule 1.** If two positive or two negative integers are added, we add their values without considering their signs and put common sign before the sum.

**Example:** Add:

$$\begin{array}{r} \text{(i)} \quad 36 + 27 \\ + 36 \\ + 27 \\ + 63 \end{array}$$

$$\begin{array}{r} \text{(ii)} \quad -36 - 27 \\ - 36 \\ - 27 \\ - 63 \end{array}$$

**Rule 2.** To add a positive and a negative integer, we calculate the difference in their numerical values regardless of their signs and put the sign of greater numerical value integer to the value of difference.

**Example:** Add:

$$\begin{array}{r} \text{(i)} \quad + 36 - 27 \\ + 36 \\ - 27 \\ + 9 \end{array}$$

$$\begin{array}{r} \text{(ii)} \quad - 36 + 27 \\ - 36 \\ + 27 \\ - 9 \end{array}$$

### Properties of Addition of Integers

- 1. Closure property of addition:** The sum of two integers is always an integer. In general, for any two integers  $a$  and  $b$ ,  $a + b$  is an integer

**For example:** (i)  $4 + 3 = 7$ , which is an integer

(ii)  $4 + (-3) = 1$ , which is an integer

Thus, we say that integers are closed under addition.

- 2. Commutative law of addition:** If  $x$  and  $y$  are any two integers, then,  $x + y = y + x$

**For example:**

(i)  $-7 + 8 = 1$  and  $8 + (-7) = 1$

$\therefore -7 + 8 = 8 + (-7)$

(ii)  $(-5) + (-8) = -13$  and  $(-8) + (-5) = -13$

$\therefore (-5) + (-8) = (-8) + (-5)$

Thus, we conclude that addition is commutative for integers.

- 3. Associative law of addition:** If  $x$ ,  $y$  and  $z$  are any three integers, then

$$(x + y) + z = x + (y + z)$$

**For example:**  $\{(-5) + (-6)\} + 7 = -11 + 7 = -4$

$$(-5) + \{(-6) + 7\} = -5 + 1 = -4$$

$$\therefore \{(-5) + (-6)\} + 7 = -5 + \{(-6) + 7\}$$

- 4. Existence of additive identity:** For any integer  $x$ , we have  $x + 0 = 0 + x = x$   
0 is called the additive identity for integers.

**For example:** (i)  $0 + 9 = 9 + 0 = 9$  (ii)  $(-6) + 0 = 0 + (-6) = -6$



### Illustration 1:

**Prove that  $(-180 + 176) + 4 = -180 + (176 + 4)$**

**Solution:**

$$\text{LHS} = (-180 + 176) + 4 = -4 + 4 = 0$$

$$\text{RHS} = -180 + (176 + 4) = -180 + 180 = 0$$

$$\text{LHS} = \text{RHS}$$

Hence Proved

## SUBTRACTION OF INTEGERS

For any integers  $x$  and  $y$ , we define.

- (i)  $x - y = x + (\text{additive inverse of } y) = x + (-y)$
- (ii)  $x - (-y) = x + \{\text{additive inverse of } (-y)\} = x + y$

### Properties of Subtraction of Integers

- 1. Closure property for subtraction:** If  $x$  and  $y$  are any integer, then  $x - y$  is always an integer.

**For example:**

- (i)  $3 - 5 = -2$ , which is an integer
- (ii)  $(-3) - (-6) = 3$ , which is an integer

Thus, we can say that integers are closed under subtraction

- 2. Commutative law of subtraction**

Consider the integers  $(-6)$  and  $(-4)$ , we have.

$$(-6) - (-4) = -6 + 4 = -2 \text{ and } (-4) - (-6) = -4 + 6 = 2$$

$$\therefore (-6) - (-4) \neq (-4) - (-6).$$

Thus, subtraction of an integer is not commutative

- 3. Associative law of subtraction**

Consider the integers  $4$ ,  $(-5)$  and  $(-6)$ , we have.

$$\{4 - (-5)\} - (-6) = (4 + 5) - (-6) = 9 - (-6) = 9 + 6 = 15$$

$$4 - \{(-5) - (-6)\} = 4 - \{(-5) + 6\} = 4 - 1 = 3$$

Since  $\{4 - (-5)\} - (-6) \neq 4 - \{(-5) - (-6)\}$

or  $a - (b - c) \neq (a - b) - c$

Thus, subtraction of integers is not associative



### Illustration 2:

**Prove that  $(-10 - 7) - 6 \neq -10 - (7 - 6)$**

**Solution:**

$$\text{LHS} = (-10 - 7) - 6 = -17 - 6 = -23$$

$$\text{RHS} = -10 - (7 - 6) = -10 - 1 = -11$$

$$\text{LHS} \neq \text{RHS}$$

Hence Proved

**CHECK POINT-1**

- Out of  $-7, 5, -3, 1, 4, 7$ , find a pair whose sum is  $-2$  and  $2$  respectively?  
 (a)  $(-3, 1)$  and  $(-5, 7)$  (b)  $(7, 4)$  and  $(-5, -3)$   
 (c)  $(-7, 5)$  and  $(4, -3)$  (d)  $(-3, -7)$  and  $(1, 4)$
- What must be subtracted from  $-59$  to obtain  $-21$ ?  
 (a)  $38$  (b)  $-42$  (c)  $42$  (d)  $-38$
- What must be added to  $221$  to obtain  $158$ ?  
 (a)  $63$  (b)  $-63$  (c)  $-60$  (d)  $60$
- A green grocer had a profit of ₹  $47$  on Monday, a loss of ₹  $12$  on Tuesday and loss of ₹  $8$  on Wednesday. Find his net profit or loss in 3 days.  
 (a) ₹  $7$  (b) ₹  $13$  (c) ₹  $20$  (d) ₹  $27$

**Solutions:**

1. (a)                      2. (d)                      3. (b)                      4. (d)

## MULTIPLICATION OF INTEGERS

Let us now learn how to multiply integers using given rules.

**Rule 1:** To find the product of two integers with unlike sign, first get their product regardless to their signs, then give minus sign to the product.

**For example:** (i)  $(-40) \times 9 = (-360)$  (ii)  $20 \times (-3) = (-60)$

**Rule 2:** To find the product of two integers with like signs, first find their product regardless to their signs then put plus sign to product.

**For example:** (i)  $3 \times 5 = (+15)$  (ii)  $-3 \times (-5) = (+15)$

**Properties of Multiplication of Integers**

1. **Closure properties for multiplication:** The product of two integers is always an integer.

**For example:** (i)  $3 \times 2 = 6$ , which is an integer (ii)  $(-3) \times 2 = -6$ , which is an integer

Thus, integers are closed under multiplication

2. **Commutative law of multiplication:** For any two integers  $x$  and  $y$ , we have  $(x \times y) = (y \times x)$

**For example:** (i)  $2 \times (-6) = -12$  and  $(-6) \times 2 = -12$

$$\therefore 2 \times (-6) = (-6) \times 2$$

(ii)  $(-3) \times (-7) = 21$  and  $(-7) \times (-3) = 21$

$$\therefore (-3) \times (-7) = (-7) \times (-3)$$

Thus, multiplication is commutative for integers.

3. **Associative law of multiplication:** For any integers  $x, y$  and  $z$ , we have

$$(a \times b) \times c = a \times (b \times c)$$

Consider the integers  $3, (-4)$  and  $(-5)$ , we have

$$\{3 \times (-4)\} \times (-5) = -12 \times (-5) = 60$$

$$\text{and } 3 \times \{(-4) \times (-5)\} = 3 \times 20 = 60$$

$$\therefore \{3 \times (-4)\} \times (-5) = 3 \times \{(-4) \times (-5)\}$$

Thus, the product of three integers is associative

- 4. Distributive law of multiplication over addition:** For any integer  $x$ ,  $y$  and  $z$ , we have:

$$x \times (y + z) = (x \times y) + (x \times z)$$

Consider the integers 5,  $(-6)$  and  $(-7)$ , we have  $5 \times \{(-6) + (-7)\} = 5 \times (-13) = -65$

$$\text{and } \{5 \times (-6)\} + \{5 \times (-7)\} = -30 + (-35) = -65$$

$$\therefore 5 \times \{(-6) + (-7)\} = \{5 \times (-6)\} + \{5 \times (-7)\}$$

- 5. Property of zero:** For every integer,  $x$  we have:  $(x \times 0) = (0 \times x) = 0$

**For example:** (i)  $5 \times 0 = 0 \times 5 = 0$  (ii)  $(-5) \times 0 = 0 \times (-5) = 0$

- 6. Existence of multiplicative identity:** For every integer  $x$  we have:  $(x \times 1) = (1 \times x) = x$ , 1 is known as the multiplicative identity for integers.

**For example:** (i)  $13 \times 1 = 13$  (ii)  $(-12) \times 1 = -12$



### Illustration 3:

**Find :**  $28 \times 12$

**Solution:**

$$28 \times 12 = 28 \times (10 + 2) = (28 \times 10) + (28 \times 2) = 280 + 56 = 336$$



### Illustration 4:

**Solve :**  $72 \times (-8) + (-72) \times 2$

**Solution:**

$$72 \times (-8) + (-72) \times 2 = 72 \times (-8) + 72 \times (-2)$$

$$= 72 \times [(-8) + (-2)] = 72 \times (-10) = (-720)$$



### CHECKPOINT-2

- $27 \times 16 + 27 \times (-14) =$   
(a)  $-810$  (b)  $810$  (c)  $-54$  (d)  $54$
- $(-12) \times 6 - (-12) \times 4 =$   
(a)  $24$  (b)  $-24$  (c)  $120$  (d)  $-120$
- A company manufactures two types of cloth material. If one of them is cotton on which the company earns ₹ 8 on each metre sold. If company sold 500 metres of cotton cloth. What is the profit earned?  
(a) ₹ 4000 (b) ₹ 6000 (c) ₹ 2000 (d) ₹ 5000
- If  $15 \times (a + 5) = 15 \times (-4) + 15 \times 5$ , then  $a$  is  
(a)  $-1$  (b)  $-2$  (c)  $-3$  (d)  $-4$

**Solutions:**

1. (d)

2. (b)

3. (a)

4. (d)

## DIVISION OF INTEGERS

Following are the rules for division of integers

**Rule 1:** To find the division of two integers with unlike sign, first get their quotient regardless to their signs, then give minus sign to the quotient.

**For example:** (i)  $-74 \div 2 = \frac{-74}{2} = -37$       (ii)  $96 \div (-3) = \frac{96}{-3} = -32$

**Rule 2:** To find the division of two integers with like signs, first find their quotient regardless to their signs then put plus sign to quotient.

**For example:** (i)  $48 \div 6 = \frac{48}{6} = 8$       (ii)  $-155 \div (-5) = \frac{-155}{-5} = 31$

### Properties of Division of Integers

- If  $x$  and  $y$  are integers, then  $(x \div y)$  is not necessarily an integer.  
**For example:** (i) 12 and 5 are both integer but  $(12 \div 5)$  is not an integer.  
 (ii)  $(-12)$  and 5 are both integer. But  $[(-12) \div 5]$  is not an integer.
- If  $x$  is an integer and  $x \neq 0$ , then  $x \div x = 1$   
**For example:** (i)  $10 \div 10 = 1$       (ii)  $(-5) \div (-5) = 1$
- If  $x$  is an integer, then  $(x \div 1) = x$   
**For example:** (i)  $5 \div 1 = 5$       (ii)  $(-5) \div 1 = (-5)$
- If  $x$  is an integer and  $x \neq 0$ , then  $(0 \div x) = 0$  but  $(x \div 0)$  is not meaningful.  
**For example:** (i)  $0 \div 9 = 0$       (ii)  $6 \div 0 = \text{Meaning less}$
- If  $x$ ,  $y$  and  $z$  are integers, then  $(x \div y) \div z \neq x \div (y \div z)$  unless  $z = 1$ .

Thus division on integers is not associative.

**For example:** Let  $x = -6$ ,  $y = 3$ ,  $z = -2$  then,

$$(x \div y) \div z = \{(-6) \div 3\} \div (-2) = (-2) \div (-2) = 1$$

$$x \div \{(y) \div (z)\} = (-6) \div \{3 \div (-2)\} = (-6) \div (-1.5) = 4$$

$$\therefore (x \div y) \div z \neq x \div \{(y) \div (z)\}$$



### Illustration 5:

**Prove that  $(12 \div 6) \div 2 \neq 12 \div (6 \div 2)$**

**Solution:**

$$\text{LHS} = (12 \div 6) \div 2 = 2 \div 2 = 1$$

$$\text{RHS} = 12 \div (6 \div 2) = 12 \div 3 = 4$$

$$\text{LHS} \neq \text{RHS}$$

Hence Proved



### Let's Do Activity

- Write any three integers (e.g.  $a$ ,  $b$ ,  $c$ ) on paper.
- Now multiply first-two integers (i.e.  $a \times b$ ). After this multiply the third integer to the former product (i.e.  $(a \times b) \times c$ ).
- Now multiply last-two integers (i.e.  $b \times c$ ) and after this multiply the first integer to former product (i.e.  $a \times (b \times c)$ ).
- Is both the product same?
- If yes, then name this property of multiplication of integer.



### CHECK POINT-3

- Find the value of  $x$  in  
 $(10 \div 2) + (20 \div 4) + (40 \div 8) = 60 \div x$   
 (a) 4 (b) 3 (c) 2 (d) 1
- The value of  
 $63 - (-3) \{-2 - \overline{8 - 3}\} \div 3 \{5 + (-2)(-1)\}$  is  
 (a) 26 (b) 48 (c) 62 (d) 96
- A gardener plans to plant 630 trees in 21 rows each containing the same number of trees, then how many trees will there be in each row ?  
 (a) 300 (b) 30 (c) 21 (d) 3
- Which division gives the greatest quotient ?  
 (a)  $20 \div (-4)$  (b)  $20 \div 4$  (c)  $(-20) \div (-5)$  (d)  $(-30) \div 5$

**Solutions :**

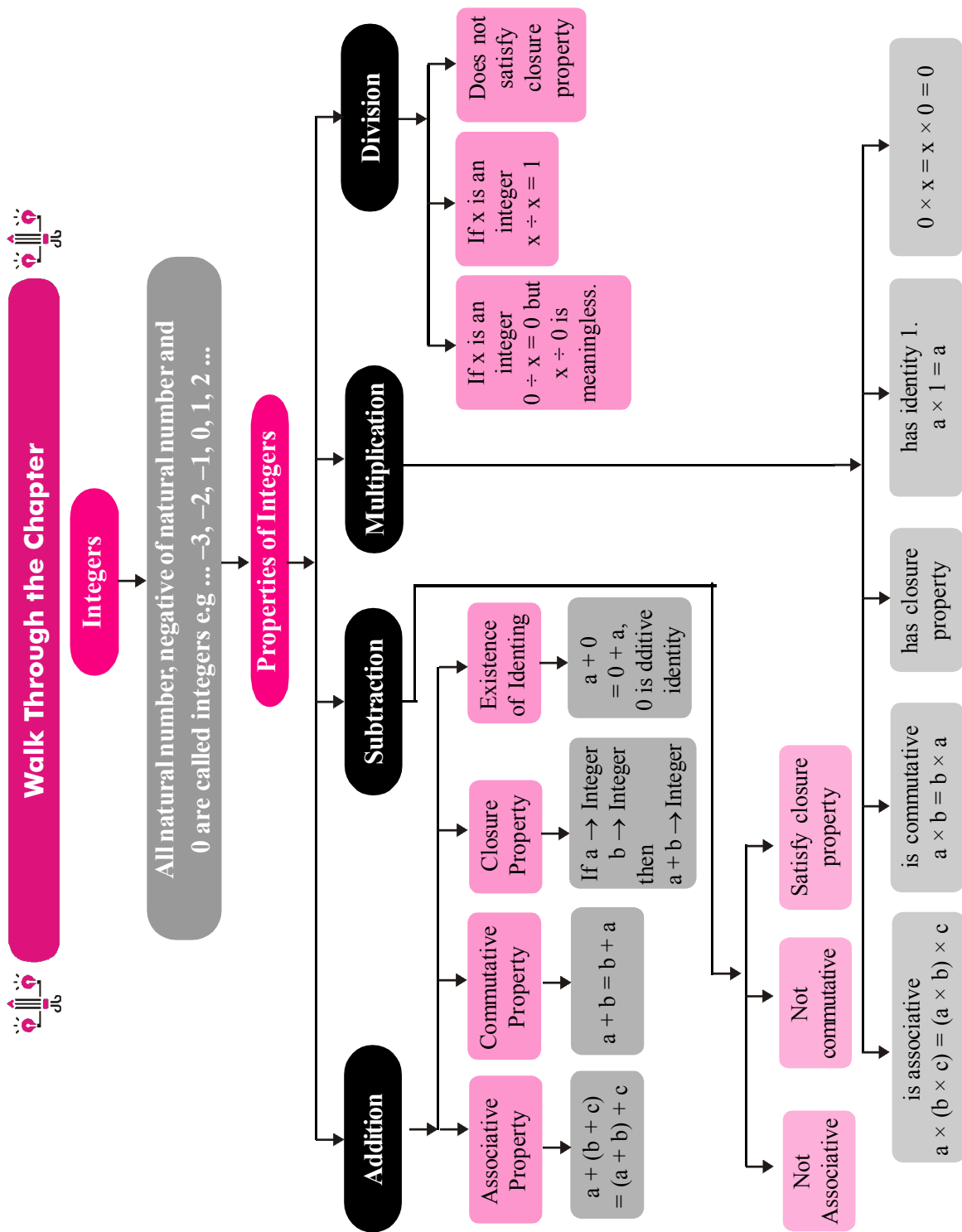
1. (a)

2. (c)

3. (b)

4. (b)



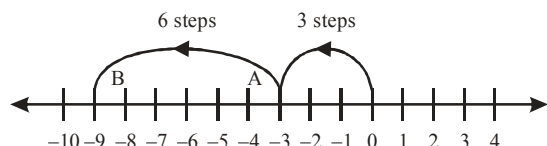


# MISCELLANEOUS

# Solved Examples

## 1. Add $-3$ and $-6$ on the number line.

**Sol.** On the number line, we start from 0 and move 3 steps to the left to reach a point A. Now, starting from A, we move 6 steps to the left to reach a point B, as shown below.



Clearly, B represents  $-9$ .

$$\therefore (-3) + (-6) = -9.$$

## 2. Verify using associative property :

$$4 + \{(-9) + (-3)\} = \{4 + (-9)\} + (-3)$$

$$\text{Sol. } \{(+4) + (-9)\} + (-3) = (4 - 9) + (-3) \\ = -5 + (-3) = -8$$

$$(+4) + \{(-9) + (-3)\} = (+4) + \{-12\} \\ = -(12 - 4) = -8$$

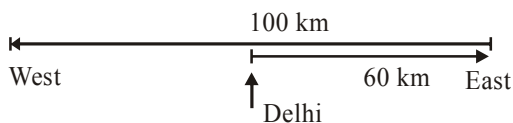
$$\therefore \{(+4) + (-9)\} + (-3)$$

$$= (+4) + \{(-9) + (-3)\}$$

Hence, associative property is verified.

## 3. A man travelled 60 km to the east of Delhi and then 100 km to the west of it. How far from Delhi was he finally?

**Sol.**



Take travelling in the east as positive and travelling in the west as negative.

Therefore, distance travelled in east = 60 km and distance travelled in west =  $-100$  km

$$\therefore \text{Total distance} = 60 + (-100) = -40 \text{ km}$$

$\therefore$  The person is 40 km to the west of Delhi.

## 4. Find each of the following products:

$$(i) (-115) \times 8 \quad (ii) 9 \times (-3) \times (-6)$$

**Sol.** (i) We have,

$$(-115) \times 8 = -(115 \times 8) = -920$$

(ii) We have,

$$9 \times (-3) \times (-6) = \{9 \times (-3)\} \times (-6) \\ = -27 \times (-6) = 162$$

## 5. Calculate and verify using associative law:

$$(i) -3 \times (-5 \times 2) \quad (ii) [8 \times (-4)] \times 5$$

$$\text{Sol. } (i) -3 \times (-5 \times 2) = -3 \times (-10) = 30$$

$$\text{or } (-3 \times -5) \times 2 = 15 \times 2 = 30$$

$$(ii) [8 \times (-4)] \times 5 = (-32) \times 5 = -160$$

$$\text{or } 8 \times (-4 \times 5) = 8 \times (-20) = -160$$

Hence, associative property holds.

## 6. Simplify using distributive law:

$$(i) (-18) \times 7 + (-18) \times (-4)$$

$$(ii) 16 \times (-9) + (-8) \times (-9)$$

**Sol.** Using the distributive laws, we get:

$$(i) (-18) \times 7 + (-18) \times (-4)$$

$$= (-18) \times \{7 + (-4)\}$$

$$[\because a \times b + a \times c = a \times (b + c)]$$

$$= (-18) \times 3 = -54.$$

$$(ii) 16 \times (-9) + (-8) \times (-9)$$

$$= \{16 + (-8)\} \times (-9)$$

$$[\because a \times c + b \times c = (a + b) \times c]$$

$$= 8 \times (-9) = -72.$$

## 7. Calculate the following using suitable property:

$$(i) (-7) \times (-5) + (-7) \times 105$$

$$(ii) (-2) \times 113 \times (-5)$$

$$\text{Sol. } (i) (-7) \times (-5) + (-7) \times 105$$

$$= (-7) \times \{(-5) + 105\}$$

[Using the distributive property of multiplication over addition]

$$= (-7) \times 100 = -700$$

$$(ii) (-2) \times 113 \times (-5)$$

$$= 113 \times \{(-2) \times (-5)\}$$

[Using the associative property of multiplication]

$$= 113 \times (+10) = 1130$$

### 8. Divide:

$$(i) -20 \div 4$$

$$(ii) -15 \div (-3)$$

$$(iii) 0 \div (-832)$$

$$(iv) -56 \div (-1)$$

**Sol.** (i)  $-20 \div 4 = -(20 \div 4) = -5.$

$$(ii) -15 \div (-3) = +(15 \div 3) = 5$$

$$(iii) 0 \div (-832) = -(0 \div 832) = 0.$$

$$(iv) -56 \div (-1) = +(56 \div 1) = 56.$$

### 9. Simplify:

$$12 - [7 - \{16 - (18 - \overline{6+3-12})\}]$$

**Sol.**  $12 - [7 - \{16 - (18 - \overline{6+3-12})\}]$

$$= 12 - [7 - \{16 - (18 + 3)\}]$$

$$= 12 - [7 - \{16 - 21\}]$$

$$= 12 - [7 - \{-5\}]$$

$$= 12 - [7 + 5] = 12 - 12 = 0$$



## Let's Revise Through FIB & T/F

- The smallest integer is zero. (T/F)
- Zero is larger than every negative integer. (T/F)
- $-[-\{-73\}] = \underline{\hspace{2cm}}$
- $-[-\{-(0)\}] = \underline{\hspace{2cm}}$
- $(-3)$  is  $\underline{\hspace{2cm}}$  more than  $(-9)$ .
- The additive identity element in the set of integers is  $\underline{\hspace{2cm}}$ .
- The sum of a negative integer and a positive integer is always a positive integer. (T/F)
- 0 is the additive identity element in the set of whole numbers. (T/F)
- $42(4+2) = (42 \times 4) + (42 \times 2)$  is an example of associative property. (T/F)
- If  $x$ ,  $y$  and  $z$  are integers then  $(x \times \underline{\hspace{2cm}}) \times z = x \times (y \times \underline{\hspace{2cm}})$
- $\underline{\hspace{2cm}}$  is the multiplicative identity for integers.
- Integers do not follow closure property with respect to division. (T/F)
- $0 \div 5$  is the same as  $5 \div 0$ . (T/F)
- $(-5) \times \{(2) + \underline{\hspace{2cm}}\} = (-5) \times \underline{\hspace{2cm}} + (-5) \times (-3)$

## EXERCISE-1

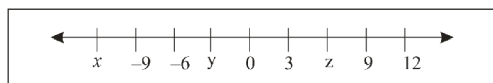
## Master Board

### Multiple Choice Questions

**DIRECTIONS :** This section contains multiple choice questions. Each questions has 4 choices (a), (b), (c) and (d) out of which only one is correct.

- In a quiz, positive marks are given for correct answers and negative marks are given for incorrect answers. If Rabi's scores in seven successive rounds were 25, -10, -15, -5, 20, 30. What is his total score at the end ?
  - 35
  - 40
  - 45
  - 50
- An insect crawls up 5 cm every second on a 60 cm vertical rod and then falls down 2 cm over the next second. How many second will it take to climb the rod ?
  - 10
  - 20
  - 30
  - 40

3. Every floor of a 25 storey building is 5 m high. If a lift moves 2 metres every second. How many seconds will it take to move from 3<sup>rd</sup> floor to 15<sup>th</sup> floor ?  
 (a) 10 (b) 20  
 (c) 30 (d) 40
4. Temperature of a place at 07:00 in the morning was  $-15^{\circ}\text{C}$ . Temperature increases by  $3^{\circ}\text{C}$  in first hour and decreases by  $1^{\circ}\text{C}$  in the second hour. What would be the temperature at 09:00 am ?  
 (a)  $-11^{\circ}\text{C}$  (b)  $-13^{\circ}\text{C}$   
 (c)  $-21^{\circ}\text{C}$  (d)  $-17^{\circ}\text{C}$
5. Based on the number line, find the value of  $x - y - z$ .



- (a)  $-21$  (b)  $-15$   
 (c)  $-3$  (d)  $15$
6. Which of the following pairs of integers have 5 as a difference ?  
 (a) 10, 5 (b)  $-10, -5$   
 (c) 15,  $-20$  (d) Both (a) and (b)
7. If the product of two integers is 72 and one of them is  $-9$ , then find the other integer.  
 (a) 8 (b)  $-8$   
 (c) 81 (d) 63
8. Which list of integers is in order from least to greatest ?  
 (a)  $-42, -39, -4, 40, 41$   
 (b)  $-42, 41, 40, -39, -4$   
 (c)  $-4, -39, 40, 41, -42$   
 (d)  $41, 40, -4, -39, -42$
9. The value of  $[-33 - (-27)] + [88 + (-82)]$  is  
 (a) 0 (b) 1  
 (c) 2 (d) 3

## Assertion & Reason Questions

**DIRECTIONS :** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- (a) If both **Assertion** and **Reason** are correct and **Reason** is the correct explanation of **Assertion**.  
 (b) If both **Assertion** and **Reason** are correct but **Reason** is not the correct explanation of **Assertion**.  
 (c) If **Assertion** is correct but **reason** is incorrect.  
 (d) If **Assertion** is incorrect but **reason** is correct.

1. **Assertion :**  $a - b = b - a$ .

**Reason :** Subtraction is not commutative.

2. **Assertion :**  $-6 \times (-2) = -12$

**Reason :** When we multiply 2 negative numbers we get a positive numbers.

## Very Short Answer Type Questions

**DIRECTIONS :** Give answer in one word or one sentence.

1. Find the following product:  
 $(-2) \times 36 \times (-5)$
2. Determine the integer whose product with ' $-1$ ' is  
 (i) 72 (ii) 0 (iii)  $-165$
3. What must be subtracted from  $-60$  to obtain  $-21$ ?
4. What must be added to 221 to obtain 158?
5. Add the following using the number line.  
 (i)  $(2) + (-5)$  (ii)  $(-4) + (-2)$
6. Find the value of the following.  
 (i)  $-92 - (-12)$  (ii)  $0 - (+123)$   
 (iii)  $0 - (-150)$
7. Subtract :  
 (i)  $-887$  from  $-188$  (ii) 578 from  $-173$   
 (iii) 345 from 282

8. Find the quotient in each of the following:
  - (i)  $(-15625) \div (-125)$
  - (ii)  $30000 \div (-100)$
9. Radha climbs up 5 stairs every minute and then climbs down 2 stairs over the next minute. How many minutes will she take to climb 60 stairs?
10. Which integer is less than every positive integer?

### Short Answer Type Questions

**DIRECTIONS :** Give answer in 2-3 sentences.

1. A company manufactures two types of cloth material. If one of them is cotton on which the company earns ₹ 4 on each metre sold. If company sold 500 metres of cotton cloth. What is the profit earned?
2. Aman has ₹ 20 with him. He spent ₹ 8 on Monday, got ₹ 5 as pocket money on Tuesday, gave ₹ 7 as a loan to a friend on Wednesday, ate an ice-cream worth ₹ 10 on Thursday, received a reward of ₹ 5 from his grandfather on Friday. How much does he have on Sunday, if his friend repays the loan on Saturday?

3. Taking  $a = -15$  and  $b = -23$ , show that  $a + b = b + a$  but  $a - b \neq b - a$
4. Find the value of the following:
  - (i)  $\{(-27) + (-73)\} + (-100)$
  - (ii)  $\{(-51) + (-83)\} - (-12)$
  - (iii)  $\{200 - (-100)\} + (-300)$

### Long Answer Type Questions

**DIRECTIONS :** Give answer in four to five sentences.

1. Find the value of:
  - (i)  $1487 \times 327 + (-487) \times 327$
  - (ii)  $28945 \times 99 - (-28945)$
2. Verify the following:  
 $(-23) \{(-5) + (+19)\} = (-23) \times (-5) + (-23) \times (+19)$
3. Solve:  $-25 + 14 \div (5 - 3)$
4. Simplify:  $22 - \frac{1}{4} \{-5 - (-48) \div (-16)\}$
5. Simplify:  $36 - [18 - \{14 - (15 - 4 \div 2 \times 2)\}]$
6. Find the value of
  - (i)  $15625 \times (-2) + (-15625) \times 98$
  - (ii)  $18946 \times 99 - (-18946)$

## EXERCISE-2

## NCERT Questions

### Text Book Questions

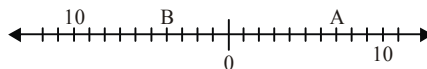
1. At Srinagar temperature was  $-5^{\circ}\text{C}$  on Monday and then it dropped by  $2^{\circ}\text{C}$  on Tuesday. What was the temperature of Srinagar on Tuesday? On Wednesday, it rose by  $4^{\circ}\text{C}$ . What was the temperature on this day?
2. A plane is flying at the height of 5000 m above the sea level. At a particular point, it is exactly above a submarine floating 1200 m below the sea level. What is the vertical distance between them?

3. Verify  $a - (-b) = a + b$  for the following values of  $a$  and  $b$ .
  - (i)  $a = 21, b = 18$
  - (ii)  $a = 118, b = 125$
  - (iii)  $a = 75, b = 84$
  - (iv)  $a = 28, b = 11$
4. Write down a pair of integers whose
  - (i) sum is  $-3$
  - (ii) difference is  $-5$
  - (iii) difference is  $2$
  - (iv) sum is  $0$
5. Verify  $(-30) \times [13 + (-3)] = [(-30) \times 13] + [(-30) \times (-3)]$
6. In a class test containing 15 questions, 4 marks are given for every correct answer and  $(-2)$  marks are given for every incorrect answer.

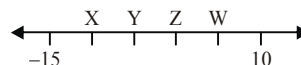
- Gurpreet attempts all questions but only 9 of her answers are correct.
- (i) What is her total score?
  - (ii) One of her friends gets only 5 answers correct. What will be her score?
7. Suppose we represent the distance above the ground by a positive integer and that below the ground by a negative integer, then answer the following:
- (i) An elevator descends into a mine shaft at the rate of 5 metre per minute. What will be its position after one hour?
  - (ii) If it begins to descend from 15 m above the ground, what will be its position after 45 minutes?
8. Find the product, using suitable properties:
- (i)  $8 \times 53 \times (-125)$
  - (ii)  $(-41) \times 102$
  - (iii)  $625 \times (-35) + (-625) \times 65$
9. A certain freezing process requires that room temperature be lowered from  $40^\circ\text{C}$  at the rate of  $5^\circ\text{C}$  every hour. What will be the room temperature 10 hours after the process begins?
10. A cement company earns a profit of ₹ 8 per bag of white cement sold and a loss of ₹ 5 per bag of grey cement sold.
- (i) The company sells 3,000 bags of white cement and 5,000 bags of grey cement in a month. What is its profit or loss?
  - (ii) What is the number of white cement bags it must sell to have neither profit nor loss, if the number of grey bags sold is 6,400 bags.
11. In a test (+ 5) marks are given for every correct answer and (– 2) marks are given for every incorrect answer.
- (i) Radhika answered all the questions and scored 30 marks though she got 10 correct answers.
  - (ii) Jay also answered all the questions and scored (– 12) marks though he got 4 correct answers. How many incorrect answers had they attempted?
12. A shopkeeper earns a profit of ₹ 1 by selling one pen and incurs a loss of 40 paise per pencil while selling pencils of her old stock.
- (i) In a particular month she incurs a loss of ₹ 5. In this period, she sold 45 pens. How many pencils did she sell in this period?
  - (ii) In the next month she earns neither profit nor loss. If she sold 70 pens, how many pencils did she sell?
13. The temperature at 12 noon was  $10^\circ\text{C}$  above zero. If it decreases at the rate of  $2^\circ\text{C}$  per hour until midnight, at what time would the temperature be  $8^\circ\text{C}$  below zero? What would be the temperature at mid-night?

### Exemplar Questions

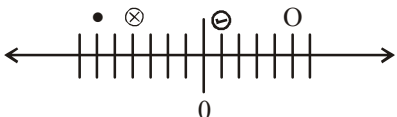
1. By observing the number line figure state which of the following statements is not true?



- (a) B is greater than –10
  - (b) A is greater than 0
  - (c) B is greater than A
  - (d) B is smaller than 0
2. On the following number line value ‘zero’ is shown by the point

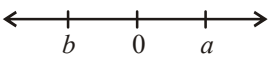


- (a) X      (b) Y      (c) Z      (d) W
3. On the number line, the value of  $(-3) \times 3$  lies on right hand side of
- (a) –10    (b) –4      (c) 0      (d) 9
4. The value of  $5 \div (-1)$  does not lie between
- (a) 0 and –10      (b) 0 and 10
  - (c) –4 and –15      (d) –6 and 6
5. Which of the following is the multiplicative identity for an integer a?
- (a) a                      (b) 1
  - (c) 0                      (d) –1

6.  $(-25) \times [6 + 4]$  is not same as  
 (a)  $(-25) \times 10$   
 (b)  $(-25) \times 6 + (-25) \times 4$   
 (c)  $(-25) \times 6 \times 4$   
 (d)  $-250$
7.  $-35 \times 107$  is not same as  
 (a)  $-35 \times (100 + 7)$   
 (b)  $(-35) \times 7 + (-35) \times 100$   
 (c)  $-35 \times 7 + 100$   
 (d)  $(-30 - 5) \times 107$
8. Which of the following shows the maximum rise in temperature?  
 (a)  $23^\circ$  to  $32^\circ$  (b)  $-10^\circ$  to  $+1^\circ$   
 (c)  $-18^\circ$  to  $-11^\circ$  (d)  $-5^\circ$  to  $5^\circ$
9. If  $a$  and  $b$  are two integers, then which of the following may not be an integer?  
 (a)  $a + b$  (b)  $a - b$   
 (c)  $a \times b$  (d)  $a \div b$
10. For a non-zero integer  $a$  which of the following is not defined?  
 (a)  $a \div 0$  (b)  $0 \div a$   
 (c)  $a \div 1$  (d)  $1 \div a$
11. Number of pairs of integers which are smaller than  $-3$ , but their difference is greater than  $-3$  are.
12. If  $\Delta$  is an operation such that for integers  $a$  and  $b$  we have  $a \Delta b = a \times a + b \times b - a \times b$ , then find  $(-3) \Delta 2$ .
13. If  $\otimes$ ,  $\ominus$  and  $\bullet$  represent some integers on number line, then descending order of these numbers is
- 
14. What is the value of  $(-43) \times (-99) + 43$ ?
15. (i) Write two integers which are smaller than  $-5$  but their difference is  $-5$ .  
 (ii) Write two integers such that one is smaller than  $-11$ , and other is greater than  $-11$  but their difference is  $-11$ .
16. You are at an elevation 380 m above sea level as you start a motor ride. During the ride, your elevation changes by the following metres:  
 540 m,  $-268$  m, 116 m,  $-152$  m, 490 m,  $-844$  m, 94 m. What is your elevation relative to the sea level at the end of the ride?
17. Evaluate the following using distributive property.  
 (i)  $53 \times (-9) - (-109) \times 53$   
 (ii)  $68 \times (-17) + (-68) \times 3$
18. If  $*$  is an operation such that for integers  $a$  and  $b$ , we have  $a * b = a \times b + (a \times a + b \times b)$  then find  
 (i)  $(-3) * (-5)$  (ii)  $(-6) * 2$
19. If  $\Delta$  is an operation such that for integers  $a$  and  $b$  we have  
 $a \Delta b = a \times b - 2 \times a \times b + b \times b - (-a) \times b + b \times b$  then find  $4 \Delta (-3)$ .
20. Height of a place A is 1800 m above sea level. Another place B is 700 m below sea level. What is the difference between the levels of these two places?
21. A green grocer had a profit of ₹ 47 on Monday, a loss of ₹ 12 on Tuesday and loss of ₹ 8 on Wednesday. Find his net profit or loss in 3 days.
22. In a test, +3 marks are given for every correct answer and  $-1$  mark are given for every incorrect answer. Sona attempted all the questions and scored +20 marks though she got 10 correct answers.  
 (i) How many incorrect answers has she attempted?  
 (ii) How many questions were given in the test?
14. What is the value of  $(-43) \times (-99) + 43$ ?
15. (i) Write two integers which are smaller than  $-5$  but their difference is  $-5$ .  
 (ii) Write two integers such that one is smaller than  $-11$ , and other is greater than  $-11$  but their difference is  $-11$ .

### HOTS Questions

1. In a class test containing 10 questions, 5 marks are awarded for every correct answer and  $(-2)$  marks are awarded for every incorrect answer and 0 for each question not attempted.

- (i) Ravi gets 4 correct and 6 incorrect answers. What is his score?  
 (ii) Heena gets 2 correct and 5 incorrect answers. What is her score?
2. An elevator descends into a mine shaft at the rate of 6 m/min. If the descent starts from 20 m above the ground level, how long will it take to reach -370 m?
3. A person earns ₹125 per day and spends ₹ 31 every day. How much would he earn and spend in 30 days? What is his total savings in 30 days?
4. What is the difference between  $0 \div 49$  and  $49 \div 0$ ? Explain.
5. What is the value of  $0 - 1 + 2 - 3 + 4 - 5 + 6 - 7 \dots - 17 + 18 - 19 + 20$ .
6. Use  $<$  or  $>$  to compare  $-2 \times (-1) \times 4 \times 2 \times (-3)$  and  $(-2) + (-1) + 4 + 2 - (-3)$ .
7. Use the given number line to find the sign of the quotient  $\frac{a-b}{ab}$ .
- 
8. Arrange  $-9 \div 3$ ,  $-4 + 6$ ,  $2(-4)$ ,  $1 \mid -7 - 3$ ,  $-5 - 3 \times 2$  in ascending order.
9. Add the additive inverse of  $(-12 + 16 - 42 \div 3 \text{ of } 7)$  to the product of  $-2$ ,  $-3$  and  $-4$ .

## EXERCISE-3

## Foundation Builder

### Multiple Choice Questions

**DIRECTIONS :** This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.

1. While removing brackets the order in which the brackets are removed is  
 (a)  $[ ]$ ,  $( )$ ,  $\{ \}$  (b)  $\{ \}$ ,  $( )$ ,  $[ ]$   
 (c)  $( )$ ,  $\{ \}$ ,  $[ ]$  (d) none
2.  $38 + 83 = 83 + 38$  is an example of  
 (a) commutative property  
 (b) associative property  
 (c) closure property  
 (d) distributive property
3. The number which is neither positive nor negative is  
 (a) 1 (b) 5  
 (c) 0 (d) 10
4. Smallest negative number  
 (a) -1 (b) -10  
 (c) 0 (d) Does not exist
5.  $-8 - 2 [6 + 4 \{7 - (2.8 + 1.2)\}]$  [Olympiad]  
 (a) -34 (b) -44  
 (c) +42 (d) 34
6.  $(-43) - (-12) =$   
 (a) +55 (b) -21  
 (c) -31 (d) +31
7. The property represented by  $a \times (b + c) = a \times b + a \times c$  is  
 (a) commutative property  
 (b) associative property  
 (c) distributive property  
 (d) none of these
8. If 'a' and 'b' are whole numbers, then  $a - b$  is  
 (a) a whole number  
 (b) a natural number  
 (c) cannot be determined  
 (d) none of these
9. Parenthesis type of brackets are denoted by  
 (a)  $[ ]$  (b)  $\{ \}$   
 (c)  $( )$  (d)  $] [$



10. Closure property is observed w.r.t. \_\_\_\_\_ operations in integers.

(a)  $+$ ,  $\div$  (b)  $+$ ,  $\div$ ,  $\times$   
 (c)  $+$ ,  $\times$ ,  $-$  (d)  $+$ ,  $-$ ,  $\div$

11. Value of  $124 \times 4 - 3 + 118 \div 2$  is

(a) 552 (b) 496  
 (c) 553 (d) -553

### More Than One Option Correct

**DIRECTIONS :** This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE or MORE may be correct.

- Which of the following statements is/are correct about integers?
  - For every integer  $a$ , we have  $a \div 1 = a$ .
  - For all non-zero integers  $a$  and  $b$ ,  $a \times b$  is always greater than either  $a$  or  $b$ .
  - The greater the integer, the lesser is its negative.
  - Every integer is a natural number.
- Which of the following statements are correct?
  - Division by zero is not defined.
  - $-3$  is greater than zero.
  - Any number multiplied by zero will give zero.
  - $0$  is an integer.
- Which of the following statement(s) is/are not correct?
  - $-5$  is less than  $0$ .
  - $-3$  lies between  $-4$  and  $4$ .
  - multiplicative inverse of  $-1$  is a positive number.
  - Product of two negative integers is positive.
- Which of the following statements is correct?
  - $0$  is called the additive identity for integers.
  - $1$  is called the multiplicative identity for integers.

(c) The additive inverse of  $0$  is zero itself.  
 (d) None of these

5. Addition of integers satisfies which of the following property?

(a) commutative (b) associative  
 (c) closure (d) None of these

### Passage/Case Based Questions

**DIRECTIONS :** Study the given passage(s) and answer the following questions.

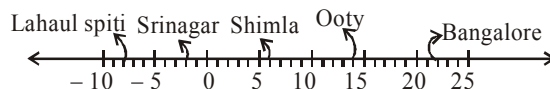
#### Passage-I

In a class test of 20 questions, 5 marks are given for every correct answer and  $(-2)$  marks are given for every incorrect answer. Gurpreet attempts all questions but only 8 of her answers are correct.

- What was Gurpreet's total score?
  - 14 (b) 36
  - 16 (d) 28
- Her friend attempts all questions and gets only 7 answers correct. What will be her score?
  - 10 (b) 15
  - 9 (d) 8
- If Gurpreet gets 10 correct answers, how much more marks she could get?
  - 16 (b) 14
  - 12 (d) 18

#### Passage-II

Following number line shows the temperature in degree celsius ( $^{\circ}\text{C}$ ) at different places on a particular day.



4. What is the temperature difference between the hottest and the coldest places among the above?
- $30^{\circ}\text{C}$  (b)  $-30^{\circ}\text{C}$
  - $14^{\circ}\text{C}$  (d)  $-14^{\circ}\text{C}$

5. What is the temperature difference between Lahaul spiti and Srinagar?  
(a)  $-6^{\circ}\text{C}$  (b)  $6^{\circ}\text{C}$   
(c)  $-10^{\circ}\text{C}$  (d)  $10^{\circ}\text{C}$
6. The temperature of srinagar and Lahaul Spiti taken together is  
(a)  $10^{\circ}\text{C}$  (b)  $-6^{\circ}\text{C}$   
(c)  $-10^{\circ}\text{C}$  (d)  $6^{\circ}\text{C}$

### Assertion & Reason Questions

**DIRECTIONS :** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- (a) If both **Assertion** and **Reason** are correct and **Reason** is the correct explanation of **Assertion**.
- (b) If both **Assertion** and **Reason** are correct but **Reason** is not the correct explanation of **Assertion**.
- (c) If **Assertion** is correct but **reason** is incorrect.
- (d) If **Assertion** is incorrect but **reason** is correct.

1. **Assertion:**  $-12 \times 2 = -24$

**Reason:** Sign of greater number among 2 and 12 is negative, then the result must be negative.

2. **Assertion:** Division by zero is not defined.

**Reason:** Zero is neither negative nor positive.

### Integer Type Questions

**DIRECTIONS :** Answer the following questions. The answer to each of the question is a single digit integer, ranging from 0 to 9.

1. The value of  $45 \div \{8 - (-2 \times 5 + 3)\}$  is
2. The deep freezer of a sweet shop should be at  $-12^{\circ}\text{C}$ . It is set at  $-18^{\circ}\text{C}$  by mistake. What is the difference between these temperature settings.
3. Which is the positive integer closest to zero on the number line?
4. The sum of two integer is  $-12$ . If one of them is  $-35$ , find the sum of digits of other.
5. Find the sum of the smallest positive integer and the greatest negative integer.
6. The additive inverse of  $-9$  is
7. By how much does  $-3$  exceed  $-5$ ?

# SOLUTIONS

## Brief Explanations of Selected Questions



### Let's Revise Through FIB & T/F

1. False
2. True
3. -73
4. 0
5. 6
6. 0
7. False
8. True
9. False
10.  $(x \times y) \times z = x \times (y \times z)$
11. 1
12. True
13. False
14. -3, 2

### EXERCISE-1

### Master Board

### Multiple Choice Questions

1. (c) Total score =  $25 + (-10) + (-15) + (-5) + 20 + 30$   
 $= (25 + 20 + 30) + [(-10) + (-15) + (-5)]$   
 $= 75 + (-30) = 45.$
2. (d) Distance covered in 1<sup>st</sup> second = 5 cm  
 Distance covered in 2<sup>nd</sup> second = -2 cm  
 $\therefore$  Total distance covered in two seconds  
 $= -5 - 2 = 3$  cm  
 Time taken in covering distance of 3 cm  
 $= 2$  secs  
 $= \frac{2}{3} \times 60 = 40$  sec
3. (c) The starting point of the lift = 3<sup>rd</sup> floor  
 The finishing point of the lift = 15<sup>th</sup> floor  
 The number of floors the lift climbed  
 $= 15 - 3 = 12$  floors  
 The height of each floor = 5 m  
 Total distance moved by the lift  
 $= 5 \times 12 = 60$  m  
 Total distance moved by the lift in one second = 2 m

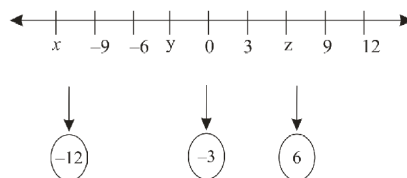
Time taken by the lift to move from 3<sup>rd</sup> to 15<sup>th</sup> floor =  $\frac{60}{2} = 30$  seconds

4. (b) Temperature at 7:00 am =  $-15^\circ\text{C}$

Temperature at 8:00 am  
 $= -15^\circ\text{C} + 3^\circ\text{C} = -12^\circ\text{C}$

Temperature at 9:00 am  
 $= -12^\circ\text{C} - 1^\circ\text{C} = (-13)^\circ\text{C}$

5. (b) On number line, there is a jump of 3



$x = (-12)$ ;  $y = (-3)$ ;  $z = 6$   
 and  $x - y - z = -12 + 3 - 6 = (-15)$

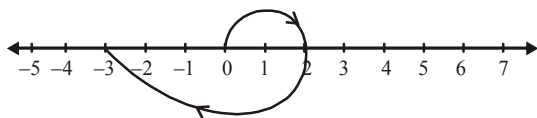
6. (d)  $10 - 5 = 5$   
 $-5 - (-10) = 5$   
 $15 - (-20) = 35$
7. (b) The product of the two integers = 72  
 One of the integers = -9  
 Let the other integers = be  $x$   
 $-9 \times x = 72$   
 $x = \frac{72}{-9} = -8$
8. (a) -42, -39, -4, 40, 41
9. (a) We have,  $[-33 - (-27)] + [88 + (-82)] = [-33 + 27] + [88 - 82]$   
 $\Rightarrow -6 + 6 = 0$

### Assertion & Reason Questions

1. (d)
2. (d)

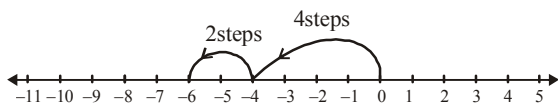
### Very Short Answer Type Questions

- 360
- (i) -72      (ii) 0      (iii) 165
- The required number =  $-60 - (-21) = -39$
- The required number =  $158 - 221 = -63$
- (i)



$$\therefore 2 + (-5) = -3$$

(ii)



$$\therefore (-4) + (-2) = -6$$

- $-92 - (-12) = -92 + 12 = -80$
  - $0 - (+123) = 0 - 123 = -123$
  - $0 - (-150) = 0 + 150 = 150$
- $-188 - (-887) = -188 + 887 = 699$
  - $-173 - 578 = -751$
  - $282 - 345 = -63$
- $(-15625) \div (-125) = \frac{-15625}{-125} = 125$
  - $30000 \div (-100) = \frac{30000}{-100} = -300$
- 39 minutes
- Zero

### Short Answer Type Questions

- Profit earned on 1 meter cloth = ₹ 8  
Profit earned on 500 metres of cloth  
= ₹  $(500 \times 8)$  = ₹ 4000
- Aman has money on Sunday  
= ₹  $(20 - 8 + 5 - 7 - 10 + 5 + 7)$  = ₹ 12
- $a + b = (-15) + (-23) = -38$   
 $b + a = (-23) + (-15) = -38$   
 $\therefore a + b = b + a$   
Now,  $a - b = (-15) - (-23) = -15 + 23 = 8$   
 $b - a = (-23) - (-15) = -23 + 15 = -8$   
 $\therefore a - b \neq b - a$

- $\{(-27) + (-73)\} + (-100)$   
 $= (-100) + (-100) = -200$
  - $\{(-51) + (-83)\} - (-12)$   
 $= (-134) - (-12) = -122$
  - $\{200 - (-100)\} + (-300)$   
 $= 300 + (-300) = 0$

### Long Answer Type Questions

- $1487 \times 327 + (-487) \times 327$   
 $= 327 \times (1487 - 487) = 327000$
  - $28945 \times 99 - (-28945)$   
 $= 28945 \times 99 + 28945 \times 1$   
 $= 28945 \times (99 + 1) = 2894500$
- $(-23)\{(-5) + (19)\} = (-23) \times 14 = -322$   
and  $(-23) \times (-5) + (-23) \times 19 = 115 - 437 = -322$
- $-25 + 14 \div (5 - 3) = -25 + 14 \div 2$   
 $= -25 + 7 = (-18)$
- $22 - \frac{1}{4}\{-5 - 3\} = 22 - \frac{1}{4}(-8) = 24$
- $36 - [18 - \{14 - (15 - 4 \div 2 \times 2)\}]$   
 $= 36 - [18 - \{14 - (15 - 2 \times 2)\}]$   
 $= 36 - [18 - \{14 - 11\}]$   
 $= 36 - (18 - 3) = 21$
- $15625 \times (-2) + (-15625) \times 98$   
 $= (-15625) \times 2 + (-15625) \times 98$   
 $= (-15625) \times (2 + 98)$   
 $= (-15625) \times 100 = -1562500$
  - $18946 \times 99 - (-18946)$   
 $= 18946 \times 99 + 18946$   
 $= 18946 \times (99 + 1)$   
 $= 18946 \times 100 = 1894600$

### EXERCISE-2

### NCERT Questions

### Text Book Questions

- $-7^\circ\text{C}; -3^\circ\text{C}$
- 6200 m
- $(-1) + (-2) = -3$  or  $(-5) + 2 = -3$
  - $(-9) - (-4) = -5$  or  $(-2) - 3 = -5$
  - $(-7) - (-9) = 2$  or  $1 - (-1) = 2$
  - $(-10) + 10 = 0$  or  $5 + (-5) = 0$

$$\begin{aligned}
 5. \quad & (-30) \times [13 + (-3)] = (-30) \times 10 = -300 \\
 & [(-30) \times 13] + [(-30) \times (-3)] \\
 & = -390 + 90 = -300
 \end{aligned}$$

$$\begin{aligned}
 & \text{So, } (-30) \times [13 + (-3)] \\
 & = [(-30) \times 13] + [(-30) \times (-3)]
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & \text{(i) Marks given for one correct answer} = 4 \\
 & \text{So, marks given for 9 correct answers} \\
 & = 4 \times 9 = 36
 \end{aligned}$$

$$\begin{aligned}
 & \text{Marks given for one incorrect answer} \\
 & = -2
 \end{aligned}$$

$$\begin{aligned}
 & \text{So, marks given for 6 (= 15 - 9)} \\
 & \text{incorrect answers} = (-2) \times 6 = -12
 \end{aligned}$$

$$\begin{aligned}
 & \text{Therefore, Gurpreet's total score} \\
 & = 36 + (-12) = 24
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Marks given for 5 correct answers} \\
 & = 4 \times 5 = 20
 \end{aligned}$$

$$\begin{aligned}
 & \text{So, marks given for 10 (= 15 - 5)} \\
 & \text{incorrect answers} = (-2) \times 10 = -20
 \end{aligned}$$

$$\begin{aligned}
 & \text{Therefore, her friend's total score} \\
 & = 20 + (-20) = 0
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & \text{(i) Since the elevator is going down, so the} \\
 & \text{distance covered by it will be} \\
 & \text{represented by a negative integer.}
 \end{aligned}$$

$$\begin{aligned}
 & \text{Change in position of the elevator in one} \\
 & \text{minute} = -5 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 & \text{Position of the elevator after 60 minutes} \\
 & = (-5) \times 60 = -300 \text{ m, i.e., 300 m} \\
 & \text{below ground level.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Change in position of the elevator in 45} \\
 & \text{minutes} = (-5) \times 45 = -225 \text{ m, i.e.,} \\
 & 225 \text{ m below ground level.}
 \end{aligned}$$

$$\begin{aligned}
 & \text{So, the final position of the elevator} \\
 & = -225 + 15 = -210 \text{ m, i.e., 210 m below} \\
 & \text{ground level.}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & \text{(i) } -53000 \quad \text{(ii) } -4182 \\
 & \text{(iii) } -62500
 \end{aligned}$$

$$9. \quad -10^\circ\text{C}$$

$$10. \quad \text{(i) Loss of ₹ 1000 (ii) 4000 bags}$$

$$\begin{aligned}
 11. \quad & \text{(i) Marks given for one correct answer} = 5 \\
 & \text{So, marks given for 10 correct answers} \\
 & = 5 \times 10 = 50
 \end{aligned}$$

$$\text{Radhika's score} = 30$$

$$\begin{aligned}
 & \text{Marks obtained for incorrect answers} \\
 & = 30 - 50 = -20
 \end{aligned}$$

$$\begin{aligned}
 & \text{Marks given for one incorrect answer} \\
 & = (-2)
 \end{aligned}$$

$$\begin{aligned}
 & \text{Therefore, number of incorrect answers} \\
 & = (-20) \div (-2) = 10
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Marks given for 4 correct answers} \\
 & = 5 \times 4 = 20
 \end{aligned}$$

$$\text{Jay's score} = -12$$

$$\begin{aligned}
 & \text{Marks obtained for incorrect answers} \\
 & = -12 - 20 = -32
 \end{aligned}$$

$$\begin{aligned}
 & \text{Therefore, number of incorrect answers} \\
 & = (-32) \div (-2) = 16
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & \text{(i) Profit earned by selling one pen} = ₹ 1 \\
 & \text{Profit earned by selling 45 pens} = ₹ 45, \\
 & \text{which we denote by } + ₹ 45
 \end{aligned}$$

$$\begin{aligned}
 & \text{Total loss given} = ₹ 5, \text{ which we denote} \\
 & \text{by } - ₹ 5
 \end{aligned}$$

$$\begin{aligned}
 & \text{Profit earned} + \text{Loss incurred} \\
 & = \text{Total loss}
 \end{aligned}$$

$$\text{Therefore, Loss incurred}$$

$$= \text{Total Loss} - \text{Profit earned}$$

$$= ₹ (-5 - 45) = ₹ (-50) = -5000 \text{ paise}$$

$$\begin{aligned}
 & \text{Loss incurred by selling one pencil} = 40 \\
 & \text{paise which we write as 40 paise}
 \end{aligned}$$

$$\text{So, number of pencils sold}$$

$$= (-5000) \div (-40) = 125 \text{ pencils}$$

$$\begin{aligned}
 \text{(ii) In the next month there is neither profit} \\
 & \text{nor loss.}
 \end{aligned}$$

$$\text{So, Profit earned} + \text{Loss incurred} = 0$$

$$\text{i.e., Profit earned} = - \text{Loss incurred.}$$

$$\begin{aligned}
 & \text{Now, profit earned by selling 70 pens} \\
 & = ₹ 70
 \end{aligned}$$

Hence, loss incurred by selling pencils  
= ₹ 70 which we indicate by

– ₹ 70 or –7,000 paise.

Total number of pencils sold

$$= (-7000) \div (-40) = 175 \text{ pencils.}$$

13. 9 p.m.;  $-14^{\circ}\text{C}$

### Exemplar Questions

- |        |         |
|--------|---------|
| 1. (c) | 2. (c)  |
| 3. (a) | 4. (b)  |
| 5. (b) | 6. (c)  |
| 7. (c) | 8. (b)  |
| 9. (d) | 10. (a) |

11.  $-5$  and  $-4$  are smaller than  $-3$  but their difference is  $(-4) - (-5) = 1$  which is greater than  $-3$ .

or

$-6$  and  $-10$  are smaller than  $-3$  but their difference is  $(-6) - (-10) = 4$  which is greater than  $-3$ .

12.  $-3 \Delta 2 = (-3) \times (-3) + 2 \times 2 - (-3) \times 2$   
 $= 9 + 4 - (-6) = 13 + 6 = 19$ .

13. O,  $\ominus$ ,  $\otimes$ ,  $\bullet$

14.  $(-43) \times (-99) + 43 = 43 \times \{(-1)(-99) + 1\}$   
 $= 43 \times (99 + 1) = 4300$

15. (i)  $(-17)$  and  $(-12)$  are smaller than  $-5$  and their difference is  $(-17) - (-12) = -5$

(ii)  $(-12)$  is smaller than  $(-11)$  and  $(-1)$  is greater than  $(-11)$  but their difference is  $(-12) - (-1) = -11$

16. Elevation relative to the sea level at the end  
 $= 380 + 540 - 268 + 116 - 152 + 490 - 844 + 94$   
 $= 356 \text{ m above sea level}$

17. (i)  $53 \times (-9) - (-109) \times 53$   
 $= 53 \times \{(-9) - (-109)\}$   
 $= 53 \times 100 = 5300$

(ii)  $68 \times (-17) + (-68) \times 3$   
 $= 68 \times \{(-17) + (-3)\}$   
 $= 68 \times (-20) = -1360$

18. (i)  $(-3) * (-5)$   
 $= (-3) \times (-5) + [(-3) \times (-3) + (-5) \times (-5)]$   
 $= 15 + (9 + 25) = 49$

(ii)  $(-6) * 2$   
 $= (-6) \times 2 + [(-6) \times (-6) + 2 \times 2]$   
 $= -12 + (36 + 4) = 28$

19.  $4 \Delta (-3) = 4 \times (-3) - 2 \times 4 \times (-3) + (-3) \times (-3) (-4) \times (-3) + (-3) \times (-3)$   
 $= (-12) - (-24) + (+108) + 9$   
 $= -12 + 24 + 108 + 9 = 129$

20. Difference between place A and B  
 $= 1800 \text{ m} + 700 \text{ m} = 2500 \text{ m}$

21. Let us denote profit by +ve integer and loss by -ve integer. Then

$$\text{Net profit/loss} = (+47) + (-12) + (-8) = ₹ 27$$

$\therefore$  He had a net profit of ₹ 27.

22. (i) 10 (ii) 30

### HOTS Questions

1. (i) Marks given for 1 correct answer = 5  
 Marks given for 4 correct answer  
 $= 4 \times 5 = 20$

Marks given for 1 incorrect answer  
 $= -2$

Marks given for 6 incorrect answer  
 $= 6 \times (-2) = -12$

Ravi's total score =  $20 + (-12) = 8$  marks

(ii) Marks given for 2 correct answer  
 $= 2 \times 5 = 10$

Marks given for 5 incorrect answer  
 $= 5 \times (-2) = -10$

Heena's total score =  $10 + (-10) = 0$

2. Let the point O denote the ground level.  
 Then, OA = 20 m and OB =  $-370$  m.

$$\therefore AB = 20 - (-370) = 20 + 370 = 390 \text{ m.}$$

Rate of descent = 6 m/min.



$$\text{Time taken} = \frac{390}{6} \text{ min} = 65 \text{ min}$$

$$= 1 \text{ hr } 5 \text{ min.}$$

3. Earning per day = ₹ 125  
 Earning in 30 days =  $30 \times 125 = ₹ 3750$   
 Expenditure per day = ₹ 31  
 Expenditure in 30 days =  $30 \times 31 = ₹ 930$   
 His total savings in 30 days  
 $= ₹ (3750 - 930) = ₹ 2820$
4.  $0 \div 49 = 0$  and  $49 \div 0$  is meaning less.
5.  $0 - 1 + 2 - 3 + 4 - 5 + 6 - 7 \dots -17 + 18 - 19 + 20$   
 $= 0 + (-1 + 2) + (-3 + 4) + (-5 + 6) + \dots$   
 $+ (-17 + 18) + (-19 + 20)$   
 $= 0 + 1 + 1 + \dots + 1 + 1 = 10$
6.  $(-2) \times (-1) \times 4 \times 2 \times (-3)$   
 $= -(2 \times 1 \times 4 \times 2 \times 3) = -48$   
 and  $(-2) + (-1) + 4 + 2 - (-3)$   
 $= -3 + 6 + 3 = 6$   
 Since  $-48 < 6$   
 $\therefore -2 \times (-1) \times 4 \times 2 \times (-3) < (-2) + (-1) + 4 + 2 - (-3)$
7. Here  $a$  is +ve and  $b$  is -ve  
 $\therefore a - b$  is +ve and  $ab$  is -ve  
 $\Rightarrow \frac{a-b}{ab}$  is -ve
8.  $-9 \div 3 = -3$   
 $-4 + 6 = 2$   
 $2(-4) = -8$   
 $1|-7-3| = 1 \times 10 = 10$   
 $-5 - 3 \times 2 = -5 - 6 = -11$   
 Since  $-11 < -8 < -3 < 2 < 10$   
 $\therefore -5 - 3 \times 2, 2(-4), -9 \div 3, -4 + 6, 1|-7-3|$
9.  $(-12 + 16 - 42 \div 3 \text{ of } 7) = (-12 + 16 - 42 \div 21) = (-12 + 16 - 2) = 2$   
 additive inverse of 2 is -2  
 Product of -2, -3 and -4

$$= (-2) \times (-3) \times (-4) = -24$$

$$\text{Now, } -2 + (-24) = -26$$

**EXERCISE-3****Foundation Builder****Multiple Choice Questions**

- (c)  $()$ ,  $\{\}$ ,  $[\ ]$
- (a) Commutative property
- (c)
- (d) Does not exist
- (b)  $-8 - 2 [6 + 4 \{7 - (4)\}]$   
 $= -8 - 2[6 + 4 \{7 - 4\}]$   
 $= -8 - 2[6 + 4 \{3\}]$   
 $= -8 - 2[6 + 12] = -8 - 2[18]$   
 $= -8 - 36 = -44$
- (c)  $(-43) + (+12) = -31$
- (c) Distributive property
- (c) we cannot determine whether  $a - b$  is a whole number or not.
- (c) Parenthesis  $()$
- (c) Addition, subtraction, multiplication.
- (a)  $[124 \times 4 - 3 + 118 \div 2]$   
 $= (124 \times 4) - 3 + 59 = 496 - 3 + 59 = 552$

**More Than One Option Correct**

- (a, c)
- (a, c, d)
- (a, b, d)
- (a, b, c)
- (a, b, c) Addition of integers satisfies commutative, associative and closure properties.

**Passage/Case Based Questions**

- (c) Score for her correct answers  
 $= 8 \times 5 = 40$   
 Marks deducted for incorrect answer  
 $= 12 \times 2 = 24$   
 Total Score =  $40 - 24 = 16$

2. (c) Marks for correct answer =  $7 \times 5 = 35$   
 Marks deducted for incorrect answer  
 $= 13 \times 2 = 26$   
 Total score =  $35 - 26 = 9$
3. (b) Marks for 10 correct answer  
 $= 10 \times 5 = 50$   
 Marks deducted for 10 incorrect answers.  
 $= 10 \times 2 = 20$   
 Total score =  $50 - 20 = 30$   
 Difference between marks  
 $= 30 - 16 = 14$
4. (a)  $22 - (-8) = 30^\circ\text{C}$ .
5. (b)  $-2 - (-8) = 6^\circ\text{C}$
6. (c)  $(-2) + (-8) = -10^\circ\text{C}$

### Assertion & Reason Questions

1. (c) If **Assertion** is **correct** but **Reason** is **incorrect**.
2. (b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.

### Integer Type Questions

1. (3)  $45 \div \{8 - (-10 + 3)\} = 45 \div \{8 + 7\}$   
 $= 45 \times \frac{1}{15} = 3$
2. (6)  $-12 - (-18) = 6^\circ\text{C}$
3. (1)
4. (5) The sum of two integers =  $-12$   
 One of them =  $-35$   
 Let the other integer be  $x$ .  
 $\therefore -35 + x = -12$   
 $\Rightarrow x = -12 + 35 = 23$   
 Sum of digits of  $x$  i.e., 23 is  $2 + 3 = 5$
5. (0) Smallest positive integer = 1  
 Greatest negative integer =  $-1$   
 $\therefore$  Their sum =  $1 + (-1) = 0$
6. (9) The additive inverse of  $-9$  is 9.
7. (2) Let  $-3$  exceed  $-5$  by  $x$   
 $\Rightarrow -3 - x = -5 \Rightarrow -3 + 5 = x \Rightarrow x = 2$