



INTEGERS

Introduction

The sum of two whole numbers is always a whole number, so the set of whole number is closed under addition, but is this true for subtraction also? The answer is no. For example, when 4 is subtracted from 9, the answer is 5, which is a whole number, but when we subtract 9 from 4 what do we get?

We get -5 , which is not a whole number. Thus, this operation cannot be performed if we have only the set of whole numbers to work with. So we extend this set and include negative natural numbers also. So let's study about this topic in broad.

Integers

Natural numbers

Counting numbers are called natural numbers.

Thus 1, 2, 3, 4, 5, 6..., etc., are all natural numbers.

Whole numbers

All natural numbers together with 0 (zero) are called whole numbers.

Thus, 0, 1, 2, 3, 4....., etc., are whole numbers.

Clearly, every natural number is a whole number but every whole number is not a natural number as 0 is a whole number which is not a natural number.

Integers

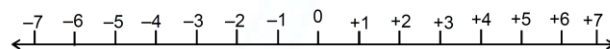
All natural numbers, 0 and negatives of natural numbers are called integers.

Set of integers is denoted by Z or I

I or $Z = \{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$ is the set of integers.

- Positive integers : 1, 2, 3, 4, 5..... etc., are all positive integers.
- Negative integers : $-1, -2, -3, -4, \dots$, etc., are all negative integers.
- Zero is an integer which is neither positive nor negative.

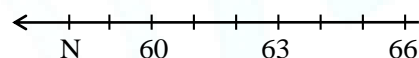
Representation of numbers on number line



We draw a line and mark a point O in the middle of that line. This point denotes the number 0.

Since negative numbers are opposites of positive numbers, therefore if positive numbers $+1, +2, +3, +4, \dots$ are marked at 1 unit, 2 units, 3 units, 4 units and so on from the 0-mark to right of it, then points at distances 1 units, 2 units, 3 units, 4 units and so on from the 0-marks to the left of it shall represent negative integers $-1, -2, -3, -4, \dots$ and so on.

For example. The letter N represents number, 58.



Predecessor

One less than a given integer is called its predecessor.

e.g predecessor of 390 is 389, while that of -390 is -391

Successor

One more than a given integer is called its successor.

e.g successor of 390 is 391, while that of -390 is -389

Comparison of integers

- Every positive integer is greater than the negative integer, e.g. $2 > -2, 7 > -12$
- Zero is less than every positive integer, e.g. $0 < 5, 0 < 9$
- Zero is greater than every negative integer, e.g. $0 > -7, 0 > -99$
- The greater the number, the lesser is its opposite, i.e., if a and b are two integers such that $a > b$, then $-a < -b$. Likewise if $a < b$ then $-a > -b$, e.g. if $7 < 9$ then $-7 > -9$ and if $3 < 6$ then $-3 > -6$

Modulus or absolute value of an integer

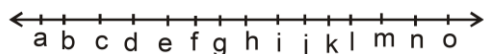
Absolute value of an integer is the numerical value of the integer regardless of its sign. The symbol is used to represent the absolute value of an integer. Thus $|8| = 8, |-8| = 8$.





FUNDAMENTAL UNLOCKED- (FU#1)

Q.1 A number line representing integer is given below



b, e are marked by -7 and -4 . Find m, n, o

Q.2 Arrange $-13, -10, 10, 5, 0, -2$ in ascending order and mark on number line.

Q.3 Write 5 integers less than -6 and 5 integer greater than -6 .

Q.4 Write predecessor of
(i) largest five digit number
(ii) smallest six digit number

Q.5 Simplify : $|18 - 3| + |-10|$

Operation on Integers

Addition of Integers

Rule : 1 If two positive or two negative integers are added, we add their values regardless of their signs and give the sum with their common sign.

For example : Add -31 and -25 .

$$\begin{array}{r} \text{Sol.} \quad -31 \\ \quad -25 \\ \hline \quad -56 \end{array}$$

Rule : 2 To add a positive and a negative integer, we find the difference between their numerical values regardless of their signs and give the sign of the integer with the greater value to it.

For example : Add : -47 and 18

$$\begin{array}{r} -47 \\ +18 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Sol.} \quad +18 \\ \quad -47 \\ \hline \quad -29 \end{array}$$

For example : Add : 456 and -181

$$\begin{array}{r} +456 \\ -181 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Sol.} \quad -181 \\ \quad +456 \\ \hline \quad 275 \end{array}$$

Properties of Addition on Integers

Closure property of Addition :

The sum of two integers is always an integer.

For example:

- (i) $5 + 4 = 9$, which is an integer.
- (ii) $4 + (-8) = -4$, which is an integer.

Commutative law of addition:

If a and b are any two integers, then $a + b = b + a$

For example:

$$\begin{aligned} \text{(i)} \quad & (-4) + 9 = 5 \text{ and } 9 + (-4) = 5 \\ \therefore & (-4) + 9 = 9 + (-4) \end{aligned}$$

Associative Law of addition:

If a, b, c are any three integers, then $(a + b) + c = a + (b + c)$

For example:

$$\begin{aligned} \text{Consider the integers } & (-6), (-8) \text{ and } 5. \text{ We have} \\ \{(-6) + (-8)\} + 5 &= (-14) + 5 = -9. \\ \text{And, } & (-6) + \{(-8) + 5\} = (-6) + (-3) = -9 \\ \therefore & \{(-6) + (-8)\} + 5 = (-6) + \{(-8) + 5\}. \end{aligned}$$

Existence of Additive Identity:

For any integer a, we have $a + 0 = 0 + a = a$
0 is called the additive identity for integers.

For example :

$$\begin{aligned} \text{(i)} \quad & 9 + 0 = 0 + 9 = 9 \\ \text{(ii)} \quad & (-6) + 0 = 0 + (-6) = (-6) \end{aligned}$$

Existence of Additive Inverse :

For any integer a, we have $a + (-a) = (-a) + a = 0$

The opposite of an integer a is $(-a)$.

The sum of an integer and its opposite is 0.

Additive inverse of a is $(-a)$.

Similarly, additive inverse of $(-a)$ is a.

For example:

$$\text{We have } 5 + (-5) = (-5) + 5 = 0.$$

So, the additive inverse of 5 is (-5) .

And, the additive inverse of (-5) is 5.

Subtraction of Integers

For any integers a and b, we define, $a - b = a + (-b)$.

For example :

Subtract (i) 8 from 5 (ii) -6 from 3.

Sol. We have :

$$\text{(i)} \quad 5 - 8 = 5 + (\text{negative of } 8) = 5 + (-8) = -3$$

$$\text{(ii)} \quad 3 - (-6) = 3 + \{\text{negative of } (-6)\} = 3 + 6 = 9.$$


Properties of subtraction
Closure Property of Subtraction :

If a and b are any two integers. Then $(a - b)$ is always an integer.

Commutative property :

Subtraction of Integers is not Commutative :

For example :

$$3 - 5 = 3 + (-5) = -2, 5 - 3 = 5 + (-3) = 2$$

Thus, $3 - 5 \neq 5 - 3$.

Subtraction of integers is not associative:
For example:

Consider the integers 3, -4 and -5 we have

$$\begin{aligned} \{3 - (-4)\} - (-5) &= \{3 + (\text{additive inverse of } -4)\} \\ - (-5) &= (3 + 4) - (-5) = 7 - (-5) \\ &= 7 + (\text{additive inverse of } -5) = (7 + 5) = 12 \end{aligned}$$

$$\text{And, } 3 - \{(-4) - (-5)\} = 3 - \{(-4) + (\text{additive inverse of } -5)\} = 3 - \{-4 + 5\} = (3 - 1) = 2$$

Hence, $\{3 - (-4)\} - (-5) \neq 3 - \{(-4) - (-5)\}$.

Multiplication of Integers

Rule : 1 To find the product of two integers with unlike signs. Find the product of their values regardless of their signs and give a minus sign to the product.

For example :

Find the product of $6 \times (-5)$.

Sol. $6 \times (-5) = -30$

Rule : 2 To find the product of two integers with the same sign. We find the product of their values regardless of their signs and give a plus sign to the product.

For example :

Find the product of : $(-8) \times (-14)$

Sol. $(-8) \times (-14) = (8 \times 14) = 112$.

Properties of multiplication

The multiplication of integers possesses the following properties.

Closure property:

The product of two integers is always an integer.

That is, for any two integers a and b , $a \times b$ is an integer.

Verification : We have

(i) $4 \times 3 = 12$, which is an integer.

(ii) $3 \times (-5) = -15$, which is an integer.

(iii) $(-7) \times (-6) = 42$, which is an integer.

Commutative :

For any two integers a and b , we have $a \times b = b \times a$ that is multiplication of integers is commutative.

Verification : We have,

(i) $7 \times (-6) = -(7 \times 6) = -42$ and $(-6) \times 7 = -(6 \times 7) = -42$

$$\therefore 7 \times (-6) = (-6) \times 7$$

Commutative property holds good.

(ii) $(-5) \times (-9) = 5 \times 9 = 45$ and $(-9) \times (-5) = 9 \times 5 = 45$

$$\therefore (-5) \times (-9) = (-9) \times (-5).$$

Associative:

The multiplication of integers is associative, i.e., for any three integers a , b , c , we have :

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

Verification: we have

(i) $(-3) \times \{4 \times (-7)\} = (-3) \times (-28) = 3 \times 28 = 84$ and, $\{(-3) \times 4\} \times (-7) = (-12) \times (-7) = 12 \times 7 = 84$

$$\therefore (-3) \times \{4 \times (-7)\} = \{(-3) \times 4\} \times (-7)$$

Thus, associative property holds good.

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

and $\{(-2) \times (-3)\} \times (-5) = 6 \times (-5) = -(6 \times 5) = -30$

$$\therefore (-2) \times \{(-3) \times (-5)\} = \{(-2) \times (-3)\} \times (-5).$$

Distributive property of multiplication over addition:

The multiplication of integers is distributive over their addition. That is, for any three integers a , b , c , we have:

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

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





Verification: We have,

$$(-4) \times \{(-2) + (-3)\} = (-4) \times (-5) = 4 \times 5 = 20$$

$$\text{and, } (-4) \times (-2) + (-4) \times (-3) = (4 \times 2) + (4 \times 3) = 8 + 12 = 20$$

$$\therefore (-4) \times \{(-2) + (-3)\} = (-4) \times (-2) + (-4) \times (-3).$$

Note:

(i) A direct consequence of the distributivity of multiplication over subtraction is :

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

(ii) **Existence of multiplicative identity :**

For every integer a , we have

$$a \times 1 = a = 1 \times a$$

The integer 1 is called the multiplicative identity for integers.

(iii) **Existence of multiplicative inverse :**

Multiplicative inverse of a nonzero integer a is the number $\frac{1}{a}$, as

$$a \cdot \left(\frac{1}{a}\right) = \left(\frac{1}{a}\right) \cdot a = 1$$

For example : Multiplicative inverse of 6 is $\frac{1}{6}$.

(iv) **Property of Zero :**

For any integer, we have

$$a \times 0 = 0 = 0 \times a$$

(i) We know that $(-a)$ is additive inverse or opposite of a . Thus, to find the opposite or additive inverse or negative of an integer, we multiply the integer by -1 .

(ii) Since, multiplication of integers is associative. Therefore, for any three integers a, b, c , we have $(a \times b) \times c = a \times (b \times c)$

Thus, we will write $a \times b \times c$ for the equal products of $(a \times b) \times c$ and $a \times (b \times c)$.

(iii) When the number of negative integers in a product is odd, the product is negative.

(iv) When the number of negative integers in a product is even, the product is positive.

(v) If a, b, c are integers, such that $a > b$, then

(a) $a \times c > b \times c$, if c is positive

(b) $a \times c < b \times c$, if c is negative.

For example:

Find each of the following products :

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

Sol. (i) We have,

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

(ii) We have,

$$9 \times (-3) \times (-6)$$

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

$$= -27 \times (-6) = 27 \times 6 = 162.$$

And, the additive inverse of (-5) is 5.

Division of Integers

We know that division is an inverse process of multiplication.

Rule 1: For dividing one integer by the other, the two having unlike signs, we divide their values regardless of their signs and give a minus sign to the quotient.

For example: Evaluate $(-48) \div 12$.

Sol. $(-48) \div 12 = \frac{-48}{12} = -4.$

Rule 2: For dividing one integer by the other having like signs. we divide their values regardless of their signs and give a plus sign to the quotient.

For example: $(-12) \div (-4) = \frac{-12}{-4} = 3$

Properties of division

Division of integers has the following properties :

(i) If a and b are integers, then $a \div b$ is not necessarily an integer.

For example, $15 \div 4, -14 \div 3$ are not integers.

(ii) If a is an integer different from 0, then $a \div a = 1$.

(iii) For every integer a , we have $a \div 1 = a$.

(iv) If a is a non-zero integer, then $0 \div a = 0$

(v) If a is an integer, then $a \div 0$ is meaningless.

(vi) If a, b, c are integers, then

(A) $a > b \Rightarrow a \div c > b \div c$, if c is positive.

(B) $a > b \Rightarrow a \div c < b \div c$, if c is negative.

Example 1:

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?


Solution:

- (i) Marks given for one correct answer = 5
 So, marks given for 10 correct answers = $5 \times 10 = 50$
 Radhika's score = 30
 Marks obtained for incorrect answers = $30 - 50 = -20$
 Marks given for one incorrect answer = (-2)
 Therefore, number of incorrect answers = $(-20) \div (-2) = 10$
- (ii) Marks given for 4 correct answers = $5 \times 4 = 20$
 Jay's score = -12
 Marks obtained for incorrect answers = $-12 - 20 = -32$
 Marks given for one incorrect answer = (-2)
 Therefore, number of incorrect answers = $(-32) \div (-2) = 16$.

Example 2:

Evaluate $(-48) \div (-16)$.

Solution:

$$(-48) \div (-16) = \frac{-48}{-16} = 3.$$

FUNDAMENTAL UNLOCKED- (FU#2)

- Q.1** Alisha participated in a quiz, she won Rs 80 for answering correct in first round, but had to pay Rs. 30 as penalty for answering wrong. In second round she again won Rs 100, but lost Rs 25 for some wrong answers. How much she scored at the end of quiz
- Q.2** Write two integers which are smaller than -3 , but their difference is greater than -3 .
- Q.3** Use the sign $>$, $<$, $=$
 (i) $29 + (-18) - 15$ _____ $36 - (-15) + 28$
 (ii) $-241 + 76 + 86$ _____ $-399 + 163 + 45$
- Q.4** (i) Write a negative integer and a positive integer whose sum is -10 .
 (ii) Write a negative integer and a positive integer whose difference is -16 .
 (iii) Find the value of $[(-4) \times (-9) \times (-25)] \div [(-2) \times (-3) \times (-5)]$
- Q.5** Simplify : $\frac{-4256}{-56} + \frac{-3780}{-54} + \frac{2132}{41} + \frac{4224}{-66}$

Operator Precedence

Generally, the order in which we perform operations sequentially from left to right is : bracket, of, division, multiplication, additions & subtraction. This order is expressed in short as 'BODMAS'

Example 3:

Simplify: $(-20) + (-8) \div (-2) \times 3$.

Solution:

We have,

$$\begin{aligned} (-20) + (-8) \div (-2) \times 3 &= (-20) + 4 \times 3 \\ &= (-20) + 12 = -8. \end{aligned}$$

Use of brackets

In order to simplify expression involving more than one brackets, we use the following steps.

Step-I See whether the given expression contains a vinculum or not. If a vinculum is present, then perform operations under it. Otherwise go to next step.

Step-II See the innermost bracket and perform operations within it.

Step-III Remove the innermost bracket by using following rules :

Rule 1 : If a bracket is preceded by a plus sign, remove it by writing its terms as they are.

Rule 2 : If a bracket is preceded by minus sign, change positive signs within it to negative and vice-versa.

Rule 3 : If there is no sign between a number and a grouping symbol, then it means multiplication.

Rule 4 : If there is a number before some brackets then we multiply the number inside the brackets with the number outside the brackets.

Step-IV See the next innermost bracket and perform operations within it. Remove the second innermost bracket by using the rules given in step III. Continue this process till all the brackets are removed.





Example 4: Simplify: $48 - [18 - \{16 - (5 - \overline{4-1})\}]$.

Solution: We have, $48 - [18 - \{16 - (5 - \overline{4-1})\}] = 48 - [18 - \{16 - (5 - 3)\}] = 48 - [18 - \{16 - 2\}] = 48 - [18 - 14] = 48 - 4 = 44$.

Example 5:

Simplify : $222 - \left[\frac{1}{3} \{42 + (56 - \overline{8+90}) + 108\} \right]$.

Solution:

We have, $222 - \left[\frac{1}{3} \{42 + (56 - \overline{8+90}) + 108\} \right]$
 $= 222 - \left[\frac{1}{3} \{42 + (56 - 17) + 108\} \right]$
 $= 222 - \left[\frac{1}{3} \{42 + 39 + 108\} \right] = 222 - \left[\frac{81}{3} + 108 \right]$
 $= 222 - [27 + 108] = 222 - 135 = 87$.

FUNDAMENTAL UNLOCKED- (FU#3)

Q.1 Simplify :

$$429 - \left[\frac{1}{2} \{-1 - (5 - (4 - (-1))) + 108\} \right]$$

Q.2 Simplify : $3 \times (5 \times 2 - 4) + 10 - 15 \div 5$

Q.3 Simplify : $4 - [6 - \{7 - (8 - \overline{6-3})\}]$

Q.4 Simplify: $7 - [3 - 2\{5 + 6(7 - 8 + 9 - 10)\}]$.

Q.5 Simplify : $-4 - [4 + 15 \div 5 - \{6 - (2 + 8)\}]$

Add to Your Knowledge

1. In this chapter we have studied modulus, but can you solve $|10 - k| = 3$.

After solving you will say $k = 7$ satisfy above equation, but what is wrong with $k = 13$. Confused !!!!!!!

Explanation : $|x| = \begin{cases} +x & , x > 0 \\ -x & , x < 0 \end{cases}$

So first we will solve above equation taking $(10 - k)$ positive, and again by considering it negative e.g. $-(10 - k)$ and by solving both we will get $K = 7$ and $K = 13$ respectively.

2. Sum of first n natural numbers $1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$

3. Sum of first n odd natural numbers
 $1 + 3 + 5 + \dots + (2n - 1) = ?$

$$1 = 1 = 1^2$$

$$1 + 3 = 4 = 2^2$$

$$1 + 3 + 5 = 9 = 3^2$$

$$1 + 3 + 5 + 7 = 16 = 4^2$$

So the answer seems to be $1 + 3 + 5 + 7 + \dots + (2n - 1) = n^2$. Where n is the number of terms.

4. Sum of first n even natural numbers

$$2 = 2$$

$$2 + 4 = 6$$

$$2 + 4 + 6 = 12. \text{ So the answer}$$

$$2 + 4 + 6 + 8 + \dots + 2n = n(n + 1)$$

Where n is the number of terms.

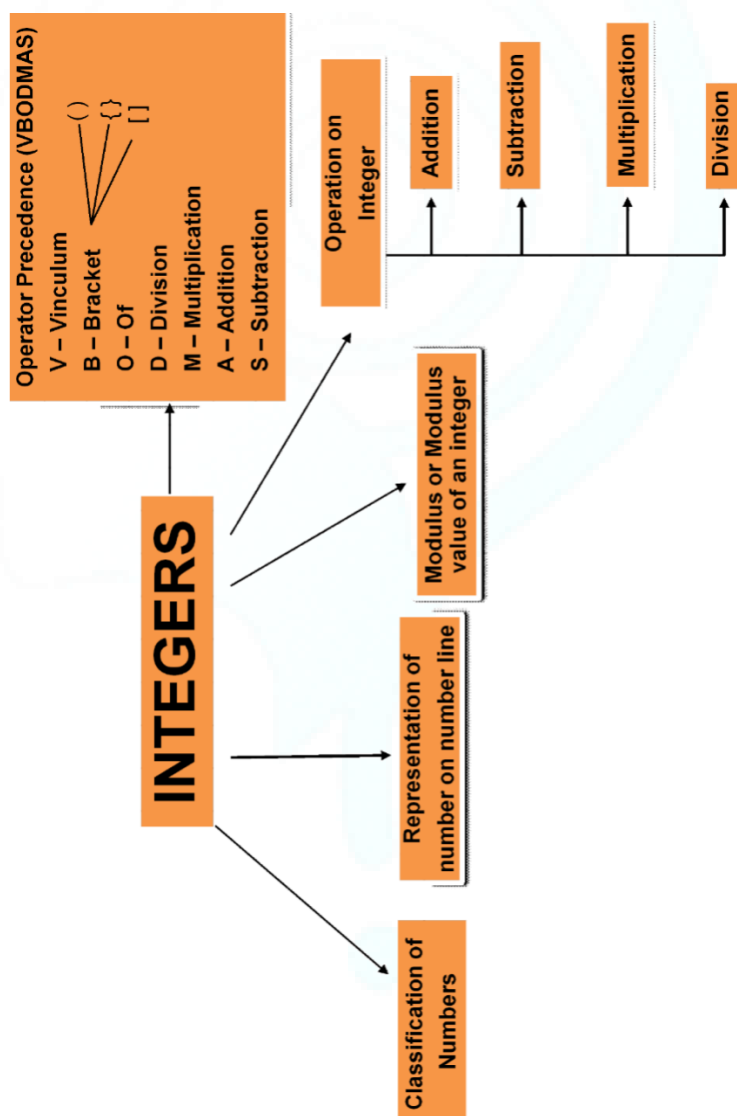
Summary/What we learned so far ?

1. I or Z = $\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$ is the set of integers.
2. (i) Positive integers : 1, 2, 3, 4, 5..... etc., are all positive integers.
 (ii) Negative integers : -1, -2, -3, -4,....., etc., are all negative integers.
 (iii) Zero is an integer which is neither positive nor negative.
3. The absolute value of an integer a is its numerical value regardless of its sign and is denoted by $|a|$
4. The sum of two integers with like signs is the sum of the absolute values of the addends having the sign of the addends. e. g. $2 + 3 = 5$ and $-2 + -3 = -5$
5. The sum of two integers with unlike signs is the difference of the absolute values of the addends having the sign of the integer with greater numerical value e. g. $-2 + 4 = 2$ and $8 + 2 = -6$
6. The operation of addition has closure, commutative, associative, addition of zero, additive inverse properties.
7. To subtract b from a , we add the additive inverse of b , to a , i.e. $a - b = a + (-b)$,
 e.g. $-4 - 5 = -4 + (-5) = -9$
 and $-7 - (-5) = -7 + (5) = -2$



8. The product of two integers with like signs is the product of the absolute values, with a positive sign. e.g. $8 \times 9 = 72$ and $-8 \times -9 = 72$
9. The product of two integers with unlike signs is the product of the absolute values, with a negative sign. e.g. $-8 \times 9 = -72$ and $8 \times -9 = -72$
10. The operation of multiplication has closure, commutative, associative properties.
11. The quotient of two integers with same sign is a positive integer obtained by dividing the absolute value of the dividend by the absolute value of the divisor. e.g. $8 \div 2 = 4$ and $(-10 \div -5) = 2$.
12. The quotient of two integers with unlike sign is a negative integer obtained by dividing the absolute value of the dividend by the absolute value of the divisor. e.g. $\{-8 \div (2)\} = -4$ and $\{10 \div (-5)\} = -2$.
13. Division by zero is not allowed.
14. Priority of brackets in BODMAS is $()$, $\{\}$, $[\]$

Chapter Map





ANSWER KEY

FUNDAMENTAL UNLOCKED- (FU#1)

- Q.1 4, 5, 6 respectively
 Q.3 $-13, -10, -2, 0, 5, 10$
 Q.3 $-7, -8, -9, -10, -11$ & $-5, -4, -3, -2, -1$
 Q.4 (i) 99998 (ii) 99999
 Q.5 25

FUNDAMENTAL UNLOCKED- (FU#2)

- Q.1 Rs.125
 Q.2 -1
 Q.3 (i) $<$ (ii) $>$
 Q.4 (i) $-25, 15$ (ii) $(-10), 6$ (iii) 30
 Q.5 134

FUNDAMENTAL UNLOCKED- (FU#3)

- Q.1 22737
 Q.2 25
 Q.3 0
 Q.4 -10
 Q.5 -15




EXERCISE - I
SINGLE CORRECT TYPE QUESTIONS

- The sum of which of the following is the smallest?
(A) $923 + 456$ (B) $701 + 632$
(C) $602 + 788$ (D) $513 + 998$
- $1384 + 5580 + 47218$
(A) 54182 (B) 54178 (C) 51184 (D) 51178
- Harshita earns Rs 3500. If she spent Rs 1249 on buying earphones, what is the balance of her salary?
(A) Rs 2751 (B) Rs 2251
(C) Rs 2151 (D) Rs 2059
- Sandhya bought 19 boxes of sweets. Each box contains 228 sweets. How many sweets would be left with her after giving 519 sweets to friends?
(A) 766 (B) 3813 (C) 4332 (D) 4851
- Riddhima saves Rs. 46.3 everyday. Find the minimum number of days for which she needs to save to get her savings as a whole number.
(A) 10 (B) 20 (C) 5 (D) 15
- For any integer x what is true :
(A) $x / 0$ is not defined
(B) $x / 1 = a$ (where $x \neq a$)
(C) option (A) and (B) both are wrong
(D) option (A) and (B) both are right
- Which of the following integer has the greatest value?
(A) -11 (B) -89 (C) -8 (D) -6
- Evaluate : $|5 - 3| - |5 - 8| + |13 - 67|$
(A) 53 (B) 33 (C) 43 (D) 67
- Simplify : $|2| + |-12| - |-2| + |-101| - |-101|$
(A) 24 (B) 12 (C) 0 (D) 22
- Find predecessor of successor of -110
(A) -111 (B) -108 (C) -112 (D) -110
- The additive inverse of -6 is :
(A) 6 (B) 0 (C) -5 (D) -7
- On subtracting (-6) from 0, we get :

- (A) -6 (B) 6
(C) 7 (D) None of these
- By how much does -3 exceed -5 ?
(A) -2 (B) 2 (C) 8 (D) -8
- Subtract -8 from -3
(A) 5 (B) -5 (C) 11 (D) -11
- Reciprocal of $\frac{1}{7}$ is :
(A) 7 (B) 1 (C) -7 (D) $\frac{1}{7}$
- For integers :
(A) Addition is associative
(B) Addition is commutative
(C) Integer "0" is the identity under addition
(D) All of the above
- What must be subtracted from -3 to get -9 ?
(A) -6 (B) 12 (C) 6 (D) -12
- The sum of two integers is 93. If one of them is -59, the other one is :
(A) 34 (B) -34 (C) 152 (D) -152
- The product of two integers is 12, if one integer is -3 then the other one is :
(A) +4 (B) -4 (C) 3 (D) -3
- A hiker is descending 152 m every 8 minute. What will be hikers change in elevation in half an hour?
(A) -4560 m (B) -76 m
(C) -570 m (D) -1216 m
- $(-8) \div 0 = ?$
(A) -8 (B) 0
(C) 8 (D) Not defined
- Resolve the brackets and simplify: $(28 \div 2) \div (56 \div 8)$.
(A) 1 (B) 4 (C) 3 (D) 2
- $(-48) \times (-1) \times (3) \times 0 \times (-4)$
(A) -576 (B) 576 (C) 0 (D) 1000
- $-4 \times [5 + 6]$ is equal to :
(A) $-4 \times 5 + 6$ (B) $-4 \times 5 + 4 \times 6$
(C) $-4 \times 5 - 4 \times 6$ (D) $5 - 4 \times 6$
- $30 \times (-23) + 30 \times 14 = ?$





- (A) -270 (B) 270 (C) 1110 (D) -1110
26. Which of the following expression is not equal to -20
 (A) -4×5
 (B) $-32 + 10 - (-2)$
 (C) $-6 \times 2 - [-2 \times -4]$
 (D) $5 \times (-2) + (-3) \times 4$
27. $(-9) + 4(6 - \overline{8 + 4})$.
 (A) -15 (B) -33 (C) 10 (D) 33
28. The difference between the largest 5-digit number and the largest 5-digit number with three distinct digits is
 (A) 10 (B) 10012 (C) 12 (D) 123
29. Re-arrange the digits of $1,02,35,007$ to get the largest and the smallest number. The difference between the place values of 2 in these two numbers is
 (A) 0 (B) $8,000$ (D) $20,000$ (D) $18,000$
30. Suppose n is an integer such that the sum of the digits of n is 2 and its range is $104 < n < 105$. The number of different values for n is
 (A) 5 (B) 4 (C) 3 (D) 2
31. If a and b are integers, then $a \div b$
 (A) may or may not be integer
 (B) always an integer
 (C) never be an integer
 (D) none of these
32. If A and B represent two integers other than zero, then $|A| + |B| - |B| - |A|$
 (A) may be negative (B) may be positive
 (C) may be 0 (D) must be 0
33. If the sum of five consecutive positive integers is A , then the sum of the next five consecutive integers in terms of A is :
 (A) $A + 1$ (B) $A + 5$ (C) $A + 25$ (D) $2A$
34. If x is an even positive integer and y is an odd positive integer, then which of the following statements is true ?
 (A) $(x - 1)y$ is even (B) $x(y - 1)$ is odd
 (C) $(x - 1)(y - 1)$ is odd (D) $x(y - 1)$ is even
35. 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?

- (A) 2400 m (B) 2500 m
 (C) 1100 m (D) 1000 m
36. $(-1)^{234} \times (-5)^{546} \times (-2)^{786}$ results in a
 (A) negative integer (B) positive integer
 (C) zero (D) none of these
37. Kanhaiya multiplied two numbers and got -4 as the product. He then subtracted the second number from the first and got the answer as 5 . The two numbers are
 (A) $2, -3$ (B) $1, -4$
 (C) $-21, 4$ (D) $5, -1$
38. If p : when a positive integer and a negative integer are added we always get a negative integer and q : when two negative integers are added, we get a positive integer, then
 (A) Both p and q are true
 (B) p is true and q is false
 (C) p is false and q is true
 (D) both p and q are false
39. Ashish had Rs 20 with him. He spent Rs 8 on Monday, got Rs 5 as pocket money on Tuesday, gave Rs. 7 loan to a friend on Wednesday, ate an ice cream worth Rs 10 on Thursday, received a reward of Rs. 5 from his grandfather on Friday. How, much does he have on Sunday, if his friend repays the loan on Saturday?
 (A) Rs 12 (B) Rs 13 (C) Rs 14 (D) Rs 9
40. The product of three integers are -600 . If two of them are -15 and 10 , the third integer is:
 (A) 4 (B) 5 (C) 6 (D) 9
41. A submarine left the surface of the water at the rate of -2 metre per second. At that rate, how long would it take the submarine to reach -60 metres level.
 (A) 30 sec (B) 20 sec (C) 50 sec (D) 80 sec
42. A 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 seconds will it take to climb the rod.
 (A) 20 seconds (B) 39 seconds





(C) 60 seconds (D) 30 seconds

43. $||22| - |22|| \div ||10| - 32|$ equals
(A) 2 (B) -2 (C) 0 (D) -4
44. Evaluate: $\frac{8 - [5 - (-3 + 2)] \div 2}{|5 - 3| - |5 - 8| \div 3}$
(A) 2 (B) 3 (C) 4 (D) 5
45. Solve for k: $|k - 5| = 8$
(A) 13
(B) -3
(C) 10
(D) both option (A) and (B)
46. Solve for x: $|2x - 5| = 1$
(A) 3
(B) 2
(C) 4
(D) both option (A) and (B)

FILL IN THE BLANKS

- Greatest negative integer is _____
- 0 is greater than every _____ integer.
- _____ is an integer which is neither positive nor negative.
- Product of 11 negative integers and 3 positive integers is _____
- In _____ inverse, $a + (-a) = (-a) + a = 0$
- One less than a given integer is called its _____.
- $12 \div 3 \times 5 - 8$ is equal to :
- $3 - 0(5 + 9)$ is equal to :

TRUE/FALSE

- Every whole number is a natural number but every natural number is not a whole number.
- Successor of a largest three-digit number is 1000.
- The product of two numbers with opposite sign is always negative.
- The difference of two numbers with opposite sign is always negative.
- The sum of two negative is less than either of the addends.
- When the number of negative integers in a product is even, the product is positive.
- When the number of negative integers in a product is odd, the product is negative.
- $3 + 4 - 5 \times 2 = -3$.
- $5 - [3 + \{5 + 2 - 1\}] = 4$.





EXERCISE - II

VERY SHORT ANSWER TYPE QUESTIONS

- Write successor of
(a) largest five digit number
(b) smallest six digit number
- In exam, student scored 18, -2, 15, -10, 20 in 5 consecutive test, arrange marks in descending order.
- Find the additive inverse of :
(i) -26 (ii) 12 (iii) 0 (iv) -1
- Solve : $-a \times -b \times 0 \times -c \times -d$
- The product of two numbers is -180. If one number is 12, find the other number.
- Sum of the two integers is 63. If one of them is -37, find the other
- Calculate: $(-6) + (6) + (-6) + (6) + (6)$
- Simplify: $3 + 2 - 8 \div 4$

SHORT ANSWER TYPE QUESTIONS

- Find the pattern and answer it.
(a) 8, 5, 2, -1, -4, _____, _____, _____
(b) 20, 15, 10, 5, 0, _____, _____, _____
(c) -3, -6, -9, -12, _____, _____, _____
- Find the sum of successor of largest three-digit number and predecessor of smallest two digit number.
- Arrange the given integer in ascending order:
3, 7, -8, -10, 12, 15, -20
- The temperature at 12 noon was 10°C above zero. If it decreases at the rate at 2°C per hour until midnight, at what time would the temperature be 8°C below zero?

For Q. 13 & 14

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 answer are correct. What is her total score?
- One of her friends gets only 5 answers correct. What will be her score?

- Solve : $25 - 5 \times 2 + 3 - 8 \div 2$.
- Simplify each of the following and find the correct answer in the same order:
(i) $39 - [23 - \{29 - (17 - \overline{9-3})\}]$.
(ii) $15 - (-3) \{4 - \overline{7-3}\} \div [3 \{5 + (-3) \times (-6)\}]$.
- A tanker contains 500 litres of milk. Due to small hole in a tanker, the quantity of milk is decreasing at the rate of 9 litres every hour. What will be the quantity of milk after 10 hours?
- Product of two numbers is -315. If one of the numbers is -7, find the other.
- A cinema hall is to be constructed in which each row has 36 seats. Determine the minimum number of rows required to seat 612 persons at a time.

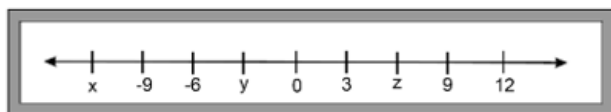
LONG ANSWER TYPE QUESTIONS

- What is the difference between sum of even number and sum of odd numbers between 10 and 30.
- Three schools take part in a campaign to raise funds for eradicating hunger. School 1 raise Rs. 1914380 as part of the campaign, School 2 raises Rs. 9974365 and School 3 raises Rs. 2608589. Find the total amount raised by all three school ?
- An elevator descends into a mine shaft at the rate of 5 metre per minute. What will be its position after one hour ?
- An elevator begins to descend from 15 m above the ground at the rate of 5 metre per minute, what will be its position after 45 minutes?
- A shopkeeper earns a profit of Re 1 by selling one pen and incurs a loss of 40 paise per pencil while selling pencils of his old stock. In a particular month he incurs a loss of Rs 5. In this period, he sold 45 pens. How many pencils did he sell in this period ?
- Simplify: $118 - [121 \div (11 \times 11) - (-4) - \{3 - \overline{9-2}\}]$.




EXERCISE - III
PREVIOUS YEAR QUESTIONS

1. In the figure given below,



Based on the number line, the value of $x - y - z$ is :

- (A) -21 (B) -15 (C) -3 (D) 15
2. If 23 integers are multiplied and the product is negative then which of the following statements can be true about them:
 (A) 10 are negative, 13 are positive
 (B) 14 are negative, 9 are positive
 (C) 12 are negative, 21 are positive
 (D) 17 are negative, 6 are positive
3. Which of the following divisions has the greatest quotient?
 (A) $20 \div (-4)$ (B) $20 \div 4$
 (C) $(-20) \div (-5)$ (D) $(-30) \div 5$
4. Find the value of the expression below :
 $0 - 1 + 2 - 3 + 4 - 5 + 6 - 7 + 8 - 9 + \dots - 17 + 18 - 19 + 20$.
 (A) 10 (B) 0 (C) -10 (D) 20
5. A place P is 82 m above the sea-level and another place is 13 m below the sea-level. What is the distance between the two places?
 (A) 95 m (B) 69 m (C) -95 m (D) -69 m
6. Find the value of the given expression $(-35) - (-15) + 8 - 9 - (-152) - 25 + (-8)$
 (A) -78 (B) 32 (C) -55 (D) 98
7. The temperature of a city at 1 p.m. was 15°C . Every hour it decreases by 3°C . The temperature at 6 p.m. was
 (A) 3°C (B) 0°C (C) -3°C (D) -6°C
8. The product of 3 integers is odd. What can their sum be?
 (A) odd (B) even
 (C) positive (D) negative

9. $1 - 2 + 3 - 4 + 5 - 6 + \dots + 2009 - 2010 + 2011 - 2012$.

(A) -2000
 (B) -1
 (C) 1000
 (D) -1006

10. Which of the following statements is INCORRECT with respect to integers?

(A) Integers are closed under both addition and subtraction.
 (B) Commutative property holds in addition but not in subtraction.
 (C) Associative property holds both in addition and subtraction.
 (D) 0 is the additive identity of integers.

11. The value of 28 in 528094 is the same as

(A) $7000 + 1094$
 (B) $8094 - 90$
 (C) $7094 + 906$
 (D) $28094 - 94$

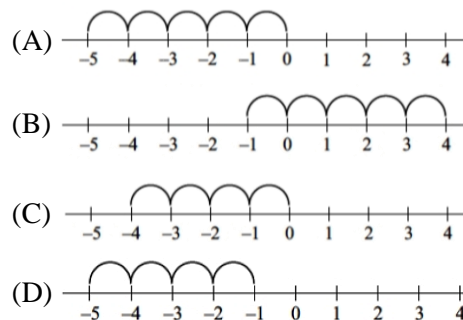
12. The melting point of mercury is -39°C . The freezing point of alcohol is -98°C . How much more is the melting point of mercury as compared to the freezing point of alcohol?

(A) -137°C (B) 137°C
 (C) -59°C (D) 59°C

13. Which of the following are the symbols of operation on integers that satisfy commutative property?

(A) $-, \div$ (B) $-, \times$ (C) $+, -$ (D) $+, \times$

14. Which of the following number line represents $-1 - 4$?





15. Study the below statements carefully and answer the question given below.

- (i) The successor of $0 \times (-52)$ is $1 \times (-52)$.
- (ii) Integers are closed under division.
- (iii) $(-20) \times (5 - 3) = (-20) \times (-2)$
- (iv) $(-2) + (-9)$ is less than $(-9) - (-2)$.

Which of the following statements is/are correct?

- (A) Only (i) (B) Both (i) and (iv)
- (C) Only (iv) (D) Both (i) and (iii)

16. Temperature of a place at 12:00 noon was 5°C . Temperature increased by 3°C in first hour and decreased by 1°C in the second hour. What was the temperature at 2:00 pm?

- (A) 5°C (B) 7°C (C) 8°C (D) 6°C

17. Which of the following options hold with respect to given below statements?

Statement 1: Value of $(-85) \times 43 - 43(-15) = (-85 + (-15)) \times 43 = 4300$

Statement 2: If $*$ is a multiply operation for integers p, q and r, then we have

$$p*(q + r) = (p * q) + (p * r)$$

- (A) Statement 1 is true and statement 2 is false.
- (B) Statement 1 is false and statement 2 is true.
- (C) Both statements 1 and 2 are true.
- (D) Both statements 1 and 2 are false.

18. Simplify: $[15 \div 3 + 10 \{60 - 8 \div 4 + 3(5 \text{ of } \overline{3-7})\}]$

- (A) -20 (B) -15 (C) 12 (D) 16

19. In the given calculation the answer 11418 is incorrect due to a mistake in one of the digits. The incorrect digit is

$$\begin{array}{r} 267 \\ \times 54 \\ \hline 1068 - \text{Step-1} \\ + 10350 - \text{Step-2} \\ \hline 11418 - \text{Step-3} \end{array}$$

- (A) 0 in step-1 (B) 1 in step-1
- (C) 0 in step-2 (D) 1 in step-2

20. Which of the following statements is true?

- (A) When we multiply two integers their product is always greater than both the integers.
- (B) Integers are not closed under multiplication.
- (C) 99×101 can be written as $(100 - 1) \times (100 + 1)$.
- (D) When we change the order of integers their difference remains the same.

21. You have Rs. 1500 in your savings account at the beginning of the month. The record below shows all of your transactions during the month. How much money is in your account after these transactions?

Date	Withdraw	Deposit
4/9/14	Rs.1200	Rs.2000
22/9/14	Rs.2100	Rs.2500
(A) Rs. 2000		(B) Rs. 3100
(C) Rs. 2500		(D) Rs. 2700




ANSWER KEY
EXERCISE-I
SINGLE CORRECT TYPE QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	A	B	B	A	A	D	A	B	D	A	B	B	A	A
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	D	C	C	B	C	D	D	C	C	A	D	B	C	D	A
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	A	D	C	D	B	B	B	D	A	A	A	B	C	D	D
Que.	46														
Ans.	D														

FILL IN THE BLANKS

1. (-1) 2. negative integer 3. 0 4. Negative
 5. additive inverse 6. predecessor 7. 12 8. 3

TRUE / FALSE

1. False 2. True 3. True 4. False
 5. True 6. True 7. True 8. True 9. False

EXERCISE-II
VERY SHORT ANSWER TYPE QUESTIONS

1. (a) 100000 (b) 100001 2. 20, 18, 15, -2 , -10
 3. (i) 26 (ii) -12 (iii) 0 (iv) 1 4. 0
 5. $x = -15$ 6. $x = 100$ 7. 6 8. 3

SHORT ANSWER TYPE QUESTIONS

9. (a) -7 , -10 , -13 (b) -5 , -10 , -15 (c) -15 , -18 , -21
 10. $1000 + 9 = 1009$ 11. -20 , -10 , -8 , 3 , 7 , 12. 15 12. Time is 9 pm
 13. 24 14. 0 15. 14
 16. (i) 34 (ii) 17. 410 liters. 18. 45 19. 17

LONG ANSWER TYPE QUESTIONS

20. 20
 21. 14497334
 22. -300 m, i.e., 300 m below ground level
 23. -210 m, i.e., 210 m below ground level
 24. 125 pencils.
 25. 109

EXERCISE-III
PREVIOUS YEAR QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	D	B	A	A	D	B	A	D	C	D	D	D	D	C
Que.	16	17	18	19	20	21									
Ans.	B	B	B	C	C	D									

