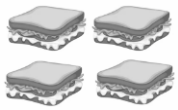
INTEGERS

Concepts Covered

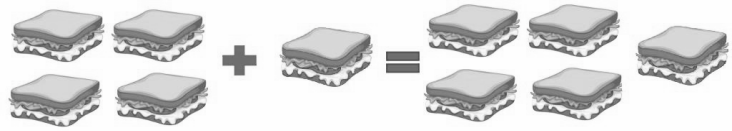
- Types of Integers, Integers on a Number Line,
- Addition of Integers, Subtraction of Integers
- Limitations of the Number Line
- Subtraction of Larger Number from Smaller Number
- Properties of Addition and Subtraction

Negative Numbers

We have already studied about natural numbers and whole numbers.
We know that we can count the number of things with the help of whole numbers like, $0, 1, 2, 3 \ldots \ldots$
Now, what if we want to measure something of the value less than 0 like the loss in the selling of goods, borrowing money, and losing money in bet, etc?
Negative numbers are required in order to reflect the above situations.
For Example: Sandeep and his sister are going for a vacation with their friends. Sandeep wants to carry sandwiches for breakfast with him, but he has got only 4 sandwiches and there are 5 friends. What is he going to do now?



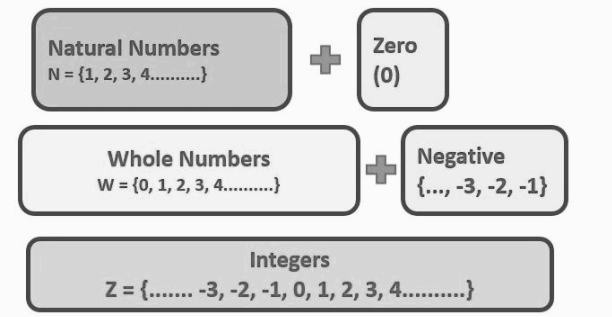
So, Sandeep decides to borrow one sandwiches from his sister, which he promises that he would return later.
How many sandwiches does he have now?



After borrowing one sandwich from his sister, he has got 5 sandwiches which he would give to his five friends.
Now, how many sandwiches are left with him?
Is your answer zero (0)?
We can say that there are no, or 0 sandwiches left with him, but we also have to keep in mind that he has borrowed one sandwich from his sister.
So, in actual Sandeep has (-1) sandwich, which means that 1 sandwich was borrowed and did not belong to him.
If he buys 4 more sandwiches next day, he will have to return 1 sandwich to his sister and will be left with 3 sandwiches only.
Numbers with a negative sign are less than zero and they are called **negative numbers.**

Integers

Integers is a set of whole numbers and negative of all natural numbers.



Example:

Represent the situations given below using Integers.
(i) The head of the volcano is located 50 feet below sea level.
(ii) Rahul spent $100.00 on baseball cards.
(iii) Alaska experienced a heat wave of 98^o on July 4th.
Solutions: (i) First, determine whether the location is positive or negative. Sea level is zero in this example. That means that "below sea level" is negative.
Then, write it as a negative integer. The answer is −50.

(ii) First, determine whether Rahul gained or lost money.
He "spent" it. That means he no longer has it. So, it is a loss.
Then, write it as a negative integer. The answer is −100.

(iii) First, determine whether the temperature is above or below zero.
A "heat wave" means it is very hot. If it were below zero, it would be very cold. That means it is positive.
Then, write it as a positive integer.
The answer is +98.

Check Your Concept - 1

(i) Write the following numbers with appropriate signs :

(a) 500 m above ground level.

(b) 35°C above 0°C temperature.

(c) 5°C below 0°C temperature.

(d) loss of 1000 rupees.

Comparing and Ordering Integers

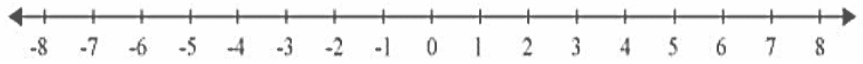
We use mathematical symbols such as > (Greater than), < (Less than), and = (Equal to) to make a comparison between two numbers.
How will we compare two numbers with the help of a number line?
We use this concept to compare integers and put the symbols (>, <, and =) accordingly. If we compare -8 and -2 with the help of number line, then we will find that -8 is to the left of -2. Hence, we can write -8 < -2.

Sometimes it is difficult to locate large integers such as 5093, 805 etc. and small integers such as -596, -8053, etc. on a number line. In such cases, we cannot compare the integers using number line. We will solve the problem by keeping some facts in our mind. They are as follows:
1. All positive integers are greater than 0 and the negative numbers. For example, 20 > 0 and 30 > -3.
2. 0 is always greater than negative integers. For example, 0 > -5.
3. To compare two negative integers, we first neglect the negative sign and then if the integer without negative sign is greater than the other integer, then that negative integer is smaller than the other negative integer.
For example, if we compare between -112 and -535, then first of all we have to neglect the negative sign of both the numbers. After neglecting the negative sign, the numbers are 112 and 535. Here, 535 > 112. Hence, -535 < -112
So far we have learnt the comparison of two integers. Now, let us discuss ordering of more than two integers. For ordering of integers, we use the concept of comparison of integers.

Example:

The temperature of Shimla is recorded to be maximum of $5^\circ C$ and minimum of $-4^\circ C$. Also, the temperature of Dehradun is recorded to be maximum of $8^\circ C$ and minimum of $-2^\circ C$. Which of the two places has
(a) Lower maximum temperature
(b) Higher minimum temperature?
Solution:

We can easily compare the lower maximum temperatures and the higher minimum temperatures of the two cities with the help of a number line. Let us draw a number line, which contains the maximum as well as the minimum temperature of the cities, as shown below.



(a) Maximum temperature of Shimla $= 5^\circ C$
Maximum temperature of Dehradun $= 8^\circ C$
From the number line, we can observe that $5^\circ C < 8^\circ C$.
Therefore, the maximum temperature of Shimla is lower than that of Dehradun.

(b) Minimum temperature of Shimla $= -4^\circ C$

Minimum temperature of Dehradun $= -2°C$
From the number line, we can observe that $-2°C > -4°C$.
Therefore, the minimum temperature of Dehradun is higher than that of Shimla.

Check Your Concept - 2

(i) Every natural number is a integer but every integer is not a natural number. Think and discuss about it.

(ii) Compare the followings pairs using > or < sign.

(a) 5 ___-5

(b) -8___-10

(c) 15___20

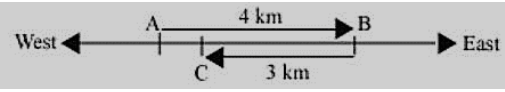
(d) -1___ 0

Addition of Integers

Rahul walked 4 km towards East. Then, he walked back 3 km towards West. Now, he is wondering about the distance between his initial and final positions.

Can we help him?

To find the distance between the initial and final positions of Rahul, let us consider that initially Rahul was at the position A. He walked 4 km towards East to reach the position B. From B, he moved 3 km towards West to reach the final position C. It can be shown by a figure as:



We will use '+' sign when Rahul moves towards East. When he moves towards West, i.e., opposite to East, we will use '-' sign. Thus, we will take the distance AB as $+4$ km and the distance BC as -3 km.

Now, we are required to calculate the distance between the initial position and the final position. We can calculate this value if we can calculate the distance AC.

But from the above figure, it is clear that the distance AC is equal to the addition of $+4$ km and -3 km i.e. $[(+4) + (-3)]$km. We can find this value if we can find the value of $(+4) + (-3)$.

We know how to add counting numbers. But the expression $[(+4) + (-3)]$km is the addition of integers. We can calculate the value of this expression if we know the method of addition of integers. First of all, let us know this method. Then we will find the value of the expression $[(+4) + (-3)]$.

We can use three different methods for addition of integers. They are as follows:

1. Using number line
2. Using concrete material and
3. Using Standard algorithm

Let us start with addition of integers using number line.

In this method, we add integers by drawing a number line. We perform addition by following these steps:

Step 1: We always start addition from 0. If the first integer is a positive integer, then we move towards the right of 0 on the number line with number of units equivalent to the given number. Similarly, if the first integer is a negative integer, then we move towards the left of 0 on the number line with number of units equivalent to the given number. Now, we mark this point.

Step 2: When we add a positive integer to the previous integer, we move towards the right of the above marked point on the number line with number of units equivalent to this integer. Similarly, when we add a negative integer to the previous integer, we move towards the left of the above marked point on the number line with number of units equivalent to this integer. Now we mark this point.

Step 3: We continue this process. The final marked point on the number line will represent the result of addition of integers.

Suppose we have to carry out the addition of integers -2 and -7 i.e., we have to find the value of the expression $[(-2) + (-7)]$.

What happen if we add 9 and (-9) ?

If we add 9 and -9, we have, $9 + (-9) = 0$

The sum of 9 and -9 is zero. These integers i.e., 9 and -9 are known as additive inverse of each other.

Thus, additive inverse can be defined as follows:

"Two integers are said to be additive inverse of each other if their sum is equal to zero".

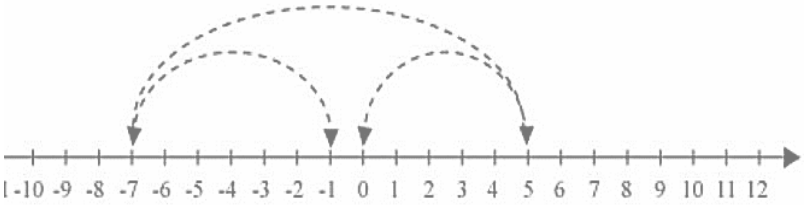
Writing Integers

We have studied about positive and negative integers and learned to write the same with their respective signs. For example, $+4, -9$ etc. Conventionally, positive integers are written without using sign. So, if a number is written without any sign, it is considered to be positive. Thus, we write 4 instead of $+4$ and read it as "four" rather than "positive four". Similarly, we can avoid $+$ sign of positive integers while writing and reading the expressions involving addition of integers.
For example, $(+4) + (-3)$ can be written as $4 + (-3)$ and read as "four plus negative three".
$(-98) + (+45)$ can be written as $(-98) + 45$ and read as "negative ninety-eight plus forty-five".
$(-65) + (-9)$ can be written as $(-65) + (-9)$ and read as "negative sixty-five plus negative nine".
$(+115) + (+13)$ can be written as $115 + 13$ and read as "hundred and fifteen plus thirteen".
From these examples, it is clear that + sign is used to represent positive integers as well as to add integers. It can be easily identified from the expression that what $+$ sign means at a particular place.
Basically, + sign is written with positive integers at learning level, but when we become familiar with the concept, we write positive integers without using sign. Henceforth, $+$ sign is used only for addition.

Example:

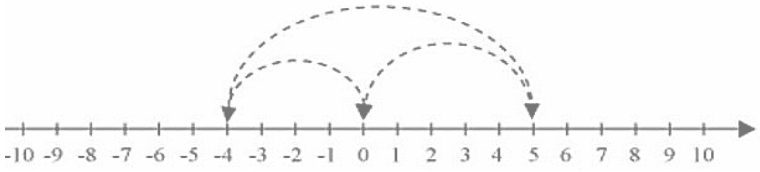
Find the value of the following expressions using number line.
(a) $(+\mathbf{5}) + (-\mathbf{12}) + (+\mathbf{6})$
(b) $(-\mathbf{4}) + (+\mathbf{9}) + (-\mathbf{5})$
Solution:

(a) To find the value of $(+5) + (-12) + (+6)$, we have to add the integers $(+5)$, (-12) and $(+6)$ First, we move 5 steps towards right from 0 to reach 5. Then, we move 12 steps towards left to reach -7. At last, we move 6 steps towards right to reach the final position -1, which can be shown on a number line as follows.



Thus, $(+5) + (-12) + (+6) = -1$

(b) To find the value of $(-4) + (+9) + (-5)$, we have to add the integers $(-4), (+9)$ and (-5).
First, we move 4 steps towards left starting from 0 to reach -4. Then, we move 9 steps towards right to reach $+5$. At last, we
move 5 steps towards left to reach the final position 0 , which can be shown on a number line as follows.



Thus, $(-4) + (+9) + (-5) = 0$

Example:

Find the values of the following expressions.
(a) $176 + (-312)$ **(b)** $(-12) + (-9) + 27$ **(c)** $(-32) + (-19) + 46 + (-52)$
Solution:

(a) $176 + (-312)$; Here, one integer is positive and the other is negative. Therefore, by ignoring the sign and by subtracting the smaller number from the bigger number, we obtain $312 - 176 = 136$ But the bigger number has "-" sign, Thus, $176 + (-312) = -136$.

(b) $(-12) + (-9) + 27 = \{(-12) + (-9)\} + 27$ (Arranging all the negative integers and positive integers in groups) $= (-21) + 27 = 6$

(c) $(-32) + (-19) + 46 + (-52) = \{(-32) + (-19) + (-52)\} + 46$
(Arranging all the negative integers and positive integers in groups) $= (-103) + 46 = -57$

Example:

Find the missing number.
(a) $\ldots\ldots + (-35) = 0$ **(b)** $(+26) + \ldots\ldots + (-19) = -19$
Solution:
(a) The missing number is $+35$. (Additive inverse of -35)
(b) The missing number is -26. (Additive inverse of 26)

Example:

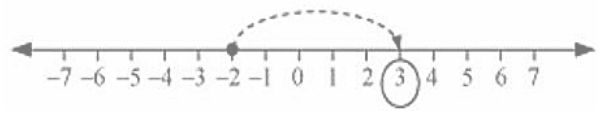
Example 4:
Write the following expressions without using + sign of positive integers. Also, write how to read the new expressions.
(a) $(+2) + (-19)$ **(b)** $(-28) + (+19)$ **(c)** $(-71) + (-34)$ **(d)** $(+156) + (+64)$
Solution:
The given expression can be written without + sign of positive integers as follows:
(a) $(+2) + (-19)$ can be written as $2 + (-19)$ and read as "two plus negative nineteen".
(b) $(-28) + (+19)$ can be written as $(-28) + 19$ and read as "negative twenty-eight plus nineteen".
(c) $(-71) + (-34)$ can be written as $(-71) + (-34)$ and read as "negative seventy-one plus negative thirty-four".
(d) $(+156) + (+64)$ can be written as $156 + 64$ and read as "hundred and fifty-six plus sixty-four".

Subtraction of Integers

On a particular day, the temperature of a place was recorded as $-2°C$. On the next day, the temperature of the place was recorded as $-5°C$. By how many degrees did the temperature decrease?
It is given that the temperature of the place was $-2°C$. On the next day, the temperature was $-5°C$. The decrease in degree of temperature is the difference of the temperatures $-2°C$ and $-5°C$.
Thus, decrease in temperature $= (-2)°C - (-5)°C = [(-2) - (-5)]°C$. We can find the result, if we can find the value of $[(-2) - (-5)]$.
We know how to carry out the subtraction of counting numbers. However, the expression $[(-2) - (-5)]$ is the expression of subtraction of integers. We can calculate the value of this expression if we know the method of subtraction of integers. First of all, let us know this method. Then, we will find the value of the expression $[(-2) - (-5)]$.
Two integers can be subtracted by two methods.

1. Using number line
2. Using standard algorithm

Let us start with the method of subtraction of two integers using number line. In this method, we subtract integers by drawing a number line. Let us simplify (-2) 4 on the number line.
Now, we can find the decrease in temperature between the two days, which was mentioned in the beginning.
The decrease in temperature was $[(-2) - (-5)]°C$. Here, we have to subtract (-5) from (-2). For this, first of all, we will locate (-2) on the number line. The integer (-5) is a negative integer. Therefore, we will move 5 units to the right of (-2). Now, we will reach 3. This can be shown on a number line as follows:



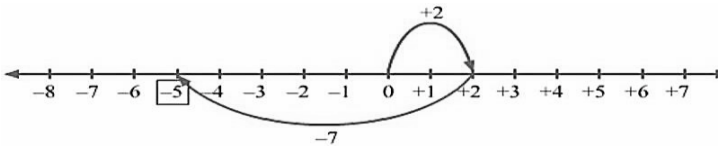
We have, $[(-2) - (-5)] = 3$
Therefore, $[(-2) - (-5)]°C = 3°C$
Thus, the decrease in temperature between the two days is $3°C$.

Example:

Can we find the value of $(-502) - (-705)$ using number line?
Solution:
Since these are large numbers and it is quite difficult to perform their subtraction on number line, we use standard algorithm method in such cases. Now, we can find the difference in temperatures of the two days, which was mentioned in the beginning of this learning section, using standard algorithm method.
$[(-2) - (-5)]°C = [(-2) + (+5)]°C$ { Additive inverse of (-5) is $(+5)$} $= 3°C$

Example:

Subtract 7 from 2 by using number line.
Solution: In order to subtract 7 from 2, firstly locate the position of $+2$ on number line. Then, from $+2$; move 7 units to the left.
This can be done as,



Here, the tip of the finale arrow is at -5. So, $2 - 7 = -5$

Example:

Find the value of the following expressions.
(a) $\mathbf{48 - (-52) - (-25)}$ **(b)** $\mathbf{(-74) + 32 - 19 - 13}$ **(c)** $\mathbf{(-63) - 37 - (-100)}$
Solution:

(a) $48 - (-52) - (-25) = 48 + (+52) + (+25)$
[Additive inverse of (-52) is $(+52)$ and additive inverse of (-25) is $(+25)$] $= 125$

(b) $(-74) + 32 - 19 - 13 = (-74) + (32) + (-19) + (-13)$ [Additive inverse of 19 is (-19) and 13 is (-13)]
$= \{(-74) + (-19) + (-13)\} + (32)$ (Arranging all the negative integers and positive integers in groups)
$= (-106) + (32) = -74$

(c) $(-63) - 37 - (-100)$
$= (-63) + (-37) + (+100)$ [Additive inverse of 37 is (-37) and (-100) is 100)]
$= \{(-63) + (-37)\} + (+100)$ (Arranging all the negative integers and positive integers in groups)
$= (-100) + (+100) = 0$

Example:

Find the missing numbers.
(a) $\mathbf{(+14) - \cdots + (-10) = (+11)}$ **(b)** $\mathbf{(-22) - (+15) - \cdots = (-6)}$
Solution:

(a) Let the missing number be x.
Thus, the given question becomes $(+14) - x + (-10) = (+11)$
Now, on adding x to both sides, we obtain $(+14) - x + (-10) + x = (+11) + x$
$\Rightarrow (+14) + (-10) = (+11) + x \Rightarrow (+4) = (+11) + x$
Now, on subtracting $+11$ from both sides, we obtain $(+4) - (+11) = (+11) + x - (+11)$
On subtracting $+11$ from both sides, we obtain $(+4) - (+11) = (+11) + x - (+11)$
$\Rightarrow (+4) + (-11) = 11 + x + (-11)$ [Additive inverse of 11 is -11]
$\Rightarrow (-7) = 11 + (-11) + x \Rightarrow (-7) = x \Rightarrow x = -7$
Hence, $(+14) - \underline{(-7)} + (-10) = (+11)$

(b) Let the missing number be x.
Thus, the given question becomes $(-22) - (+15) - x = (-6)$
On adding x to both sides, we obtain $(-22) - (+15) - x + x = (-6) + x$
$\Rightarrow (-22) + (-15) = x + (-6)$ [Additive inverse of $+15$ is -15] $\Rightarrow (-37) = x + (-6)$
On adding 6 to both sides, we obtain $(-37) + 6 = x + (-6) + 6 \Rightarrow x = -31$
Hence, $(-22) - (+15) - (-31) = (-6)$

Example:

Fill in the blanks with $>, <$ or $=$ sign.
(a) $\mathbf{(-13) + (-16)}$ **(b)** $\mathbf{(-18) - (-20)}$ $\mathbf{(-17) - (-11)}$
Solution: To put $>, <$ or $=$ sign, we have to simplify both the sides.

(a) LHS $= (-13) + (-16) = -29$
RHS $= (-13) - (-16) = (-13) + (16) = 3$
However, $-29 < 3$ Hence, $(-13) + (-16) < (-13) - (-16)$.

(b) LHS $= (-18) - (-20) = (-18) + 20 = 2$
RHS $= (-17) - (-11) = (-17) + 11 = -6$
However, $2 > -6$ Hence, $(-18) - (-20) > (-17) - (-11)$.

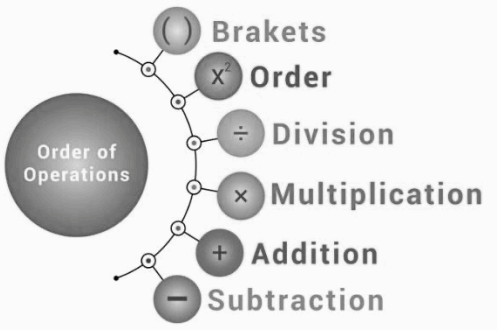
Simplification

To simplify arithmetic expressions, which involve various operations like brackets, multiplication, addition a particular sequence of operations has to be followed. For example: $2 + 3 \times 4$ has to be calculated by multiplying 3 with 4 and the result is 12. Now, 12 has to be added to 2 to produce an the result of 14. This is because in arithmetic operations, multiplication should be done before addition is taken up.

The hierarchy of arithmetic operations is given by a rule called **BODMAS** rule. The operations have to be carried out in the order, in which they appear in the word BODMAS, where different letters of the word BODMAS stand for the following operations Brackets, Order, Division, Multiplication, Addition, and Subtraction.

There are four types of brackets:

1. **Vinculum:** This is represented by a bar on the top of the numbers.
   For example: $2 + 3 - \overline{4 + 3}$.
   Here, the figures under the vinculum have to be calculated as $4 + 3$ first and the 'minus' sign before 4 is applicable to 7. Thus, the given expression is equal to $2 + 3 - 7$ which is equal to -2.
2. **Simple Brackets**: These are represented by ( ).
3. **Curly Brackets:** These are represented by { }.
4. **Square Brackets:** These are represented by [ ].



Note:

(i) The brackets in an expression must be opened in the order of vinculum, simple brackets, curly brackets, and square brackets, i.e., $[\{(-)\}]$ to be opened from inside to outwards.
(ii) O in the BODMAS rule stands for "order", which means higher order (i.e., power) must be solved first.

Examples:

Simplify:
(i) $4 \times 3 - 2 + 16 \div 8$
Solution: $4 \times 3 - 2 + 16 \div 8 = 4 \times 3 - 2 + 2 = 12 - 2 + 2 = 12$

(ii) $12 \div 4 - 3 \times 6 + 7$
Solution: $12 \div 4 - 3 \times 6 + 7 = 3 - 3 \times 6 + 7 = 3 - 18 + 7 = 10 - 18 = -8$

(iii) $92 - [18 + 16 \div 4\{26 - (14 - 7 + 3)\}]$ $Solution$: $92 - [18 + 16 \div 4\{26 - (14 - 4)\}] = 92 - [18 + 16 \div 4\{26 - 10\}]$
$= 92 - [18 + 16 \div 4 \times 16] = 92 - [18 + 4 \times 16] = 92 - [18 + 64] = 92 - [82] = 10$

Example:

If P means multiplication, Q means division, R means addition, and S means subtraction, then find the value of $36P48Q16R15S23$.
Solution : $36P48Q16R15S23$
$= 36 \times 48 \div 16 + 15 - 23 = 36 \times 3 + 15 - 23 = 108 + 15 - 23 = 100$

Check Your Concept - 3

(i) Answer the followings.

(a) 33+11

(b) 24+48

(c) 41+19

(d) 17+34

(ii) Solve the followings.

(a) (+9) - (-14)

(b) (+45) –(13)

(c) (-67) - (-13)

(d) (-38) - (+42)

Solved Examples

(1) What is the opposite of 15 km to the North?
Solution: 15 km to the south

(2) Write all integers between −25 and −20
Solution: −24, −23, −22, −21

(3) Find the value of 112 + (−6)
Solution: 106

(4) Opposite of −125 is
Solution: 125

(5) Sum of −45 and 30 is
Solution: −15

(6) Which is greater −65 or −56
Solution: −56

(7) −5 + (−11) =
Solution: −16

(8) 8 + (−6) =
Solution: 2

(9) Match the following:

Column A	Column B
(a) $(-1)^4$	(i) −16
(b) $(-1)^3$	(ii) −11
(c) 96 ÷ (−6)	(iii) 1
(d) – (11)	(iv) −1

Solution:

Column A	Column B
(a) $(-1)^4$	(iii) 1
(b) $(-1)^3$	(iv) −1
(c) 96 ÷ (−6)	(i) −16
(d) – (11)	(ii) −11

(10) Write the number with appropriate signs: 150 m below sea level.
Solution: −150

(11) Value of −15 − 16 is:
Solution: -31

(12) Match the following:

Column A	Column B
(a) 10 steps to the right	(p) −1000
(b) **10 km** below sea level	(q) 1000
(c) Deposit Rs. 1000 in a bank	(r) 10
(d) Spending Rs. 1000	(s) −10

Solution: (a) - (r), (b) - (s), (c) - (q), (d) - (p)

(13) Fill in the blanks:
(a) When we subtract −10 from 18 we get ……
(b) ……. is an integer which is neither positive nor negative.
(c) 272 – 198 – ……. = 0
(d) 15 +…… = 0
Solution: (a) 28, (b) 0, (c) 74, (d) −15

(14) State whether the following statements are true or false:
(a) If a and b are any two integers such that a > b, then −a > −b.
(b) If the sum of an integer and its opposite is zero, they are called additive inverses of each other.
(c) The negative of 0 is −0.
(d) The sum of positive and negative integers is always negative.

Solution: (a) False (b) True (c) False (d) False

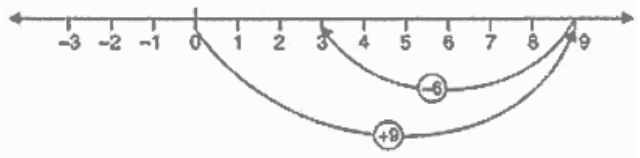
(15) Write four negative integers less than −20.
Solution: Four negative integers less than −20 are −21, −22, −23 and −24.

(16) Write all the integers between −8 and −15. (Write them in the increasing order.)
Solution: The integers between −8 and −15 in increasing order are −14, −13, −12, −11, −10 and −9.

(17) Find the solution of the following : (−9) + (+13).
Solution: (−9) + (+13) = (−9) + (+9) + (+4) = 0 + (+4) = +4

(18) Subtract: (−20) − (−13).
Solution: (−20) − (−13) = (−20) + (additive inverse of −13) = (−20) + (13) = −7

(19) Using number line, add the following integers: 9 + (−6).
Solution: On the number line we first move 9 steps to the right from 0 reaching 9 and then we move 6 steps to the left of 9 and reach
3. Thus, 9 + (−6) = 3



(20) Find the value of : (−7) + (−9) + 4 + 16
Solution: (−7) + (−9) + 4 + 16 = (−16) + 20 = (−16) + 16 + 4 = 0 + 4 = 4

(21) The temperature on a certain morning is −11° C at 5 a.m. If the temperature drops 3 degree at 6 a.m. and rises 5 degree at 8 a.m. and again drops 3 degree at 9 a.m., what is the temperature at 9 a.m.?
Solution: Temperature at 5 a.m. = −11° C
Temperature decreased at 6 a.m. = 3° C = −3
Temperature raised at 8 a.m. = 5° C = +5
Temperature decreased at 9 a.m. = 3° C = −3
Final temperature at 9 a.m. = (−11) + (−3) + (+5) + (−3) = −11 – 3 + 5 – 3 = −17 + 5 = −12° C

(22) Match the items of Column I with that of Column II.

Column I	Column II
(i) The additive inverse of −2	(a) 0
(ii) The greatest negative integer	(b) −2
(iii) The greatest negative even integer	(c) 2
(iv) The smallest integer than every negative integer	(d) 1
(v) Sum of predecessor and successor of −1	(e) −1

Solution: (i) The additive inverse of +2 = −2.
(ii) The greatest negative integer = −1.
(iii) The greatest negative even integer = −2.
(iv) The smallest integer greater than every negative integer = 0.
(v) The predecessor of −1 = −1 – 1 = −2 and the successor of −1 = −1 + 1 = 0. ∴ −2 + 0 = −2.

(23) Write two integers, whose sum is 6 and difference is also 6.
Solution: We know that, 0 is an integer such that if we add any integer to it then we get the same integer and if we subtract it from any integer,
then also we get same integer. So, possible two integers are 6 and 0.
i.e. 6 + 0 = 6 and 6 – 0 = 6

(24) Observe the following : 1 + 2 – 3 + 4 + 5 – 6 – 7 + 8 – 9 = – 5
Change one '–' sign as '+' sign to get the sum 9.
Solution: Given, 1 + 2 – 3 + 4 + 5 – 6 – 7 + 8 – 9 = – 5
Now, add 14 both sides, because we have to get the sum of 9.
1 + 2 – 3 + 4 + 5 – 6 – 7 + 8 – 9 + 14 = – 5 + 14
Now, we can arrange the integer so that the positive integers and negative integers are grouped together.
∴ 1 + 2 + 4 + 5 + 8 + 14 + (−3) + (−6) + (−7) + (−9) = 1 + 2 + 4 + 5 + 8 + 14 – 3 – 6 – 7 – 9 = 34 – 25 = 9
As we add 14 on left hand side, we see that (−7 + 14) = +7, it means that we have to change the sign 7.

(25) The sum of two integers is 30. If one of the integers is −42 then find the other.

Solution: Given, the sum of two integers = 30 and one of the integer = −42

Now, the other integer is obtained by subtracting −42 from 30

The required integer = 30 − (−42) = 30 + 42 = 72

Hence, the second integer is 72.

(26) Write six distinct integers whose sum is 7.

Solution: Let the six integers be 1, 2, −2, 3, −3 and 6.

Now, sum of above integers =1 + 2 + (−2) + 3 + (−3) + 6 We can arrange the numbers so that the positive integers and the negative integers are grouped together.

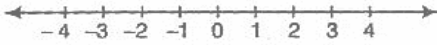
We have, i.e. = 1 + 2 + 3 + 6 + (−2) + (−3) = 12 – 2 – 3 = 12 – 5 = 7

Hence, required integers are 1, 2, −2, 3, −3 and 6.

Note There are infinite combination exist.

(27) Write the integer, which is 4 more than its additive inverse.

Solution: Firstly, draw a number line.



Let +1 be an integer and its additive inverse is -1. From the number line, we see that 2 more than its additive inverse. So, we reject this integer.

Again, let +2 be an integer and its additive inverse is −2. From the number line, we see that 4 more than its additive inverse.

Hence, the required integer is 2.

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

Solution: Given, initial temperature at 12:00 noon was +5° C. Since, the temperature increased by 3° C in first hour.

∴ Temperature at 1:00 pm = 5° C + 3° C = 8° C

Also, the temperature decreased by 1° C in the second hour.

∴ Temperature at 2:00 pm = 8° C – 1° C = 7° C

Hence, the temperature at 2:00 pm is 7° C.

Exercise

FILL IN THE BLANKS

(1) Multiplicative inverse of 3 is …….
(2) Multiplicative inverse of 1/2 is …….
(3) 4 – (–4) + 1 = …….
(4) Product of 7 × (6) = …….
(5) Value of 4 × 3 × 0 is …….
(6) What is (−70) ÷ 7 …….
(7) What is 96 ÷ (-16) …….
(8) Value of x from the equation −19x = 95 is …….
(9) 20 + (3 - 1) / 2 =_____

TRUE OR FALSE

(1) −100 > −50
(2) −11 is greater than −25
(3) 11 + (−16) = 27
(4) (−7) + (−1) = −8
(5) −15 is smaller than −25
(6) The greatest positive integer is 100.
(7) Zero is positive integer.
(8) Every negative integer is greater than every positive integer.
(9) 20 is the simplified form of 2*(10+2) – 4/2.

OBJECTIVE TYPE QUESTION

(1) 0 is:
(A) a positive integer (B) a negative integer
(C) neither positive nor negative (D) none of these

(2) What is opposite of '50 km of south'?
(A) 50 km of east (B) 50 km of west
(C) 50 km of north (D) None of these

(3) Sum of -30 and -12 is
(A) -42 (B) 42
(C) -18 (D) 18

(4) Compare pairs of numbers using > or <: 0 − 15
(A) < (B) =
(C) > (D) None of these

(5) 10 − (−6) is:
(A) 16 (B) 4
(C) 60 (D) 6

(6) What must be added to −35 to get 35 ?
(A) 40 (B) 70
(C) 0 (D) 100

(7) Product of −140 and +8 is
(A) 1120 (B) 3200
(C) −1120 (D) −3200

(8) (−4) + (+3) =
(A) 7 (B) −1
(C) 6 (D) None of these

(9) Value of (−6) + (−5) is:
(A) −11 (B) 11
(C) −1 (D) 1

(10) Every negative integer is less than:
(A) −1 (B) 0
(C) −2 (D) none of these

(11) Value of 2 less than -1 is:

(A) −3 (B) 3
(C) 2 (D) −4

(12) Which of the following is the greatest negative integer?

(A) −100 (B) Does not exist
(C) −1 (D) −9

(13) Value of 12 + (−6) is:

(A) 6 (B) 18
(C) 12 (D) none of these

(14) Which number is neither positive nor negative?

(A) 1 (B) 5
(C) 0 (D) 10

Answer Key

CHECK YOUR CONCEPT

(1)	**(i)** (a) +500 m	(b) + 35°C	(c) -5°C	(d) -1000
(2)	**(ii)** (a) >	(b) >	(c) <	(d) <
(3)	**(i)** (a) 44	(b) 72	(c) 60	(d) 51
	(ii) (a) 23	(b) 32	(c) -44	(d) -80

FILL IN THE BLANKS

(1) 1/3 **(6)** −10
(2) 2 **(7)** −6
(3) 9 **(8)** −5
(4) −42 **(9)** 21
(5) 0

TRUE OR FALSE

(1) False **(6)** False
(2) True **(7)** False
(3) True **(8)** False
(4) True **(9)** False
(5) False

OBJECTIVE TYPE QUESTION

(1)	(C)	**(6)**	(B)	**(11)**	(A)
(2)	(C)	**(7)**	(C)	**(12)**	(C)
(3)	(A)	**(8)**	(B)	**(13)**	(A)
(4)	(C)	**(9)**	(A)	**(14)**	(C)
(5)	(A)	**(10)**	(B)		