Chapter 4

INTEGERS

One day, the students of the class requested their teacher to let them play some games. The teacher happily agreed to this and said, “Why not? let us play a game of numbers today”.

She said, “All of you write any single digit number in your notebooks, multiply it with 2, subtract 12 from the obtained product and tell me the answer”.

Directions	Fatima	Kamli	Monu
Number considered	7	6	5
After multiplying by 2	$7 \times 2 = 14$	$6 \times 2 = 12$	$5 \times 2 = 10$
Subtracting 12 from the product	$14 - 12 = 2$	$12 - 12 = 0$	$10 - 12 = ?$

The number of students could have three types of possibilities:

(1) Some students might have a result like that of Fatima.
(2) Some students might have a result like that of Kamli.
(3) Some other students might have a problem like that of Monu, they might not be able to subtract the number.

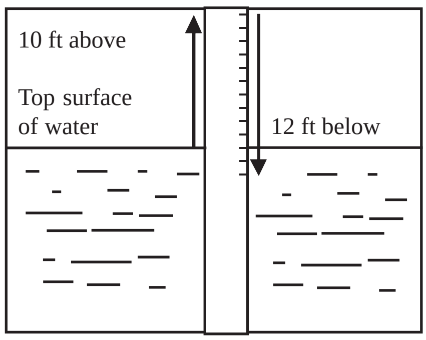

Fig 1

All the children who were in a situation like Monu, asked the teacher, “What should we do?” the teacher said “Let us understand the problem first.”

Suppose, there is a bamboo fixed vertically in your village pond. An insect of the pond climbs 10 feet straight up the bamboo from the surface of water and then slips back 12 feet down wards.

This means, the insect could not climb up and is now 2 feet under the surface of water. If the level of water be considered 0, then how will you show the measurement below the point zero?

But Monu couldn’t yet understand what number could be used to show 10-12. he said “I still can’t understand what to do with my problem. Then the teacher played another game of dice and scale. She said “I have a big scale on which 0 is written in the center. On both left and right sides of the 0, ten divisions made on the right side of 0, number 1-10 are written and we have two dices- one red and the other green.”

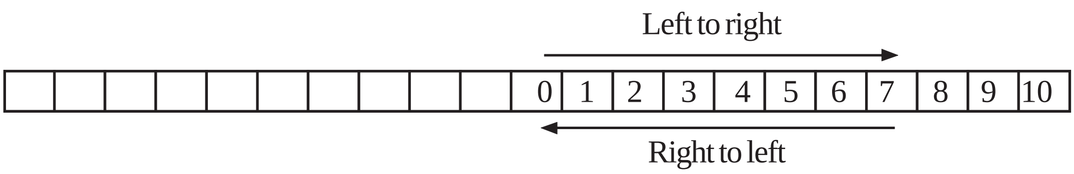

Fig 2

There are two conditions for the game.

First: We shall move as many numbers towards right on the scale which will be equal to the number of points that be seen on the face of the red dice.

Second: We shall move as many numbers towards left on the scale which equal to the number of points that will be seen on the face of the green dice. This move will begin from that point where we have stopped after making the move for the red dice.

The Game Starts Now

First of all, Fatima throws the dices. Fatima's red dice showed 5 places and green dice showed 3 points. According to the conditions, Fatima would move 5 places towards right from zero and then come back 3 places. This means her position will be at 2 on the scale as shown in figure 3.

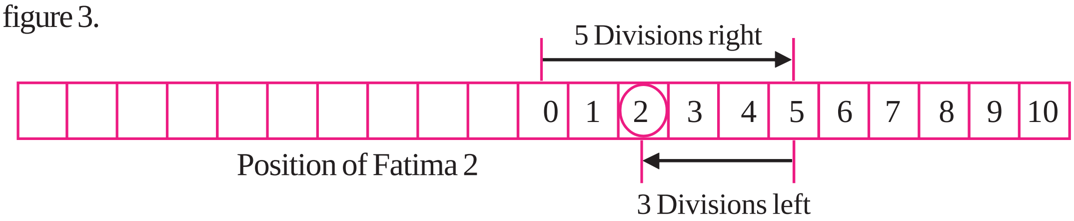

Fig 3

Now Kamli throws the two dices. Both the dices showed 4 points. As per the conditions, Kamli would move 4 places towards right and come back four places. So, her position would be at 0 as in figure 4.

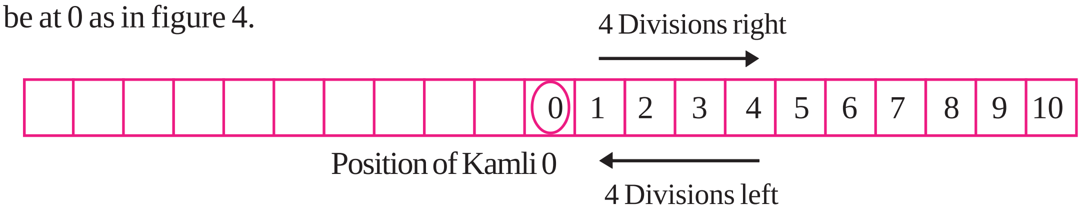

Fig 4

At last Rakesh throws both dices. On his red dice, he got 2 points and the green dice showed 5. As per the conditions, Rakesh has to move 2 places towards, the right and from there comes back 5 places.

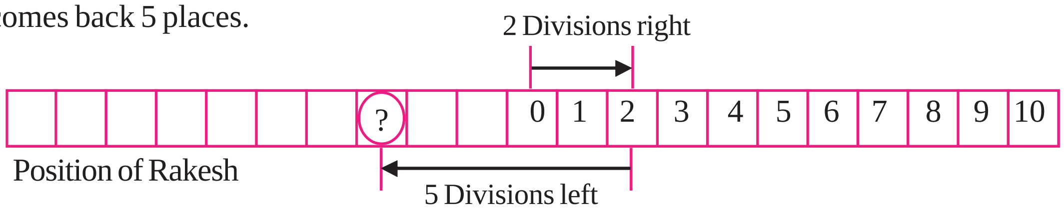

Fig 5

Towards left which means he crosses 0 and stops at the third place to the left of 0. Once again the children are not able to understand how this position can be represented by a numbers.

But Kamli and other students are slightly able to understand the fact that numbers are increasing by one, to the right of zero which means to move towards right 1 added to the previous number to get the next number. Similarly, to go towards left 1 is subtracted from the original number to get the preceding number.

"So, the numbers towards the right of 0 are obtained by adding one and there towards the left of 0 are obtained by subtracting one." "Did you understand what I said," asked the teacher.Monu said "Does that means that the numbers to the right of 0 are positive and those to the left of 0 are negative? The teacher said, "Exactly, that's rightly."

Example :

0 + 1	= 1
1 + 1	= 2
2 + 1	= 3
3 + 1	= 4
• + •	= •

3 – 1	= 2
2 – 1	= 1
1 – 1	= 0
0 – 1	= –1
–1–1	= –2
• – •	= •

If we subtract one-one number from zero .

The 0-1= - 1, -1-1=-2, -2-1=-3 etc. will be obtained. Therefore, Rakesh's position is at -3, because this will be the value of the third division to the left of 0. similarly, all the numbers towards the left of zero. -1,-2,-3,-4,-5 etc would be negative numbers. As we move towards left, the number value would become less and greater negative numbers would be obtained.

					–5	–4	–3	–2	–1	0	1	2	3	4	5	6	7	8	9	10

← Numbers left to zero | Numbers right to zero →

Fig 6

Fatima says, "this means numbers gradually increase from zero towards right. 1>0,2>1, 3>2, 4>3, 5>4 ….. etc and the numbers towards left will get reduced. i.e. -1<0, -2<-1, -3<-2 etc. (To understand negative numbers, you must practice playing this game at home as well as in your classroom. If you don't get dices, take papers of two different colors are write the numbers 1 to 6, separately and fold it in a way that the numbers are not seen. Now pick out one paper of each color and open the chits to find the numbers. You can then play the game.)

On the basis of your experience, put the > or < symbol in the appropriate boxes. If required.

0		-1	-1		-2
50		70	100		101
-5		5	-53		-5

Think of some more such pairs and ask your friends to solve them.

Negative Numbers

ACTIVITY 1

From the examples, we find that just as we have positive numbers, we have negative numbers also. If we include these numbers, we can work on some more new operations like subtract 14 from 12 and show an answer for it. On adding 3 and 4, we get 7. If 3 is kept constant, then which number should be added, so that we get the numbers 6,5,4,3,2,1 and 0 consecutively, write these value in the empty boxes. Think of more such questions and solve them. Can you tell the value of the smaller and the greatest negative numbers.

3 + [4] = 7
3 + [ ] = 6
3 + [ ] = 5
3 + [ ] = 4
3 + [ ] = 3
3 + [ ] = 2
3 + [ ] = 1
3 + [ ] = 0

Integers

You know about Natural numbers and whole numbers. What will happen if you add the negative numbers also to these numbers? Numbers to the right of zero are Natural numbers and those towards the left are negative numbers. Positive numbers, negative numbers and zero, all the three together make Integers. Integers are denoted by I or Z, which means:

Integer I = {.........., -3, -2, -1, 0, 1, 2, 3, 4, 5, ...}

Just as we do not have any whole number that is the greatest number, similarly, we do not have the largest integer also. Can you think of a number that will be the smallest integer ?

Representing Integers on the numberline

Draw a straight line. Put some points/marks on the line at equal distance. On the line, write zero in the middle and write positive numbers on the right of '0' and negative numbers to the left of '0' (according to fig. 7).

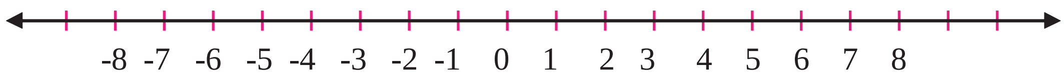

Fig 7

Any line drawn like this is known as a number line.

Representation of Integers through pictures

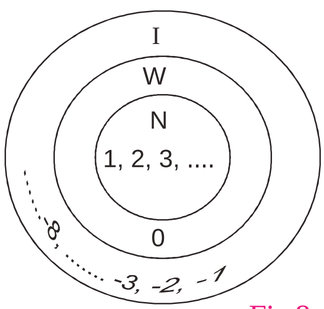

Fig 8

Where

N = Natural number

W = Whole number

I = Integer number

Look at the symbols used above and identify the numbers that are included in integers as represented in figure 8. What numbers do you think are included in whole numbers?

Representing Operations With Integers on the Number Line

Addition of Integers:

When both the numbers are positive. 3 + 5 = ?

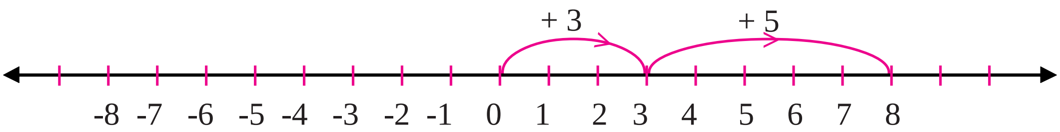

Fig. 9

First we move from zero to 3 in the positive directions then from 3, we move 5 places in the positive direction, we reach the number 8.

Hence, 3 + 5 = 8.

When both the numbers are negative,

e.g. (- 2) + (- 5) then,

First we move 2 places in the negative direction. Then from that point, we move 5 places towards left and reach -7.

i.e. (- 2) + (- 5) = -7

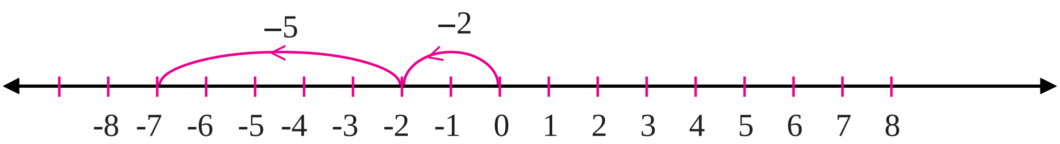

Fig 10

When one is positive and the other a negative number

(a) 8 + (- 5) = ?

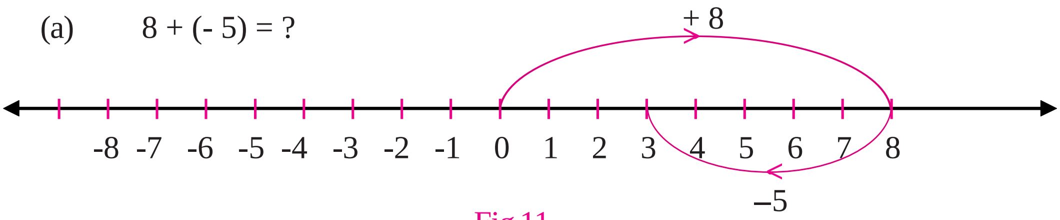

Fig 11

First we move from zero to 8 in the positive direction and then move 5 places back in the negative direction from the 8th place. Considering the direction with respect to zero, we reach at the 3rd place in the positive direction, therefore,

8 + (- 5) = 3.

(b) - 8 + 5 = ?

In this situation we shall move 8 places from zero in the negative direction and then move 5 places towards zero (in the positive direction) so that finally we reach the place 3 in the negative direction, which means,

- 8 + 5 = - 3

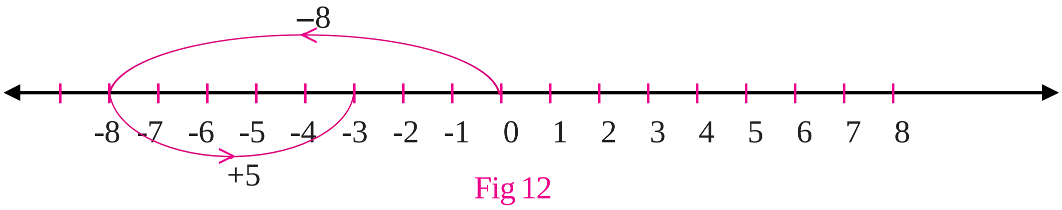

Fig 12

Thus from the examples, we observe that :

(1) On addition of two same signs, the result retain the same sign as that of the added numbers.

(2) When the signs used in two integers are different, the result of the addition takes the signs of the greater number. This means the result depends on the numbers added.

In addition integers abide by all the characterstics that are followed by whole numbers:

1. The addition or sum of two integers is an integer.
2. Commutative law is applicable in the addition of all integers.
3. The sum of two integers is always an integer. This is the closure rule for Integers.
4. There's no change in the value of an integer when zero is added to it.

Subtraction of Integers

Just as in whole numbers subtraction is an operation that is opposite to addition, similarly, in integers also the operation of subtraction is opposite to that of addition.

Observe the following examples:

(a) 14 - 18 = - 4

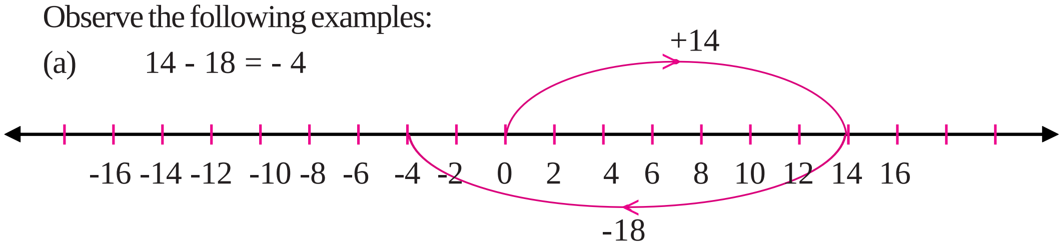

Fig 13

(b) 5 - 3 = 2

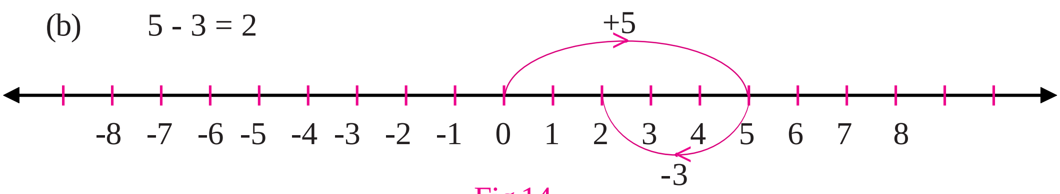

Fig 14

(c) 8 - 4 = 4

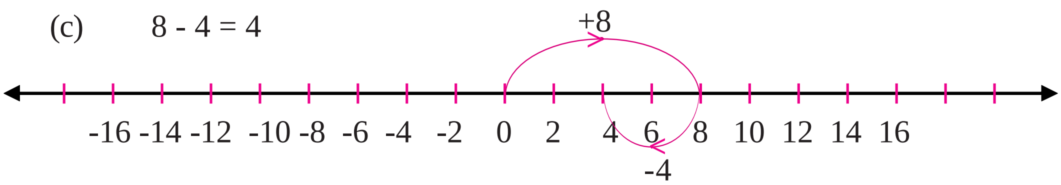

Fig 15

You are already familiar with the process of subtraction. But if you are asked to subtract - 6 from 10. Then you might face problem because we often don't understand how negative numbers can be brought into the process of subtration. Let us clarify this :

You know that 5 + 0 = 5, 8 + 0 = 8, 111 + 0 = 111.

This means if zero is added to any number, the sum will remain the same number. There by **zero is known as the additive identity**.

An Additive Inverse is a number which when added to any would give the additive identity or zero as the sum.

Example : 5 + (additive inverse of 5) = Additive Identity

What should then be added to 5 so as to get zero as the sum? The answer is -5.

Similarly, the additive inverse of 8 will be -8 and 13 would be -13.

Thence, -7 + (additive inverse of -7) = Additive Identity

Here, what should be added to - 7, to get zero ? Your answer would be +7 which means -7 + (+ 7) = 0. Similarly, the additive inverse of -3 would be 3 and that of -9 would be +9.

Now, find out the additive inverse of the numbers given below:

Number		Additive Inverse of the number	Additive Identity
35	+	(-----------------------)	0
- 40	+	(-----------------------)	0
- 17	+	(-----------------------)	0
- 35	+	(-----------------------)	0
- 13	+	(-----------------------)	0

Subtracting the first number from the second number means adding the additive the inverse of the second number to the first number. Think, Is this true?

e.g. 12 – (5) = 12 + (additive inverse of 5)

= 12 + (- 5)

Similarly, 12 - (- 5) = 12 + (additive inverse of -5)

= 12 + (+ 5)

= 12 + 5 = 17

Now, can you subtract -6 from 10?

Practice 1

Find the additive inverse of the number to be subtracted and solve the following questions:

(i) - 3 - (- 7) (ii) 12 - (- 10) (iii) 15 - (+ 7)

(iv) 7 - (+ 18) (v) 19 - (- 7)

In the above examples, you can see that the negative of a negative number is a positive number and the negative of a positive number is a negative number.

Thus, - (- 3) = + 3

(- 1) × (- 3) = + 3

(- 5) × (- 3) = + 15

This means, the product of two negative Integers is always a positive Integers.

Similarly,

- (+ 7) = - 7

(- 1) × (+ 7) = - 7

(- 5) × (+ 3) = - 15

This means, the product of a negative Integer and a positive Integer is always negative Integer.

Short Cut Method of Subtraction

When we have to subtract any number from 10, 100, 1000 etc. then we will convert highest place value of 1 to its smaller unit. let us take some examples.

Example 1

```
  1 0 0
–     7
```

Solution – From unit place of 100 we cannot subtract 7. There is zero in ten's place also so we cannot borrow from ten's place. You can convert one hundred into ten, ten's value and from this tens we will change one ten in to 10 unit values.

H	T	O		H	T	O	
1	0	0	→	0	9	10	(100= 90+10)

Means one hundred will change in to 9 tens and 10 unit values. In this manner it is easy to subtract any value which is less then hundred.

Subtract –

H	T	O
0	9	10
		7
	9	3

(100 – 7 = 90 + 10 – 7)

(= 90 + 3 = 93)

One more Example –

Example 2

```
   1 0 0 0 0
–    2 8 7 4
```

\

Given	Tth	Th	H	T	O
	1	0	0	0	0
–		2	8	7	4

Change ten thousand into smaller units

Have given

	Tth	Th	H	T	O
		9	9	9	10
–		2	8	7	4
		7	1	2	6

(10000 = 9990 + 10)

Example 3 1000 – 8 7 6

	9	9	(10)
–	8	7	6

From these examples we can see that we are subtracting any unit place value from ten and other place values from 9.

Now you can write the answer directly.

100 – 23	=	(9 – 2) (10 – 3) = 77
100 – 69	=	(9 – 6) (10 – 9) = 31
1000 – 512	=	(9 – 5) (9 – 1) (10 – 2) = 488
1000 – 32	=	(9 – 0) (9 – 3) (10 – 2) = 968
1000 – 8	=	992
10,000 – 982	=	9018
10,000 – 8374	=	1626

Properties Related to Subtraction of Integers

1. The difference of two integers is always an integer. (Closure property)
2. Zero subtracted from an integer does not change the value of the integer.
3. Every number that is an integer, has a predecessor.

   e.g. The predecessor of 0 is - 1, that of -1 is - 2 and that -5 is - 6.

Verification of Addition And Subtraction by Digit Sum (Bijank) Method

You know that for obtaining digit sum we add each digit of number until we not get a single digit. The single digit obtained in last, is the digit sum of given number.

Example –

Digit sum of 45 = 4 + 5 = 9

and digit sum of 457 = 4 + 5 + 7 = 16

two digits are there in 16 = 1 + 6 = 7

So, digit sum of 457 is 7

We can check our solved problems with the help of digit sum.

Verification of Addition

For verification of addition we have to find digit sum of number to be added and their sum.

If the sum of digit sum of numbers to be added and their sum is equal then our result is correct.

Digit sum of 453 is 3 and digit sum of 158 is 5 and the digit sum of result obtained (611) is 8 which is equal to sum of digit sum of numbers to be added.

In this manner we can check our solved questions of addition.

Verification of Subtraction

If the sum of digit sum of subtrahend and digit sum of difference is equal to digit sum of minuend then our result is correct.

let us see an example – 587 – 235 = 352

The digit sum of difference 352 is 1

and digit sum of subtrahend 235 is 1

The sum of their digit sum is 2

and the digit sum of minuend 587 is also 2. Means our calculation is right.

Now, by using this method verify your solved problems.

Multiplication of Integers.

ACTIVITY 1

In the given table the product of integers is shown. Some blank spaces are given in the table, fill it :-

S. No.	First Number	Second number	First no. × Second no.	Product	Conclusion
01	3	4	3 × 4	+12	The product of two positive integer is a positive integer.
02	–6	–2	(–6) × (–2)	+12	The product of two negative integer is a positive integer.
03	–5	2	(–5) × (+2)	–10	The product of a positive integer and a negative integer is a negative integer.
04	3	–6	(3) × (–6)	–18	....
05	–5	–4	....	....	....
06	–7	2	....	....	....
07	–8	–12	....	....	....
08	15	–13	....	....	....
09	–17	–19	....	....	....

Multiplication of 9, 99, 999 .... etc.

Multiplication of one, two or three digit number to 9, 99, 999 respectively gives an interesting pattern. Let us see some examples –

$8 \times 9 = 72$ $\qquad$ $47 \times 99 = \underline{46}\ \underline{53}$

$7 \times 9 = 63$ $\qquad$ $78 \times 99 = \underline{77}\ \underline{22}$

$5 \times 9 = 45$

You can see that the multiplicand and multiplier are one digit number. Ten's place digit of product is always one less than multiplicand and the difference between digit obtained in one's place and 9 is digit obtained tens place.

Does this pattern will also obtained in other numbers?

	Ten's	Unit value	T.	O	
6 × 9	= (6 – 1)	(9 – 5)	= 5	4	= 54 is true
4 × 9	= (4 – 1)	(9 – 3)	= 3	6	= 36 is true

What will happen if multiplicand and multiplier are two digit number? in the product we will get a 4 digit number. (Except 10 x 99)

	Th H	T O	Th	H	T	O	
10 x 99	= (10 -1)	(99 - 9)	=	9	9	0	= 990
75 x 99	= (75 - 1)	(99 - 74)	= 7	4	2	5	= 7425
84 x 99	= (84 - 1)	(99 - 83)	= 8	3	1	6	= 8316

take it slightly more -

solve 100 × 999

	T Th Th	H T O	
100 × 999	= (100 – 1)	(999 – 99)	
	99	900	= 99900

If we take any three digit number greater than, 100, then its products will be of 6 digits.

217 × 999	= (217 – 1)	(999 – 216)	
	216	783	= 2 1 6 7 8 3
999 × 999	= (999 – 1)	(999 – 998)	
	998	001	= 9 9 8 0 0 1

Let us think, How does all this happen -

$8 \times 9 = 8 \times (10 - 1) = 80 - 8 = 70 + 10 - 8$

$= 70 + 9 - 7$

$= 70 + 2$

$= 72$

$(7 + 1)(10 - 1) = 70 + 10 - 7 - 1$

$= 70 + 10 - 1 - 7$

$= 70 + 9 - 7$

$= 70 + 2$

$= 72$

Now look at these examples carefully-

$3 \times 2 = 6$,	$2 \times 1 = 2$,	$4 \times 2 = 8$,	$1 \times 4 = 4$
$5 \times 3 = 15$,	$2 \times 8 = 16$,	$7 \times 3 = 21$,	$9 \times 9 = 81$

In the first four examples given above, you are seeing that on multiplying unit place digit of multiplicand to unit place digit of multiplier we are getting unit place digit of product and in the last four examples given above on multiplying unit place digit of multiplicand to unit digit of multiplier we are getting ten's place digit along with unit place digit of product.

In this manner we can see that on multiply ten's place digit of multiplicand unit place digit of multiplier we will get hundred's place digit and ten's place digit or ten's place digit only.

i.e.	$20 \times 3 = 60$,	$30 \times 1 = 30$,	$10 \times 4 = 40$
	$40 \times 3 = 120$,	$50 \times 5 = 250$,	$30 \times 7 = 210$

On multiplying 20 means 2 tens to 3 we will get 60 units means 6 tense and on multiplying 4 tense (40) to 3 we will get 12 tens or 1 hundred and 2 tens.

If you keep these things in mind and do multiplication then we can summarise multiplication process. Let us see more example to understand it more.

Example 1 13×12

Solution

$$\begin{array}{r} 13 \\ \times\ 12 \end{array}$$

Step 1 -

$$\begin{array}{r} 13 \\ \times\ 12 \\ \hline 6 \end{array}$$

On multiplying 3 and 2 of unit place we will get 6 units write it in unit place.

Step 2 -

$$\begin{array}{r} 1\ 3 \\ \times\ 1\ 2 \\ \hline 5\ 6 \end{array}$$

1 3
X
1 2

On multiplying unit place digit 3 of first number to ten's place digit 1 of second number we will get 3 tens and on multiplying unit place digit 2 of second number to ten's place digit 1 of second number we will get 2 tens. We get total (3 + 2) = 5 tens write it in ten's place.

$(3\times1) + (2 \times 1) = 3 + 2 = 5$ tens

Step 3 -

$$\begin{array}{r} 1\ 3 \\ \times\ 1\ 2 \\ \hline 1\ 5\ 6 \end{array}$$

on multiply ten's place digit 1 of first number to ten's place digit 1 of second number we will get 1 hundred. Write it in hundred's place. We get 156.

We can see all three steps like this

H	T	O	
1	1	3	3
↕	✕		↕
1	1	2	2
1	(3 + 2)		6
1	5	6	= 156

Example 2- Solve 12 × 31

Solution -

Step 1

```
   1 2
     ↕
 × 3 1
 ------
     2
```

Unit 2 x Unit + 1 = 2 Units

(Write in unit's place)

Step 2 -

```
  1 2
   ✕
  3 1
 -----
  7 2
```

Unit 2 x Ten's 3 = 6 tens

Unit 1 x Ten's 1 = 1 tens

Total = 7 tens

(Write in ten's place)

Set 3 -

```
   1  2
   ↕
 × 3  1
 -------
  3 7 2
```

tens 1 × tens 3 = 1 × 3 = 3 hundred

(Write in hundred's place)

12 × 31 = 372 (result)

We did not get the carry on multiplication in these two example but it we take some greater number then this condition will arrive.

Let's see

Example 3 - Solve 43 x 12

Step 1

```
   4 3
     ↕
 × 1 2
 ------
     6
```

Unit 3 x Unit 2 = 6 Units

(Write in unit's place)

Step 2

```
  4 3
   X
  1 2
 ----
  1 6
```

(unite 3 x tens 1) + (unit 2 x Tens 4)

= 3 + 8 = 11 Tens

11 tens = 1 Hundred + 1 Ten

Write 1 ten in ten's place. We keep

1 hundred for further carry

Step 3

```
    4 3
    ↕
 ×  1 2
 ------
   5 1 6
 ------
```

Tens 4 x Tens 1 = 4 hundreds

= + 1 hundred (carry)

= 5 hundreds

Write in the hundred's place

Product = 43 x 12 = 516

Example 4 - Solve 76 x 58

Step 1

```
    7 6
     ↕
 ×  5 8
 ------
      8
    (4)
```

6 × 8 = 48 8 Ones

4 Tens (of carry)

Step 2

```
   7 6
    X
   5 8
 ------
   0 8
 (9) (4)
```

(65) + (87)

30 + 56 =	8 6	tens
	+ 4	tens (carry)
	9 0	tens

= 9 hundreds + 0 tens

Write 0 in Tens and 9 in hundred (for carry)

Step 3

```
   7 6
    ↕
 × 5 8
 ------
 4 4 0 8
```

7 × 5	= 35	hundreds
	+ 9	hundreds (of Carry)
	44	hundreds

4 thousands and 4 Hundreds

Write them in their respective places

We get the solution 76 × 58 = 4408

Properties of Multiplication of Integers

1. The product of two integers is always an integer. It is called closure property.

   Thus, $3 \times (-6) = -18$ (Here, the product of 3 and - 6 is - 18 and it is an integer.)

2. The product of integers follow the commutative rule,

   As, $(-7) \times 2 = 2 \times (-7) = -14$.

3. **1** is multiplied to any integer, we get the same integer.

   As, $(-4) \times 1 = 1 \times (-4) = -4$.

   Here, the number **1** called multiplicative identity.

4. Any integer is multiplied by its multiplicative inverse 1 is always obtianed.

   As, $5 \times \frac{1}{5} = 1$.

   Here, multiplicative inverse of 5 is $\frac{1}{5}$.

5. Multiplication of zero - If any integer is multipied by zero, zero is obtained.
   As, $(-3) \times 0 = 0 \times (-3) = 0$.

6. The product of integers follows the Associative law.
   For example : $-3 \times (4 \times 5) = (-3 \times 4) \times 5$

7. Distributive property - The operation of product in integers is distributive over the operation of addition.
   e.g., $3 \times (-4 + 5) = 3 \times (-4) + 3 \times 5$

   or $3(-4 + 5) = 3(-4) + 3 \times 5$

   $= 3$.

Division of Integers

In the previous lesson, you have learnt the division of whole numbers. We have already seen examples of multiplication of whole numbers. On this basis, we can understand the division of integers.

$3 \times 4 = 12$	$-5 \times 6 = -30$	$(-7) \times (-2) = 14$
$12 \div 3 = ?$	$-30 \div -5 = ?$	$14 \div (-2) = ?$
$12 \div 4 = ?$	$30 \div 6 = ?$	$14 \div (-7) = ?$

Just as we have seen in whole numbers, similarly, apart from zero, for all numbers multiplication and division can be considered as operations opposite to each other. Therefore, for the above problems put numbers in place of the question marks.

Properties of Division in Integers

1. Closure properties are not always applicable to the operation of division. e.g. In $3 \div 4$, the quotient is not an integer.
2. Every integer (excluding zero) divided by the same integer would always give 1 as the quotient e.g. $7 \div 7 = 1$.
3. Excluding zero, all integers when divided by their additive inverse give -1 as the quotient e.g. $15 \div (-15) = -1$.
4. Zero divided by any integer would always give zero. e. g. $0 \div 16 = 0$
5. No integer can be divided by zero. This means the quotient for the division of an integer by zero is not defined, e.g. $4 \div 0$ = not defined.

EXERCISE 4

1. Represent the following numbers on the number line and write the results:-

(i)	$2 + (-4)$	(ii)	$-3 + 5$	(iii)	$(-6) + (-3)$
(iv)	$6 + 4 + (-2)$	(v)	$4 + (-3) + (-5)$	(vi)	$0 + 3$
(vii)	$0 + (-5)$	(viii)	$9 + 0 + (-1)$		

2. Find the sums of :-

(i)	1531, (-503)	(ii)	-55, -211	(iii)	117, -81
(iv)	-18, 172				

3. Fill in the blanks with >, =, or <, so that the statements become true:

(i) $8 + (-3)$ .... $-3 + 8$
(ii) $-28 + 25$ .... $-25 + 28$
(iii) $-4 + 0$ .... $4 + 0$
(iv) $0 + 9$ .... $9 + 0$
(v) $25 + (+25)$ .... $+ 25 - (-25)$
(vi) $208 + 53$ .... $208 - 53$

4. Find the product of the following:

(i)	$(+2) \times (3) \times (5)$	(ii)	$3 \times (-5) \times (-6)$
(iii)	$(-4) \times 3 \times (-2)$	(iv)	$(-6) \times (-4) \times 1$
(v)	$3 \times 0 \times (-2)$	(vi)	$2 \times (-7) \times (-3)$

5. Fill in the blanks with symbols >, =, or <

(i) $(2) \times (5)$ .... $(-3) \times (5)$
(ii) $2 \times -4 \times -3$ .... 8×3
(iii) $4 \times -3 \times -1$ 28
(iv) $(-8) \times (-5)$ .... 2×20
(v) $2 \times -3 \times 0$ .... 0×-8
(vi) $4 \times 5 \times (-3)$ .... $-4 \times (+5) \times (-3)$
(vii) $3 \times 8 \times (-5)$ .... $3 \times 8 \times (-5)$

6. **The sum of two integers is 69. If one of them is 56. Find the other integer.**
7. **The sum of two integers is 85. If one of them is -15. Find the other integer.**
8. **Find the quotients for each of the following divisions:**
   (i) 30 ÷ 2 (ii) 40 ÷ (-4) (iii) -48 ÷ 12
   (iv) 24 ÷ 0 (v) -14 ÷ 1 (vi) 95 ÷ (-5)
9. **Fill in the blanks:**
   (i) -80 ÷ ....= - 20 (ii) 46 ÷ .... = -23
   (iii) -24 ÷ .... = 24 (iv) 12 ÷ .... = -1
10. **Find the additive inverse of the following integers:**
   (i) 17 (ii) -23 (iii) 68
   (iv) -75
11. **Fill in the blanks:**
   (i) -18 + ... = 0 (ii) 26 + ... = 0
   (iii) 161 + ... = 0 (iv) -79 + ... = 0

What Have We Learnt ?

1. When two integers with the same sign are added, the sum is also represented with the same sign as that of the added integers.
2. The sum of two integers is always an integer. This is the closure property for Integers.
3. Zero added to any integer doesn't change its value.
4. When a positive number is multiplied by a negative number the product is always negative number, e.g. (+ 1) × (- 1) = - 1 or (- 1) × (+ 1) = - 1.
5. On multiplying 1 to any integer there is no change in it's value. Integer 1 is called as multiplicative indenity.
6. A negative number multiplied by another negative number always gives a positive number as the product (- 1) × (- 1) = + 1.
7. The difference of two Integers is an integer.
8. When zero (0) is subtracted from an integer, its value does not change.
9. Every integer has a predecessor.
10. The additive inverse of a negative number is a positive number and the additive inverse of a positive number is a negative number.
11. The closure property is not always applicable on the division of integers. e.g. In 3 ÷ 4, the quotient is not an integer.
12. Except zero dividing an integer with the same integer, always gives **1** as the quotient.
13. Except zero, all integers when divided by their additive inverse would give - 1 as the quotient.
14. There is no existence of multiplicative inverse of zero.
15. Properties of Integers :-

Properties	Addition	Subtraction	Multiplication	Division
Closure	✓	✓	✓	✗
Commutative	✓	✗	✓	✗
Associative	✓	✗	✓	✗