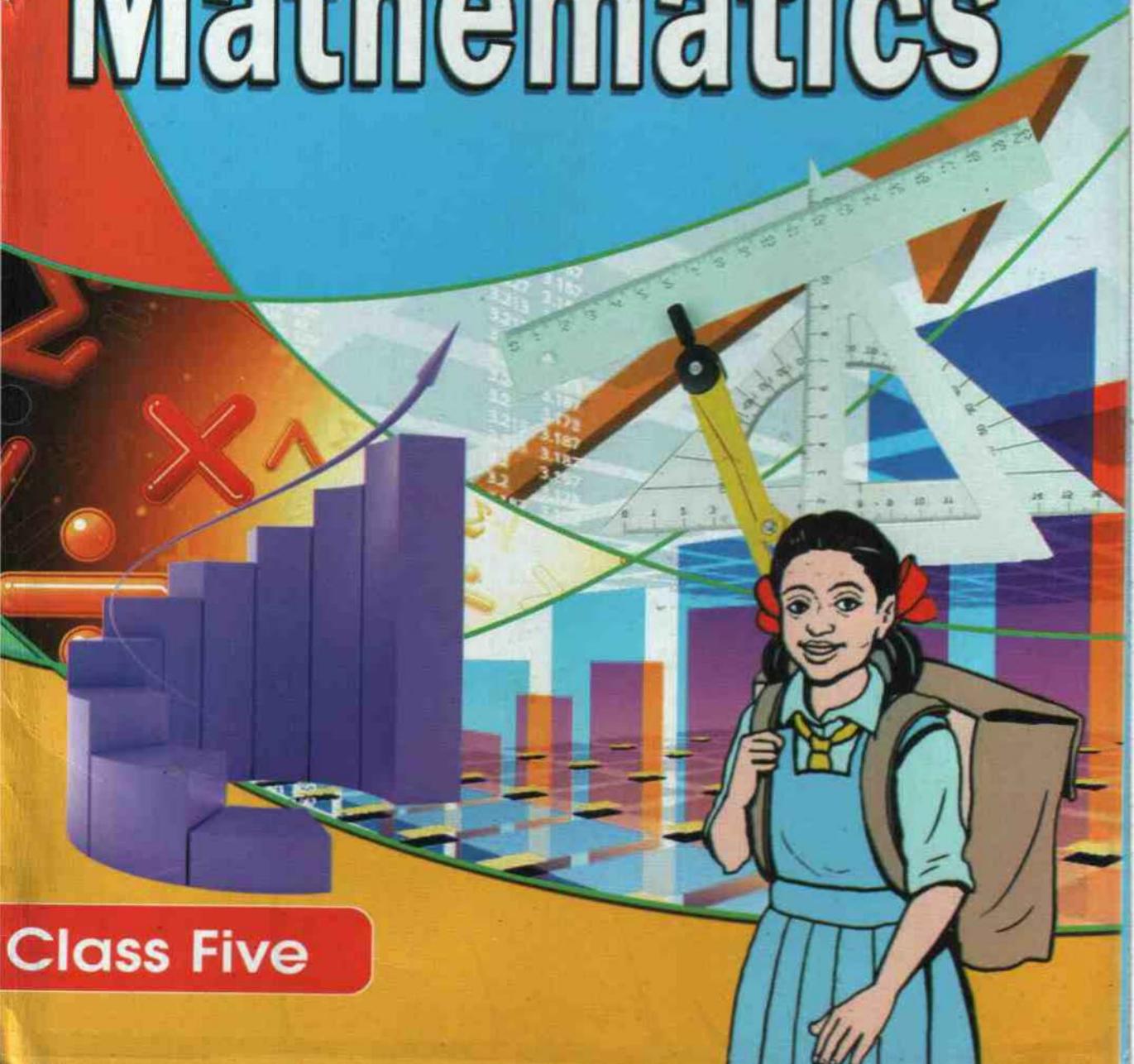


*New Edition*

# My Mathematics

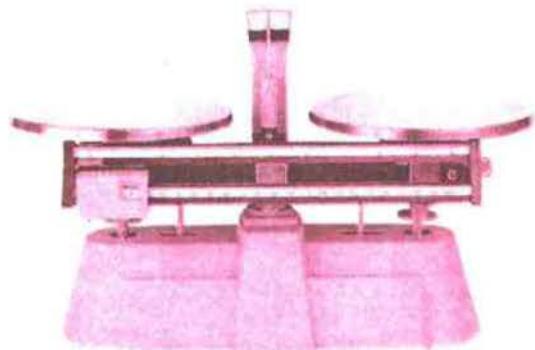


**Class Five**

MY

# MATHEMATICS

Grade 5



Government of Nepal  
Ministry of Education  
**Curriculum Development Centre**  
Sanothimi, Bhaktapur

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## Preface

With the intention of making school level education more purposeful, behavioural and contextual, a process of continuous revision and reform is adopted by the Curriculum Development Centre (CDC). It is obvious that the curriculum is the core part of teaching-learning process, and the textbooks are major means of implementing school curricula at grassroots level. In accordance with the school curricula, the text books keep on changing with a view to addressing societal needs, demands of learners and modern technology in the field of teaching and learning, especially to foster knowledge, skills and positive attitudes in the students so that we can produce skilful, moral, obedient and globally competent citizens. To accomplish this purpose, an attempt is made to bring this book in the present form.

The contents of "My Mathematics" of grade 5 are presented in the two page display system with the clear teaching instructions, pictures and activities. This book (Nepali version) was originally written by Dr. Santosh Man Shakya and Mr. Hari Narayan Upadhyaya in 2049 BS. Likewise, in accordance with the revised curriculum of primary level, it was revised by Mr. Chitra Prasad Devkota, Mr. Barun Prasad Baidhya, Mr. Hari Narayan Upadhyaya, Mr. Dillishwor Pradhan, Mr. Danda Pani Sharma, Ms. Nirmala Gautam, Mr. Shyam Prasad Acharya and Mr. Narayan Wagley. Moreover, Dr. Siddhi Prasad Koirala, Dr. Shiva Ram Nyaupane and Mr. Mukund Raj Sharma have also contributed significantly. The subject expert involved in translating the textbook was Raj Narayan Yadav. Hence, the CDC would like to express its thanks to all of them.

Finally, a textbook is a vital tool of effective teaching learning process in the schools. However, both experienced teachers and inquisitive students can use a number of reference materials and various other resources available in the market to teach and learn a variety of subject matters respectively. Due to lack of different types of reference materials in all schools throughout the country, most of the teaching-learning activities highly depend on the textbooks. In this context, it is expected that the experienced teachers are capable enough to design additional activities as per the demands that usually emerge in the classroom. Moreover, an attempt is made to make this book child friendly by including several motivating teaching-learning activities. Despite our sincere efforts, there may be some mistakes and errors in terms of subject matter, language, presentation style and graphics. In this regard, we definitely expect the constructive suggestions from the teachers, students, parents, readers and other concerned stakeholders to improve the book in its future editions.

Ministry of Education  
Curriculum Development Centre  
Sanothimi, Bhaktapur

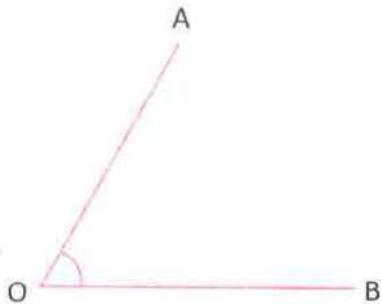
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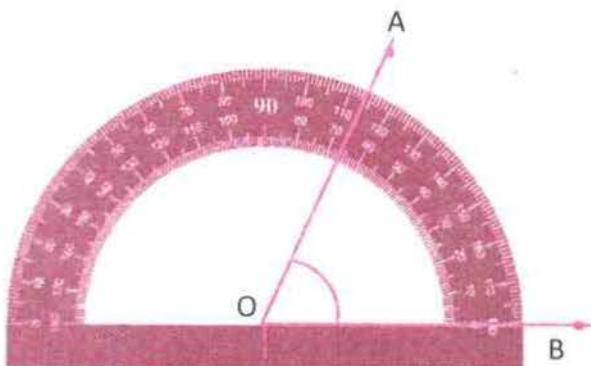
# Geometry

## 1.1 Measurement of Angles

What is the measurement of this angle? How can it be measured?



We use a protractor to measure angles. Look at the picture given below:

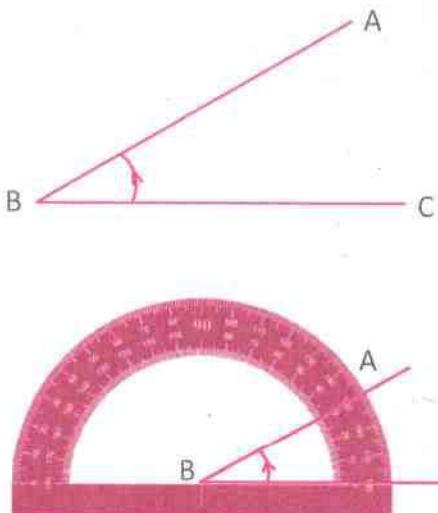


In the picture, a protractor is divided into 180 equal parts. Each equal part is called **degree**. A degree is the unit of an angle. Protractor has two scales. In outer scale, 0 degree has started from left and increased towards right up to  $180^\circ$  and in-inner scale, 0 degree has started from right and increased towards left up to  $180^\circ$ . Why does a protractor have two scales?

We use protractor for two purpose:

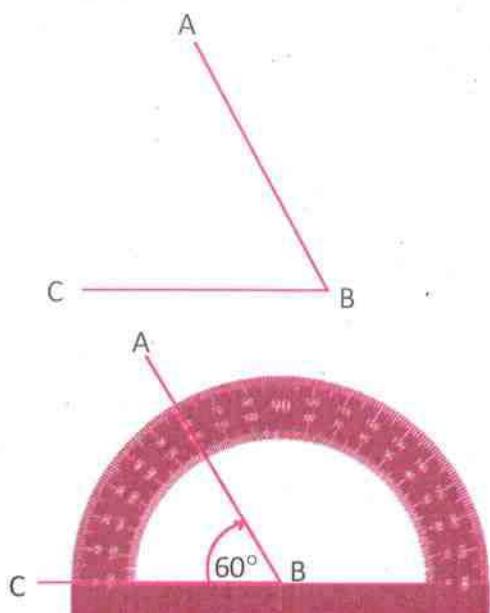
- 1) To measure angles.
- 2) To draw the angles of the given measurement.

## Activity 1



Angle ABC is to be measured. Now, put the BC on the base line of protractor in such a way so that point B should be on the centre of protractor and BC should be straight to the line which shows  $0^\circ$ . Now, see, where the line AB shows in the in-scale of protractor. In figure, AB has shown  $30^\circ$  in-scale of protractor. So the angle ABC is  $30^\circ$  (thirty degree). Here we used in-scale, why?

## Activity 2



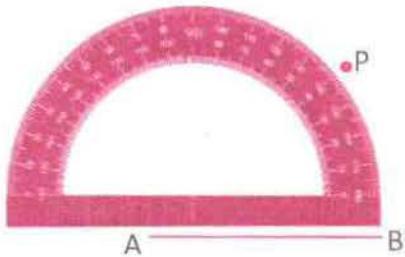
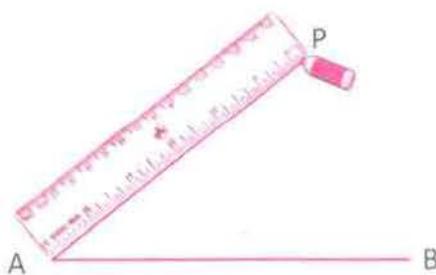
We need the measurement of angle ABC. Now put the side BC of angle ABC on the base line of protractor in such a way that point B should be on the centre of protractor and BC should be straight to the line which shows  $0^\circ$  on left. Now, where the line AB has touched on out-scale of protractor, see. In the figure, AB has shown  $60^\circ$  in the out-scale of protractor. So, angle ABC is of  $60^\circ$ . Here, we use out-scale of protractor, why?

Here, you learnt to measure angles by using in-scale and out-scale of protractor. Now, see the example to learn how to draw angle of the given measurement.

### Example 1

Draw an angle of  $45^\circ$  with the help of protractor by using in-scale and out-scale of the protractor.

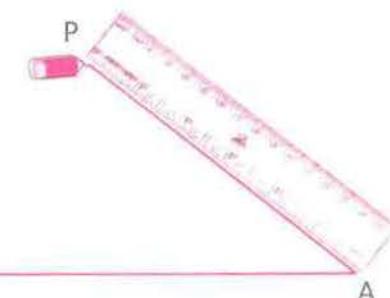
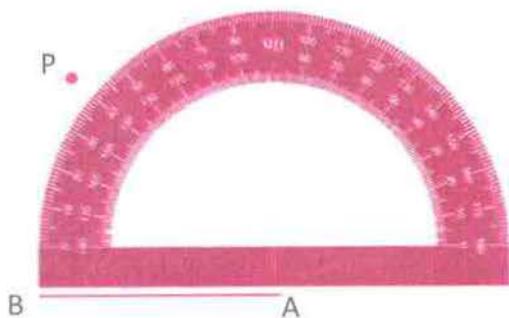
Draw AB base line and put A on the centre of protractor and match AB straight to the base line of the protractor on the right. See  $40^\circ$  in-scale of protractor and mark P.



Now, remove the protractor and join A and P with the help of pencil and scale.

Now, the required  $\angle PAB = 40^\circ$ .

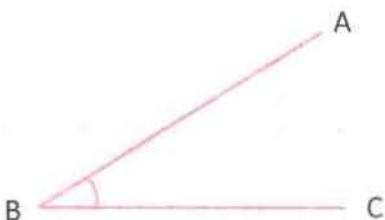
Draw base line AB, put A on the centre of protractor and match the line AB to the base line of the protractor on the left. Now, see  $40^\circ$  on out-scale of the protractor and mark P.



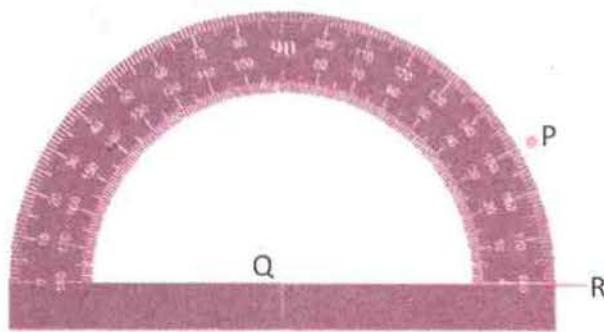
Now, remove the protractor and join A and P with the help of pencil and scale. Now, the required  $\angle PAB = 40^\circ$ . In this way, angle of the same measurement can be constructed by using out-scale and in-scale of protractor.

### Example 2

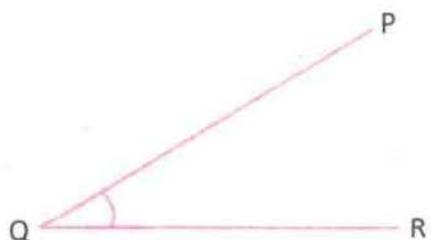
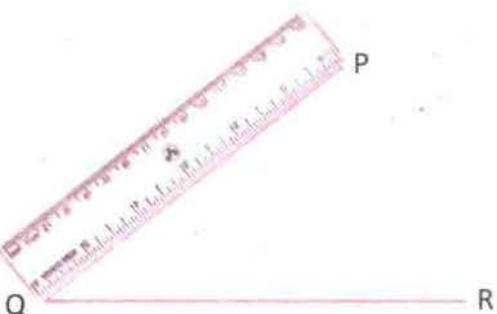
Draw the angle PQR equal to the given angle ABC with the help of protractor.



The given angle is ABC. Angle PQR should be constructed equal to the angle ABC. For this, how big the angle ABC is. Measure it by using protractor.  $\angle ABC = 30^\circ$ .



Now, draw base line QR and put the point Q on the centre of protractor and QR on the base line of the protractor which shows  $0^\circ$ . Mark point P on the circumference of scale of the protractor where it shows  $30^\circ$ .

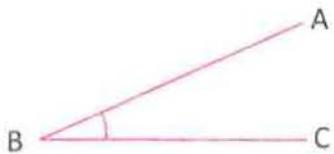


Now, remove the protractor. Join P and Q with the help of scale and pencil. The angle PQR is equal to the angle ABC.

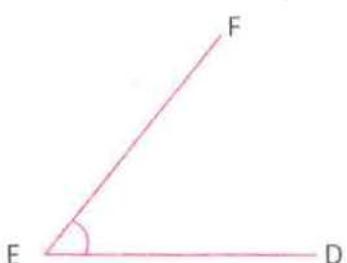
## Exercise 1.1

1. Guess the measurement of each of the angles given below. Now, you are right or wrong, see by measuring with a protractor.

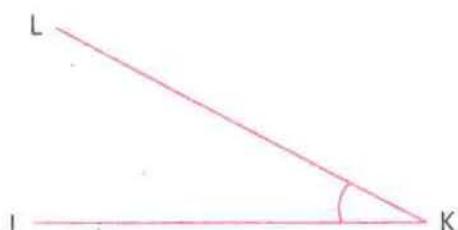
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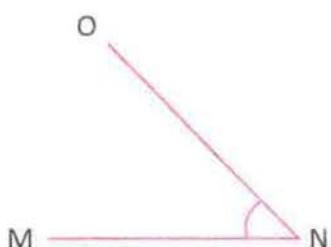
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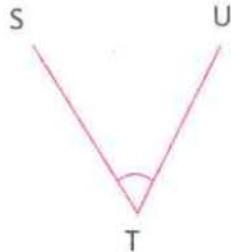
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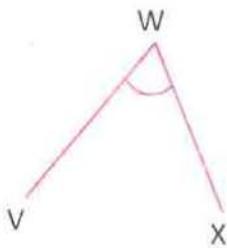
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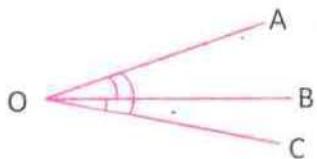
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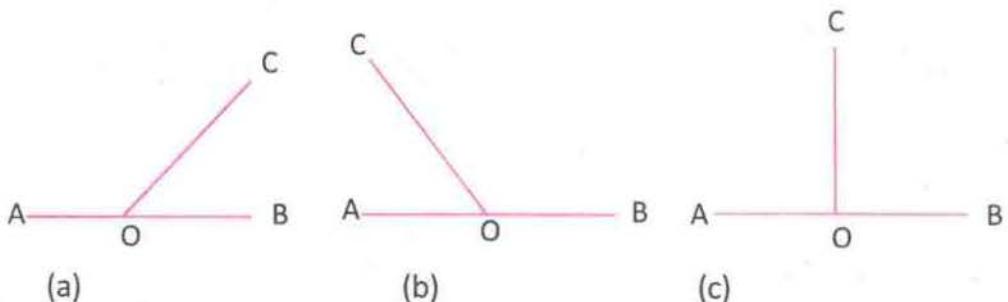
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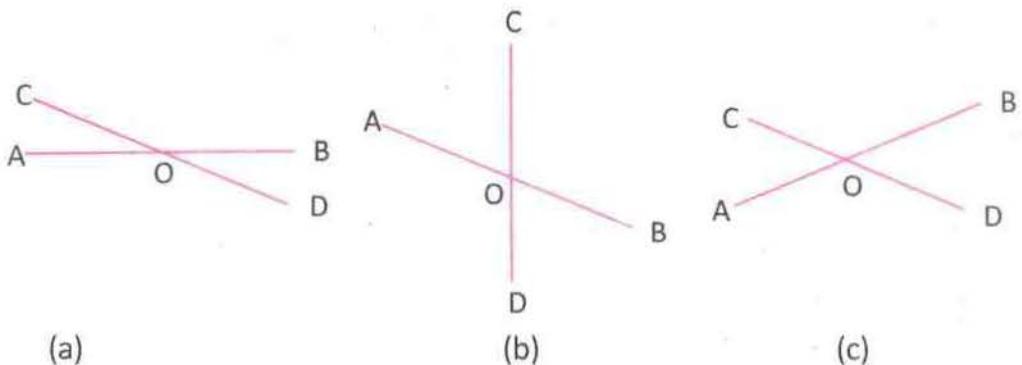
2. How many angles are there in the given figure, write the measurement of each of the angles in degree.



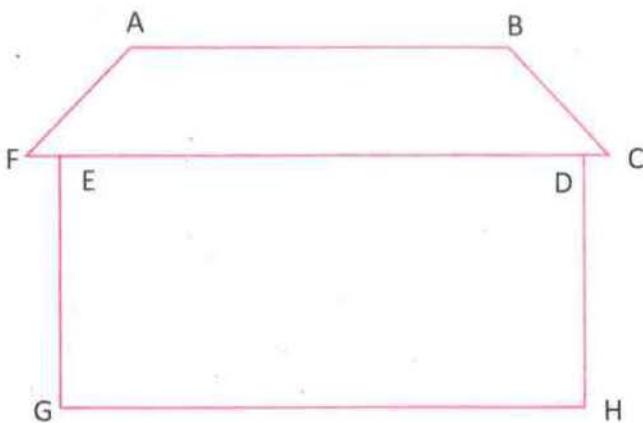
3. Write the measurement of  $\angle AOC$  and  $\angle BOC$  in degree of each of the figures given below. What is the sum of the angle  $AOC$  and angle  $BOC$  in degree?



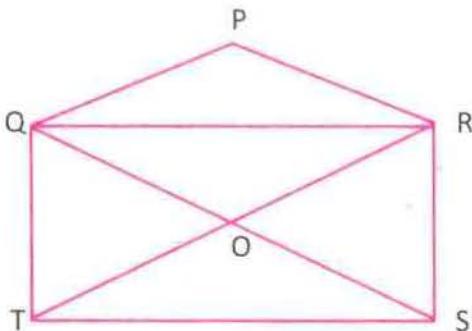
4. In each of the figures given below, measure  $\angle AOC$ ,  $\angle COB$ ,  $\angle BOD$ , and  $\angle DOA$  in degree.



5. Which pairs of angles have equal sum in the figure of Q.N.4?
6. Find the angles in the figure given below and measure each of the angles.



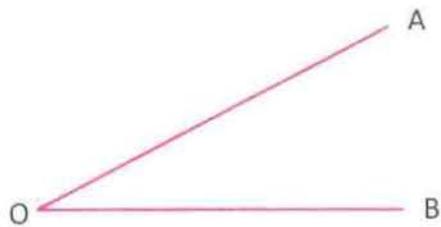
7. How many angles are there in an open envelope of the given figure? Find and measure each of them.



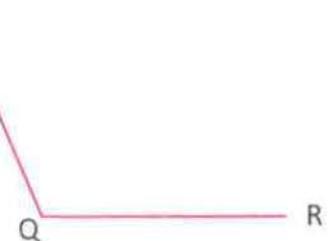
8. Draw each of the angles given below with the help of a protractor.

- a.  $20^\circ$    b.  $30^\circ$    c.  $40^\circ$    d.  $70^\circ$    e.  $110^\circ$   
f.  $120^\circ$    g.  $180^\circ$    h.  $80^\circ$    i.  $90^\circ$    j.  $50^\circ$

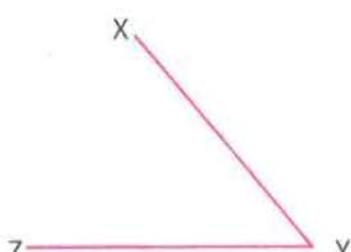
9. Draw angles of equal measurement of each of the angles given below:



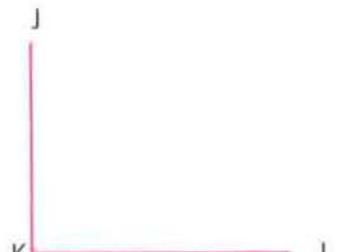
(a)



(b)



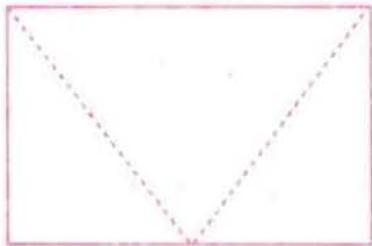
(c)



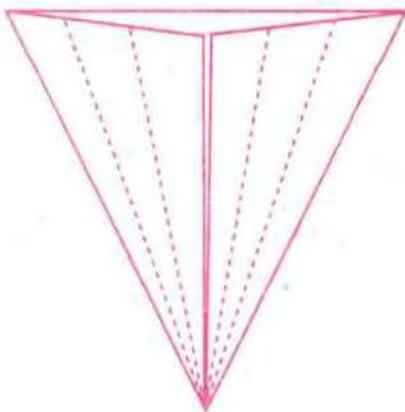
(d)

Now, let's make a protractor ourselves (double the length of breadth):

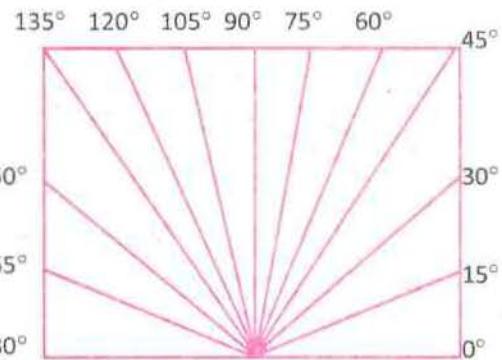
Take a sheet of rectangular paper:



Fold it in the following way.



Now, open it after folding into 3 equal parts.  
It seems like this.



It can be taken and used having  $15^\circ/15^\circ$  angle differences. How many angles are drawn on it? Can you write the measurement of each of them?

**Teaching Instruction:** Make students do extra creative activities related to the lesson as mentioned above while doing learning of teaching mathematics.

## 1.2 Classification of Triangles

- a) Classification of triangles on the basis of sides

### Activity 1

Collect 3 sets of pencils or sticks in the following ways.



Set 1  
(Three equal  
pencils)

Set 2  
(Any two equal  
pencils)

Set 3  
(All three  
different pencils)

Now, draw triangles of different shapes with all three sets of pencils.



Set 1 (triangle)  
(all sides equal)



Set 2 (triangle)  
(two sides equal)



Set 3 (triangle)  
(None of the sides equal)

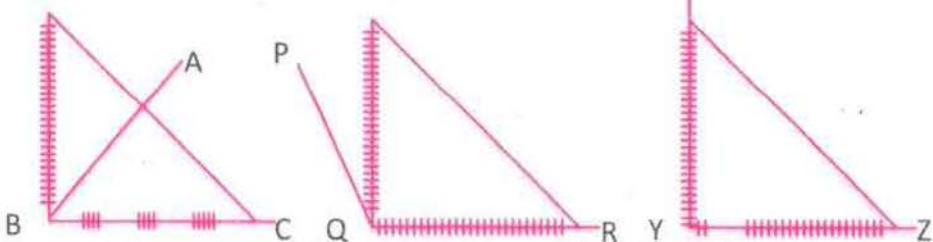
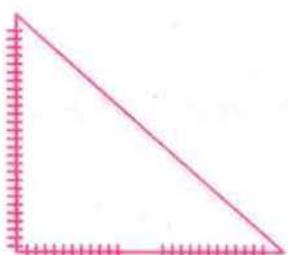
In this way, three types of triangles are constructed on the basis of sides.

1. Triangle with three sides equal is called equilateral triangle.
2. Triangle with two sides equal is called isosceles triangle.
3. Triangle with none of the sides equal is called scalene triangle.

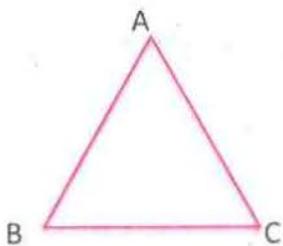
## b) Classification of Triangles on the basis of angles

### Activity 2

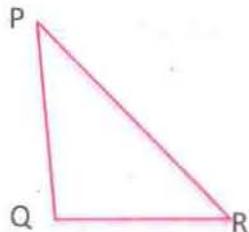
See the setsquare given in the figure. Which angle of the set square is right angle? Set square has an angle  $90^\circ$ , so, angles less than right angle or more than, right angle or equal to right angle can easily be found with the help of set square. See the figure given below:



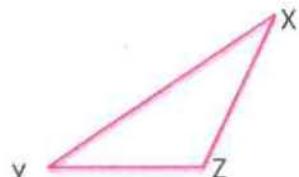
1. Both sides of  $\angle ABC$  are inside of the set square. So,  $\angle ABC$  less than right angle, is an acute angle.
2. The side PQ of  $\angle PQR$  is outside of the set square, so,  $\angle PQR$  greater than right angle, is obtuse angle.
3. Both sides of  $\angle XYZ$  are exactly matched to the set square, so,  $\angle XYZ$  is right angle. Now, are each of the angle of the given triangles below acute angle, obtuse angle or right angle? Measure and find:



Triangle - 1



Triangle - 2



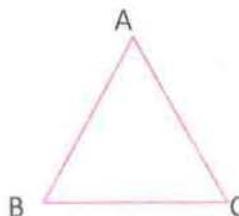
Triangle - 3

- If all three angles of a triangle are less than right angle, then the triangle is called acute angled triangle. In above  $\triangle ABC$  is an acute angled triangle.
- If one of the angles of a triangle is right angle, then the triangle is called right angled triangle. Above  $\triangle PQR$  is a right angled triangle.
- If one of the angles of a triangle is greater than right angle then the triangle is called obtuse angled triangle. Above  $\triangle XYZ$  is an obtuse angled triangle.

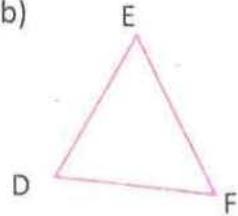
### Exercise 1.2

- Measure the sides of each of the triangles given below and identify the equilateral, isosceles and scalene triangles.

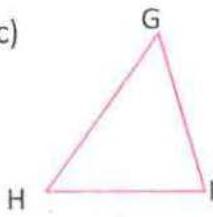
(a)



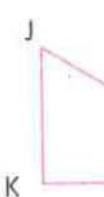
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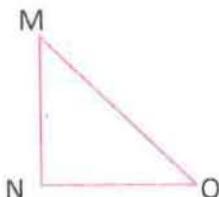
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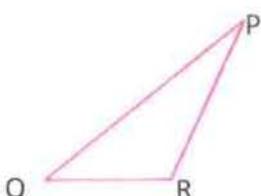
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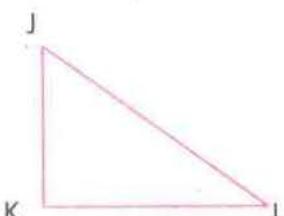


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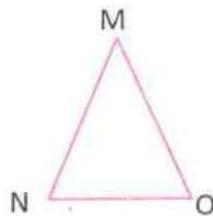


- Are each of the triangles given below acute angled, right angled or obtuse angled? Identify:

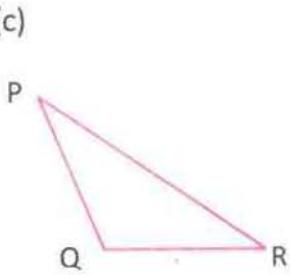
(a)



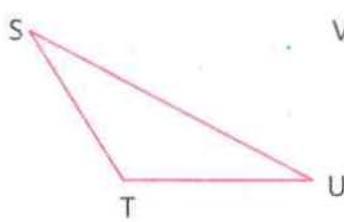
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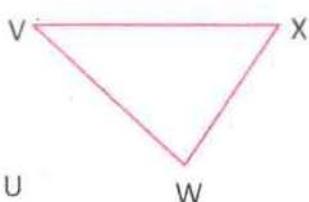
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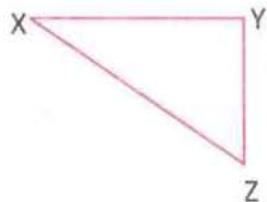
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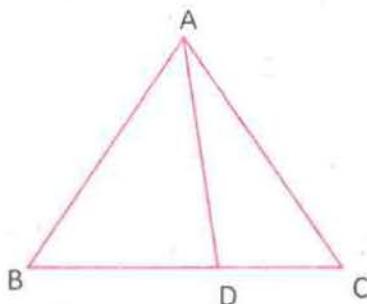
(e)



(f)



3. Which of the triangles of Q.N. 2 are equilateral, isosceles and scalene triangles?
4. How many triangles are there in the figure given below, which of these triangles are equilateral, isosceles or scalene triangles.

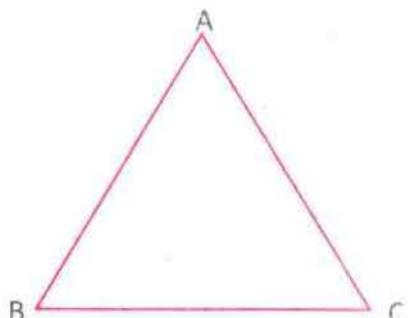


5. Write which of the triangles of Q.N. 4 are acute angled, right angled or obtuse angled triangles.

**Teaching Instruction:** Ask the students do more exercises making extra problems as given in the exercise above.

### 1.3 Measurement of Angles of Triangle

Draw a triangle ABC of any measurement. Compare your triangle with the triangle drawn by your friend. Are the triangles of your and your friend equal? Measure the three angles of the triangle you have drawn and fill in the table given below copying it in your exercise book.



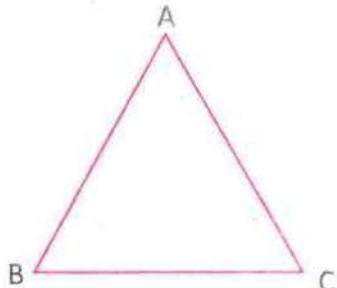
Angles	$\angle BAC$	$\angle ABC$	$\angle ACB$	$\angle BAC + \angle ABC + \angle ACB$
Measurement				

Now, what is the sum of angles? Show the sum to your friend that you have found. Are the sums equal? Now, ask to other friends too. What conclusion can be taken from this?

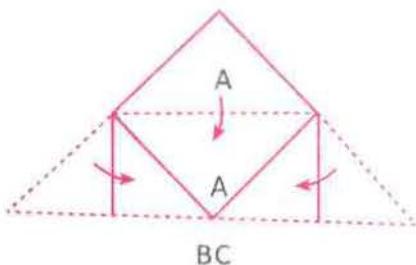
**Conclusion:** The sum of angles of a triangle is  $180^\circ$ .

#### Activity 3

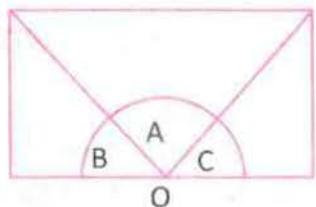
Draw a big size of triangle (in full page). Write the name of vertex of triangle as shown in the figure. Now, cut out the triangle with scissors. Now, fold the vertices B and C to match BC together.



Now, fold vertex A on the point where the vertices B and C meet together.



Now, the three vertices A, B and C are at the same point O. Angles A, B and C together have made a straight angle. So,  $\angle A + \angle B + \angle C = 180^\circ$ .

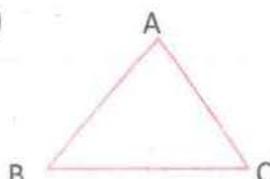


Similarly, repeat the above experiment by folding the angles of triangles with different sizes. Is the sum of all the three angles  $180^\circ$ , while folding all the triangles?

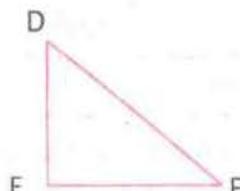
### Exercise 1.3

1. Measure each of the angles of triangles given below and find their sum.

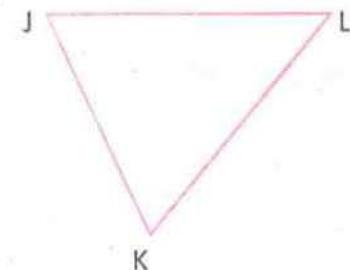
(a)



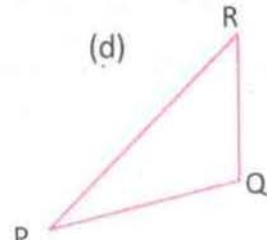
(b)



(c)

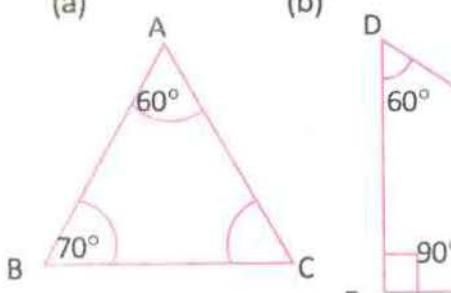


(d)



2. Find the remaining angles of each of the triangles given below. (without using protractor).

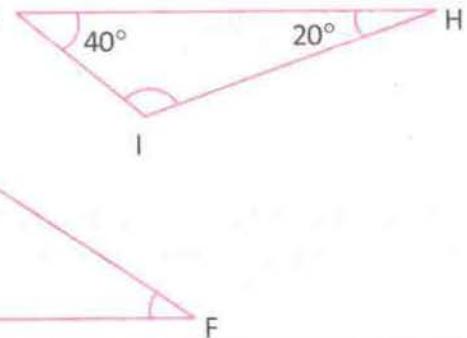
(a)



(b)



(c)



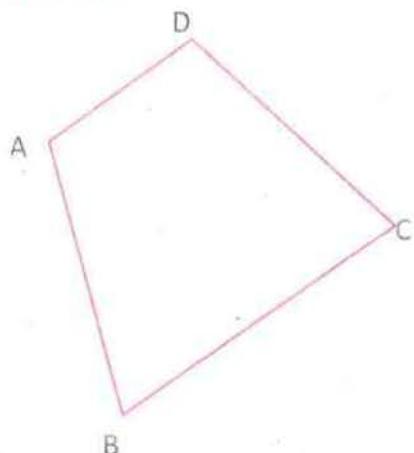
**Teaching Instruction:** Ask the students draw different triangles and find the sum of the angles of the triangles. Ask them make more problems as given in Q.N. 2 above and solve them.

## 1.4 Measurement of angles of quadrilateral

### Activity 1

Draw a quadrilateral ABCD. Show the quadrilateral you have drawn to your nearby friend. Are the quadrilaterals drawn by you and your friend of similar shape?

Now, measure each of the angles of quadrilateral you have drawn, copy the table in your exercise book and fill it.



Angles	$\angle ABC$	$\angle BCD$	$\angle CDA$	$\angle DAB$	$\angle A + \angle B + \angle C + \angle D$
Measurement					

What is the sum of angles that you have found? Show the sum you have found to your friend. Are the sums equal? Now, ask to other friends too, are the sums found by everyone  $360^\circ$ ? What conclusion can be taken out from this activity?

**Conclusion:** The sum of the angles of a quadrilateral is  $360^\circ$ .

### Activity 2

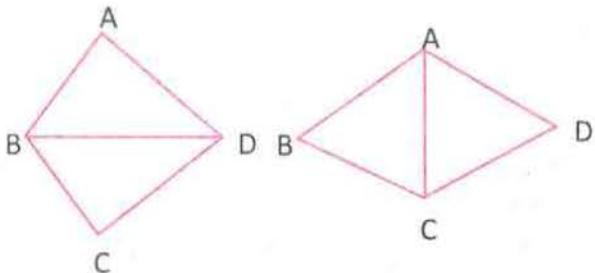
Shilal! The sum of angles of a quadrilateral is double than the sum of angles of a triangle, isn't it?



Yes! It means, a quadrilateral can be divided into two triangles, isn't it?



Draw a quadrilateral ABCD. Join B and D with the help of scale and pencil. Now, see, in how many triangles of the quadrilateral ABCD is divided. Now, the sum of the angles of  $\triangle ABD$  is  $180^\circ$ , also the sum of the angles of  $\triangle BCD$  is  $180^\circ$ .



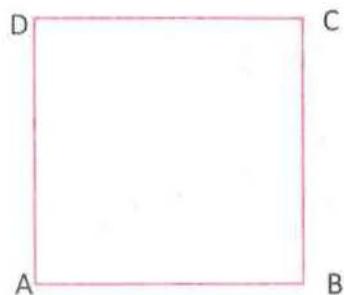
The sum of the angles of a quadrilateral ABCD is  $360^\circ$ , while the sum of the two triangles are together.

Again, join A and C of the same quadrilateral ABCD. In how many triangles of quadrilateral ABCD is divided? Here, is the sum of the angles of quadrilateral ABCD equal to the sum of the angles of two triangles ABC and ADC?

Here, the line segment BD and AC are called the diagonals of quadrilateral. How many diagonals are there in a quadrilateral, discuss and find.

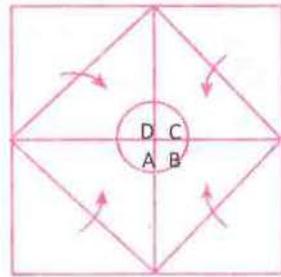
### Activity 3

Draw a quadrilateral ABCD with full sheet of paper. Now, cut out the quadrilateral from the sheet of paper, then, fold the vertices A, B, C and D on the same vertex O inside the quadrilateral as shown in the figure. Four angles A, B, C and D have made a complete angle while folding this way.



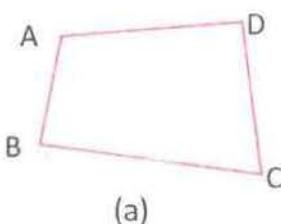
We know that, a complete angle is  $360^\circ$ . So, the sum of the angles A, B, C and D of quadrilateral ABCD is  $360^\circ$ .  $\angle A + \angle B + \angle C + \angle D = 360^\circ$ .

From the above activity, it can be concluded that the sum of the angles of a quadrilateral is  $360^\circ$ .

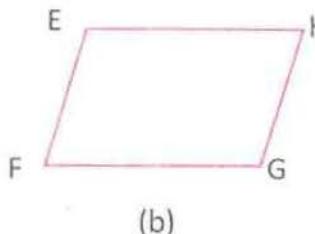


## Exercise 1.4

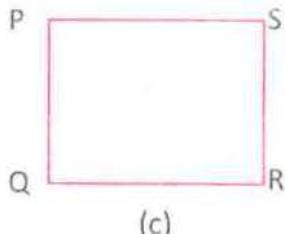
1. Measure each of the angles of quadrilateral given below and find the sum of each of them.



(a)

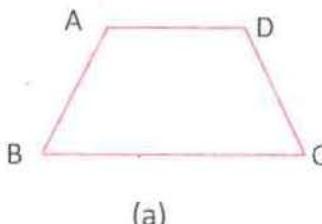


(b)

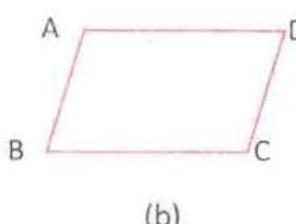


(c)

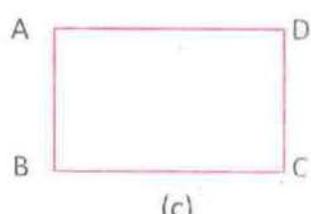
2. Draw diagonal AC on each of the quadrilaterals ABCD given below and find the sum of the angles of both triangles. Is the sum of the angles of both triangles  $360^\circ$ ?



(a)

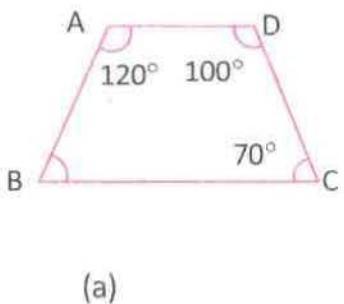


(b)

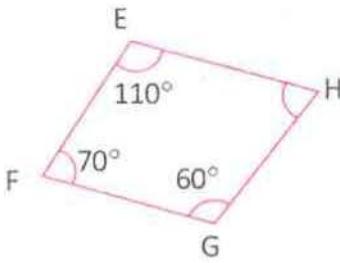


(c)

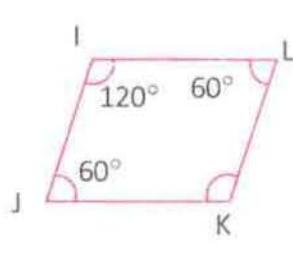
3. Sum of all the angles of quadrilateral is  $360^\circ$ . Find the unknown angle of each of the quadrilaterals given below:



(a)



(b)



(c)

**Teaching Instruction:** Ask the students make such problems and solve them for extra practice.

## Concept of Numbers

### 2.1 Counting upto Ten Crore and Place Value

There are ten Hindu-Arabic digits. They are, 0,1,2,3,4,5,6,7,8,9. Make a number 36582292 by using these digits. Put this in place value table and let's see and find the place value of 5.

Crore	Ten Lakhs	Lakhs	Ten thousands	Thousands	Hundreds	Tens	Ones
3	6	5	8	2	2	9	2

5 is in place of lakhs. So, place value of 5 is 5 lakhs = 5,00,000.

In place value table, 3 is in place of crore. So, place value of 3 is 3 crore = 3,00,00,000.

3,65,82,292 can be read as three crore sixty five lakh eighty two thousand two hundred and ninety two.

In the table given below, counting numbers upto 10 crores and their reading method or number name are given. See the table properly and discuss what you found.

By how many digits is made ?	Number	Number name
Smallest number of one digit	1	One
Smallest number of two digits	10	Ten
Smallest number of three digits	100	Hundred
Smallest number of four digits	1000	Thousand
Smallest number of five digits	10000	Ten Thousand
Smallest number of six digits	100000	Lakh
Smallest number of seven digits	1000000	Ten Lakh
Smallest number of eight digits	10000000	Crore
Smallest number of nine digits	100000000	Ten crore

## Methods of writing number name

Number 106739862 can be written in place value table in the following way:

Number	Place value									
	Crôres		Lakhs		Thousands			Units		
	Ten crore	Crore	Ten lakhs	Lakhs	Ten thousands	Thousands	Hundreds	Tens	Ones	
106739862	1	0	6	7	3	9	8	6	2	

Comma (,) is sued to make it easy to read any number according to place value. By using comma 106739862 can be written 10,67,39,862. While reading, ten crore sixty seven lakh thirty nine thousand eight hundred and sixty two.

### Example 1

Write the number name: 19,56,02,183

19,56,02,183 = Nineteen crore fifty six lakh two thousand one hundred and eighty three.

### Method of writing the given number name into number by digits.

While writing ten crore sixteen lakh eight thousand nine hundred and thirty six in number:

10 crore 16 lakh 8 thousand 9 hundred 36 = 10,16,08,936.

Similarly, while writing, ten crore eighty two lakh fifteen thousand and fifteen in number.

10,82,15,015

### Example 2

Write in number:- Eighteen crore eleven lakh four thousand and sixty.

Eighteen crore eleven lakh four thousand and sixty = 18,11,04,060.

## Exercise 2.1

1. What is the place value of 2 in each of the given numbers, write:
  - a. 13524
  - b. 1235497
  - c. 2305343
  - d. 4263578
2. How many lakhs are there in each of the given numbers?
  - a. 1234567
  - b. 50031247
  - c. 67853479
3. How many thousands are there in one crore?
4. Put comma (,) in each of the given numbers.
  - a. 1350739
  - b. 2476893
  - c. 275403016
  - d. 75003052
  - e. 105300274
  - f. 592070593
5. Write the number name of each of the numbers of Q.N.4.
6. Write in numbers:
  - a. One crore eighty two lakh and fifteen
  - b. Seventeen crore seventy five lakh three thousand six hundred and five
  - c. Twenty two crore sixty five thousand seven hundred and seventy
  - d. Thirty six crore fifty lakh six hundred and ninety
  - e. Ninety nine crore five hundred and twenty five

## 2.2 Writing Numbers in International System

Putting comma in the number 57363542 is different in international system than Nepali system. In international system, comma should be kept after every three digits from the right. According to that in the above number, comma can be kept this way:- 57, 363, 542.

Putting the number in place value table:-

Number	Million			Thousands			Units		
	Hundred	Ten	One	Hundred	Ten	One	Hundred	Ten	One
57363542	-	5	7	3	6	3	5	4	2

While reading: 57 millions, 363 thousands and 542.

or, Fifty seven million, three hundred sixty three thousand and five hundred forty two.

### Example 1

Write the number name of: 123,430,316

$123,430,316 = 123$  million, 430 thousand and 316.

= One hundred twenty three million, four hundred thirty thousand and three hundred sixteen.

### Method of writing number from number name in international system

Sixty million three hundred forty two thousand and eighty two.

= 60 million, 342 thousand and 082 = 60,342,082

### Example 2

Write in number

One hundred seven million, two hundred ninety three thousand and six hundred fifty.

= 107,293,650

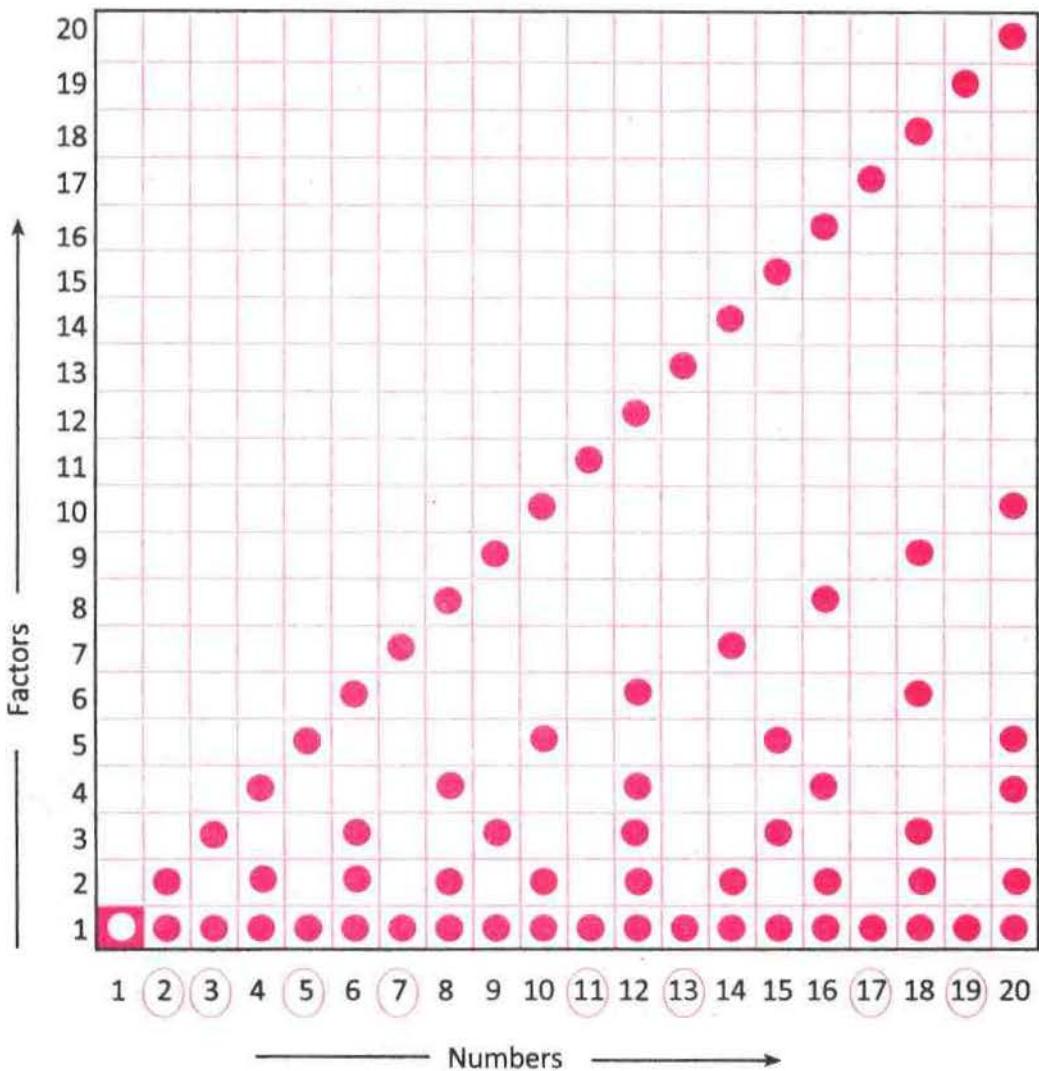
## Exercise 2.2

1. Put the comma(,) in each of the following numbers given below according to international system.
  - a. 35768229
  - b. 38962352
  - c. 158632932
  - d. 628293563
2. Put the following numbers in place value table according to international system and write the number name.
  - a. 32,567,832
  - b. 178,625,123
  - c. 595,207,257
  - d. 185,090,159
3. Write in number:
  - a. Fifty seven million nine hundred twenty six thousand and one hundred thirty three.
  - b. One hundred twenty four million sixty six thousand and three hundred four.
  - c. Two hundred fifty seven million four hundred twenty thousand and seventy four.
  - d. Seven hundred thirty four million thirty seven thousand and two hundred sixty three.

**Teaching Instruction:** Ask the students make questions as given in the exercise above and ask in grasp like in quiz contest.

## 2.3 Prime and Composite Numbers up to 100.

Prime and composite numbers from 1 to 20 are shown in the figure given below. The dots indicate the factors of the number just below than it in the figure. See the figure and make a list of numbers 1 to 20, and find which has got how many factors.



See the list you have made and answer the following questions:

- Which number has factor 1 and the number itself?
- What can you say about the circled number in the figure?

- c. Which of the numbers from 1-20 has got factors beside 1 and number itself, discuss.

The number which has factor 1 and number itself is called prime number. The number which has other factors beside 1 and the number itself is called composite number. Prime number can not be exactly divisible by another numbers beside 1 and number itself. Such prime numbers from 1 to 20 are 2,3,5,7,11,13,17,19 altogether 8. 1 is neither prime nor composite whereas 2 is only one even prime number. Other all the prime numbers are odd.

### Exercise 2.3

1. a. Write the numbers 1-100 in a sheet of square paper with 10x10 box.  
b. Cross the number 1.  
c. Leave 2 and cross all the numbers exactly divisible by 2.  
d. Leave 3 and cross all the numbers exactly divisible by 3.  
e. Leave 5 and cross all the numbers exactly divisible by 5.  
f. Leave 7 and cross all the numbers exactly divisible by 7.  
g. After crossing, are the remaining numbers prime or composite?  
h. How many prime numbers are there between 1-100?  
i. How many prime numbers are there less than 60 and more than 50?

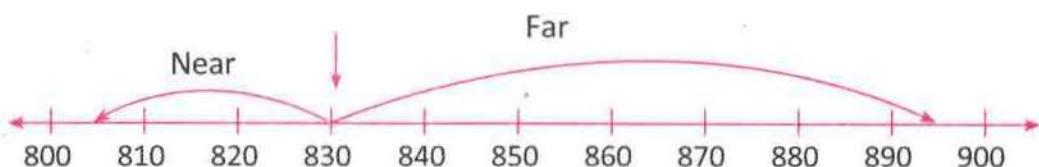
Note:- The method of finding prime numbers as in Q.N.1 is called Eratostheni's sieve. This method was firstly used by Eratostheni so that it is called so.

2. Find which of the following numbers given below are prime and which not?

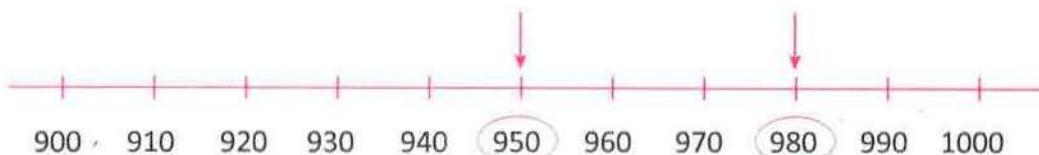
a. 2	b. 5	c. 6	d. 7	e. 13
f. 23	g. 33	h. 41	i. 53	j. 72
k. 75	l. 79	m. 81	n. 83	o. 99
3. Write the prime numbers between 75 and 85.
4.  $11 \times 11 = 121$ , 11 is prime number. What is 121 ?

## 2.4 Rounding off the Numbers

See and discuss



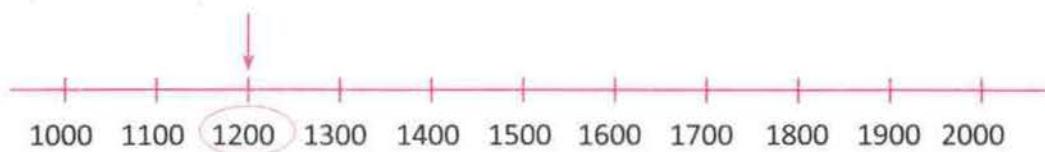
In number line, 830 is near to 800 but far from 900. So 830 becomes 800 while rounding off to the nearest hundred.



In number line, 980 is near to 1000 but far from 900. So 980 becomes 1000, while rounding off to the nearest hundred. Similarly 950 is in the just middle of 900 and 1000, but 950 becomes 1000 while rounding off to the nearest hundred.

### Example 1

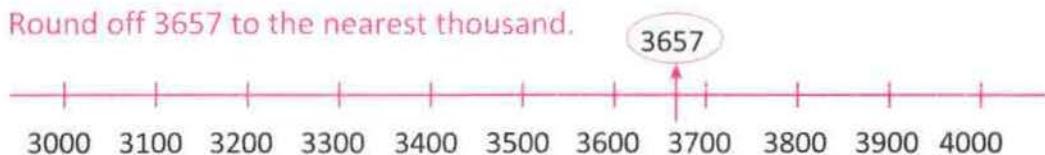
Round off 1200 to the nearest thousand.



1200 is near to 1000. So, 1200 becomes 1000 while rounding off to the nearest thousand.

### Example 2

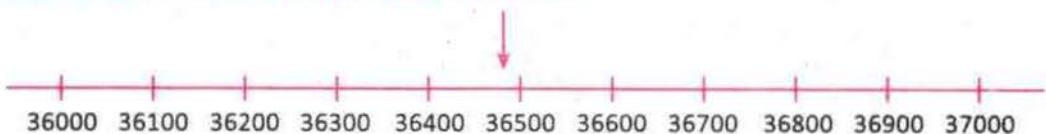
Round off 3657 to the nearest thousand.



3657 lies near to 4000. So, 3657 becomes 4000 while rounding off to the nearest thousand.

### Example 3

Round off 36500 to the nearest thousand.



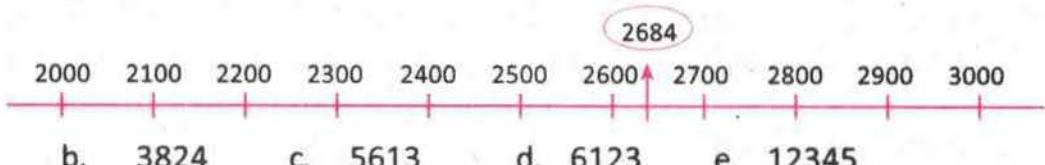
36500 lies in the middle of 36000 and 37000. 36000 becomes 37000 while rounding off to the nearest thousand.

**Teaching Instructions:** Let, the students discuss about rounding off to the nearest hundred and thousand by using number line.

### Exercise 2.4

1. Round off the given numbers to the nearest hundred.

a.



b. 3824

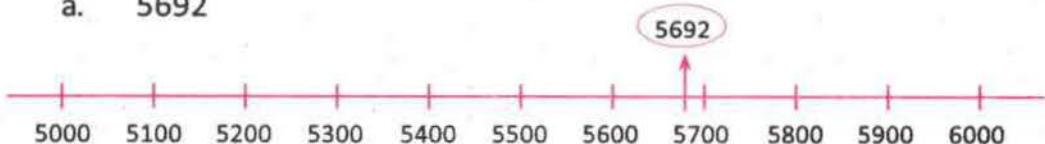
c. 5613

d. 6123

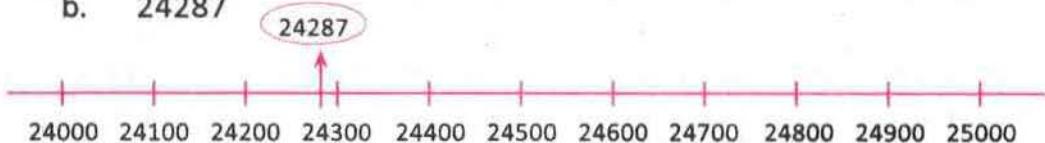
e. 12345

2. Round off the given numbers to the nearest thousand.

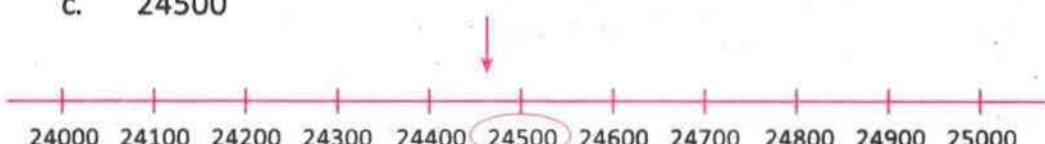
a. 5692



b. 24287



c. 24500



d. 1697

e. 15287

f. 58999

g. 93902

## 2.5 Square and Cube Numbers

### 2.5.1 Square numbers

Study the table given below and discuss:

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Could you say anything about the circled numbers?

$$1 \times 1 = 1$$

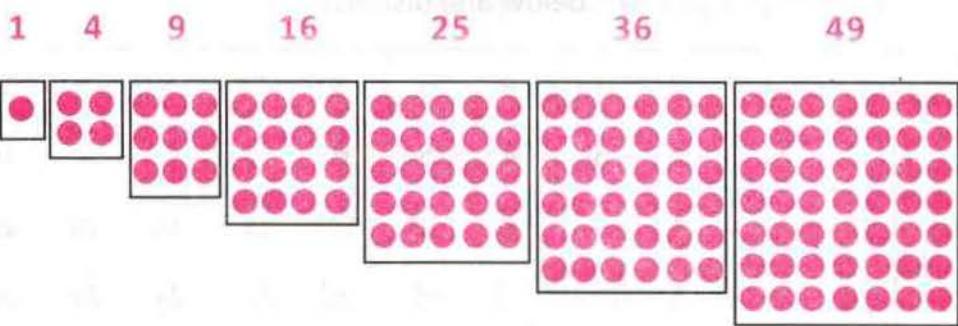
$$2 \times 2 = 4$$

$$3 \times 3 = 9$$

Are there the same kind of two factors in each of the circled numbers?

Can all the circled numbers be expressed in the same way? See by multiplying.

Now, let's make a shape with the dots of the circled numbers. What does it make?



Here, the shape of the dots of every number has made a square. In this way the points of number make a square shape, so these all numbers are called square numbers.

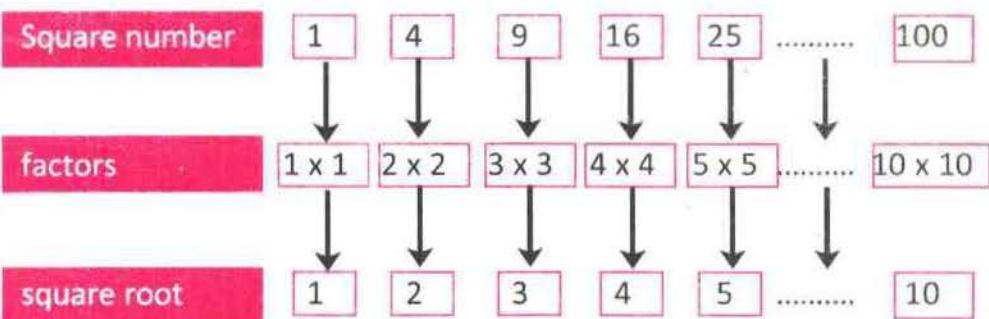
These square numbers can be found by multiplying any number with itself. See the table given below.

Number	Multiply (Number x Number)	Square number
1	$1 \times 1$	1
2	$2 \times 2$	4
3	$3 \times 3$	9
4	$4 \times 4$	16
5	$5 \times 5$	25

In this way, if any number is given, the product of the number with the same number is called square number of the given number. So, to find out either the given number is square number or not, we should try to express the given number with two similar factors and see that can it be or not. For example,  $64 = 8 \times 8$ , so 64 is square number but  $15 = 5 \times 3$ , so 15 is not a square number.

Here, the number 64 has two similar factors  $8 \times 8 = 64$  in which 8 is called the square root of 64 and 64 is called the square number of 8 .

See flow chart given below representing square number and square root.



In the flow chart, square number can be found, while looking from down to up. Square number of 3 is 9. Square root can be found, while looking from up to down. Square root of 16 is 4, while looking from up to down. Similarly, square root of 100 is 10.

### Example 1

Find square root of 9.

Here, given number = 9

So, square number of 9 =  $9 \times 9 = 81$

### Example 2

Chessboard is in square shape and has 64 rooms. How many number of rooms are there in each of the rows and columns?

Here,

Total number of rooms in square shaped chess board = 64

Product of the same two identical numbers =  $8 \times 8 = 64$

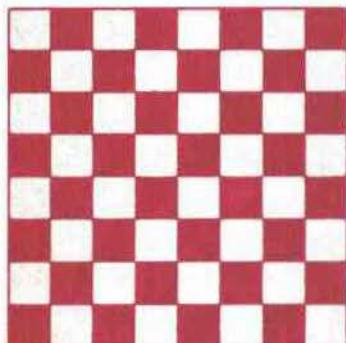
So, number of rooms in each row and column = 8

### Example 3

Find the square root of number 25.

Here,  $25 = 5 \times 5$

So, square root of 25 = 5.



## Exercise 2.5.1

1. Find the square number of each of the following given numbers:-

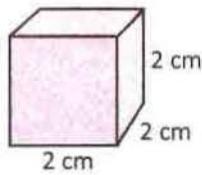
a. 2	b. 5	c. 6	d. 7	e. 8
f. 9	g. 10	h. 11	i. 12	j. 13
k. 14	l. 15			
2. Find, which of the following numbers are square numbers.

a. 16	b. 25	c. 42	d. 49	e. 60
f. 81	g. 100	h. 120	i. 121	j. 225
3. Find square root of each of the given square numbers.

a. 36	b. 49	c. 64	d. 81	e. 100
f. 121	g. 144	h. 169	i. 196	j. 225
4. How many plants of cauliflowers are needed to plant in a square field to plant 20 in each of the rows?
5. If 36 students of a class are kept in square shape, how many students are there in each line?
6. If 144 soldiers are having parade in square shape, how many soldiers are there in one line?
7. When a square is made keeping 45 students in each line, 6 students become more. What is the total number of students?
8. How many square numbers are there between 1-100?

## 2.5.2 Cubic-Numbers

The length, breadth and height of a dice are 2/2 cm. It is an cubical object. When the numbers which represent length, breadth and height of dice are multiplied  $2 \times 2 \times 2 = 8$ . Here, 8 is the product of three identical numbers. Such numbers are called cube numbers. The cube numbers from 1 to 5 are given in the table.



Number	Multiply while multiplying thrice	Square number
1	$1 \times 1 \times 1$	1
2	$2 \times 2 \times 2$	8
3	$3 \times 3 \times 3$	27
4	$4 \times 4 \times 4$	64
5	$5 \times 5 \times 5$	125

So, while finding the cube number of given number, the given number should be multiplied three times with itself.

### Example 1

Find the cube number of 6.

Here, cube number of 6.

$$= 6 \times 6 \times 6$$

$$= 36 \times 6$$

$$= 216$$

### Example 2

Find the cube root of 64.

Here,  $64 = 4 \times 4 \times 4$

So, cube root of 64 is 4.

### Exercise 2.5.2

1. Find the cube number of each of the given numbers.

a. 2

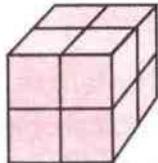
b. 5

c. 7

d. 8

e. 10

2. This is a cube with length, breadth and height 3cm. If it is cut into cubical pieces of length, breadth and height  $1/1$  cm, how many pieces will be there?



3. If one of the factors from the product of three identical factors of a number is 5, what is the number?  
 4. Which of the given numbers are cube numbers?  
 a. 64      b. 125      c. 16      d. 100      e. 27

## 2.6 Prime Factorization of Numbers

See the example given below:

$$\begin{aligned} 12 &= 12 \times 1 = \text{two factors (12 is compound number)} \\ &= 6 \times 2 = \text{two factors (6 is compound number)} \\ &= 4 \times 3 = \text{two factors (4 is compound number)} \\ &= 2 \times 2 \times 3 \text{ three factors (All are prime numbers)} \end{aligned}$$

Can more factors be added? Discuss.

In this way, the method of expressing a number in the form of the product of 2 or more than 2 factors is called finding of factors or factorization. Any number which is expressed in the form of all prime factors is called prime factorization.

Prime factors can be found in two ways.

- a. By continue division process

### Example 1

Find the prime factors of 12.

Here,  $2 \overline{)12}$   $\rightarrow$  12 is even, let's divide by 2.  
 $2 \overline{)6}$   $\rightarrow$  6 is even, let's divide by 2.  
 3  $\rightarrow$  3 is prime, so stop dividing.

So,  $12 = 2 \times 2 \times 3$

While dividing in this way, should be divided by the smallest prime numbers.

## Example 2

Find the prime factors of 675.

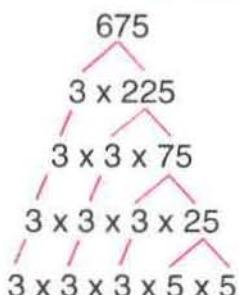
Here,  $3 \mid 675$     675 is divided by 3.  
 $3 \mid 225$     225 is divided by 3.  
 $3 \mid 75$     75 is divided by 3.  
 $5 \mid 25$     25 is divided by 5.  
5

So,  $675 = 3 \times 3 \times 3 \times 5 \times 5$

### b. By making factor tree of factors

## Example 3

Make factor tree of factors of number 675.



So,  $675 = 3 \times 3 \times 3 \times 5 \times 5$

## Exercise 2.6

1. Find the prime factors of each of the given numbers by continuous division method:
  - a. 8
  - b. 12
  - c. 18
  - d. 24
  - e. 42
  - f. 62
  - g. 64
  - h. 85
  - i. 121
  - j. 144
2. Find the prime factors of each of the given numbers by making factor tree.
  - a. 16
  - b. 30
  - c. 44
  - d. 70
  - e. 162
  - f. 252
  - g. 676
  - h. 625
  - i. 750
  - j. 925

# Fundamental Operations in Mathematics

## 3.1 Simplification of problems including fundamental operations

**Read, discuss and learn**

The solving of problems including four simple rules, Add (+), Subtract (-), Multiply (x) and Division (÷) of math is called simplification. In simplification, multiplication or division, one should be done at first as which comes. After that Add or Subtract one should be done as which comes at first.

### Example 1

**Simplify**

$$15 \div 5 \times 3 + 7 - 15$$

This problem can be expressed in word:- 15 is divided by 5,7 is multiplied to quotient, then seven is added and then 15 is subtracted from the sum. So, Division, Multiplication, Addition and Subtraction should be done respectively.

$$\text{So, } 15 \div 5 \times 3 + 7 - 15$$

$$\begin{aligned}
 &= 3 \times 3 + 7 - 15 && [15 \div 5 = 3, \text{Division is done}] \\
 &= 9 + 7 - 15 && [3 \times 3 = 9, \text{Multiplication is done}] \\
 &= 16 - 15 && [9 + 7 = 16, \text{Addition is done}] \\
 &= 1 && [16 - 15 = 1, \text{Subtraction is done}]
 \end{aligned}$$

### Example 2

**Simplify**  $55 - 576 \div 12 + 11 \times 3$

Here,  $55 - 576 \div 12 + 11 \times 3$

$$\begin{aligned}
 &= 55 - 48 + 11 \times 3 && [\text{by Division}] \\
 &= 55 - 48 + 33 && [\text{by Multiplication}] \\
 &= 7 + 33 && [\text{by Subtraction}] \\
 &= 40 && [\text{by Addition}]
 \end{aligned}$$

### Example 3

What is the sum while 13 is added to the difference while 20 is subtracted from the product of double 16? While writing this sentence in mathematical form:

$$16 \times 2 - 20 + 13$$

So,  $16 \times 2 - 20 + 13$

$$= 32 - 20 + 13$$

$$= 12 + 13$$

$$= 25$$

[Multiplication]

[Subtraction]

[Addition]

Or  $16 \times 2 - 20 + 13$

$$= 32 - 20 + 13$$

$$= 32 + 13 - 20$$

$$= 45 - 20$$

$$= 25$$

### Exercise 3.1

#### Simplify

1.  $44 + 24 \div 3 - 30$

2.  $63 \div 9 \times 7 + 4 - 52$

3.  $6 \times 64 \div 16 + 7 - 21$

4.  $24 \times 12 \div 12 - 24 + 17$

5.  $55 \div 11 + 7 \times 3 - 13$

6.  $132 \div 12 \times 12 - 124 \div 31$

7.  $422 + 124 \div 4 \times 2 - 355$

8.  $144 \div 24 - 3 \times 15 \div 5 + 16$

9.  $625 \div 25 - 25 \times 25 \div 5 + 100$

10.  $576 \div 24 + 51 \div 17 - 20$

11. Express each of the following problems in mathematical form and simplify:-

- What is the sum when 3 is added to the product of 5 and 2?
- What is the sum when 7 is added to the product of 12 and 3?
- What is the sum when 5 is subtracted from one third of 36 then 7 is added?
- What is the sum when 50 is added to the product of 15 and 10 then 200 is subtracted from the sum?
- What is when one third of 9 is multiplied by 2 and subtracted from 15?

### 3.2 Use of brackets in simplification

#### Read, Discuss and Learn:

What is the cost of a copy of Rs. 10 and an eraser of Rs. 2 when bought for three people?

$$\text{Cost for one person} = 10 + 2$$

$$\text{Total cost for 3 persons} = (10 + 2) \times 3$$

$$= (10 + 2) \times 3, \text{ if simplified}$$

$$= 12 \times 3 [\text{solved inside the brackets}]$$

$$= \text{Rs. } 36$$

#### Example 1

Simplify:  $12 - (20 - 12)$

$$\begin{aligned}\text{Here, } 12 - (20 - 12) \\ &= 12 - 8 \quad [\text{Operation inside brackets}] \\ &= 4\end{aligned}$$

#### Example 2

Simplify:  $5 + 8 \times 2 - (5 - 2)$

$$\begin{aligned}\text{Here, } 5 + 8 \times 2 - (5 - 2) \\ &= 5 + 8 \times 2 - 3 \quad [\text{Operation inside brackets}] \\ &= 5 + 16 - 3 \quad [\text{Multiplied first}] \\ &= 21 - 3 \quad [\text{Added first}] \\ &= 18 \quad [\text{Subtracted}]\end{aligned}$$

#### Example 3

What is the sum, if 6 is subtracted from 3 times of the sum of 5 and 2? In this operation, addition, subtraction and multiplication are included. Multiply should be done at first among them but here, 3 times of the sum of 5 and 2 is said, so at first addition should be done.

So, since 5 and 2 are to be added at first, writing in mathematical form by using brackets:

$$\begin{aligned}(5 + 2) \times 3 - 6 \\ &= 7 \times 3 - 6 \quad [\text{Operation inside brackets at first, brackets should be removed after having operations inside brackets}] \\ &= 21 - 6 = 15\end{aligned}$$

Therefore, if brackets are used, complete the operation inside the brackets at first then other operations should be done. In simplification, operation inside small brackets, curly brackets should be done respectively.

### Example 4

**Simplify**  $8 + 14 \times \{(8 - 2) + 3\} \div 18$

Here,

$$\begin{aligned} & 8 + 14 \times \{(8 - 2) + 3\} \div 18 \\ &= 8 + 14 \times \{6 + 3\} \div 18 \\ &= 8 + 14 \times 9 \div 18 \\ &= 8 + 14 \times \frac{9}{18} \\ &= 8 + 7 \\ &= 15 \end{aligned}$$

Or,

$$\begin{aligned} & 8 + 14 \times \{(8 - 2) + 3\} \div 18 \\ &= 8 + 14 \times \{6 + 3\} \div 18 \\ &= 8 + 14 \times 9 \div 18 \\ &= 8 + 126 \div 18 \\ &= 8 + 7 \\ &= 15 \end{aligned}$$

### Exercise 3.2

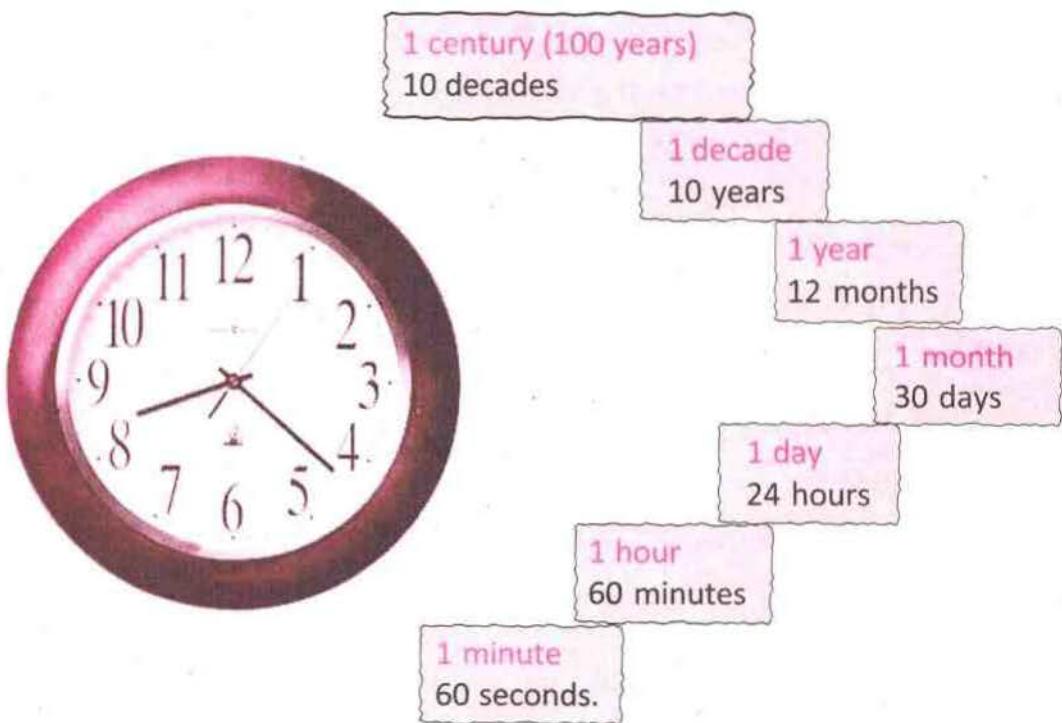
#### a. Simplify

1.  $6 - (5 - 2)$
2.  $(16 - 4) \times (5 - 3)$
3.  $(16 + 4) \div 5 - 3$
4.  $20 - \{8 - (5 + 2)\}$
5.  $3 - \{12 \div (2 \times 3)\}$
6.  $19 - 7 + \{4 - (5 - 2)\} \times 2$
7.  $3 + 4 \div \{2 + 4 \div (4 - 2)\}$
8.  $30 \div \{60 - 3(21 - 6)\}$
9.  $22 \div \{20 \div (4 + 6)\} \times 2$
10.  $80 - 5 \{9 - (14 - 12)\} \div 5$

#### b. Write in mathematical sentence and solve:

11. What is the quotient, if 3 times of difference of 12 and 5 is divided by 7?
12. What is while subtracting 3 times difference of 9 and 5 from 20?
13. What is while subtracting the difference of 70 and 30 from 5 times of the sum of 7 and 3?
14. What is while subtracting the difference of 16 and 7 from one fourth of the sum of 16 and 20?
15. What is while dividing the difference of 50 and one third of two times of 12 into 6 equal parts?
16. What is while 4 is added to the difference of 5 and 2 is subtracted from 7 then 9 is added?

# Time



Comparing the units of time given above search the relation. The second hand of a clock crosses 60 small lines in 1 round. At the same time, the minute hand moves to just next line then. Now, discuss with the friends and answer the questions given below related to the speed among these hands of clock.

- How many lines are crossed by the minute hand when the second hand makes a round?
- How many rounds are made by the second hand when the minute hand makes a round?
- How much time does the hour hand of a clock take to make a round?
- How many rounds are made by the hour hand in a day? and How many rounds are made by the minute hand?

### Example 1

Multiply 3 years 8 months 12 days by 3.

Multiplying 3 years 8 months 12 days separately.

year	months	days	
3	8	12	
	x 3		
9	24	36	30 days = 1 month, 36 days = 1 month 6 days
9	25	6	12 months = 1 year, 25 months = 2 years 1 day
11	1	6	

### Example 2

Divide 15 hours, 30 minutes 48 seconds by 4.

Here, dividing hour, minute and second separately by 4.

$$\begin{array}{r} 3\text{h} \quad 52\text{m} \quad 42 \text{ seconds} \\ \hline 4 ) \quad 15 \quad 30 \quad 48 \\ - 12 \\ \hline 3 \quad 30 \quad 48 \\ \hline 210 \quad 48 \quad \rightarrow 3 \text{ hours} = 180 \text{ minutes} \\ - 20 \\ \hline 10 \\ - 8 \\ \hline 2 \quad 48 \\ \hline 168 \quad \rightarrow 2 \text{ minutes} = 120 \text{ seconds} \\ - 16 \\ \hline 8 \\ - 8 \\ \hline 0 \end{array}$$

### Example 3

Divide 10 years 7 months 12 days by 6.

Dividing years, months and days separately by 6.

	1 year	9 months	7 days	
6 )	year	month	day	
	10	7	12	
	- 6			
	4	7	12	
		55	12	4 years = 48 months
		- 54		
		1	12	
			42	1 month = 30 days
			- 42	
			0	
			x	

### Example 4

A microbus move 6 times from Narayangadh to Kathmandu. The bus has taken 28 hours 34 minutes in 6 times. If the bus takes equal time in each turn, find the time taken to come Kathmandu from Narayangadh.

Hence, Total time in 6 times = 28 hours 34 minute.

While finding time for 1 time.

	4 hours	45 minutes	40 seconds	
6 )	28	34		
	- 24			
	4 x 60 → 240 + 34			
	274			
	- 24			
	34			
	- 30			
	4 x 60 → 240			
	- 240			
	0			

## Exercise 4

1. **Multiply:**
  - (a) 2 years 7 months 16 days by 4.
  - (b) 5 years 6 months 12 days by 5.
  - (c) 7 years 4 months 18 days by 3.
  - (d) 8 years 9 months 6 days by 8.
  - (e) 6 hours 40 minutes 15 seconds by 5.
2. **Divide:**
  - (a) 10 years 8 months 20 days by 2.
  - (b) 15 years 6 months 21 days by 3.
  - (c) 13 years 7 months 12 days by 6.
  - (d) 5 hours 7 minutes 32 seconds by 4.
  - (e) 8 hours 10 minutes 35 seconds by 7.
3. If  $\frac{1}{2}$  part of a work can be finished in 6 hours 30 minutes, how much time will be taken to finish the whole work?
4. 2 hours 15 minutes time will be taken to plant cauliflower in a square field. How much time will be taken to plant in 6 such square fields?
5. A pipe fills a tank in  $1\frac{1}{2}$  hours. In how many hours the same pipe can fill 5 similar tanks?
6. 7 subjects are taught in Shila's class. If a period is of 45 minutes, in how many minutes, Shila reads all 7 subjects?
7. Shiva does all his homework in  $3\frac{1}{2}$  hours. He gives equal time to all subjects and does the homework of seven subjects. How much time does he take to complete the homework of 1 subject?
8. The time table of buses which travel different places from Pokhara is given below. The bus A and the bus B depart from Pokhara for Kathmandu at 5:30 morning and they reached in the following places in the mentioned time:

Pokhara	Bus 'A'	Bus' B'
Khairenitar	6:45am	7:00 am
Damauli	7:50 am	8:45 am
Dumre	9:30 am	10:30am
Anbukhaireni	10:15 am	12:30 noon
Muglin	11:00am	1:00 pm
Mahadev Bensi	11:50am	2:30 pm
Naubise	1:00 pm	4:00 pm
Kathmandu	2:00 pm	5:30 pm

**Reply the following questions:**

- At what time did the bus A reach Damauli?
- How much late did the bus B reach than the bus A?
- The passengers rode in the bus A at Dumre, after how much time, did they reach Muglin?
- How much time did the bus B take to reach Mahadev Bensi from Dumre?
- Where the bus B was, when the bus A was at Naubise?
- Which bus should be taken to reach Mahadev Bensi by 2 o'clock?
- After how much time did the bus B reach in Kathmandu in comparison to bus A ?

## Lesson 5

# Money

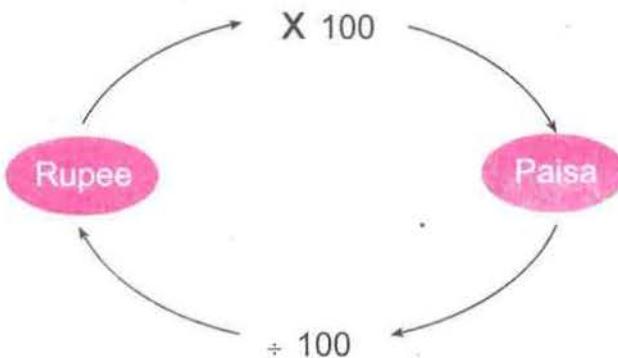
We use different coins and notes to pay the same amount of property with different payments. For example to pay Re. 1 and 25 paise.

- Note of Re. 1 and a coin of 25 paise.
- Two coins of 50 paise and a coin of 25 paise.
- 5 coins of 25 paise etc.

There are other several methods to pay Re. 1 and 25 paise. Find and discuss with friends in how many ways Re. 1 and 25 paise can be paid. To indicate Re. 1 and 25 paise, we write Rs. 1.25. In this process, we put decimal between Rupees and paisa. Why?

Rs. 1 has 100 paisa or 100 paisa = Re. 1. So while converting Rupees in paisa we should multiply by 100 because 100 paisa makes Re.1 so while converting paisa into Rupees, we should divide paisa by 100.

Try to understand this process from the picture given below:



In the above example, in Re. 1 and 25 paisa there are 125 paisa and Rs. 1.25 will be obtained while 125 paisa is divided by 100.

### **Example 1**

Convert Rs. 4 and 35 paisa into paisa.

Here, Rs. 4 and 35 paisa =  $(4 \times 100 + 35)$  paisa = 435 paisa.

### **Example 2**

Convert 525 paisa into rupees.

Here, 525 paisa = Rs.  $(525 \div 100)$  = Rs. 5.25

### **Example 3**

If Ramesh gave Rs.20 note to the shopkeeper to pay Rs.10.75, how much did he get return?

Here, Rs. 20 =  $20 \times 100$  paisa = 2000 paisa

and      Rs. 10.75 =  $10.75 \times 100$  paisa = 1075 paisa

The amount that he should get return =  $(2000 - 1075)$  paisa

= 925 paisa = Rs. 9.25

(To convert paisa into rupees, decimal sign is kept after two digits from the right.)

### **Subtracting in short**

Rs. 20.00

– Rs. 10.75

                    
Rs. 9.25

**Next method:-** ( Subtracting Rs. from Rs. and paisa from paisa)

Rs	Paisa	Rs	Paisa
20	00	=	19 100
10	75		– 10 75
		=	Rs. 9 25

In this way, while doing addition and subtraction of Rs. and paisa, Rs. to Rs. and paisa to paisa should be added or subtracted.

### Example 4

- a. What is the sum of Rs.6.80 and Rs. 7.25?

Adding Rs and paisa separately.

Rs	Paisa
6	80
7	25
<u>13</u>	<u>105</u>
14	05

$$= \text{Rs. } 14.05$$

In short,

$$\begin{array}{r} \text{Rs } 6.80 \\ + \text{Rs } 7.25 \\ \hline = \text{Rs } 14.05 \end{array}$$

105 paisa means Re.1 and 5 paisa. So, Re. 1 is added to Rs.13 and becomes Rs. 14 and 5 paisa.

- b. What is the difference while subtracting Rs 3 and 75 paisa from Rs.5 and 25 paisa?

Subtracting Rs and paisa separately,

Rs	Paisa
4 <u>5</u>	<u>25</u> 125
- 3	75
<u>1</u>	50
	= Rs 1.50

75 paisa cannot be subtracted from 25 paisa.

So Re. 1 = 100 paisa is borrowed.

In short:

$$\text{Rs. } 5.25$$

$$\underline{\text{Rs. } 3.75}$$

$$\text{Rs. } 1.50$$



This is the subtraction of decimal.

### Example 5

How much does Kamlesh earn in 7 days at the rate of Rs. 25.35 per day?

Here, to find the income of 7 days, his income of 1 day Rs. 25.35 should be added 7 times. Which can be found by multiplying.

So, the income of Kamlesh in 7 days = Rs. 25.35

$$\begin{array}{r} \times 7 \\ \hline \text{Rs. } 177.45 \end{array}$$

### Next method:

Multiplying Rs and paisa separately.

Rs	Paisa
25	35
$\times$	7
175	245
177	45

245 paisa = Rs. 2.45 so, it becomes Rs. 177.45

So, income of Kamlesh is Rs. 177.45

### Example 6

If Dawa gave Rs.125 to his son Nima for the pocket money for 10 days, how much did he give for 1 day?

Here, Rs.125 is for 10 days. So, Rs.125 should be divided into 10 equal parts.  
So, it's the problem related to division.

Now, dividing Rs. 125 by 10

$$\begin{array}{r} \text{Rs. } 12.50 \\ \hline 10 ) \text{ Rs. } 125 \\ - 10 \\ \hline 25 \\ - 20 \\ \hline 5 \times 100 \text{ paisa} \\ 500 \text{ paisa} \\ - 50 \\ \hline 0 \end{array}$$

When remainder Rs.5 is converted into paisa  
it becomes 500 paisa.

So, expenditure of one day = Rs. 12.50

### Next method:

$$\begin{array}{r} 12 \\ \hline 10 ) \quad \text{Rs. } 125 \\ - 10 \\ \hline 25 \\ - 20 \\ \hline 5 \end{array}$$

So, per day expenditure = Rs.  $12\frac{5}{10}$  = Rs. 12.50

### Example 7

If 12 pencils are bought at Rs. 2.15 per piece and sold them at Rs. 2.50 per piece, what is the profit?

Here, selling price of 1 pencil = Rs. 2.50

Cost price of 1 pencil = Rs. 2.15

Profit in 1 pencil = selling price – cost price = Rs. 2.50 – Rs. 2.15 = Rs. 0.35

Profit in 12 pencils =  $12 \times \text{Rs. } 0.35$  = Rs. 4.20

So, profit = Rs. 4.20

### Exercise 5

1. How many coins of the following are there in Re. 1?

- a. 25 paisa      b. 50 paisa      c. 10 paisa

2. Convert into paisa.

- a. Rs.  $\frac{1}{2}$       b. Rs.  $\frac{1}{4}$       c. Rs.  $\frac{1}{10}$       d. Rs.  $\frac{1}{5}$   
e. Rs.  $1\frac{1}{2}$       f. Rs. 5.05      g. Rs. 10.15      h. Rs. 75.35

3. Convert into rupees.

- a. 125 paisa      b. 105 paisa      c. 325 paisa  
d. 10 paisa      e. 15 paisa      f. 20 paisa  
g. 25 paisa      h. 50 paisa      i. 1235 paisa  
j. 2357 paisa      k. 5437 paisa      l. 4857 paisa

4. See the price list and find the total cost of goods given below:-

Price list	
Particulars	Cost(per unit)
Pencil	Rs. 1.50
Copy	Rs. 3.50
Book	Rs. 18.75
Geometry box	Rs. 45.00
Bag	Rs. 150.00
Pen	Rs. 10.00

- a. 1 pencil, 1 pen and 1 copy
  - b. 1 bag and 1 geometry box
  - c. 1 book and 1 pencil
  - d. 5 copies
  - e. 5 books and 10 copies
  - f. 2 pens and 4 copies.
5. Find the price difference between the given goods according to the price list given in Q.N.4
- a. Pen and pencil
  - b. Bag and geometry box
  - c. Book and copy
  - d. Pencil and geometry box
6. Three packets of biscuits and 4 eggs cost Rs. 40. If the cost of three packets of biscuits is Rs. 27.
- a. What is the cost of 4 eggs?
  - b. What is the cost of 1 packet of biscuits?
7. If the cost of 1 battery is Rs. 10, what is the cost of 1 dozen of batteries?
8. The cost of boating in Phewa Lake is Rs.15 but the children should pay half of the cost. How much Bimal should pay for his 3 children and wife Shushila for boating?
9. A 500 rupee note is given to a shopkeeper after buying the goods of Rs. 225.65, How much should come return?
10. If Pawan gave Rs. 53.75 for his 5 kids for snacks, what is the share of each of the children?

## Lesson 6

# Distance

### Division and Multiplication of units of distance:

What is the distance from your house to the school? Guess it. How much distance should you walk to go and come back home from school for one week? How to calculate? Discuss.

#### Example 1

Multiply 3 km 200m 55 cm by 8.

Hence, multiplying different units of distance separately,

Km	m	cm	
3	200	55	
	X	8	
24	1600	440	$440 \text{ cm} = 4 \text{ m } 40 \text{ cm}$
24	1604	40	$1604 = 1 \text{ km } 60 \text{ m } 4\text{cm}$
25	604	40	

#### Example 2

Dividing 5km 600m 56cm by 8.

Hence, divide the units of distance separately,

$$\begin{array}{r} 0 \text{ km} & 700 \text{ m} & 7 \text{ cm} \\ 8 ) & 5 & 600 & 56 \\ & 0 & 5000 & \xleftarrow{\quad 5 \times 1000 \quad} \\ & & 5600 & 56 \\ & & -56 & \\ & & 00 & 56 \\ & & -56 & \\ & & & x \end{array}$$

So, quotient = 700 m 7 cm

### Example 3

The school is 1 km 500 m far from Hari's house. The school is three times farther from Shyam's house than from Hari's house. How far is the school from Shyam's house ?

Here,

$$\text{The distance of school from Hari's house} = 1 \text{ km } 500 \text{ m}$$

$$\begin{aligned}\text{The distance of school from Shyam's house} &= 3 \times (\text{distance from} \\ &\quad \text{Hari's house}) \\ &= 3 \times (1 \text{ km } 500 \text{ m}) \\ &= 3 \text{ km } 1500 \text{ m} \\ &= 4 \text{ km } 500 \text{ m}\end{aligned}$$

So, the distance of school from Shyam's house = 4 km 500 m.

### Example 4

If a plan is to pitch a road of length 55 km 600 m 80 cm by equally dividing into 4 parts, what is the length of each part?

Here, road of length 55 km 600 m 80 cm divided into 4 parts means dividing the distance by 4. Therefore dividing the units of distance separately:

13 km      900 m      20 cm			
4 )	km	m	cm
	55	600	80
	- 4		
	15		
	- 12		
	3	600	80
	3600	80	
	- 36		
	00	80	
	- 8		
	0		

So, length of each of the pitched parts = 13 km 900 m 20 cm

## Exercise 6

1. Guess and measure the length of the objects given below, is your guess right?
  - a. The length and breadth of 'My Mathematics Class 5'.
  - b. Length and breadth of blackboard
  - c. Length and breadth of your desk
  - d. Height and breadth of the door of your classroom.
  - e. Length and breadth of your classroom.
2. Convert the given units of distance into cm.

a. 1m75 cm	b. 5 m 65 cm
c. 1 km 200 m 80 cm	d. $1\frac{1}{2}$ m
e. 5 km 350 m 75 cm	f. 3.2 m
g. 5.72m	
3. Convert the given units into m.

a. 1 km 200 m	b. 1.5 km	c. 3 m 80 cm
d. 5 m 70 cm	e. 250 cm	f. 15 cm
4. Multiply:

a. km      m      cm	b. km      m      cm
5      320      25	3      750      75
x                6	x                9

c. km      m      cm	d. km      m      cm
6      20      5	8      425      60
x                12	x                15

e. km      m      cm	f. km      m      cm
17      250      65	22      560      30
x                17	x                25

5. Divide
- 5km 600m 75 cm by 5
  - 3km 145m 20cm by 6
  - 12km 200m 64cm by 8
  - 8km 650m 71cm by 9
  - 12km 330m 96cm by 6
  - 2km 580m 83cm by 7
  - 3.693km by 3
6. Height of a brick is 12cm. How many bricks are required to make a wall of height 3.6m from the side of height of brick? (Here, cement is not taken)
7. A 6m long ribbon is equally divided among 10 girls, what is the length of ribbon the each girl gets?
8. If a sugarcane of length 2m50cm is shared equally among 5 people, what is the length of each share?
9. A road of length 200km is equally divided into 8 parts and pitched. What is the length of each part?
10. If 10km650m long road is constructed in 1 month, how long road can be constructed in 7 months?

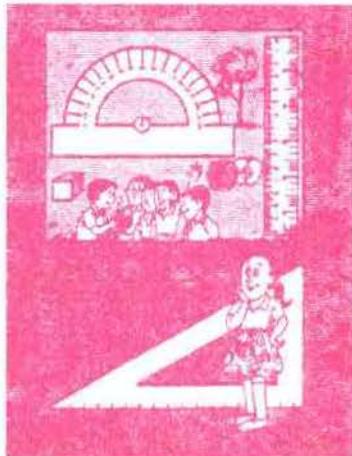
# Perimeter

## Perimeter of rectangular objects

Put a thread around 'My Mathematics Class 5' book from the length side. How long thread is required to put around it?

Is the length of book 24cm and breadth 18cm, equal to the length of thread around it?

**The total measurement of surrounding length of any object or surface is called its perimeter.**



How many times the length should be measured while measuring the perimeter of a rectangular book? Should the breadth also be measured by the same way?

Here, perimeter of 'My Mathematics Book Class 5'

$$= 24 \text{ cm} + 18 \text{ cm} + 24 \text{ cm} + 18 \text{ cm} = 84 \text{ cm}$$

While finding the perimeter of any rectangular object or surface

$$\begin{aligned}\text{Perimeter (P)} &= \text{length} + \text{breadth} + \text{length} + \text{breadth} \\ &= 2 \text{ length} + 2 \text{ breadth} \\ &= 2 (\text{length} + \text{breadth}) = 2 (l + b)\end{aligned}$$

While the surface is square

$$\begin{aligned}\text{Perimeter (P)} &= 2 (\text{length} + \text{breadth}) \\ &= 2(\text{length} + \text{length}) \quad [\text{because length} = \text{breadth}] \\ &= 2(2 \text{ length}) = 4 \times \text{length} = 4 \times l = 4l\end{aligned}$$

So, perimeter of square =  $4 \times \text{length}$ .

### **Example 1**

What is the surrounding length of a rectangle with length 8cm and breadth 6cm?

Here, Length of the rectangle ( $\ell$ ) = 8cm

Breadth of the rectangle (b) = 6cm

Perimeter (P) = ?

By formula,

$$\begin{aligned}\text{Perimeter of the rectangle (P)} &= 2(\ell + b) \\ &= 2(8\text{cm} + 6\text{cm}) \\ &= 2 \times 14\text{cm} \\ &= 28\text{cm}\end{aligned}$$

So, surrounding length of the rectangle = 28cm.

### **Example 2**

What is the perimeter of a square having a side of length 8cm?

Here, Length of square ( $\ell$ ) = 8cm

Perimeter (P) = ?

By formula,

$$\begin{aligned}\text{Perimeter of square (P)} &= 4\ell \\ &= 4 \times 8\text{cm} \\ &= 32\text{cm}\end{aligned}$$

Therefore, perimeter of the square = 32cm

### **Example 3**

How long a metal wire is required to fence with 5 rounds of a rectangular field of 50m length and 30m breadth?

Length of metal wire = 5 times of the perimeter of field

Here, Length ( $\ell$ ) = 50m

Breadth (b) = 30m

Perimeter (P) = ?

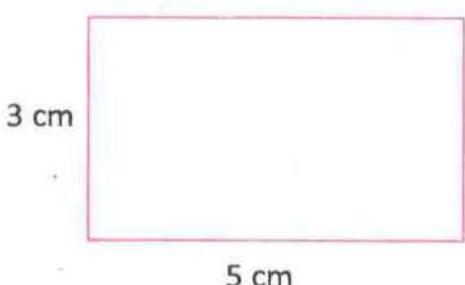
$$\begin{aligned}\text{Perimeter of field (P)} &= 2(\ell + b) \\ &= 2(50\text{m} + 30\text{m}) \\ &= 2 \times 80\text{m} \\ &= 160\text{m}\end{aligned}$$

Therefore, length of metal wire =  $5 \times 160\text{m} = 800\text{m}$

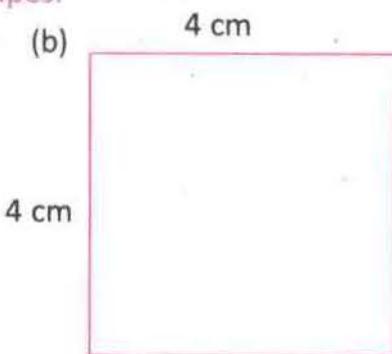
## Exercise 7

1. Find the perimeter of the following shapes:

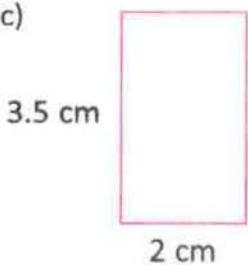
(a)



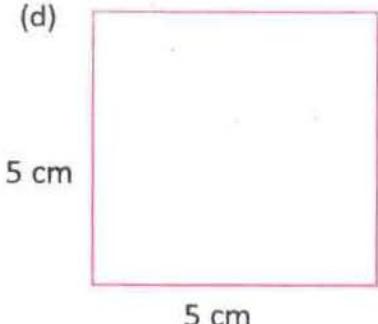
(b)



(c)



(d)



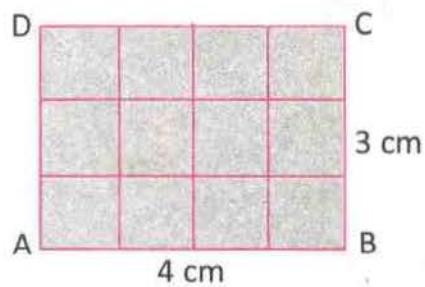
2. Find the perimeter of surface of rectangular with the given length and breadth.
- a.  $\ell = 8 \text{ cm}, b = 6 \text{ cm}$       b.  $\ell = 7 \text{ cm}, b = 3 \text{ cm}$   
c.  $\ell = 6 \text{ cm}, b = 5 \text{ cm}$       d.  $\ell = 10 \text{ cm}, b = 5 \text{ cm}$   
e.  $\ell = 6.8 \text{ cm}, b = 3 \text{ cm}$       f.  $\ell = 5.6 \text{ cm}, b = 2 \text{ cm}$   
g.  $\ell = 10.3 \text{ cm}, b = 6.5 \text{ cm}$
3. Find the perimeter of the square of the length given below:
- a.  $\ell = 3 \text{ cm}$       b.  $\ell = 5 \text{ cm}$   
c.  $\ell = 8 \text{ cm}$       d.  $\ell = 12 \text{ cm}$   
e.  $\ell = 5 \frac{1}{2} \text{ cm}$       f.  $\ell = 7.5 \text{ cm}$
4. If the length of a field 55cm and breadth is 40m, find its perimeter.  
5. The length of a square ground is 12m. What is the perimeter?  
6. The length of a square field is 30m. What is the length of wall surrounding it?  
7. How long wire is required to fence with 3 rounds of a rectangular field of 60m length and 40m breadth?

# Area

## Area of Rectangular Surface

The area of any object means the counting of unit square inside it.

In the given figure, the length of the rectangle is 4cm and breadth is 3cm. There are 12 unit squares in it. Therefore the area of rectangle ABCD is 12 square cm. Square cm can be written  $\text{cm}^2$  in short. It is difficult to find area of any object by constructing unit square on it. So, to find short method, learn the table given below and complete it after discussing.



Rectangular surface	length	breadth	Area (By counting box)	length x breadth
	3 cm	1 cm	$3 \text{ cm}^2$	$3 \text{ cm} \times 1 \text{ cm} = 3 \text{ cm}^2$
	3 cm	2 cm	$6 \text{ cm}^2$	$3 \text{ cm} \times 2 \text{ cm} = 6 \text{ cm}^2$
	4 cm	2 cm	$8 \text{ cm}^2$	.....
	4 cm	3 cm	$12 \text{ cm}^2$	.....

What did you know from the table?

Is the product of length and breadth equal to the area of rectangle?

From the above discussion,

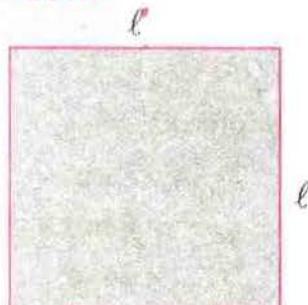
**Area of rectangular objects = length x breadth**

Or,  $A = \ell \times b$ .

Length and breadth are equal in square.

So,  $b = \ell$  and  $a = \ell \times b = \ell \times \ell$

So, area of a square ( $A$ ) =  $\ell^2$



### Example 1

What is the area of a rectangle having length 5cm and breadth 3cm?

Here, Length ( $\ell$ ) = 5 cm

Breadth (b) = 3 cm

Area (A) = ?

By formula,

$$A = \ell \times b = 5 \text{ cm} \times 3 \text{ cm} = 15 \text{ cm}^2$$

Area of the rectangle (A) =  $15 \text{ cm}^2$

5 cm



Checking the given rectangle by making unit square on it.

The rectangle has 15 unit squares. So

Area of rectangle (A) =  $15 \text{ cm}^2$

### Example 2

What is the area of square having length 5 cm?

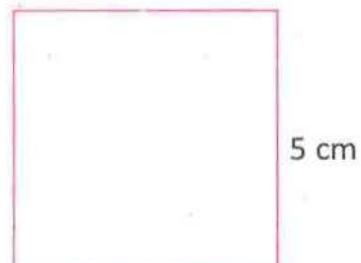
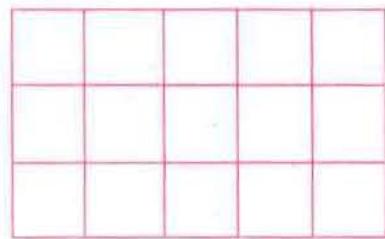
Here, length ( $\ell$ ) = 5 cm

Area (A) = ?

$$\text{Area of square (A)} = \ell^2$$

$$= (5 \text{ cm})^2$$

$$= 25 \text{ cm}^2$$



5 cm

### Example 3

If the length of rectangle room is 6 m and breadth is 4 m, what is its area?

Here, Length of room ( $\ell$ ) = 6 m

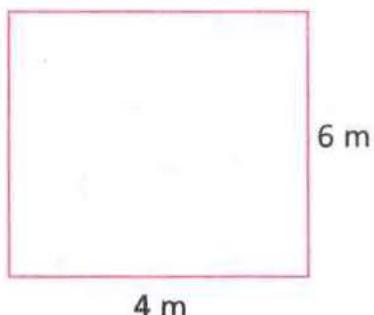
Breadth (b) = 4 m

Area (A) = ?

By formula,

$$\begin{aligned} A &= \ell \times b \\ &= 6 \text{ m} \times 4 \text{ m} \\ &= 24 \text{ m}^2 \end{aligned}$$

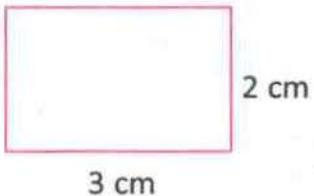
$\therefore$  Area of the room =  $24 \text{ m}^2$



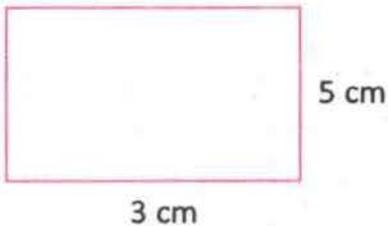
### Exercise 8

- Find the area of the given rectangular shapes.

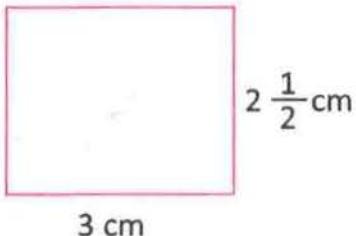
(a)



(b)



(c)



(d)



2. Find the area of each of the squares given below:

(a)



(b)



3. Find the area of the surface of the given objects.

(a)



(b)



Length of carpet = 2.5 m

Breadth = 1.8 m

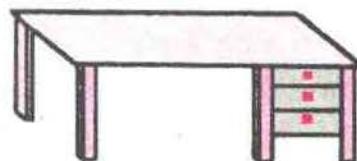
Length of frame = 30 cm

Breadth = 22 cm

(c)



(d)



Length of book = 20. 2cm

Breadth = 15.9 cm

Length of surface of table = 1.3 m

Breadth = 80 cm

4. The length of surface of a table is 3.1 m and breadth is 2.4 m. Find its area.

5. The length of a rectangular field is 52 m and breadth is 32.5 m. Find its area.

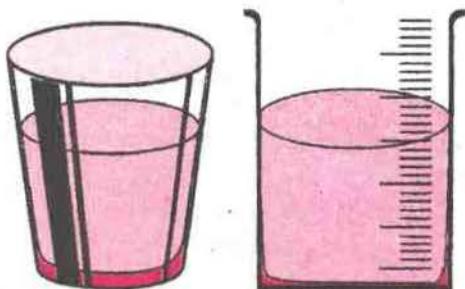
6. The length of a square shape handkerchief is 30 cm. What is its area?

7. The length of a square field is 68m. What is its area?

# Capacity

How much water does a glass hold?  
 By how much water a water pot is filled?  
 To reply such questions, we should measure the water in the given pot. To measure water or such liquid litre and millilitre units are used.

Capacity means the quantity of liquid which it holds. The units of measuring capacity are litre and millilitre.



$$1 \text{ litre } (\ell) = 1000 \text{ millilitre } (ml)$$

### Example 1

How many ml are there in  $5 \ell 200 \text{ ml}$ ?

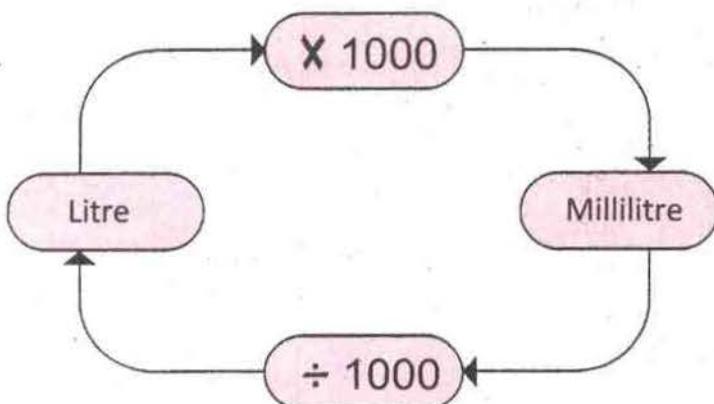
$$\text{Here, } 5 \ell = 5 \times 1000 \text{ ml} = 5000 \text{ ml}$$

$$\text{Now, } 5 \text{ ml } 200 \text{ ml} = (5000 + 200) \text{ ml} = 5200 \text{ ml}$$

### Example 2

Multiply:

$$\begin{array}{r}
 \ell \qquad \qquad \text{ml} \\
 2 \qquad 300 \\
 \times \qquad 4 \\
 \hline
 8 \qquad 1200 \\
 = 9\ell \qquad 200\text{ml}
 \end{array}$$



### Example 3

Simplify:  $15\ell \ 600\text{ml} \div 5$

$$\begin{array}{r} 3\ell & 120 \text{ ml} \\ \hline 5) \quad \ell & \text{ml} \\ 15 & 600 \\ -15 & \hline 600 \\ \times & -5 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

### Example 4

A glass holds 250ml water. Sujan drank 5 glasses of water at a time. How much water did he drink? Find in litre.

Here, 1 glass = 250ml

$$\begin{aligned} 5 \text{ glasses} &= 5 \times 250\text{ml} \\ &= 1250\text{ml} \\ &= 1250 \div 1000\ell \\ &= 1.250\ell \end{aligned}$$

### Example 5

In how many times a jug of capacity  $2\ell \ 500\text{ml}$  can be filled by a glass of capacity 500ml?

Here, Capacity of the jug =  $2\ell \ 500\text{ml}$

$$\begin{aligned} &= (2 \times 1000 + 500)\text{ml} \\ &= 2500\text{ml} \end{aligned}$$

Capacity of the glass = 500ml

So, number of times to fill the jug =  $\frac{2500}{500} = 5$

The jug can be filled in 5 times.

## Exercise 9

1. Do the following:

a.  $\begin{array}{r} \ell \\ \times 3 \\ \hline \end{array}$  ml

b.  $\begin{array}{r} \ell \\ \times 15 \\ \hline \end{array}$  ml

c.  $\begin{array}{r} \ell \\ \times 21 \\ \hline \end{array}$  ml

d.  $\begin{array}{r} \ell \\ \times 16 \\ \hline \end{array}$  ml

e.  $10 \ell 200 \text{ ml} \div 3$

f.  $15 \ell 750 \text{ ml} \div 6$

g.  $48 \ell 500 \text{ ml} \div 5$

h.  $28 \ell 250 \text{ ml} \div 10$

2. Capacity of a glass is 280 ml. In how many times a jug of capacity 4 ℓ 200 ml can be filled with the glass?
3. What should be the capacity of a kettle need if 50 people should be given tea 300 ml per person?
4. Shila poured oil with a pot of capacity 750 ml to a gallion and filled it in 4 times. What would be the total oil in gallion?
5. How many glasses of capacity 250 ml are there in a bottle of drinks of capacity 1.5 ℓ?
6. A jug can be filled by 15 glasses of capacity 180 ml. What is the capacity of the jug?
7. A dairy fills milk into the plastic packets of 500 ml. How many plastic packets of similar kind are required to sell 40,000 ℥ milk?

# Volume

## Area of rectangular solid objects

A cube of  $1/1$  cm length, breadth and height is given in the figure. The volume of this cube is  $1$  cubic cm. The unit cube of  $1$  cubic cm is taken as the unit to measure the volume of rectangular solid objects.

To find out the volume of rectangular solid objects, the number of unit cubes inside it is counted. In the figure, length =  $3$  cm, breadth =  $2$  cm and height =  $2$  cm of a rectangular solid is given. In this,  $3$  unit cubes on the side of length and  $2$  unit cubes on the breadth side so altogether  $6$  unit cubes are there on the lower surface. On the upper surface also  $6$  unit cubes are there. Each cube is of  $1$  cubic cm ( $1\text{ cm}^3$ ).

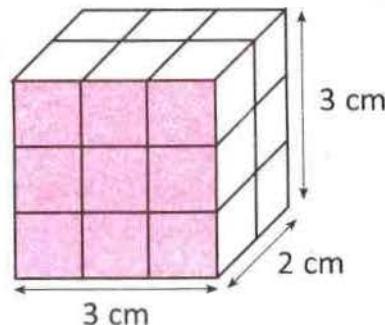
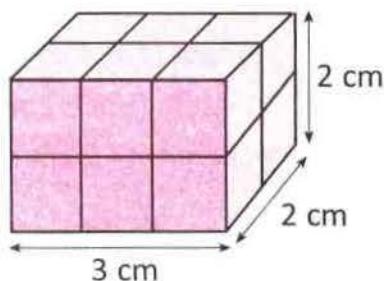
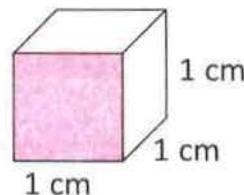
So, volume of the given solid object is  $12$  cubic cm ( $12\text{ cm}^3$ ).

Here, while length, breadth and height of rectangular solid are multiplied.

$$\text{Length} \times \text{breadth} \times \text{height} = 3\text{ cm} \times 2\text{ cm} \times 2\text{ cm} = 12\text{ cm}^3$$

Now, add one more the same surface on the top,  $6$  more unit cubes should be added. In this condition volume of rectangular solid is  $18\text{ cm}^3$ .

$$\text{Here, also } l \times b \times h = 3\text{ cm} \times 2\text{ cm} \times 3\text{ cm} = 18\text{ cm}^3.$$



**On the basis of the above discussion:**

Volume of rectangular solid = length x breadth x height

Or,  $V = \ell \times b \times h$

Similarly, length, breadth and height are equal in cube

So,

Volume of cube( $V$ ) = (length) $^3$  or (side) $^3$

$$(V) = \ell^3$$

### **Example 1**

Find the volume of rectangular solid whose length is 4 cm, breadth 3 cm and height 2 cm.

Here, Length ( $\ell$ ) = 4 cm

Breadth (b) = 3 cm

Height ( $\ell$ ) = 2 cm

Volume (V) = ?

By formula,

$$V = \ell \times b \times h$$

$$= 4 \text{ cm} \times 3 \text{ cm} \times 2 \text{ cm}$$

$$\therefore V = 24 \text{ cm}^3$$

### **Example 2**

Find the volume of a cube with length 4cm.

Here, length of cube ( $\ell$ ) = 4 cm

Volume( $V$ ) = ?

By formula,

$$(V) = \ell^3$$

$$= 4 \text{ cm} \times 4 \text{ cm} \times 4 \text{ cm}$$

$$\therefore V = 64 \text{ cm}^3$$

### Example 3

What is the volume of a soap having length 5 cm, breadth 4 cm and height 3 cm?

Here, Length ( $\ell$ ) = 5 cm

Breadth (b) = 4 cm

height (h) = 3 cm

volume (v) = ?

From formula,

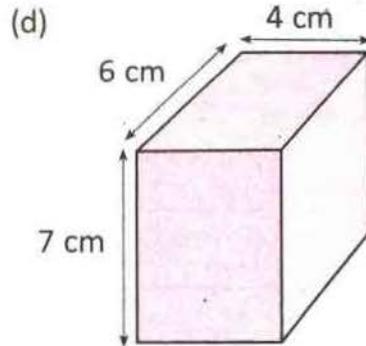
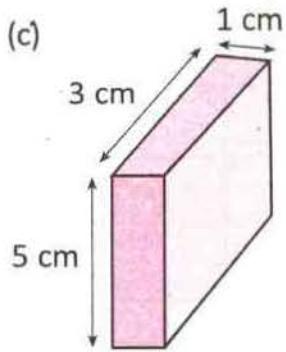
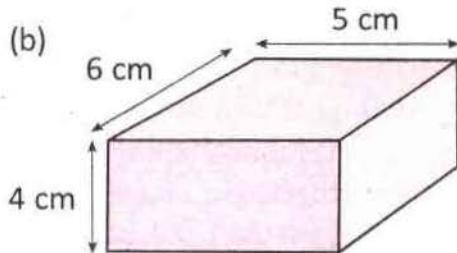
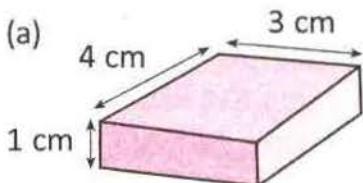
$$\begin{aligned} v &= \ell \times b \times h \\ &= 5 \text{ cm} \times 4 \text{ cm} \times 3 \text{ cm} \end{aligned}$$

$$= 60 \text{ cm}^3$$

$\therefore$  volume of the soap (v) = 60 cm<sup>3</sup>

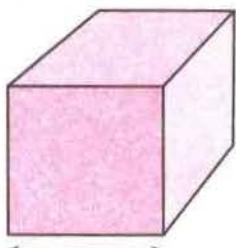
### Exercise 10

- Find the volume of each of the given rectangular objects.



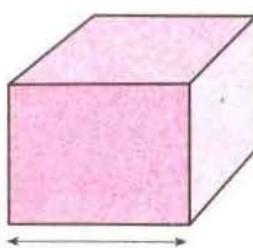
2. Find the volume of each of the given cubical objects.

(a)



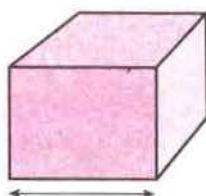
4 cm

(b)



6 cm

(c)



3.5 cm

3. Find the volume of rectangular objects of the given measurement.

- length = 4 cm, breadth = 3 cm, height = 2cm
- length = 5 cm, breadth = 2 cm, height = 1cm
- length = 3.5 cm, breadth = 2.2 cm, height = 4cm
- length = 4.8 cm, breadth = 3.3 cm, height = 2.5cm

4. The length of a match box is 4.5cm, breadth 3cm and height 2cm. What is its volume?

5. The length of a toothpaste is 13cm, breadth 3cm and height 3cm. Find its volume.

6. The length of an ink pot is 8cm, breadth 4cm, height 5cm. What is the volume of that ink pot? What is the total volume of such 18 ink pots?

7. Ram has made some blank spaces while making a table with length, breadth, height and volume of rectangular objects. The table is given below. Fill the blank boxes of the table.

Measurement	a	b	c	d	e
Length ( $\ell$ )	3 cm	7 cm	6 cm	7 cm	5 cm
Breadth (b)	2 cm	5 cm	5 cm	6 cm	4 cm
Height (h)	4 cm	2 cm	4 cm	4 cm	4 cm
Volume (V)	?	?	?	?	?

**Teaching Instruction:** Ask the students find out the volume of the solid rectangular objects found around their school or home while conducting teaching learning activities of the lesson volume.

## Lesson 11

# Weight

What is the weight of 'My Mathematics Class 5' book? Guess, what is used to measure the weight? What is the unit of weight? Measuring balance is used to measure the weight. Weighting blocks, used with balance are of 100 gram, 200 gram, 500 gram, 1 kilogram etc.

### Learn the facts about weight:

1 kilogram standard	= 2 standards of $\frac{1}{2}$ kilogram
	= 5 standard of 200 gram
	= 10 standards of 100 gram
	= 1000 gram
100 kilogram	= 1 quintal

### Example 1

Convert 3.5 kg into gram.

Here, 1 kg = 1000 gram

So, 3.5 kg =  $3.5 \times 1000$  gram = 3500 gram.

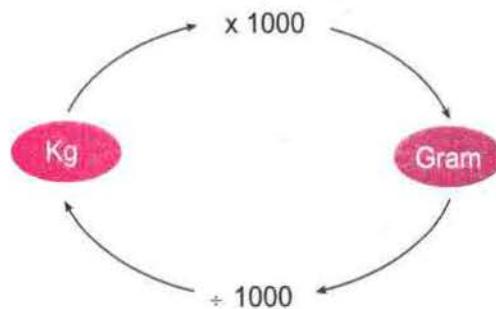
### Example 2

Convert 75 grams into kg.

Here, 1000 gram makes 1 kg.

So, 75 gram =  $\frac{75}{1000}$  kg = 0.075kg

From the above example, the following circle can be made to convert kg to gram and gram to kg.



### Example 3

The weight of a tea bag is 1 kg 250 gram. What is the weight of such 8 bags?

Here, weight of 8 bags is 8 times the weight of 1 bag. So, multiplying kg and gm separately.

Kg	gm
1	250
x 8	
<hr/> 8	2000
10	000

→ 2000 gm = 2 kg  
= 10 kg

By next method,

$$\text{Weight of 8 tea bags} = 1.250 \text{ kg}$$

$$\begin{array}{r} x 8 \\ \hline 10.000 \text{ kg} \\ = 10 \text{ kg} \end{array}$$

### Example 4

The weight of 7 packets of chocolates is 5 kg 250 gm. What is the weight of 1 packet of chocolates?

Here, to find the weight of 1 packet of chocolate, 5 kg 250 gm should be equally divided into 7 equal parts.

So,

0 Kg	750 gm
7 } 5	250
0	
<hr/>	
5250	→ 5 kg = 5000 gm
- 49	
<hr/>	
35	
35	
<hr/>	
00	

$$\text{So, Weight of 1 packet of chocolate} = 0.750 \text{ kg}$$

$$\text{or } 750 \text{ gram}$$

### Example 5

What is the total weight of 2 packets of biscuits of 450 gm each, 4 packets tea of 125 gm each and 3 packets of butter of  $\frac{1}{2}$  kg each?

Here, Weight of 2 packets of biscuits =  $2 \times 450$  gm = 900 gm

Weight of 4 packets of tea =  $4 \times 125$  gm = 500 gm

Weight of 3 packets of butter =  $3 \times 500$  gm = 1500 gm

So, Total weight = 900 gm + 500 gm + 1500 gm

= 2900 gm

= 2 kg 900 gm

= 2.9 kg

### Exercise 11.1

1. Convert into gram.

a. 5 kg

b. 12 kg

c. 16 kg

d.  $\frac{1}{2}$  kg

e.  $\frac{1}{4}$  kg

f.  $6\frac{1}{2}$  kg

g.  $7\frac{1}{5}$  kg

h.  $5\frac{1}{4}$  kg

i. 0.2 kg

j. 0.34 kg

k. 5.05 kg

l. 0.005 kg

2. Convert into kilogram.

a. 3000 gm

b. 5000 gm

c. 2100 gm

d. 350 gm

e. 250 gm

f. 200 gm

g. 15 gm

h. 90 gm

i. 5 gm

j. 2 quintal

k. 5 quintal

3. Multiply:

a. 2 kg    250 gm  
                  x 5

b. 6 kg    720 kg  
                  x 6

c. 5 kg    650 gm  
                  x 8

d. 8 kg    105 gm  
                  x 9

e. 16 kg    270 gm  
                  x 5

f. 17 kg    350 gm  
                  x 7

4. Divide:
- 500 gm by 25
  - 750 gm by 15
  - 3 kg 650 gm by 5
  - 5 kg 460 gm by 4
  - 9 kg 300 gm by 6
  - 12 kg 420 gm by 9
5. A box has 36 packets of powder. The weight of each packet is 750 gm and the weight of box is 2.3kg. What is the total weight of the box with powder?
6. The weight of a teacup is 350 gm then,
- What is the weight of 12 cups?
  - The weight of how many cups is 1.05 kg?
7. The weight of an ink pot is 270 gm then,
- What is the weight of 14 pots?
  - The weight of how many pots will be 5.4 kg?
8. 30 students ate 15.6 kg of apples dividing equally among them. How much did each of the students eat?
9. If  $3\frac{1}{4}$  kg of apples is equally divided among 25 people, what is the share of each person?
10. How can 400 gm weight be taken in once in beam balance by using the following units of weight?



500 gm



200 gm



100 gm



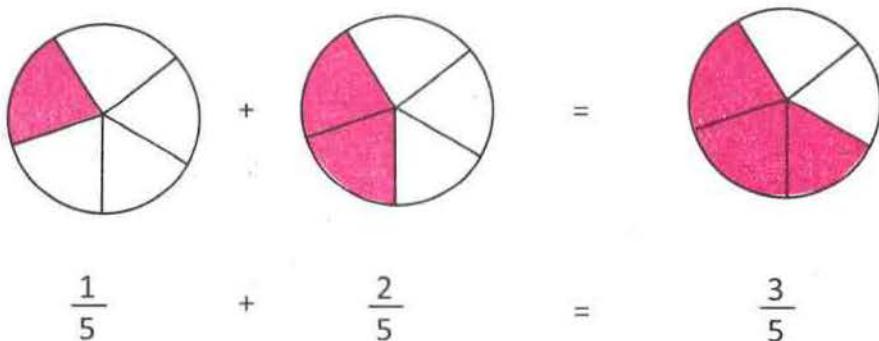
50 gm

**Teaching Instruction:** Tell the students guess the weight of the solid objects around them while doing teaching-learning of weight. Then, practise them guess correctly weighing and comparing the actual and guessed weight.

# Fraction and Decimal

## 12.1 Addition of Mixed Numbers

Mother gave a bread to Shila. Shila divided it into 5 equal parts. At first she ate 1 part. After a while she ate 2 parts out of 5 parts. In this way, Shila ate total 3 parts out of 5 parts. This can be represented in figure.



Representing in mathematical way:

$$\begin{aligned} &= \frac{1}{5} + \frac{2}{5} \\ &= \frac{1+2}{5} \\ &= \frac{3}{5} \end{aligned}$$

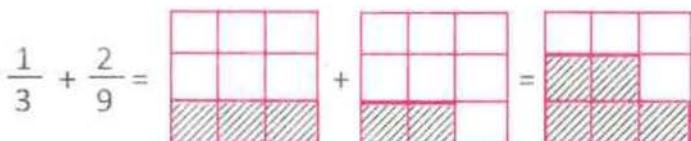


If the denominator of fractions is equal, then only numerators should be added and denominator remains the same.

If the fractions that should be added have different denominators then at first denominator should be made equal than only they can be added. Some examples are given below:

### Example 1

$$\begin{aligned}\frac{1}{3} + \frac{2}{9} &= \frac{1 \times 3}{3 \times 3} + \frac{2}{9} \\&= \frac{3}{9} + \frac{2}{9} \\&= \frac{3+2}{9} = \frac{5}{9}\end{aligned}$$



To make equal denominator on both fractions,  
the numerator and denominator of fraction

$\frac{1}{3}$  is multiplied by 3 =

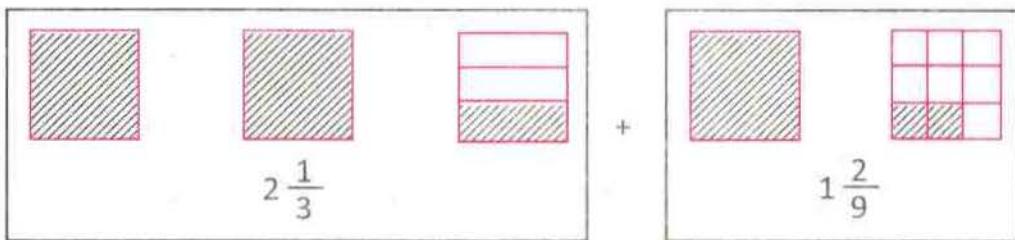
$$\frac{1}{3} = \frac{1 \times 3}{3 \times 3} = \frac{3}{9}$$

### Example 2

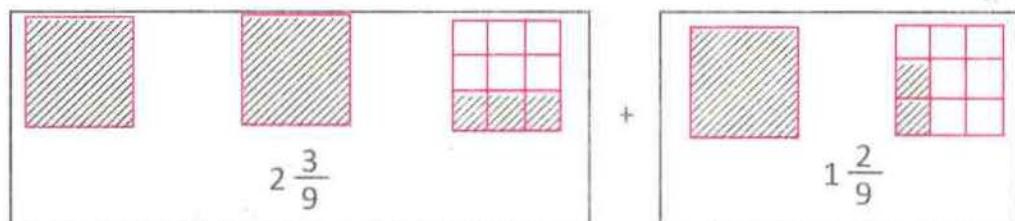
Add:

$$2\frac{1}{3} + 1\frac{2}{9}$$

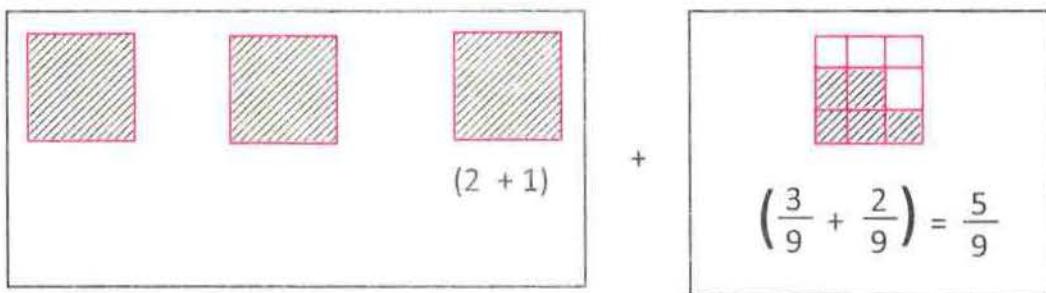
Here, numbers should be added are mixed numbers. See the figure given below to understand.



Now, by making equal denominator



Adding whole and parts separately:



$$\text{So, } 2\frac{1}{3} + 1\frac{2}{9} = 2\frac{3}{9} + 1\frac{2}{9} = (2+1) + \left(\frac{3}{9} + \frac{2}{9}\right) = 3 + \frac{5}{9} = 3\frac{5}{9}$$

### Example 3

Add:

$$5\frac{3}{8} + 3\frac{3}{4}$$

$$\text{Here, } 5\frac{3}{8} + 3\frac{3}{4}$$

$$\begin{aligned}&= (5+3) + \left(\frac{3}{8} + \frac{3}{4}\right) \\&= 8 + \left(\frac{3}{8} + \frac{3 \times 2}{4 \times 2}\right) \\&= 8 + \left(\frac{3}{8} + \frac{6}{8}\right) \\&= 8 + \frac{9}{8} \quad \rightarrow \left[\frac{9}{8} \text{ is improper fraction.}\right] \\&= 8 + 1\frac{1}{8} = (8+1) + \frac{1}{8} = 9\frac{1}{8}\end{aligned}$$

## Exercise 12.1

Add:

$$1. \quad 2\frac{1}{2} + 1\frac{1}{2}$$

$$2. \quad 3\frac{1}{2} + 4\frac{1}{4}$$

$$3. \quad 3\frac{1}{4} + 2\frac{1}{8}$$

$$4. \quad 4\frac{1}{3} + 5\frac{2}{9}$$

$$5. \quad 4\frac{2}{5} + 3\frac{3}{10}$$

$$6. \quad 3\frac{1}{4} + 2\frac{5}{12}$$

$$7. \quad 3\frac{3}{4} + 1\frac{1}{2}$$

$$8. \quad 6\frac{2}{5} + 5\frac{4}{15}$$

$$9. \quad 8\frac{5}{6} + 1\frac{1}{12}$$

$$10. \quad 3\frac{1}{4} + 5\frac{1}{12}$$

$$11. \quad 7\frac{1}{3} + 2\frac{5}{6}$$

$$12. \quad 4\frac{2}{7} + 1\frac{11}{14}$$

$$13. \quad 10\frac{2}{3} + 7\frac{1}{6}$$

$$14. \quad 3\frac{5}{6} + 2\frac{5}{12}$$

$$15. \quad 9\frac{3}{11} + 6\frac{21}{22}$$

## 12.2 Subtraction of mixed numbers

Subtraction of mixed numbers also can be done as the addition of mixed numbers by subtracting whole from whole numbers and fraction from fraction.

### Example 1

Subtract:

$$6\frac{1}{3} - 3\frac{2}{9}$$

Then,

$$6\frac{1}{3} - 3\frac{2}{9} = (6 - 3) + \left(\frac{1}{3} - \frac{2}{9}\right) \rightarrow \text{(Subtracting whole from whole and fraction from fraction)}$$

$$= 3 + \left(\frac{1 \times 3}{3 \times 3} - \frac{2}{9}\right) = 3 \left(\frac{3}{9} - \frac{2}{9}\right)$$

$$= 3 + \left(\frac{3-2}{9}\right) = 3 + \frac{1}{9} = 3\frac{1}{9}$$

## Example 2

Simplify:

$$10 \frac{3}{4} - 5 \frac{7}{8}$$

Here,

$$\begin{aligned}10 \frac{3}{4} - 5 \frac{7}{8} &= (10 - 5) + \left( \frac{3}{4} - \frac{7}{8} \right) = 5 + \left( \frac{3 \times 2}{4 \times 2} - \frac{7}{8} \right) \\&= 5 \left( \frac{6}{8} - \frac{7}{8} \right) = 4 + \left( \frac{8}{8} + \frac{6}{8} - \frac{7}{8} \right) \quad \rightarrow 7 \text{ cannot be subtracted from} \\&\qquad\qquad\qquad 6, \text{ so borrowing} \\&= 4 + \left( \frac{8+6-7}{8} \right) = 4 + \frac{7}{8} = 4 \frac{7}{8} \qquad\qquad\qquad 1 = \frac{8}{8} \text{ from } 5\end{aligned}$$

## Example 3

In  $\frac{1}{3}$  parts of a garden are oranges and in  $\frac{1}{6}$  parts are planted mangoes and remaining part is of pineapple. What is the planted part of pineapple?

Here,

$$\begin{aligned}\text{The total parts of oranges and mangoes} &= \frac{1}{3} + \frac{1}{6} \\&= \frac{1 \times 2}{3 \times 2} + \frac{1}{6} \\&= \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2} \text{ part}\end{aligned}$$

$$\begin{aligned}\therefore \text{The remaining part} &= 1 - \frac{1}{2} \\&= \frac{2}{2} - \frac{1}{2} \quad [\text{making denominator 2 in whole}] \\&= \frac{1}{2} \qquad \text{or,} \quad 1 - \left( \frac{1}{2} + \frac{1}{6} \right)\end{aligned}$$

$$\begin{aligned}\text{Therefore, parts of pineapple} &= \frac{1}{2} \qquad \qquad \qquad = 1 - \left( \frac{2+1}{6} \right) \\&= 1 - \frac{1}{2} = \frac{1}{2}\end{aligned}$$

## Exercise 12.2

1. Subtract:

a.  $7\frac{5}{8} - 3\frac{1}{4}$

b.  $4\frac{1}{5} - 2\frac{3}{10}$

c.  $15 - 13\frac{1}{2}$

d.  $5\frac{3}{7} - 3\frac{5}{14}$

e.  $8\frac{13}{14} - 7\frac{1}{2}$

f.  $10\frac{4}{5} - 3\frac{3}{10}$

2. Simplify:

a.  $2\frac{4}{7} - 1\frac{3}{14}$

b.  $13\frac{1}{4} - 9\frac{11}{12}$

c.  $25\frac{4}{5} - 20\frac{11}{12}$

d.  $87\frac{3}{13} - 37\frac{5}{26}$

e.  $18\frac{7}{8} - 6\frac{33}{40}$

f.  $12\frac{1}{13} - 7\frac{4}{39}$

g.  $1\frac{3}{4} - \frac{5}{6} + 2\frac{1}{2}$

h.  $5 - 1\frac{1}{2} - \frac{5}{8}$

i.  $3\frac{1}{4} - 2\frac{3}{4} + 2\frac{1}{2}$

3. A student did  $\frac{1}{2}$  parts of a work and another student did  $\frac{1}{4}$  parts of the same work. What is the remaining work?

4. Two parties of an election got  $\frac{1}{2}$  and  $\frac{1}{3}$  votes of total votes and remaining votes were invalid. How many parts of votes were invalid?

5. Ram took  $\frac{1}{2}$  and Shyam took  $\frac{3}{10}$  parts of money of a packet and Mahesh took the remaining money. How much money did Mahesh get?

6. Out of total seats of a cinema  $\frac{3}{7}$  seats are in the first class,  $\frac{5}{14}$  seats are in the second class. If the remaining seats are in the third class, how many part of seats are in the third class?

## 12.3 Multiplication of Fractions

### (a) To multiply fractions by whole number

Multiplication of whole number means repeated addition.

$3 \times 4$  means 3 times 4

$$\text{So, } 3 \times 4 = 4 + 4 + 4 = 12$$

Similarly, multiplication in fraction means repeated addition.

For example:

$3 \times \frac{1}{2}$  means 3 times  $\frac{1}{2}$ .

$$\text{So, } 3 \times \frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$$

Same thing represented by picture.



$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 1\frac{1}{2}$$

$$\text{or } 3 \times \frac{1}{2} = \frac{3 \times 1}{2} = \frac{3}{2} = 1\frac{1}{2}$$

- ∴ When a fraction is multiplied by a whole number, the whole number should be multiplied to numerator and the denominator should be the same. If fraction obtained by such is improper fraction, it should be converted into mixed number.

### Example 1

Multiply:

$$5 \times \frac{7}{12}$$

Here,  $5 \times \frac{7}{12}$

$$= \frac{5 \times 7}{12}$$

$$= \frac{35}{12} = 2 \frac{11}{12}$$

So,  $\frac{35}{12} = 2 \frac{11}{12}$

Note: While converting  $\frac{35}{12}$  into mixed number, numerator should be divided by

denominator.

e.g.  $12 \overline{) 35}^2$   
           $\underline{-24}$   
                  11

### (b) Fraction multiplied by fraction

$\frac{1}{2} \times \frac{1}{3}$  means  $\frac{1}{2}$  times  $\frac{1}{3}$ . It means half of

$\frac{1}{3}$ . In figure,  $\frac{1}{6}$  is shown while  $\frac{1}{3}$  is divided into

$\frac{1}{2}$ . Another way, it can be said one third of  $\frac{1}{2}$ .

That is also  $\frac{1}{6}$ . See the figure given below:



If each part is divided into  $\frac{1}{2}$ .



$$\begin{aligned}\text{Coloured part} &= \frac{1}{2} \text{ of } \frac{1}{3} \\ &= \frac{1}{6}\end{aligned}$$



Each part is divided into one third.



$$\begin{aligned}\text{Coloured part} &= \frac{1}{2} \times \frac{1}{3} \\ &= \frac{1}{6}\end{aligned}$$

Let's think it in this way:

$$\frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$$

So, while multiplying fractions their numerator by numerator and denominator by denominator should be multiplied.

### Example 2

Multiply:

$$\frac{3}{4} \times \frac{5}{7}$$

$$\frac{3}{4} \times \frac{5}{7} = \frac{3 \times 5}{4 \times 7} = \frac{15}{28}$$

### Exercise 12.3

1. Multiply:

a.  $7 \times \frac{1}{3}$

b.  $8 \times \frac{1}{5}$

c.  $4 \times \frac{2}{9}$

d.  $9 \times \frac{9}{10}$

e.  $12 \times \frac{1}{5}$

f.  $15 \times \frac{11}{12}$

g.  $6 \times \frac{1}{8}$

h.  $4 \times \frac{1}{12}$

i.  $6 \times \frac{5}{12}$

j.  $\frac{3}{5} \times \frac{2}{5}$

k.  $\frac{6}{7} \times \frac{1}{5}$

l.  $\frac{2}{7} \times \frac{3}{5}$

2. Simplify:

a.  $\frac{3}{5} \times \frac{2}{5}$

b.  $\frac{6}{7} \times \frac{1}{5}$

c.  $\frac{2}{7} \times \frac{3}{5}$

d.  $\frac{3}{10} \times \frac{5}{12}$

e.  $\frac{2}{5} \times \frac{9}{10}$

f.  $\frac{4}{11} \times \frac{7}{9}$

g.  $\frac{5}{11} \times \frac{7}{13}$

h.  $\frac{6}{7} \times \frac{8}{9}$

i.  $\frac{11}{12} \times \frac{1}{7}$

3. Represent the figure to show the following multiplication:

a.  $5 \times \frac{1}{7}$

b.  $3 \times \frac{1}{7}$

c.  $4 \times \frac{2}{3}$

## 12.4 Decimal

Denominator 10 or fraction with 10 multiplication is called decimal fraction.

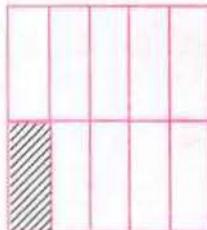
Shaded part in the figure shows  $\frac{1}{10}$ .

$\frac{1}{10}$  is written 0.1

Similarly, while writing one hundredths

$\frac{1}{100} = 0.01$  and

One thousandths  $= \frac{1}{1000} = 0.001$ .



$$\frac{1}{10} = 0.1$$

While converting fraction into decimal, denominator of the fraction should be 10 or multiplication of 10 or numerator should be divided by denominator.

### Example 1

Convert fraction into decimal:

$$\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} = 0.5$$

### Example 2

Convert fraction into decimal:

$$\begin{aligned}3\frac{1}{4} &= 3 + \frac{1}{4} \\&= 3 + \frac{1 \times 25}{4 \times 25} \\&= 3 + \frac{25}{100} \\&= 3.25\end{aligned}$$

See the place value table of decimal system. 13.204 is shown in the table.

Tens	Ones	Tenths	Hundredths	Thousands
10 (10)	1 (1)	$\frac{1}{10}$ (0.1)	$\frac{1}{100}$ (0.01)	$\frac{1}{1000}$ (0.001)
1	3	2	0	4

While converting decimal into fraction, whole number should be kept same and fraction should be written according to the tenths, hundredths, thousandths as given in decimal.

### Example 3

Add:

$$\begin{array}{r} 16 . 10 \\ + 31 . 32 \\ \hline 47 . 42 \end{array}$$

### Example 4

Subtract:

$$\begin{array}{r} 21 . 50 \\ - 16 . 59 \\ \hline 4 . 91 \end{array} \quad \rightarrow 0 \text{ is added to make equal place of decimal.}$$

### Exercise 12.4

1. Convert the fractions given below into decimal:

- |                   |                     |                    |                    |
|-------------------|---------------------|--------------------|--------------------|
| a. $\frac{2}{10}$ | b. $\frac{3}{10}$   | c. $\frac{7}{10}$  | d. $\frac{1}{4}$   |
| e. $1\frac{1}{2}$ | f. $21\frac{3}{10}$ | g. $13\frac{1}{3}$ | h. $15\frac{1}{5}$ |

2. Convert the decimal given below into fraction:

- |         |          |           |          |
|---------|----------|-----------|----------|
| a. 0.12 | b. 0.08  | c. 3.06   | d. 12.05 |
| e. 0.25 | f. 0.009 | g. 17.012 | h. 0.005 |

3. Represent each of the following given numbers in place value table:
- |         |          |          |          |
|---------|----------|----------|----------|
| a. 1.35 | b. 13.01 | c. 15.12 | d. 0.05  |
| e. 6.48 | f. 10.73 | g. 0.123 | h. 15.01 |
4. Simplify:
- |                         |                        |                  |
|-------------------------|------------------------|------------------|
| a. $5.01 + 3.25$        | b. $6.07 + 3.2$        | c. $0.69 + 1.28$ |
| d. $73.68 - 9.07$       | e. $15.04 - 11.06$     | f. $12 - 9.37$   |
| g. $0.06 - 4.27 + 5.38$ | h. $4.5 - 8.25 + 5.07$ |                  |
5. By how much the sum of 3.91 and 6.04 is greater than 2.46?
6. If 16.80 cm and 14.25cm is taken out from a ribbon of length 50cm, what is the part remaining ?
7. How much should be returned from a note of Rs.50, if a pen of Rs.11.65 and 1 dozen copies of Rs.36.50 are bought?
8. The distance of Kathmandu from Pokhara is 200km. If 103.675km is travelled by a bus and 73.025 km by a taxi, how long is left to travel?

## 12.5 Multiplying decimal by 10, 100 and 1000.

$\frac{2}{1000} \times \frac{10}{1} = \frac{20}{1000}$ . If two thousandths are multiplied by 10, it becomes twenty thousandths. 20 out of 1000 means, the same as 2 out of 100.

$$\text{So, } \frac{2}{1000} \times \frac{10}{1} = \frac{20}{1000} \text{ or } 0.002 \times 10 = 0.02$$

Similarly,

$$\frac{2}{1000} \times \frac{100}{1} = \frac{200}{1000} \text{ or } 0.002 \times 100 = 0.2$$

$$\text{And } \frac{2}{1000} \times \frac{1000}{1} = \frac{200}{1000} \text{ or } 0.002 \times 1000 = 2$$

So, while decimal is multiplied by 10, the decimal sign moves one step right side. Similarly, while multiplying by 100, 1000 it moves 2, 3 steps right or removes respectively.

This is clearly shown in the table given below:

Decimal	Number of fraction	What to do, while multiplying?
0.001	10	$0.001 \times 10 = \overset{\smile}{0.001} = 0.01$ decimal sign is taken one step right.
0.001	100	$0.001 \times 100 = \overset{\smile}{0.001} = 0.1$ decimal sign is taken two steps right
0.001	1000	$0.001 \times 1000 = \overset{\smile}{0.001} = 1.0$ decimal sign is taken three steps right

### Example 1

Multiply 10.3045 by 10, 100 and 1000 separately:

Here,

$$10.3045 \times 10 = \overset{\smile}{10.3045} = 103.045$$

$$10.3045 \times 100 = \overset{\smile}{10.3045} = 1030.45$$

$$10.3045 \times 1000 = \overset{\smile}{10.3045} = 10304.5$$

### Exercise 12.5

Multiply each of the given numbers by 10, 100 and 1000.

- |          |           |          |          |
|----------|-----------|----------|----------|
| a. 0.002 | b. 0.013  | c. 0.137 | d. 1.005 |
| e. 2.679 | f. 10.805 | g. 1.2   | h. 13.5  |

## 12.6 Multiplication of decimal by whole number

See example related to multiplication:

### Example 1

- a.  $3 \times 5 = 15$   
b.  $3 \times 10 \times 5 = 30 \times 5 = 150$  or  $3 \times 10 \times 5 = 3 \times 50 = 150$   
 $3 \times 5 = 15$ , if 3 or 5 is multiplied by 10, the product is 10 times more.

### Example 2

$$3 \times 100 \times 5 = 300 \times 5 = 1500$$

or  $3 \times 100 \times 5 = 3 \times 500 = 1500$

$3 \times 5 = 15$  or  $5 \times 3 = 15$ , if each of 3 or 5 is multiplied by 100, the product is 100 times more.

These examples and on the basis of exercise 12.5, the multiplication of decimal can be done this way.

### Example 3

Multiply:

$$0.3 \times 5$$

Here,

$$\begin{array}{r} & \xrightarrow{x 10} \\ 0.3 & \downarrow \\ \xrightarrow{x 5} & \xrightarrow{x 5} \\ \hline 1.5 & \hline 15 \\ \uparrow & \downarrow \\ \hline \end{array}$$

$\div 10 \leftarrow$

$0.3 \times 10 = 3$ , if multiplied by 5, 3 is 10 times greater than  $0.3 \times 5$ . So,  $0.3 \times 5 = 3 \times 5 \div 10$

**Another method**

$$\begin{aligned} 0.3 \times 5 &= \frac{3}{10} \times 5 \\ &= \frac{15}{10} = 1.5 \end{aligned}$$

### Example 4

Multiply:

$$0.03 \times 5$$

Here,

$$\begin{array}{r} & \xrightarrow{x 100} \\ 0.03 & \downarrow \\ \xrightarrow{x 5} & \xrightarrow{x 5} \\ \hline 0.15 & \hline 15 \\ \uparrow & \downarrow \\ \hline \end{array}$$

$\div 100 \leftarrow$

$0.03 \times 100 =$  product of 3 and 5 = 15, 100 times greater than  $0.03 \times 5$ . So, it comes when required product 15 is divided by 100.

**Another method**

$$\begin{aligned} 0.03 \times 5 &= \frac{3}{100} \times 5 \\ &= \frac{15}{100} = 0.15 \end{aligned}$$

Solution of both methods gave equal product. What did you learn from this? What is the similarity between the decimal sign of given decimal number and product?

So,



While multiplying decimal number, it is done as same as the multiplication of general numbers and in answer, the place of decimal is made equal as the decimal sign of multiplication factors.

### Example 5

#### Multiply:

$$3.57 \times 12$$

Here,

$$\begin{array}{r} 3.57 \\ \times 12 \\ \hline 714 \\ 357 \\ \hline 42.84 \end{array}$$

This method is like other simple multiplication. In 3.57 there are two digits after decimal so in product also after decimal two digits should be there.

### Exercise 12.6

#### 1. Multiply:

- |                     |                      |                       |                       |
|---------------------|----------------------|-----------------------|-----------------------|
| a. $0.4 \times 2$   | b. $0.5 \times 3$    | c. $0.3 \times 7$     | d. $0.2 \times 2$     |
| e. $3 \times 0.8$   | f. $5 \times 0.6$    | g. $8 \times 0.4$     | h. $9 \times 0.9$     |
| i. $0.05 \times 5$  | j. $0.03 \times 4$   | k. $0.07 \times 6$    | l. $0.08 \times 9$    |
| m. $6 \times 0.12$  | n. $7 \times 0.45$   | o. $9 \times 0.99$    | p. $7.45 \times 6$    |
| q. $15.02 \times 3$ | r. $14 \times 0.235$ | s. $21.096 \times 12$ | t. $17.651 \times 13$ |

#### 2. Multiply:

- |                                |                               |                         |
|--------------------------------|-------------------------------|-------------------------|
| a. $32.4 \times 0.3$           | b. $7.24 \times 0.5$          | c. $17.32 \times 2.3$   |
| d. $42.07 \times 3.4$          | e. $33.33 \times 0.9$         | f. $56.6 \times 3.23$   |
| g. $76.5 \times 3.02$          | h. $0.05 \times 0.02$         | i. $33.07 \times 14.04$ |
| j. $2.5 \times 2.5 \times 2.5$ | k. $7 \times 0.7 \times 0.07$ |                         |

#### 3. Find the total cost in the following conditions:

- 12 oranges at the rate of Rs. 2.25 each.
- 15 copies at the rate of Rs. 4.75 each.

- c. 32 envelopes at the rate of Rs. 0.75 each.
  - d. 35 pencils at the rate of Rs. 1.05 each.
4. What is the total cost of a sewing machine, if Rs.500 is paid at first and then Rs.205.75 per month up to 12 months?
5. Volume of a rectangular object = length x breadth x height.  
By using this formula, find the volume of rectangular objects given below:
- a. length = 1.2cm, breadth = 0.8cm and height = 1.1cm
  - b. length = 4.5cm, breadth = 2.2cm and height = 1.8cm

## 12.7 Rounding off of decimal numbers

How much each would get if Rs.8 is equally divided to 9 people?

Here, when 9 is divided by 8,

$$\begin{array}{r} 1 \\ 8 ) \overline{) 9} \\ -8 \\ \hline 1 \end{array}$$

So, each would get Rs.  $1\frac{1}{8}$

While converting into decimal  $= \frac{1}{8} = 0.125$

So, each would get Rs. 1.125 . It means each would get Re. 1 and 125 parts out of 1000 parts of Re. 1

But it is not possible in daily life.

Or, Re. 1 cannot be divided in 1000 equal parts. So, what to do? In this condition, we say each would get almost Rs. 1.13 or Re. 1 and 13 paisa. Here, to say Rs. 1.125 = Rs. 1.13 is said to rounding off the digits of thousandths place or making it zero. While doing this, the digit which should be made zero if 5 or greater than 5 it is made zero but 1 is added the digit just left than this digit. If the digit that should be round off is smaller than 5, it is made zero and other digits remain the same.

**For example, 5.20735**

- = 5.2074, rounding off up to 4 digits place of decimal
- = 5.207, rounding off up to 3 digits place of decimal
- = 5.21, rounding off up to 2 digits place of decimal
- = 5.2, rounding off up to 1 digit place of decimal

### **Exercise 12.7**

**1. Round off up to 1 digit of decimal:**

- a. 8.53      b. 2.67      c. 4.07      d. 13.51

**2. Round off up to 2 digits of decimal:**

- a. 4.821      b. 3.456      c. 0.493      d. 3.008

**3. Round off up to 3 digits of decimal:**

- a. 3.4156      b. 4.0051      c. 13.5305      d. 15.6708

**4. Round off each of the numbers up to digits given in brackets:**

- a. 5.635(2)      b. 1.8918(3)

- c. 15.3445(2)      d. 3.0729(1)

- e. 0.00581(2)      f. 3.14159(3)

# Percentage

## 13.1 Meaning of Percentage

Dhruba got the following marks in an exam:

Subject	Nepali	English	Math	Science
Obtained marks	16	19	34	45
Full marks	20	25	50	100

In which subject, Dhruba has done the best?

In this table, marks of Science is 45 and Nepali is 16. Can it be said that, Dhruba is the best in Science and the worst in Nepali?

Here, writing in fraction on the basis of obtained marks and full marks,

$$\text{In Nepali, } \frac{16}{20}$$

$$\text{In English, } \frac{19}{25}$$

$$\text{In Math, } \frac{34}{50}$$

$$\text{In Science, } \frac{45}{100}$$

Now, among the ratios which is the greatest?

How to say? For that, by making equal denominator of all the fractions,

$$\text{In Nepali} = \frac{16}{20} = \frac{16 \times 5}{20 \times 5} = \frac{80}{100}$$

$$\text{In English} = \frac{19}{25} = \frac{19 \times 4}{25 \times 4} = \frac{76}{100}$$

$$\text{In Math} = \frac{34}{50} = \frac{34 \times 2}{50 \times 2} = \frac{68}{100}$$

$$\text{In Science} = \frac{45}{100} = \frac{45}{100}$$

Now, from this, it can be said that Dhruba is the best in Nepali, and the worst in Science. Here, the denominator of each fraction is 100. So, numerator of fraction indicates percentage. Percentage is represented by (%).

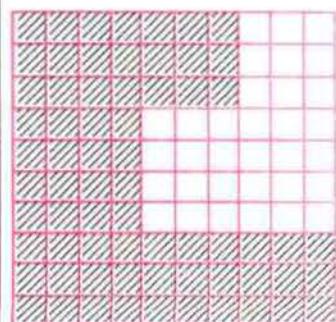
Here,

Dhruba got 80% in Nepali, 76% in English, 68% in Math and 45% in Science.

If the denominator is 100, numerator indicates percentage, which means out of 100. In the adjoining figure, 67 parts are coloured out of 100. It is written

$\frac{67}{100}$  = 67% and read as 67 percentage.

Percentage helps to compare two things or objects.



## 13.2 Converting Fraction into Percentage

Convert  $\frac{3}{4}$  into percentage

### Method 1

$$\frac{3}{4} = \frac{3 \times 25}{4 \times 25}$$

$$= \frac{75}{100} = 75\% \text{ (Making 100 in denominator)}$$

### Method 2

$\frac{3}{4}$  means 3 parts out of 4 parts.

$\frac{3}{4}$  parts in 1 part.

So,  $\frac{3}{4} \times 100$  in 100 parts.  
 $\frac{1}{4} = 25$   
 $= 3 \times 25\% = 75\%$

So,  $\frac{3}{4} = 75\%$

While converting a fraction into percentage, multiply by 100%.

### 13.3 Convert Percentage into Fraction

#### Example 1

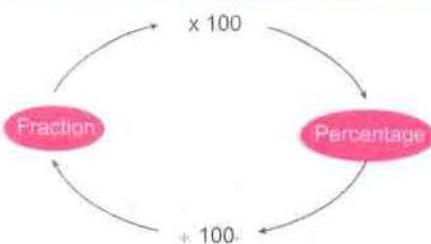
Convert 75% into fraction.

Here, 75% means 75 parts out of 100 parts.

$$\text{So, } 75\% = \frac{\cancel{75}^3}{\cancel{100}^4} = \frac{3}{4}$$

**While converting percentage into fraction, divide the number by 100 which represents percentage.**

According to the above discussion, the method when percentage is converted into fraction and fraction is converted into percentage is given in the along side circle.



#### Exercise 13.1

##### 1. Write in percentage:

- |                     |                     |                      |
|---------------------|---------------------|----------------------|
| a. $\frac{25}{100}$ | b. $\frac{27}{100}$ | c. $\frac{75}{100}$  |
| d. $\frac{45}{100}$ | e. $\frac{63}{100}$ | f. $\frac{125}{100}$ |

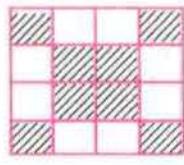
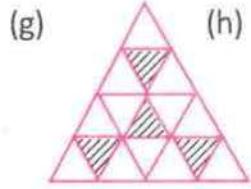
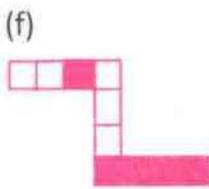
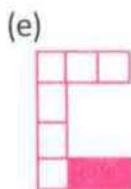
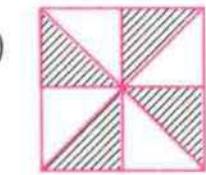
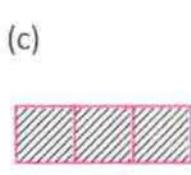
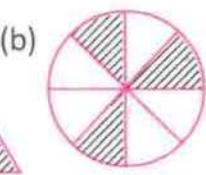
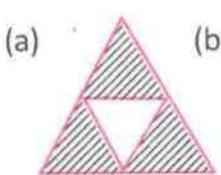
##### 2. Convert into percentage (by both methods):

- |                  |                    |                    |                    |
|------------------|--------------------|--------------------|--------------------|
| a. $\frac{1}{2}$ | b. $\frac{3}{4}$   | c. $\frac{2}{5}$   | d. $\frac{7}{10}$  |
| e. $\frac{3}{5}$ | f. $\frac{17}{20}$ | g. $\frac{22}{25}$ | h. $\frac{33}{50}$ |
| i. $\frac{5}{2}$ | j. $\frac{7}{5}$   |                    |                    |

##### 3. Convert the percentage into fraction:

- |                      |         |                      |        |
|----------------------|---------|----------------------|--------|
| a. 15%               | b. 20%  | c. 25%               | d. 35% |
| e. 50%               | f. 85%  | g. 48%               | h. 16% |
| i. $12\frac{1}{2}\%$ | j. 115% | k. $33\frac{1}{2}\%$ |        |

4. Write the shaded part in fraction and convert the fraction into decimal.



5. Convert the unshaded part of Q.N. 4 into percentage.  
6. What is the sum of percentage of shaded part and unshaded part of Q.N. 4?

### 13.4 Use of percentage

We use percentage in our daily life to solve different problems appearing in our daily life. See the examples given below.

#### Example 1

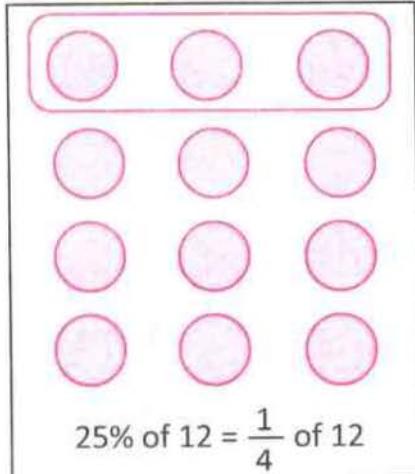
What is 25% of Rs. 12?

Here, 25% of Rs. 12

$$= \frac{25}{100}^1 \text{ of Rs. } 12$$

$$= \frac{1}{4} \times \text{Rs. } 12 \quad (\text{of means multiply in fraction})$$

$$= \text{Rs. } 3$$



### Example 2

There are 400 students in a school. If 35% are girls, what is the number of girls and boys?

Here, number of girls = 35% of 400

$$= \frac{35}{100} \times 400 \\ = 140$$

And percentage of boys =  $(100 - 35)\% = 65\%$

So, Number of boys = 65% of 400

$$= \frac{65}{100} \times 400 \\ = 260$$

After finding number of girls, to find the number of boys another method can be applied.

### Exercise 13.2

1. Find the value:
  - a. 12% of 50
  - b. 15% of 20
  - c. 35% of 60
  - d. 60% of Rs. 5
  - e. 35% of 150
  - f. 25% of 1 kg
  - g. 15% of 1 hour
  - h.  $5\frac{1}{2}\%$  of Rs. 200
  - i.  $6\frac{2}{3}\%$  of 30km
  - j.  $12\frac{1}{2}\%$  of 16 litre
  - k. 200% of 100ml
  - l. 150% of Rs. 30
2. There are 40 students in a class. If 15 are girls, find the percentage of girls and boys.
3. There are 32 eggs in a crate. If 8 are broken out of total,
  - a. What is the percentage of broken eggs?
  - b. What is the percentage of safe eggs?
4. If Hari obtained 45 marks out of 60 in mathematics, what is the percentage of his marks?
5. The cost of a sweater is Rs.500. If 20% discount is allowed, what is the amount of discount?

## Lesson 14

# Unitary Method and Simple Interest

### 14.1 Unitary Method

The number of pencils and their cost are given below in the table. Read the table and discuss the questions given below:

Pencils					
Cost	5	10	15	20	25

- When number of pencils increases, what happens to the cost?
- Can we find the cost of any number of pencils with the cost of 1 pencil? How?
- From the cost of some pencils, can we find the cost of 1 pencil? How? From the above table to find the cost of some pencils from the cost of 1 pencil, number of pencils should be multiplied by the cost of 1 pencil, e.g. the cost of 1 pencil in above table = Rs.5. So, the cost of 4 pencils =  $Rs. 5 \times 4 = Rs. 20$ .

or, total cost of objects = cost of 1 object  $\times$  number of objects.

Similarly, to find the cost of 1 object from the cost of some objects, cost should be divided by the number of objects. According to above table,

cost of 3 pencils = Rs.15. So, cost of 1 pencil =  $Rs. \frac{15}{3} = Rs.5$

Or      Cost of 1 object = 
$$\frac{\text{Total cost of objects}}{\text{Number of objects}}$$

If the cost of some similar objects is given, the cost of an object can be find by dividing total cost of objects by the number of objects. It is called unit value. Similarly, if cost of one object is known to find the cost of some objects, multiply the number of objects by the cost of one object. This method is called Unitary Method.

#### Example 1

What is the cost of 5 pens if each costs Rs. 25?

Here, cost of 1 pen = Rs. 25

Number of pens = 5

Cost of 5 pens = Rs.  $25 \times 5$  = Rs. 125

∴ Cost of 5 pens = Rs. 125

### Exercise 14.1

1. Find the total cost:

Unit cost	Number of objects
a. Rs. 20	15
b. Rs. 400	45
c. Rs. 15.50	24
d. Rs. 250.50	64

2. Find the unit cost:

Number of objects	Total cost
a. 10	Rs. 250
b. 32	Rs. 672
c. 60	Rs. 5,460
d. 234	Rs. 18,720

3. What is the cost of 25 kg of sugar if the cost is Rs. 40 per kg?
4. If the cost of a box of 12 dozens biscuits is Rs. 1860, find the cost of 1 dozen biscuits?
5. Shibaram sold 45 kg of potatoes at the rate of Rs. 27 per kg, find the total cost that he got.
6. If the cost of 2 dozens of copies is Rs. 240, what is the cost of 1 copy?
7. 64 oranges are eaten by distributing among 8 people, what is the share of each person?
8. How many breads are required to feed 15 people at 5 pieces each person?

### 14.2 Simple Interest

Jayaram took a loan of Rs. 8,000 from Agricultural Development Bank. After 1 year, he paid Rs. 8800 to clear debt with Rs. 800 extra.

Here, the loan taken from the bank is called principal. Here, Rs. 8000 is principal. The extra money given to the bank is called interest. Bank takes certain rate of interest.

Here, the interest of Rs. 8000 for 1 year is Rs. 800. So, the rate of interest per year =  $\frac{800}{8000} \times 100\% = 10\%$

The total duration time for which the amount of money is given or taken is called time duration. The interest of certain amount of money can be find by unitary method.

### Example 1

Rama gave Rs. 100 to Bishnu at the rate of 10% per year. How much interest will Rama get after 3 years?

Here,

Since the rate is 10%

The interest of Rs. 100 in 1 year = Rs. 10

The interest of Rs. 100 in 3 years = Rs.  $10 \times 3 = \text{Rs. } 30$

Rama will get Rs. 30 as interest after 3 years.

### Example 2

Suraj deposited Rs. 400 in a bank. At the rate of 5 percentage per year, how much interest will he get after 1 year?

Here, at the rate of 5% interest.

The interest of Rs. 100 in 1 year = Rs. 5

The interest of Re. 1 in 1 year = Rs.  $\frac{5}{100}$

The interest of Rs. 400 in 1 year = Rs.  $\frac{5}{100} \times 400 = 20$

Suraj got Rs. 20 interest.

### Exercise 14.2

- What is the interest of Rs. 300 in 1 year at the rate of 15 percent?
- What is the interest of Rs. 1200 in 1 year at the rate of 10 percent?
- What is the interest of Rs. 100 in 5 year at the rate of 7%?
- What is the interest of Rs. 100 in 7 years at the rate of 11%?
- If the interest of Rs. 100 in 1 year is Rs. 8, what is the interest in 5 years?
- If the interest of Rs. 100 in 1 year is Rs. 12, what is the interest of Rs. 600 in 1 year?
- If the interest of Rs. 400 in 1 year is Rs. 48, what is the interest of 7 years?

## Lesson 15

# Bill and Budget

### Bill

Rupa was given a bill while buying food provisions from Siddheshwor food store. See the bill and answer the questions:

Siddheshwor Food store Dawan, Bhojpur.					Bill No. 0061
Name of the customer: Rupa Pariyar					Date: 06/07/20
Address: Dawan, Mohariya, Bhojpur					
S.N.	Particulars	Amount	Rate	Cost	
1.	Sugar	5 kg	70	350	
2.	Rice	7 kg	30	210	
3.	Maida	3 kg	40	120	
4.	Lentil	2 kg	80	160	
5.	Gram	1 kg	60	60	
					<b>Total</b> <b>900</b>
<b>E. &amp; O.E.</b>					<i>Bimala</i> <u>Sold by</u>

- What is the name and address of the customer?
- Who gave the bill to the customer?
- Which thing is more that Rupa has bought?
- How much did Rupa pay altogether?
- Can you make such bill?
- How is the price of rice Rs. 210?

### Budget

To run a family, an organization or an office needs budget to continue the daily work. To continue the work, the income from where it is and on which the expenditure is going on should be care. For that, it will be easy if we make budget at first. See the example given below:

The budget of family of Mr. Ramsewak Tharu is given in the following table. See the given budget the discuss and give the questions.

Income		Expenditure	
Source	Amount(Rs.)	Topic	Amount(Rs.)
Vegetables	7000	Food provision	7000
Hens	10000	Clothing	4000
Milk	8000	Education	12000
Goat	9000	Miscellaneous	5000
<b>Total</b>	<b>34000</b>		<b>28000</b>

- Which is more expenditure and income in Ramsewak's family?
- How much does the family save in a year?
- From which he gets more and less income among others?
- On which he spends more and less among others?
- Can you make such budget in your family?

There is more income than expenditure in Ramsewak's family. So, the family makes saving. If expenditure is more than income, the money should be maintained from other places to recover expenditure.

**Teaching Instruction:** Read bill(without discount, VAT and Tax) should be shown and information should be given also let practice them. Also let them make the budget of their family by discussing with friend give knowledge how to make it.

### Exercise 15

- Read the price list of vegetables of one day of Kalimati whole sale shop and answer the following questions.

Price list	
Particulars	Price per kg
Cauliflower	Rs. 30
Cabbage	Rs. 25
Tomato	Rs. 40
Bean	Rs. 35
Peas(Green)	Rs. 32
Bitter gourd	Rs. 36
Chillies	Rs. 60
Carrot	Rs. 24
Radish	Rs. 18

- a. Which vegetable is the cheapest?  
 b. Which vegetable is the most expensive?  
 c. What is the price difference between peas (Green) and beans?  
 d. How much Hari should pay to the shopkeeper for 2 kg of carrots?
2. If four people bought vegetable according to a, b, c, d, how much did each pay? Make bill and show:
- |                    |                      |
|--------------------|----------------------|
| a. 2kg cauliflower | b. 2 kg beans        |
| 1 kg tomato        | 1 kg carrot          |
| 2 kg radish        | 2 kg cabbage         |
| c. 1kg chillies    | d. 2 kg bitter gourd |
| 3 kg radish        | 2 kg tomatoes        |
| 1 kg carrot        | 1 kg radish          |
| 1 kg tomato        | 1 kg chilli          |
- e. Among all above the bills, which is of the highest cost?

3. The annual budget of Janata Primary School, Mugu is given below. See the budget and answer the following questions:

Income		Expenditure	
Source	Amount (Rs.)	Topic	Amount (Rs.)
Donation from District Education Office	2,00,000	Salary	2,30,000
Donation from VDC	50,000	Maintenance	25,000
Local Donation	20,000	Miscellaneous	12,000
Others	25,000	Education materials	5,000
<b>Total</b>	<b>2,75,000</b>	Miscellaneous	2,000
		<b>Total</b>	<b>27,4,000</b>

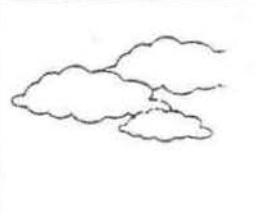
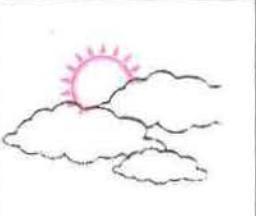
- a. What is the biggest source of income?  
 b. On which source the highest expenditure is there?  
 c. Which is the more expenditure or income of the school?  
 d. What is the annual saving of the school?

## Lesson 16

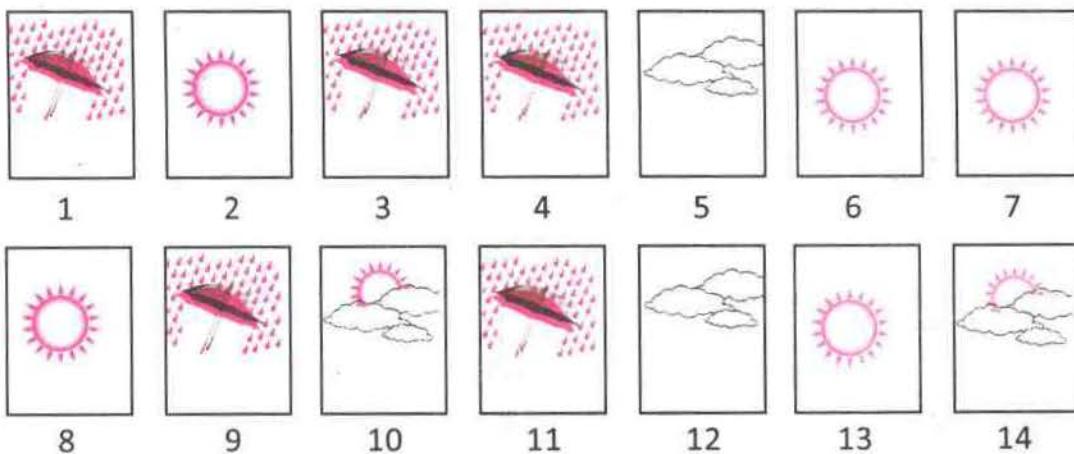
# Statistics

### 16.1 Introduction

Notice and information are shown by figure in some places. We can see the food items and their cost in menu of a hotel or restaurant. We get bill of things which bought in shop. Some of the office, school or factory represent their information, annual program, income, expenditure in chart or graph. In this way, if notice or information are represented by figure, chart or graph, it is very easy to understand and get conclusion. For example the information of climate of Pokhara up to 2 weeks of the month Bhadra is represented in the chart below. First understand the symbols and read the chart.

			
Heavy rain	Cloudy	Clean	Partially cloudy

Climate information of Pokhara of 2 weeks (from Bhadra 1 to 14)



**Now, answer the following questions:**

- How many days did it rain in Pokhara within 14 days?
- How many days were clean days in Pokhara within 14 days?
- How many days were cloudy days in Pokhara within 14 days?
- In which 2 days, there were partial clean in Pokhara within 14 days?
- In how many days, there was not raining in Pokhara within 14 days?
- In which week, there was raining more in Pokhara within two weeks?
- How was the climate on the last day of second week?

### **Exercise 16**

- Read the price list of food items in the market of Janakpur and answer the following questions:

Price list	
Particulars	Price per kg
Rice (thin)	Rs. 45
Rice Mansuri	Rs. 35
Lentil	Rs. 90
Gram	Rs. 75
Peas(Green)	Rs. 62
Sugar	Rs. 52
Maida	Rs. 25
Wheat flavour	Rs. 20

- Which is the cheapest food item?  
Which is the most expensive item?  
What is the difference between the price of peas(green) and gram?  
How much Hari should pay for 2kg of sugar?
- The types of vehicles and their number moved through Sahidgate from morning 6 to 7'o'clock on Sunday is given below in the table. Read the table properly and answer the following questions:

Types of vehicles	Number of vehicles
Bus	12
Minibus	16
Private car	20
Tempo	10
Taxi	22

- a. Which vehicle is mostly used?
- b. Which vehicle is used very less?
- c. If one third buses went out of the valley, how many buses went out of the valley?
- d. If 40 passengers were there in a bus in average, how many passengers were travelling by bus?

**Teaching Instruction:** Ask the students make price list asking at home or nearby shop and discuss on the basis of the price list.

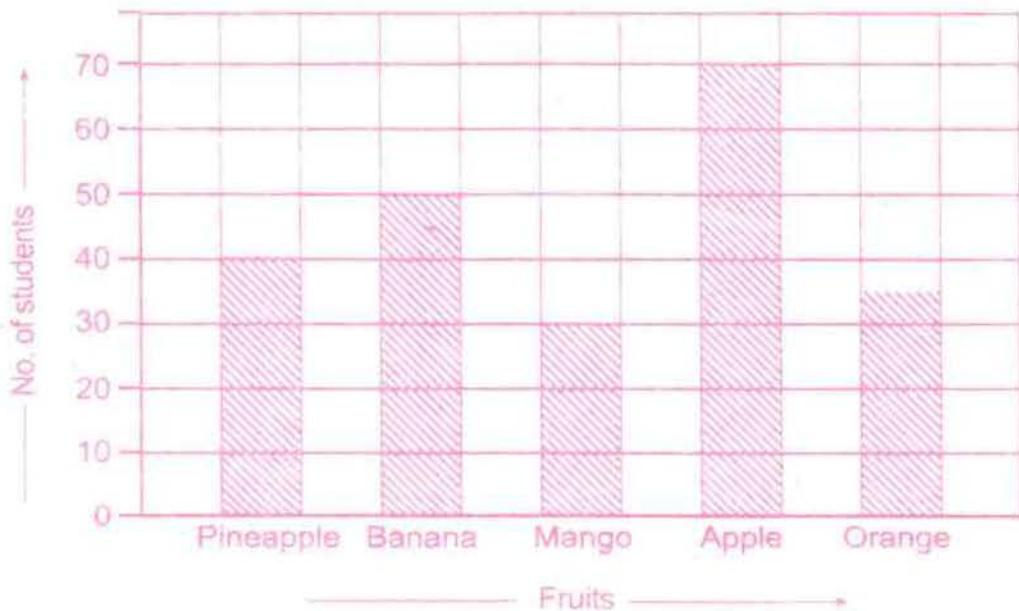
## 16.2 Bar Graph

Ramesh had been said to collect the information about the fruits that the students like to have while having their breakfast. Ramesh got that 40 liked pineapple, 50 liked banana, 30 liked mango, 70 liked apple and 35 liked orange. Ramesh got a problem and started thinking, ‘How to represent this information to understand easily? He represented this information in the following table.

Fruits	Pineapple	Banana	Mango	Apple	Orange
No. of students who liked	40	50	30	70	35

In this way, many things can be easily understood represented by such table.

More than this, how can it be made attractive, easy on comparison so that it can be understood easily? He thought deeply and thought to make a bar graph. In a square sheet of paper, he started writing 10, 20, 30, 40 in vertical line and name of the fruits in horizontal line. In this way, he made a bar graph as shown below.



In this way, the breadths of bars are equal which Ramesh has made and height of bar represents number of students also the distance between every bar is also equal. In this way, from data or the information which are represented on bargraph, many things can be understood easily at a glance and also can be easily compared.

The following things should care while making bar graph:

- Variable should be given on horizontal line while making bar graph(as done in the above example)
- Number should be given on vertical line. (In the above example the number of students is shown who like fruits)
- The breadth of bars and distance between them should be equal. While showing number in vertical line, it should be shown in equal distance and by the same unit.

## Exercise 16.2

Use graph paper in this exercise

- The Traffic Police collected the following information about the vehicles moved in Tansen Bazaar during 6 to 9 o'clock in the morning.

Name of vehicles	Local buses	School buses	Private cars	Government vehicles	Taxies
Number	10	7	3	10	25

Make a bar graph showing number of vehicles in vertical line taking 1 box equal to 1 vehicle and types of vehicle in horizontal line.

- The following are the heights of students of class 5:

Height(in cm)	105	106	107	108	109	110
Number	3	12	20	13	7	5

Take 1 box = 1 student in vertical line and make a bar graph of the given data.

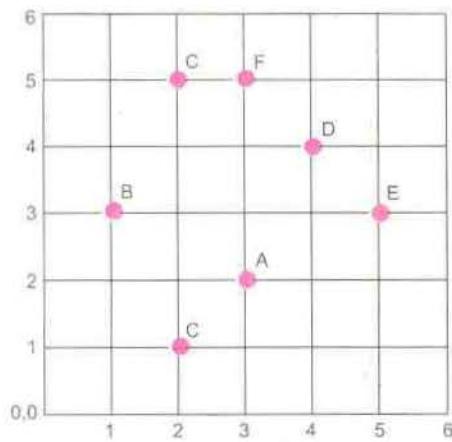
- Number of the students present in a school during one week is given in the table below:

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
No. of present students	25	20	22	18	22	23

Represent the above information in bar graph.

## 16.3 Order Pair Number and Co-ordinates

A pair of numbers can be written to represent each of the points on square paper given below.



If Hari is at  $(0, 0)$ , to reach at A, Hari should go 3 units on the right and 2 units above.

To represent A  $(3, 2)$  can be written. In this way such pair numbers written in fixed way are called order pair or co-ordinates.

From  $(0, 0)$  to reach in point E, Hari should go 5 units on right and 3 units above. The order pair numbers of E  $(5, 3)$ . From  $(0, 0)$  to go in any point, firstly we should go right and then above.

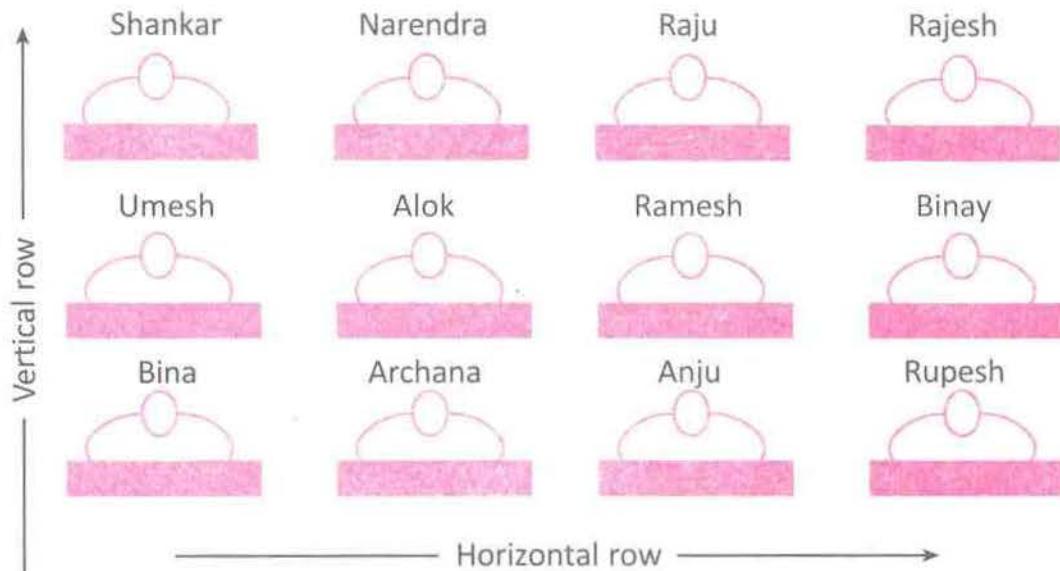
What are the order pair numbers of point D?

Write the letter which is represented by order pair  $(1, 3)$ .

Which letter is represent by  $(4, 4)$ ?

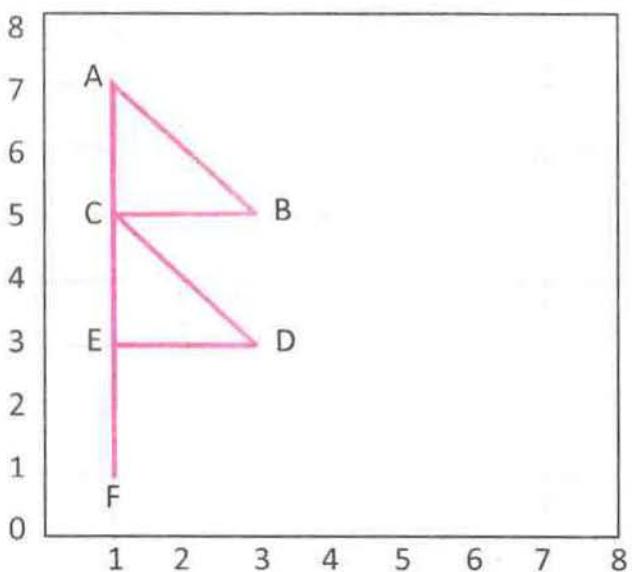
### Exercise 16.3

1. The 12 students of class 5 are kept in row and column in the following ways. To find out the place of any student first go through the horizontal line and then vertical line. In this way the place of Ramesh is in  $(3, 2)$ . Now write co-ordinates to find the place of the following students.

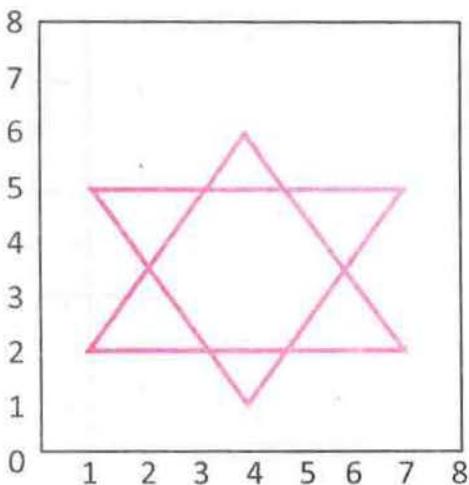


- |            |             |           |           |
|------------|-------------|-----------|-----------|
| a. Shankar | b. Narendra | c. Raju   | d. Rajesh |
| e. Umesh   | f. Alok     | g. Ramesh | h. Binay  |
| i. Bina    | j. Archana  | k. Anju   | l. Rupesh |

2. See the figure and write the co-ordinates of A, B, C, D, E and F.



3. Write the co-ordinates of vertices of the given figure:



4. Plot the points  $(2, 2)$ ,  $(2, 4)$ ,  $(1, 4)$ ,  $(3, 6)$ ,  $(3, 7)$ ,  $(2, 7)$ ,  $(4, 9)$ ,  $(6, 7)$ ,  $(5, 7)$ ,  $(5, 6)$ ,  $(7, 4)$ ,  $(6, 4)$ ,  $(6, 2)$  in a graph paper and join them with a scale continuously. Write the name of figure constructed.

## Set

In the group of the given figure, there are mangoes, bananas, apples, papayas and oranges. This is the set of fruits. Each of the fruits of this set is called element of the set. Can you write how can it be written?

Listing elements is one of the methods to represent a set. To show a set in this method, set is represented by a capital letters (A, B, C, D, ..... X, Y, Z) and its elements by small letters. To write name of set at first write a capital letter and equal to sign and then the name of elements inside curly {} brackets and each elements are separated by comma (,). Write the above set in above method and discuss.

Above set can be written  $C = \{1, 2, 3, 4, 5\}$ . This is the set of first 5 counting numbers. It has got 5 elements. This set can also be written  $C = \{5, 4, 3, 1, 2\}$  or  $C = \{2, 3, 1, 5, 4\}$ . For this way, elements of set can be written in any order. Similarly, the letters of the word SCHOOL in the set {S, C, H, O, O, L} only will be written. The digits of number 12423 in the set {1, 2, 3, 4} will be written. One element should be written only once in a set.

### Example 1

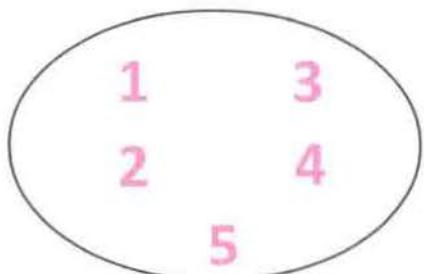
Write the seven days of a week in listing method of set:

$$D = \{\text{Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}\}.$$

### Example 2

$$E = \{2, 4, 6, 8, 10\} \text{ this is the set of what?}$$

This is the set of first five even numbers.



## Exercise 17

A. Write the following sets in listing method:

1. The set of Nepali name of 12 months.
2. The set of Five development regions of Nepal.
3. The set of vowel letters of English Alphabet.
4. The set of subjects of Class 5.
5. The set of odd numbers below than 10.
6. The set of numbers by which 24 is exactly divisible.

B. Describe the following sets which is the set of what?

1.  $C = \{\text{Cow, Buffalo, Horse}\}$
2.  $D = \{\text{Kathmandu, Lalitpur, Bhaktapur}\}$
3.  $S = \{\text{Nepal, India, Bangladesh, Srilanka, Pakistan, Afghanistan, Maldives, Bhutan}\}$
4.  $V = \{\text{a,e,i,o,u}\}$
5.  $R = \{\text{I, II, III, IV, V}\}$
6.  $E = \{10, 12, 14, 16, 18, 20\}$
7.  $M = \{5, 10, 15, 20, 25\}$
8.  $G = \{\triangle, \square, \circ, \square\}$
9.  $F = \{0\}$

# Algebra

## 18.1 Algebraic Expressions and their Value

In algebra, to represent number letters or  $\square$ ,  $\Delta$ , \* symbols are used. As  $2 \times 4$  represents the products of 2 and 4 in arithmetic in the same way  $2 \times x$  represents the product of 2 and  $x$  in algebra. In algebra  $2a$ ,  $3b$ ,  $5x$ ,  $7x$ ,  $\square$  are called algebraic terms.  $a$ ,  $b$ ,  $x$  and  $\square$  symbol are called variables in algebra. In algebraic term  $2a$ , 2 is called coefficient of  $a$ . The value of  $2a$  depends on variable  $a$ .

When  $a = 2$ ,  $2a = 2 \times 2 = 4$

When  $a = 3$ ,  $2a = 2 \times 3 = 6$

When  $a = 0$ ,  $2a = 2 \times 0 = 0$

If algebraic terms are represented by using four fundamental signs of mathematics ( $+$ ,  $-$ ,  $\times$ ,  $\div$ ) in mathematical language are called algebraic expression.

$a + 4$ ,  $x^2 - xy + y^2$ ,  $8a^2bc$ ,  $\frac{2x+3}{5y}$  are the examples of algebraic expressions.

### Example 1

- The expression  $\square + 4$  means the sum of  $\square$  and 4.
- The expression  $x - 5$  mean difference of  $x$  and 5.
- The expression  $2a$  means the product of 2 and  $a$ .
- $\Delta \div 4$  means the quotient obtained after dividing  $\Delta$  by 4.

### Example 2

If  $x = 4$  and  $y = 3$ , find the value of each of the given expressions.

- $x + 5$
- $3x - 2y$
- $\frac{3x + 2y}{2y}$

a. Here,  $x + 5$

$$\begin{aligned} &= 4 + 5 \quad [\text{putting the value of } x = 4] \\ &= 9 \end{aligned}$$

b. Here,  $3x - 2y$

$$\begin{aligned}
 &= 3 \times 4 - 2 \times 3 \quad [\text{putting the value of } x = 4 \text{ and } y = 3] \\
 &= 12 - 6 \\
 &= 6
 \end{aligned}$$

c. Here,  $\frac{3x + 2y}{2y}$

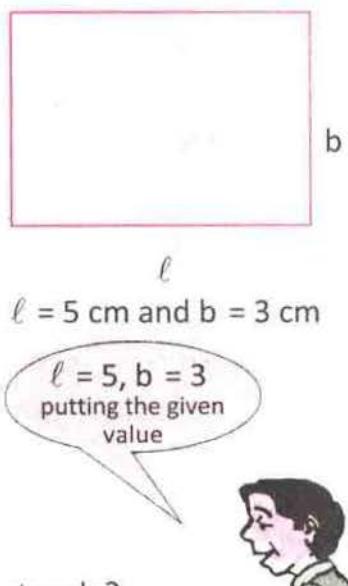
$$\begin{aligned}
 &= \frac{3 \times 4 + 2 \times 3}{2 \times 3} \\
 &= \frac{12 + 6}{6} \quad [\text{putting } x = 4 \text{ and } y = 3] \\
 &= \frac{\cancel{18}}{\cancel{6}}^3 \\
 &= 3
 \end{aligned}$$

In this way, to find the value of given expression means, putting value of variable and simplifying.

### Example 3

If the length of given rectangle =  $\ell$  and breadth =  $b$   
 its perimeter  $P = 2(\ell + b)$ . If  $P = 2(\ell + b)$  is written it  
 is algebraic formula. Now, if  $\ell = 5$  cm and  $b = 3$  cm,  
 what is the perimeter of the rectangle.

$$\begin{aligned}
 \text{Here, perimeter (P)} &= 2(\ell + b) \\
 &= 2(5\text{cm} + 3\text{cm}) \\
 &= 2 \times 8\text{cm} \\
 &= 16\text{cm}
 \end{aligned}$$

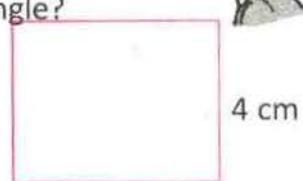


### Example 4

Area of rectangle ( $A$ ) =  $\ell \times b$  square units.

Now,  $\ell = 5$  cm and  $b = 4$  cm. What is the area of rectangle?

$$\begin{aligned}
 \text{Here, area of rectangle} &= A = \ell \times b \\
 &= 5 \text{ cm} \times 4 \text{ cm} \\
 &= 20 \text{ cm}^2
 \end{aligned}$$



Area ( $A$ ) = 20 square cm.

**Things to be known:** Unit of area is always square units. If length is in cm, its area will be in square cm or  $\text{cm}^2$ .

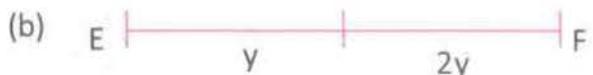
## Exercise 18.1

1. Write the meaning of each of the expressions.

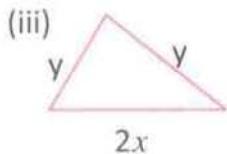
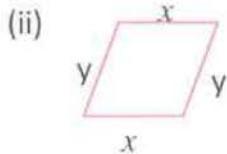
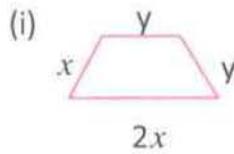
- a.  $\square + 3$
- b.  $\square \div 3$
- c.  $\square - 5$
- d.  $3 \times \square$
- e.  $3a$
- f.  $5m$
- g.  $ab$
- h.  $5mn$

2. Write the following saying in algebraic expression.

- a. Sum of  $a$  and 3.
  - b. The difference of  $\square$  and 7.
  - c. The quotient while dividing 16 by  $\square$
  - d. 3 times product of  $p$  and  $q$ .
  - e. 3 times the difference of 7 and  $y$ .
  - f. The difference of  $b$  and two times of  $a$ .
3. Write the sentences to represent the following expressions.
- a.  $2(p + q)$
  - b.  $3(r - s)$
  - c.  $4(x + y)$
  - d.  $qyz$
4. Write the algebraic expressions to express total length of the given line segments.



5. Write the expressions to represent the perimeter of the given figure.



6. Write the algebraic expressions to represent the following sentences:

- a. Bikash had  $x$  apples. He bought two more apples. Now how many apples does he have.
- b.  $x$  students of a school out of 500 were absent. How many were present?
- c. A tree had 30 birds,  $b$  number of birds came and sat on the tree. How many total birds were there in the tree?

7. What is the value of each of the expressions if  $x = 2$ ?

- a.  $3x$       b.  $3 + x$       c.  $5 - x$       d.  $x - 1$   
e.  $3x + 2$       f.  $2x \div 4$       g.  $(5x + 2) \div 4$   
h.  $\frac{12x + 4x}{2x}$

8. If  $a = 1$ ,  $b = 3$ ,  $c = 5$ , find the value of expressions given below.

- a.  $a + b + c$       b.  $2a + 3b + 4c$       c.  $b + c - 8a$   
d.  $abc$       e.  $10a + 10b + 10c$       f.  $ab + bc + ca$

## 16.2 Addition and Subtraction of Algebraic Expressions

### Example 1

What is the sum of  $3a$  and  $5a$ ?

Here,  $3a = a + a + a$  (3 times) and

$5a = (a + a + a + a + a)$  (Five times)

So,  $3a + 5a$

$= (a + a + a + a + a + a + a + a)$  (8 times)

$= 8a$

Same, by next method

$$3a + 5a$$

$$= (3 + 5)a$$

$$= 8a$$

Same, by vertically

$$\begin{array}{r} 3a \\ + 5a \\ \hline 8a \end{array}$$

Sum of 3 and 5 is  
8. So the sum of 3  
times a and 5 times  
a is 8 times a.



### Example 2

Subtract  $3a$  from  $5a$ .

Here, subtracting  $3a$  from  $5a$  means subtraction of 3 times a from 5 times a .

$$5a - 3a = (5 - 3)a = 2a$$

Same by vertically

$$\begin{array}{r} 5a \\ - 3a \\ \hline 2a \end{array}$$

From the above examples:

5a and 3a both are like terms. Addition and subtraction of like terms means sum and difference of their coefficient then common coefficient with a single variable is written. The addition and subtraction of two or more expression is done one with like terms. See the examples given below.

### Example 3

Simplify:

$$3ab - 4bc + 7ab$$

$$\text{Here, } 3ab - 4bc + 7ab$$

$$= 3ab + 7ab - 4bc \quad [\text{arranging like terms}]$$

$$= (3 + 7)ab - 4bc \quad (\text{ab and bc are unlike terms. So can't be subtracted but sign of minus is shown})$$

$$= 10ab - 4bc$$

### Example 4

Simplify:

$$\text{Add: } 2x + 8y - 10z \text{ and } 5x - 7y + 12z$$

$$\text{Here, } 2x + 8y - 10z \text{ and } 5x - 7y + 12z$$

$$= 2x + 5x + 8y - 7y - 10z + 12z$$

$$= (2 + 5)x + (8 - 7)y + (12 - 10)z$$

$$= 7x + y + 2z$$

Adding same vertically

$$\begin{array}{r} 2x + 8y - 10z \\ 5x - 7y + 12z \\ \hline 7x + y + 2z \end{array}$$

I understand, like terms should be in the same column while adding vertically.



### Example 5

Subtract  $(2a + 3b)$  from  $3a + 4b + 7c$

Here,

$$\begin{aligned}3a + 4b + 7c - (2a + 3b) \\= 3a + 4b + 7c - 2a - 3b \\= (3a - 2a) + (4b - 3b) + 7c \\= (3 - 2)a + (4 - 3)b + 7c \\= a + b + 7c\end{aligned}$$

Subtracting vertically

$$\begin{array}{r}3a + 4b + 7c \\2a + 3b \\- \quad - \\a + b + 7c\end{array}$$

In this way, while subtracting the sign of like terms that should be subtracted will be changed. If + then - and if - then +.



### Example 6

What should be added to  $5a + 6b$  to make it  $7a + 2b$ ? Let's think it this way, what should be added to 5 to make 7? Simply can be said 2, but which mathematic rule is hidden here? That should be think. Given number 5, number that should be made is 7. Which number should be added to make 7? We came to know the number that should be added is 2. Yes, 2 is obtained if 5 is subtracted from 7. So, if the given number is subtracted from the number that should be made, the required number comes. So, in the above problem.

$$\begin{aligned}7a + 2b - (5a + 6b) \\= 7a + 2b - 5a - 6b \\= 7a - 5a + 2b - 6b \\= 2a - 4b \text{ is required number.}\end{aligned}$$

### Example 18.2

1. Simplify:

- |                        |                    |                        |
|------------------------|--------------------|------------------------|
| a. $a + 3a$            | b. $3m + 4m$       | c. $45p - 13p$         |
| d. $17n - 3n$          | e. $3x + 4x - 5x$  | f. $5cd - 10cd + 12cd$ |
| g. $30pr - 35pr + 5pr$ |                    |                        |
| h. $17x + 3 + 5x - 2$  | i. $a + b + a + c$ |                        |

2. Add:

a. 
$$\begin{array}{r} 13c \\ + 8c \\ \hline \end{array}$$

b. 
$$\begin{array}{r} 10c \\ + 8c \\ \hline \end{array}$$

c. 
$$\begin{array}{r} 4a + 5b \\ + 4a + 7b \\ \hline \end{array}$$

d. 
$$\begin{array}{r} 4m + 3n \\ + 2m + n \\ \hline \end{array}$$

e. 
$$\begin{array}{r} 9ab + 5bc \\ + 7ab - 3bc \\ \hline \end{array}$$

f. 
$$\begin{array}{r} 16ab + 14cd \\ + 2ab - 10cd \\ \hline \end{array}$$

3. Subtract:

a. 
$$\begin{array}{r} 7m \\ - 2m \\ \hline \end{array}$$

b. 
$$\begin{array}{r} 16x \\ - 9x \\ \hline \end{array}$$

c. 
$$\begin{array}{r} 7x + 9y \\ - 3x + 4y \\ \hline \end{array}$$

d. 
$$\begin{array}{r} 3pq - 2qr \\ - 2pq - 4qr \\ \hline \end{array}$$

e. 
$$\begin{array}{r} 14ab - 7bc \\ - 9ab + 6bc \\ \hline \end{array}$$

f. 
$$\begin{array}{r} 12mn + 10xy \\ 10mn + 2xy \\ \hline \end{array}$$

4. Add the following expressions vertically:

a.  $5x + 7y - z$  and  $6x + 3y - z$

b.  $m - 4n + 3$  and  $7m + 5n + 2$

c.  $17ab - 13bc + 8ca$  and  $13ab + 2bc - 6ca$

d.  $12x - 16y + 2z$  and  $2x + 8y - z$

5. Subtract the following expressions vertically:

a.  $3x + 2y + 10z$  from  $5x + 7y + 12z$

b.  $a + 3b + c$  from  $3a + 5b + 7c$

c.  $7bc - 2ab + 3ac$  from  $13bc + 11ab + 4ac$

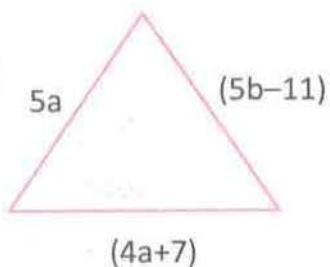
6. If  $a = 2\text{cm}$  and  $b = 9\text{cm}$ , find the perimeter of the triangle given here.

7. What should be added to  $x + y$  to make  $7x + 3y$ ?

8. By how much  $7x - 4y + 3z$  is greater than  $3x - 6y + z$ ?

9. What should be added to  $4a + 36$  to make  $7a + 116$ ?

10. What should be added to  $2a + 7b + 4c$  to make  $7a + 7b + xc$ ?



### 18.3 Equation

In a football game, in first half of the game A hit 5 goals and became equal to team B. Here, goals hit by B can be supposed  $x$ . The goal of team B is equal to the term A so  $x = 5$  can be written.  $x = 5$  is an equation. In the second half both the teams made 2/2 goals and equally game had ended. Total goals of first half and second half of team B is  $x + 2$  and team A is  $x + 2$  but both the teams have equal goals.

So,  $x + 2 = 5 + 2$

Or,  $x + 2 = 7$  is the next equation.

In this way equal quantity can be added on both sides of an equation. It is called equality fact.

Let's think it in other way. Equation of whole game is  $x + 2 = 7$ . Now, how to find the number of goals  $x$  in first half?

We know that there are 2/2 goals in second half. So, to find the number of goals in first half, we can subtract 2/2 on both sides of equation.

So,  $x + 2 - 2 = 7 - 2$

Or,  $x = 5$  is number of goals in first half.

$x = 5$  is the correct solution of this equation because at the first of lesson, it has been said that team A and team B with equal goals. In this way, equal quantity can be subtracted on both sides of equation, can't it?



Can we multiply or divide both sides of equation by equal quantity?

Let's see next example.

Shiva had 6 apples, Kailash had as much apples as Shiva.

Here, if  $x$  denoted apples with Kailash,  $x = 6$ . Since both of them had equal number of apples. This is an equation.

Now, if both of them ate their own half of the apples, then both of them have equal apples. Hence,  $\frac{1}{2}$  of 6 means  $6 \times \frac{1}{2}$  and  $\frac{1}{2}$  of  $x$  means  $x \times \frac{1}{2}$ . Both had equal number of apples.

So,  $x \times \frac{1}{2} = 6 \times \frac{1}{2}$

Or,  $\frac{x}{2} = 3$  It means  $\frac{1}{2}$  of  $x$  is 3, which is the remaining number of apples that both of them have. Here, it is same as the equation  $x = 2$  is either multiplied both sides by  $\frac{1}{2}$  or divided both sides by 2. So, both sides of equation can be multiplied or can be divided by equal quantity.

Now, remember the following statements of equality according to the above discussion.

- If equal is added to equal, the sum is also equal.
- If  $x = 5$ ,  $x + 2 = 5 + 2$
- If equal is subtracted from equal, the difference is also equal.
- If  $x = 5$ ,  $x - 2 = 5 - 2$
- If equal is multiplied to equal, the product is also equal.
- If  $x = 6$ ,  $x \times 2 = 6 \times 2$
- If equal is divided by equal, the quotient is also equal.
- If  $x = 6$ ,  $\frac{x}{3} = \frac{6}{3}$

### Example 1

Solve:

$$x + 5 = 7$$

Here,  $x + 5 = 7$

Or,  $x + 5 - 5 = 7 - 5$  [subtracting 5 on both sides]

Or,  $x = 2$