

My Mathematics

Grade 4

Government of Nepal
Ministry of Education
Curriculum Development Centre

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Preface

With the aim of making school level education more purposeful, behavioral and contextual, a process of continuous revision and reform of curriculum and textbook 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 grass-roots 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.

This book (Nepali version) was originally written by Dr. Santosh Man Maskey and Mr. Hari Narayan Upadhyaya and edited by Sunma Tuladhar in 2049 BS. Likewise, in accordance with the revised curriculum of primary level 2065 BS., 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. Language of this book was edited by Ramesh Ghimere. Art editing and layout concept of this book was done by Shreehari Shrestha by making it four colour. CDC would like to thank all those who contributed in developing this book.

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.

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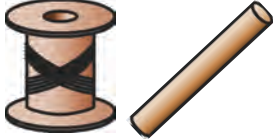


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Geometry

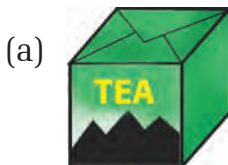
1.1 Solid shapes

Some solid shapes, their mathematical names and physical models are given in the following table. Could you add two more examples in each row as given in the table?

Solid shapes	Mathematical names	Physical models
	Cuboid (All surfaces are rectangular)	
	Cube (All surfaces are square)	
	Cylinder (Bases are circular and surrounded by curved surface)	
	Sphere (Round solid shape)	

Exercise

1. Write the mathematical names for each of the following solid objects.

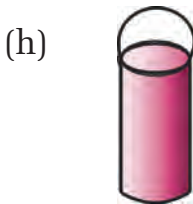
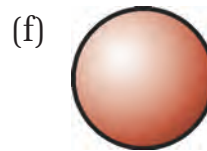
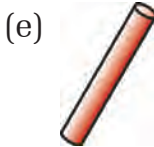
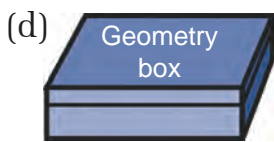


(b)



(c)





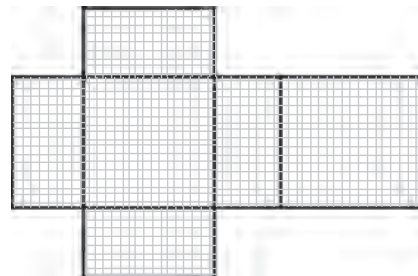
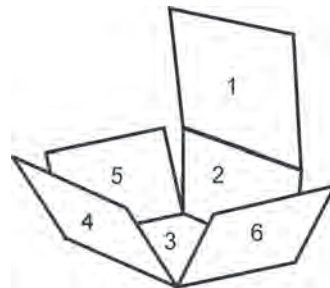
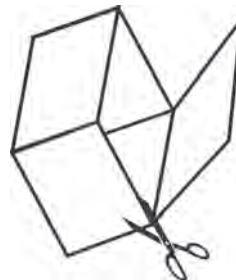
1.2 Face, edge and corner of solid

Could you tell which geometrical shape is the chalk box? Yes, it is an example of cuboid. Cut the chalk box with scissors along the edges and open it as shown in the figure. What do you find?

A cuboid has six rectangular faces. For example: Chalk box

All faces of a cuboid are rectangular. A cuboid has six rectangular faces.

Net is a drawing which shows all faces of a solid. We can make solid objects by folding nets.

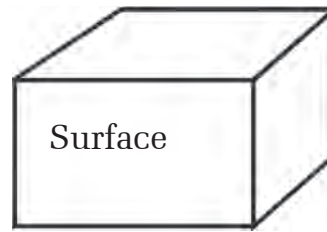


Net of cuboid

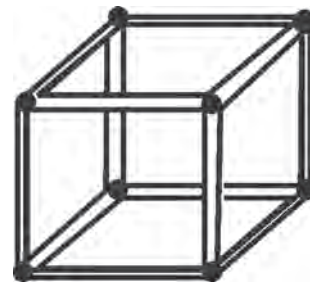
We can make a chalk box again by folding the previous six faces which is cut above. Try it yourself.

Skeletal models of solids can be made by using straws of wheat, pipes of cold drinks, sticks, etc.

In the adjoining figure, figure of a cuboid and skeletal model of that cuboid are given. The skeletal model is made by pipes. Such models made by pipes, straws and sticks are called the skeletal models.



Solid object



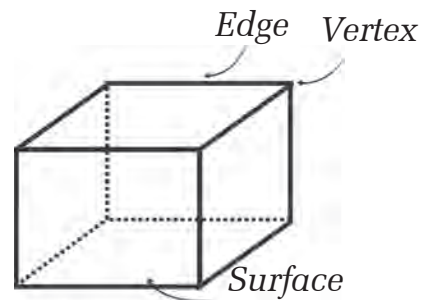
Skeletal model

How many pieces of pipes are used in the above skeletal model? Each piece of pipe represents the edge of the solid.

In the above figure, three edges of the skeletal model meet at a point. Such points are called vertices of the solid.

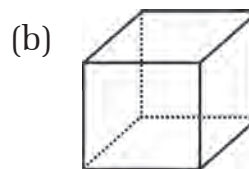
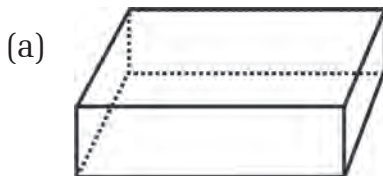
In the above cuboid, how many faces, edges and vertices are there? Above activities help us to draw the following conclusion:

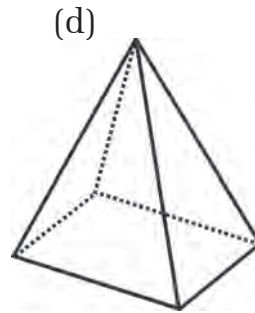
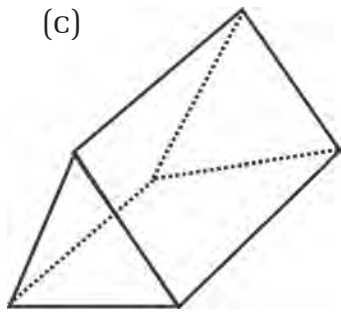
There are 6 faces, 12 edges and 8 vertices in a cuboid.



Exercise

1. Write the number of faces, edges and vertices of the following solids.





Teaching Instructions:

Collect some solid objects found in your surrounding. Show each object and tell their local and mathematical names. Draw a table and write local and mathematical names. Ask the students to collect solid objects and identify their mathematical names and classify. Use practical method to teach faces, edges and vertices.

1.3 Angles

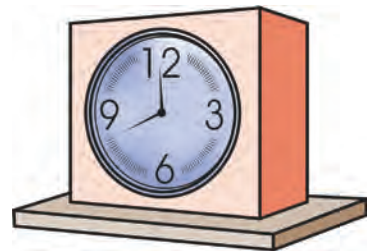
When we lift any object with hand, our arms make an angle.



Our legs make angles while walking.

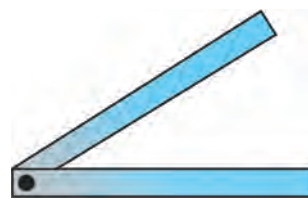
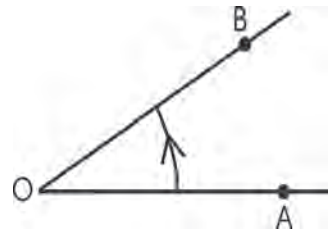


Hands of a clock make different angles at different time.

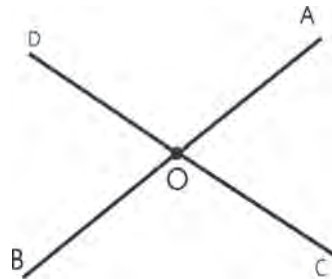


Similarly, can you give some more examples of angles?

When the end of a line segment is kept fixed and other end of line segment is rotated, an angle is formed. In the adjoining figure, point "O" of line segment "OA" is kept fixed and point "A" is rotated, when it reaches at point 'B', it makes an angle AOB. It is written as $\angle AOB$. The angle can also be written as $\angle BOA$. But it cannot be written as $\angle OBA$ or $\angle OAB$, why? A model of angle can be made by using two long strips of card board as shown in the adjoining figure.

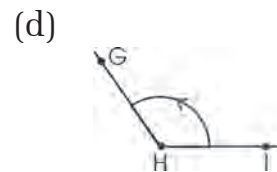
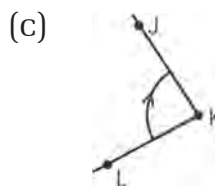
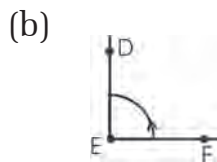
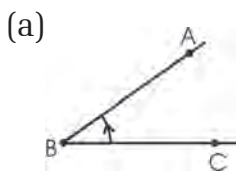


When two line segments intersect each other, angles are formed. In the adjoining figure, line segment AB and CD intersect at point O, and $\angle AOC$ is formed. There are some more angles in the figure, can you write names of angles?



Exercise 1.3

1. Write the names of the following angles in two ways:



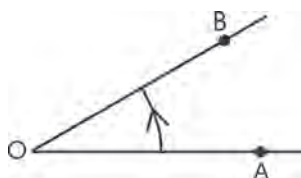
2. The objects that can be used to make angles, and objects having angles are given below. Write three such figures in your exercise book.



Teaching Instructions:

Ask the students to use physical objects as the example of angles. The example given here are symbolic only.

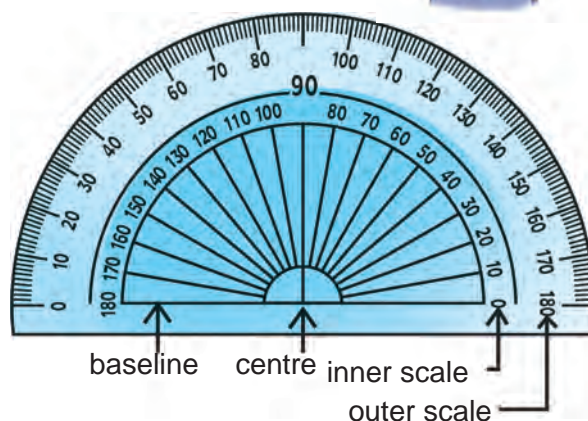
1.4. Measurement of angles



What is the measurement of this angle? How can you find it?



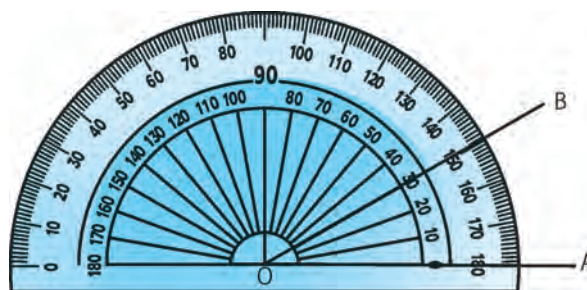
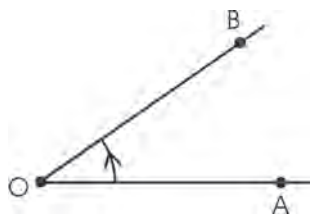
We use protractor to measure angles. The unit of an angle is measured in degree. Look at the protractor carefully given in the figure. There are two scales in the protractor, inner scale and outer scale. There is 0° mark in inner scale and 180° mark in outer scale at the same point. Similarly, there is 180° mark in inner scale and



0° starts mark in outer scale at the same point. In the inner scale, 0° from the right side and gradually increases up to 180° reaching left side. Likewise, in the outer scale, 0° starts from left side and gradually increases up to 180° reaching the right side. Two scales are in the protractor to measure angles conveniently. Let's study how to measure an angle.

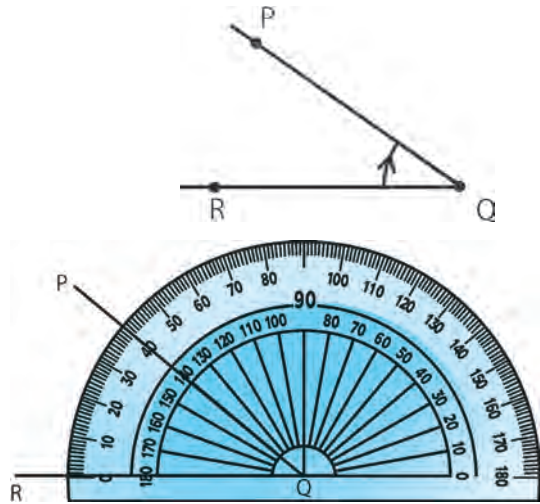
To measure $\angle AOB$

- Fix the protractor over the angle keeping the point O at the centre of the protractor and OA along the base line of the protractor.
- The line segment OB passes through 30° in the inner scale. Therefore, $\angle AOB$ is 30° .



Similarly, to measure $\angle PQR$

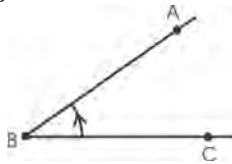
- Fix the protractor over the angle keeping the point Q at the centre of the protractor and QR along the base line of the protractor.
- The line segment PQ passes through 40° in the outer scale. Therefore, $\angle PQR$ is 40° .



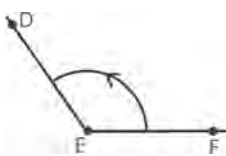
Exercise 1.4

- 1. Measure the size of each of the following angles using protractor and write in your exercise book.**

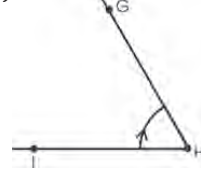
(a)



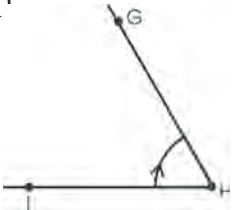
(b)



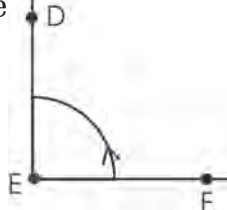
(c)



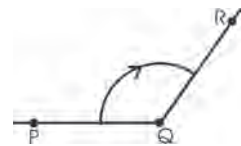
(d)



(e)

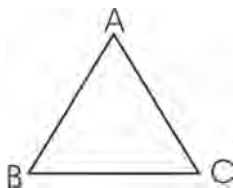


(f)

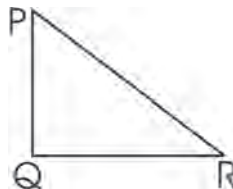


- 2. Measure the size of internal angles of the following triangles:**

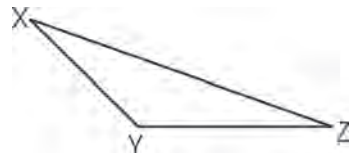
(a)



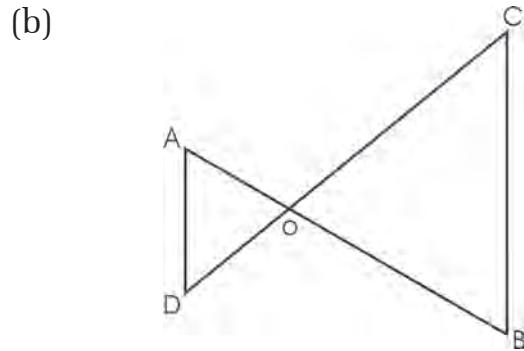
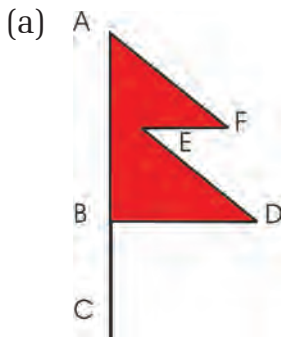
(b)



(c)



3. Find the size of angles in the following figures.



Teaching Instructions:

While teaching to measure size of angles, to boost the self confidence of the students, draw the angles of different sizes on the board and ask them to measure the size. Collect the objects which represent angles found in your surrounding, and draw or ask them to draw figures of the objects. Then, ask them to measure the size of the angles.

1.5 Construction of angles in the interval of 10° .



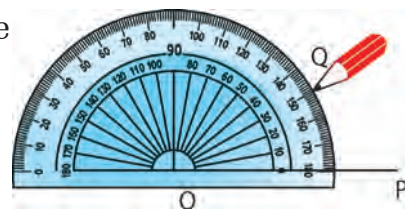
I learnt to measure the size of angle but I cannot construct the angle of the given size, what to do?

Don't worry. It's easier.

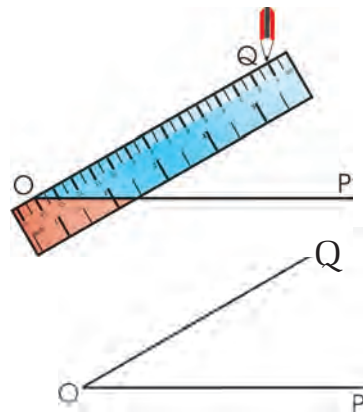


Let's construct an angle of 30° .

- Take a point O in your exercise book.
- Draw a straight line segment OP.
- Place the protractor in such a way that its centre is at point O and adjust base line of the protractor along OP.
- Observe 30° on the inner scale and mark a point Q against it.



- Remove the protractor and join O and Q using a ruler.
- The POQ is the required angle of 30° .
- $\angle POQ = 30^\circ$



Exercise 1.5

1. Construct angles of the following sizes by using the protractor.

- | | | | | |
|----------------|-----------------|-----------------|-----------------|-----------------|
| (a) 20° | (b) 40° | (c) 50° | (d) 60° | (e) 80° |
| (f) 90° | (g) 110° | (h) 120° | (i) 140° | (j) 150° |

Teaching Instructions:

While teaching construction of angle, it will be better to demonstrate on the board by using educational materials (protractor and ruler), and ask the students to follow as classwork.

1.6 Angles less than and greater than 90°

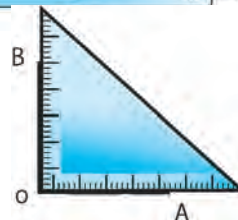
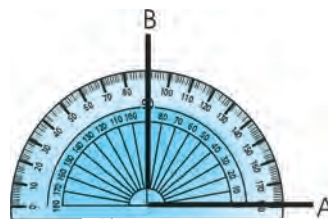
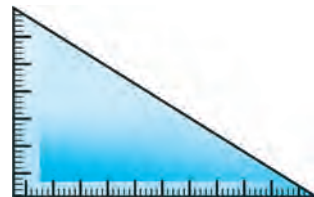
The figure alongside is the figure of set square. One of the angles of the set square is 90° .

Construct 90° by using protractor.

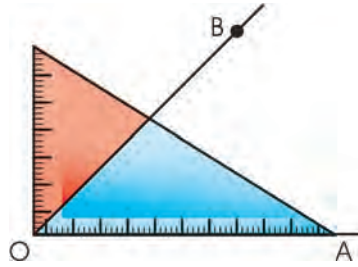
Place a set square as shown in the figure. Adjust 90° corner of the set square just over point O of $\angle AOB$ and edges of the set square along the side of the arms of the angle.

An angle of 90° is called a right angle.

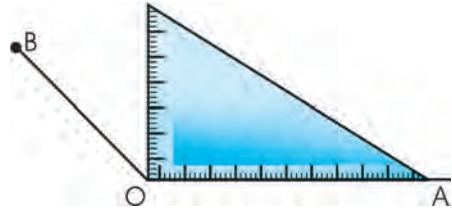
Right angle, angles greater or less than right angle can be recognized by using a set square.



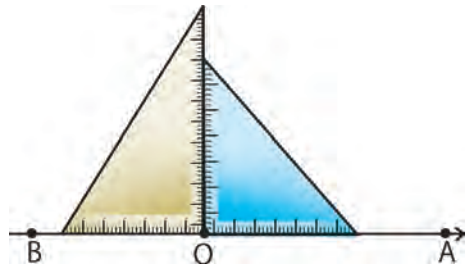
In the adjoining figure, arm OB of $\angle AOB$ lies within the set square as the base line of the set square is adjusted along the arm OA. In such case, $\angle AOB$ is less than 90° . An angle of size lesser than 90° is called an acute angle.



In the adjoining figure, arm OB of $\angle AOB$ lies outside the set square as the base line of the set square is adjusted along the arm OA. In such case, $\angle AOB$ is greater than 90° . An angle of size greater than 90° is called an obtuse angle.

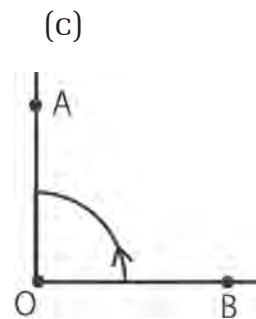
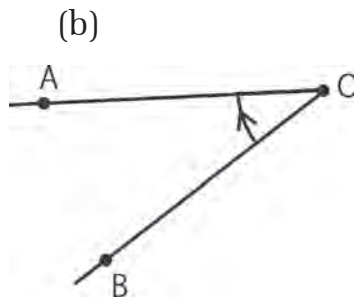
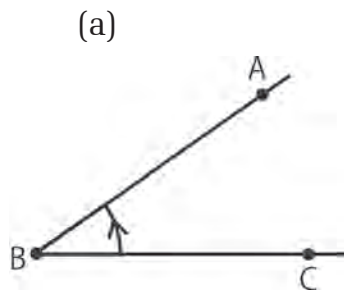


Some angle's size may be of two right angles. Such angles are called straight angles. The size of a straight angle is 180° . In the adjoining figure, arms OA and OB of $\angle AOB$ lie along the bases of set squares (two set squares). Therefore, $\angle AOB = 180^\circ$. $\angle AOB$ is a straight angle.



Exercise 1.6

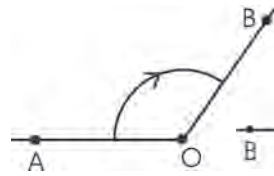
1. Estimate which of the following angles is right, acute, obtuse or straight angle. Use a set square to check your answer.



(d)



(e)

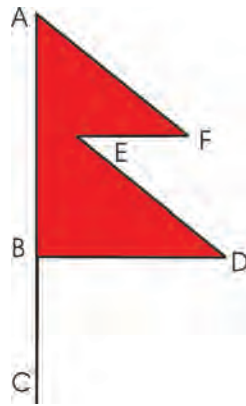


(f)

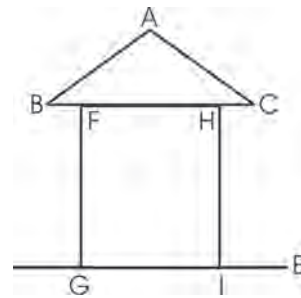


2. Name all angles in each figure below and classify them into obtuse, acute or right angles.

(a)



(b)



3. Classify the angles formed by hands in each of the following clocks into acute, right, obtuse and straight angle.

(a)



(b)



(c)



(d)



Teaching Instructions:

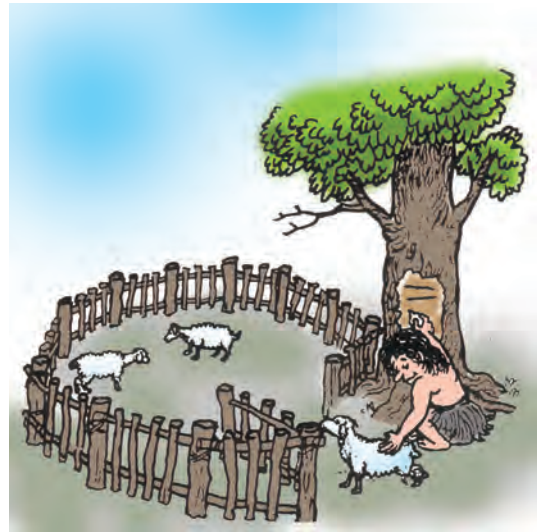
Here, set squares are used to classify angles. Besides that protractor can be used to measure angles. It will be appropriate to use paper cutting set squares to classify angles into acute, right and obtuse angles. In order to classify angles formed in objects found in the surrounding, ask the students to collect such objects found in their surrounding.

2

Concept of Numbers

2.1 Origin of numbers

Our forefathers had no numerals as we have today. They had faced difficulty to live in the absence of counting numerals. What problems might they have faced in the absence of counting numerals? How did they know if any sheep is lost from the herd in the absence counting numerals? Look at the figure, did you know how they used to count at that time?



They used to put sheep one by one in the pen and would draw a tally mark for each sheep in the tree or wall. This method continued for a long time. They might have used one pebble for each object for counting because they faced difficulty in drawing tally marks. This is only guess but tally marks are found on the walls of the old caves at many places. After that, it is said that people also used to make knots in the strings as the number of objects they had.

After many years, people began to use their fingers for counting numbers. They had not faced any difficulty to count twenty objects using their fingers in hands and feet. It is difficult to say exactly when counting was started in the history of human development. But it is predicted that counting was started about fifty thousands years ago.



One object



Two objects



Three objects

There were different races in different countries and their development histories were also different. Therefore, different races of the world had developed their own counting numerals at different times. It took place after thousands of years of origin of human beings.

I	II	III	IV	V	VI	VII	VIII	IX	X
---	----	-----	----	---	----	-----	------	----	---

The above numerals which were developed at the time of Roman civilization are still in use. Where have you seen the use of these numerals? Can you make a list?

The counting numerals, which we use at present, were developed first by the Hindus. We are using the developed form of the numerals ०, १, २, ३, ४, ५, ६, ७, ८, ९. developed by the Hindus. Arabians spread these numerals all over the world. So these numerals are called Hindu Arabic numerals. The developed forms of numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are used all over the world today.

Hindu Arabic numerals is also known as decimal system. In this lesson, you will learn to read, write and count Hindu Arabic numerals.

Read and understand:

Number made by digit	Number	Number name
The smallest number of one digit	1	One
The smallest number of two digits	10	Ten
The smallest number of three digits	100	One hundred
The smallest number of four digits	1000	One thousand
The smallest number of five digits	10000	Ten thousands
The smallest number of six digits	100000	One lakh (One hundred thousand)
The smallest number of seven digits	1000000	Ten lakh (Ten hundred thousand)
The smallest number of eight digits	10000000	One crore

Example

1. Write the place value of numeral 4 in the number 2345687, and write its expanded form.

Solution:

Here, the given number is written in the place value table as follows:

Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	3	4	5	6	8	7

The numeral 4 is in the place of ten thousands in the place value table. Therefore, the expanded form of 4 = $4 \times 10,000 = 40,000$ (Forty thousands).

2. Write 1258712 in expanded form.

Solution:

$$\begin{aligned} 1258712 &= 1 \times 10,00,000 + 2 \times 1,00,000 + 5 \times 10,000 + 8 \times 1,000 + \\ &7 \times 100 + 1 \times 10 + 2 \times 1 \\ &= 10,00,000 + 2,00,000 + 50,000 + 8,000 + 700 + 10 + 2 \end{aligned}$$

Exercise 2.1

1. Write the place of 5

(a) 1,53,268

(b) 51,68,719

(c) 12,67,815

(d) 3,45,628

(e) 34,21,451

(f) 27,35,869

2. Write in expanded form.

(a) 3, 25,614

(b) 19, 82,543

(c) 67, 89,123

(d) 67, 30,195

(e) 2, 00,465

(f) 70, 40,053

2.2 Number up to crore

2.2 (a) Read, discuss and write in your copy.

Lakhs	Ten Thousands	Thousands	Hundreds	Tens	One
3	6	5	2	4	8

3 is in the place of lakh. Therefore, the place value of 3 = $3 \times 1,00,000$
= 3,00,000 (three lakhs)

Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	9	2	5	2	0

6 is in the place of lakh. Therefore, the place value of 6 = $6 \times 1,00,000$
= 6,00,000 (six lakhs)

6,92,520 = Six lakhs ninety two thousands five hundreds and twenty.

8,06,888 = Eight lakhs six thousands eight hundreds and eighty eight.

9,72,506 = Nine lakhs seventy two thousands five hundreds and six

Five lakhs thirty six thousands nine hundreds and twelve = 5,36,912.

Seven lakhs thirteen thousands and fifteen = 7, 13, 015.

Teaching Instructions:

Let the students remember the numeral names and use place value table to give the concept of numbers up to lakh.

Exercise 2.2

1. Write the place value of 4.

(a) 3,54,032 (b) 3,45,032 (c) 4,35,032 (d) 3,50,432

2. Write the digits which are in place of lakhs.

(a) 2,54,321 (b) 5,63, 204 (c) 4,08,452 (d) 9,75,608

3. Write the number name.

(a) 2,56,312 (b) 3,35,258 (c) 5,23,907 (d) 6,66,298

4. Write the number

- (a) One lakh sixty one thousands five hundreds and six
- (b) Three lakhs twenty six thousands two hundreds and seventeen
- (c) Five lakhs twenty seven thousands eight hundreds and twenty
- (d) Nine lakhs seventy five thousands four hundreds and twenty two

2.2 (b) Read, discuss and write in your exercise book

What comes after lakh in the place value table?

Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones	
1	0	0	0	0	0	= One lakh
2	0	0	0	0	0	= Two lakhs
5	0	0	0	0	0	= Five lakhs
9	0	0	0	0	0	= Nine lakhs

Ten lakhs comes after nine lakhs.

Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones	
1	0	0	0	0	0	0	= Ten lakhs

Put 15,63,842 in place value table.

Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
1	5	6	3	8	4	2

One ten lakh and five lakhs = 15 lakhs

Therefore, 15,63,842 = Fifteen lakhs sixty three thousands eight hundreds and forty two.



What comes after 19 lakhs?



20 lakhs comes after 19 lakhs.

20,16,857 = Twenty lakhs sixteen thousands eight hundreds and fifty seven.
Twenty five lakhs twenty six thousands six hundreds and fifty six
= 25,26,656

Exercise 2.3

1. Write which digits are in the place of ten lakhs

(a) 12,23,345 (b) 15,25,904 (c) 21,22,608 (d) 29,17,892

2. Write the number name

(a) 15,27, 981 (b) 25,27,003 (c) 26,18,598 (d) 29,82,581

3. Write the number .

- (a) Fifteen lakhs six thousands three hundreds and seventeen
- (b) Twenty one lakhs sixteen thousands five hundreds and twenty seven
- (c) Twenty four lakhs five thousands and fifteen
- (d) Twenty nine lakhs eleven thousands two hundreds and thirty one

Teaching Instructions:

Tell students to write number and number name up to thirty lakhs by using place value table.

2.2 (c) Read, discuss and write in your exercise book.

29,00,000 = Twenty nine lakhs.

If we add 1,00,000 in 29,00,000, the sum is 30,00,000.

Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	2	9	3	6	5	7

Three ten lakhs and two lakhs = thirty two lakhs

32,93,657 = Thirty two lakhs ninety three thousands six hundreds and fifty seven.

39,01,500 = Thirty nine lakhs one thousand five hundreds.

45,42,396 = Forty five lakhs forty two thousands three hundreds and ninety six.

48, 34, 673 = Forty eight lakhs thirty four thousands six hundreds and seventy three

Exercise 2.4

1. Put the following numbers in place value table and write number names.

(a) 43,50,432

Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
4	3	5	0	4	3	2

Forty three lakhs fifty thousands four hundreds and thirty two.

(b) 35,78,045

(c) 36,48,810

(d) 39,82,847

(e) 44,87,627

(f) 46,72,345

(g) 48,02,212

2. Write the number

(a) Thirty six lakhs eighty three thousands five hundreds and nine

(b) Forty seven lakhs seventy five thousands six hundreds and sixty

(c) Forty two lakhs twenty three thousands five hundreds and eighty two

(d) Fifty lakhs sixty seven thousands nine hundreds and six

2.2 Read, Discuss and Write in your copy.

Ten Lakhs	Lakhs	Ten Thousand	Thousands	Hundreds	Tens	Ones	
5	1	0	0	0	0	0	Fifty one lakhs
5	9	0	0	0	0	0	Fifty nine lakhs
6	0	0	0	0	0	0	Sixty lakhs
6	9	0	0	0	0	0	Sixty nine lakhs
7	5	0	0	0	0	0	Seventy five lakhs
8	9	0	0	0	0	0	Eighty nine lakhs
9	9	0	0	0	0	0	Ninety nine lakh

83,82,653 = Eighty three lakhs eighty two thousands and six hundreds fifty three

97,56,369 = Ninety seven lakhs fifty six thousands three hundreds and sixty nine.

Fifty six lakhs twenty seven thousands nine hundreds and twelve = 56,27,912.

Eighty two lakhs nine thousands six hundreds and thirty two = 82,09,632.

If we add 1 in 99,99,999, we get 1,00,00,000 (one crore).

Exercise 2.5

1. Fill the place value table and write number names as given in example.

(a) 59,16,713

Ten Lakhs	Lakhs	Ten	Thousands	Hundreds	Tens	Ones
5	9	1	6	7	1	3

= Fifty nine lakhs sixteen thousands and seven hundreds thirteen

(b) 57,26,696 (c) 64,46,931 (d) 66,23,549 (e) 72,39,302

(f) 89,40,200 (g) 92,51,339 (h) 94,07,737 (i) 97,38,392

2. Write the number .

(a) Fifty two lakhs six thousands and fifty three = 52,06,053

(b) Sixty three lakhs fifty six thousands and seventeen

(c) Seventy four lakhs nine thousands seven hundreds and twenty seven

(d) Eighty seven lakhs fifty five thousands four hundreds and forty four

3. Write in the interval of one lakh from 50,00,000 to 60,00,000.

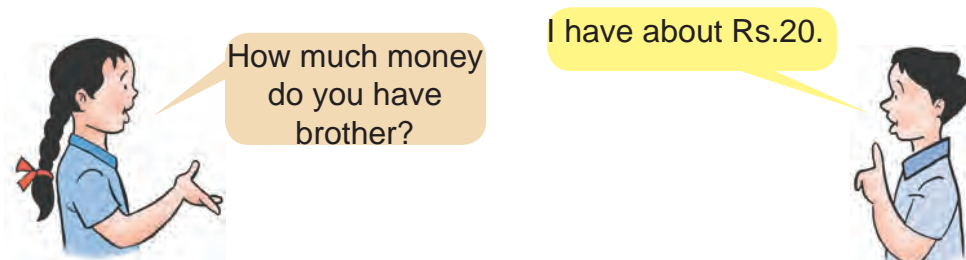
4. Write in the interval of ten lakhs from 30,00,000 to 90,00,000.

Teaching instructions:

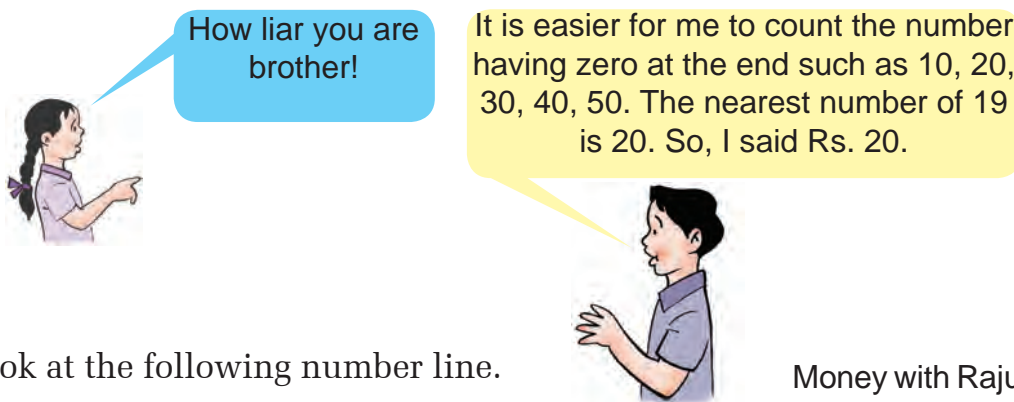
Use place value table to give the concept of numbers up to one crore. Let the students practise to write numbers and number names.

2.3 Rounding off Numbers

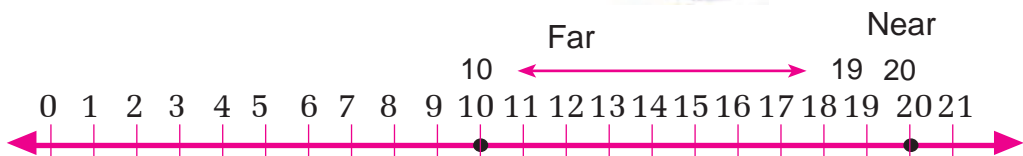
Rounding off three digit numbers into the nearest hundred



Shila counted the money but there was only Rs. 19.



Look at the following number line.



In the number line, number 19 is nearer to 20 but farther from 10. Thus, the approach of writing any number in the form of the nearest number having zero in the last digit such as 10, 20, 30,,100, 200, 300, etc. is called rounding off numbers.

Numbers rounding off to the nearest 10 are: 10, 20, 30,...120, 130,...2350, ...etc.

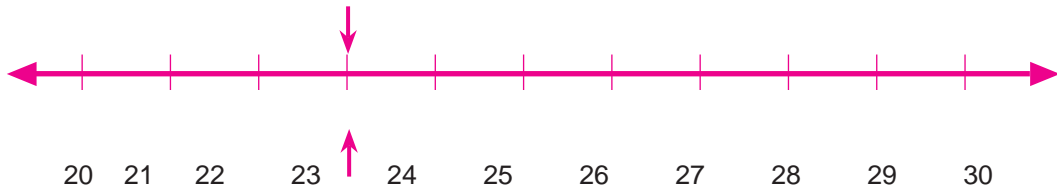
Numbers rounding off to the nearest 100 are: 100, 200,....., 2300,.....etc.

Teaching Instructions:

Make the students discuss the method of rounding off numbers to the nearest ten and hundred by using number line.

Example 1

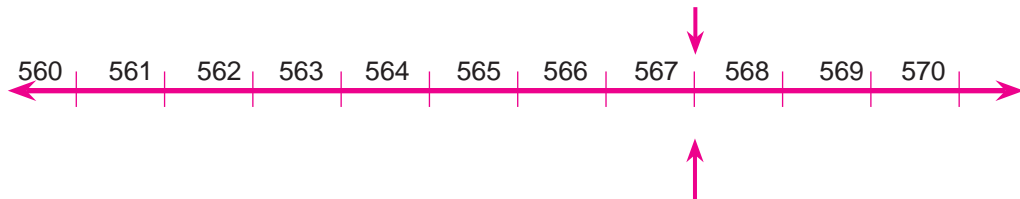
Round off 23 to the nearest ten



23 is nearer to 20. So, 23 is rounded off to the nearest ten = 20.

Example 2

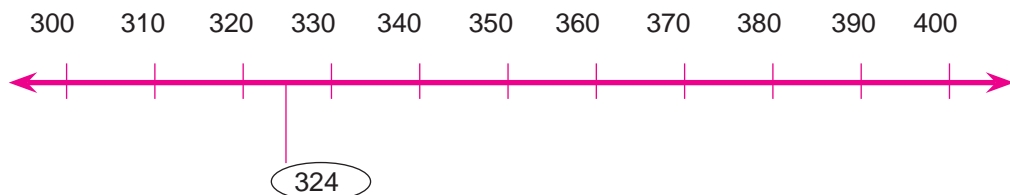
Round off 567 to the nearest ten.



567 is nearer to 570. So, 567 is rounded off to the nearest ten = 570.

Example 3

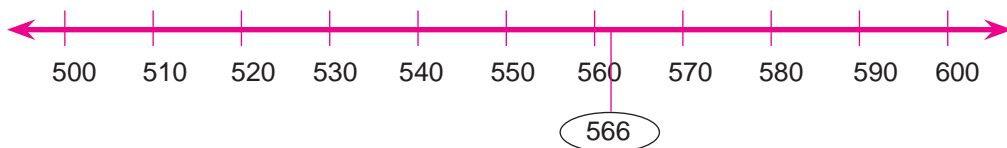
Round off 324 to the nearest hundred.



324 is nearer to 300. So, 324 is rounded off to the nearest hundred = 300.

Example 4

Round off 566 to the nearest hundred.



566 is nearer to 600. So, 566 is rounded off to the nearest hundred = 600.

Example 5

Round off 15 to the nearest ten.



15 is exactly in the middle of 10 and 20. In practice, while rounding off 15 to the nearest ten = 20.

Example 6

Round off 250 to the nearest hundred.



250 is exactly in the middle of 200 and 300. In practice, while rounding off 250 to the nearest hundred = 300.

Exercsie 2.6

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

(a) 44



44 is round off to 40 in the nearest ten.

(b) 16 (c) 12 (d) 125 (e) 276 (f) 561 (g) 672

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

(a) 720

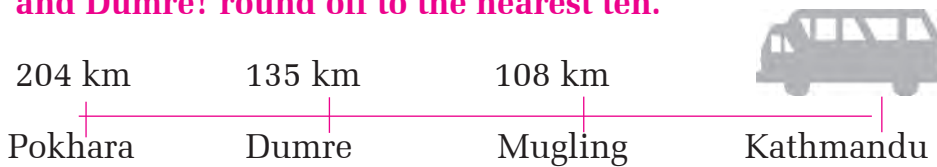


720 is round off to 720 in the nearest hundred.

(b) 390 (c) 550 (d) 450 (e) 1691

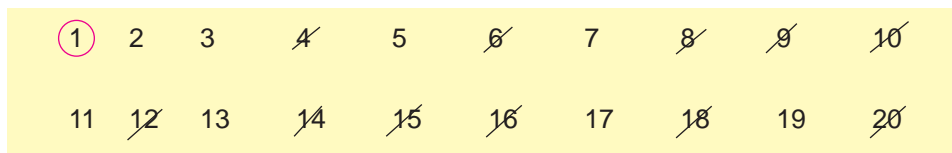
- (f) 6621 (g) 505 (h) 360 km (i) 570 m.
 (j) 145 cm.

3. The given figure shows the distance from Kathmandu to Pokhara. What is the distance in km from Kathmandu to Pokhara, Mugling and Dumre? round off to the nearest ten.



2.4 Prime and composite numbers

Write the numbers from 1 to 20 in rows in order.



- Encircle the number 1.
- Cross out the numbers, which are divisible by 2, except 2. (For example: ~~4~~, ~~6~~)
- Cross out the numbers which are divisible by 3, except 3 e.g. ~~6~~, ~~9~~.
- All the numbers, which are not crossed out in the above are prime numbers. Which numbers are they? Find which numbers exactly divide. Let's try.

The number which is exactly divisible by 1 and itself is called a prime number. For example: 2,3,5,7,11,13, etc.

The number which is exactly divisible by 1, itself and another numbers is called a composite number. For example: 4,6,8,10, etc.

Exercise 2.7

1. How many prime and composite numbers are there from 1 to 25?

2. Write numbers from 1 to 50 in row in order.

As done above encircle the number 1, cross out the numbers exactly divisible by 2 except 2, cross out the numbers exactly divisible by 3 except 3.

Similarly, keep on crossing out the numbers divisible by 5 and 7

How many prime numbers are there? Write all the prime numbers.

How many composite numbers are there? Write all the composite numbers.

How many prime numbers are there, which are greater than 30 and less than 50?

Add any two prime numbers from 1 to 50 except 2. What is the nature of the sum ?

3. Which is prime and composite number in 27 and 37? Why?

Teaching Instructions:

Let the students practice in finding prime and composite numbers from 1 to 20 using chart. 1 is neither prime nor composite number.

2.5 Prime Factors

Factors from 1 to 99

Example 1

What are the factors of 12?

If 12 is divided by 2, quotient is 6.

Again if 6 is divided by 2, quotient is 3.

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

$$\begin{array}{r|l} 2 & 12 \\ \hline 2 & 6 \\ & 3 \end{array}$$

$$\begin{array}{c} 12 \\ \swarrow \quad \searrow \\ 2 \times 6 \\ \swarrow \quad \searrow \\ 2 \times 3 \end{array}$$

Example 2

What are the factors of 36?

If 36 is divided by 2, quotient is 18.

If 18 is divided by 2, quotient is 9.

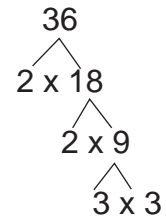
9 is not divisible by 2. 3 is greater prime number than 2.

If 9 is divided by 3, quotient is 3.

Therefore, $36 = 2 \times 2 \times 3 \times 3$

2, 2, 3 and 3 are the factors of 36.

$$\begin{array}{r|l} 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$



Exercise 2.8

1. Find the factors of the following:

(a) 18 (b) 24 (c) 32 (d) 48

(e) 72 (f) 91 (g) 95 (h) 64

Teaching Instructions:

Divide numbers by prime numbers such as 2, 3, 5, 7, 11, 13 etc. to make students find the prime factors. Do practice more exercises for factorization.

3

Basic Operation in Mathematics

3.1 Subtraction

Study, discuss and learn:



Total exercise books of Rs.65,325



Sold exercise books of Rs. 36,476



Left exercise books

A factory manufactured exercise books of amount Rs. 65, 325 in a day, and sold the exercise books of amount Rs. 36, 476. Exercise books of how much amount left?

Ten thousand	Thousand	Hundred	Ten	One
6	5	3 ¹	2 ¹⁵	5
- 3	6	4	7	6
				9

6	5	3 ²	2 ¹	5
- 3	6	4	7	6
			4	9

At first, subtract the number of ones place. We cannot subtract 6 from 5. So, we borrow 1 ten from 2 tens. 1 ten means 10 ones. 10 ones and 5 ones make 15 ones. Now subtract 6 ones from 15 ones then we get 9 ones.

1 ten is borrowed from 2 tens. So, only 1 ten is remained in ten's place. 7 tens cannot be subtracted from 1 ten. So, borrow 1 hundred from hundred's place. 1 hundred means 10 tens. 10 tens and 1 ten makes 11 tens. Now, subtract 7 tens from 11 tens, we get 4 tens.

There is only 2 hundreds remain in hundred's place. Borrow 1 thousand from 5 thousands because 4 hundreds cannot be subtracted from 2 hundreds. 1 thousand means 10 hundreds. 10 hundreds and 2

Exercise 3.1

1. Ten thousand Thousand Hundred Ten One

$$\begin{array}{r} 9 \qquad \qquad 2 \qquad \qquad 3 \qquad \qquad 1 \qquad \qquad 5 \\ - 7 \qquad \qquad 4 \qquad \qquad 5 \qquad \qquad 7 \qquad \qquad 6 \\ \hline \end{array}$$

2. Ten thousand Thousand Hundred Ten One

$$\begin{array}{r} 8 \qquad \qquad 3 \qquad \qquad 5 \qquad \qquad 7 \qquad \qquad 6 \\ - 4 \qquad \qquad 5 \qquad \qquad 3 \qquad \qquad 9 \qquad \qquad 6 \\ \hline \end{array}$$

3. 5 7 2 8 9 7

$$\begin{array}{r} 572897 \\ - 352890 \\ \hline \end{array}$$

4. 3 7 2 9 5 4

$$\begin{array}{r} 372954 \\ - 172868 \\ \hline \end{array}$$

5. 8 7 5 4 3 6

$$\begin{array}{r} 875436 \\ - 229758 \\ \hline \end{array}$$

6. 6 3 7 5 4 6

$$\begin{array}{r} 637546 \\ - 299679 \\ \hline \end{array}$$

Teaching Instructions:

Let the student practise subtraction of problems upto six digit numbers.

3.2 Daily life problems related to subtraction

Read and learn subtraction

Example 1

Pema had Rs. 28, 538. She bought a television at Rs. 25, 283. How much rupees remained with her?

Here,

Total amount = Rs. 28, 538

Spent amount = Rs. 25, 283

Remaining amount = ?

Rs. 28538

- Rs. 25283

Rs. 3255

Rs. 3,255 remained with Pema.

Example 2

Shivani thinks to start a cottage industry. She requires Rs. 1, 68, 539 for that but she has only Rs. 1, 59, 847. How much money will she require?

Here,

Required money = Rs. 1, 68, 539

Available money = Rs. 1, 59, 847

Insufficient money = ?

$$\begin{array}{r} \text{Rs. } 1, 68, 539 \\ - \text{Rs. } 1, 59, 847 \\ \hline \text{Rs. } 8, 692 \end{array}$$

Hence, insufficient money = Rs. 8, 692

Exercise 3.2

- Kajol Khatoon had Rs. 1, 75, 000. If she bought a motorcycle at Rs. 1,20, 775, how much money remained with her?**
- Population of a municipality was 3, 58, 238. If there were 1, 90, 789 males, how many females were there?**
- Barsha's annual family income is Rs. 2, 10, 000 and annual expense is Rs. 1, 92, 832. How much is the annual saving?**
- A village development committee's expenditure was only Rs. 7, 89, 569 out of total annual budget of Rs. 9, 00, 000. How much budget was left?**
- Krishna wrote number 6,54,321 and Srijana wrote number 9,85,738. Find the difference between these numbers.**
- Make two problems related to subtraction of six digit numbers as given above. Exchange the problems among your friends and solve.**

Teaching Instructions:

Ask the students to make simple and daily life related subtraction problems, and solve them.

3.3 Multiplication

Multiplication of three or more than three digit numbers by three digit number.

Read, discuss and learn.



256 oranges



256 oranges



256 oranges



256 oranges

How many oranges will be there if four baskets oranges are put together?

Total oranges = $256 + 256 + 256 + 256 = 1024$ oranges

Now, let's multiply 256 by 4.

$$\begin{array}{r} 256 \\ \times 4 \\ \hline 1024 \end{array}$$

Adding any number four times and multiplying it by 4 is the same.



Example 1

Multiply:

$$\begin{array}{r} 268 \\ \times 23 \\ \hline \end{array}$$

At first multiply by the number of ones place

$$\begin{array}{r} 268 \\ \times 3 \\ \hline 804 \end{array}$$

Then multiply by the number of tens place. There is 2 in ten's place. 2 ten means 20 ones. So, multiply by 20.

$$\begin{array}{r} 268 \\ \times 20 \\ \hline 5360 \end{array}$$

Then, add the products of both

$$\begin{array}{r} 268 \\ \times 23 \\ \hline 804 \\ + 5360 \\ \hline 6164 \end{array}$$

Example 2

Multiply:

$$\begin{array}{r} 3728 \\ \times 125 \\ \hline \end{array}$$

At first, multiply by the number of ones place

Then, multiply by the number of tens place.

There is 2 in tens' place. 2 ten means 20 ones.

So, multiply by 20.

There is 1 in hundreds' place. So, multiply by 100.

In short method

$$\begin{array}{r} 3728 \\ \times 125 \\ \hline 18640 \\ 74560 \\ + 372800 \\ \hline 466000 \end{array}$$

Then, add the three products.

$$\begin{array}{r} 3728 \\ \times 5 \\ \hline 18640 \\ 3728 \\ \times 20 \\ \hline 74560 \\ 3728 \\ \times 100 \\ \hline 372800 \\ + 372800 \\ \hline 466000 \end{array}$$

Note: Put one, two and three zeros in the product of any number as multiply any number by 10, 100 and 1000 respectively. For example, to multiply 20 by 8, multiply 2 by 8 and put one zero in the right of the product.

Exercise 3.3

Multiply:

1. $\begin{array}{r} 105 \\ \times 80 \\ \hline \end{array}$

2. $\begin{array}{r} 370 \\ \times 27 \\ \hline \end{array}$

3. $\begin{array}{r} 989 \\ \times 17 \\ \hline \end{array}$

4. $\begin{array}{r} 3255 \\ \times 120 \\ \hline \end{array}$

5. $\begin{array}{r} 4760 \\ \times 256 \\ \hline \end{array}$

6. $\begin{array}{r} 3926 \\ \times 376 \\ \hline \end{array}$

7. 7904×832

8. 9743×984

Teaching Instructions:

In the beginning, let the students practise separate multiplication by giving sufficient exercise as above. Then, introduce short method. Use multiplication table to teach multiplication.

3.4 Daily life problems related to multiplication

Read, discuss and learn.

Example 1

If a match box contains 56 sticks, how many sticks will be there in 312 such match boxes?

Here,

Sticks in one match box = 56

Number of match boxes = 312

Total number of sticks = ?

$$\begin{array}{r} 312 \\ \times 56 \\ \hline 1872 \\ 15600 \\ \hline 17472 \end{array}$$

Adding 312, repeated 56 times means multiplying 312 by 56.

Hence, there are 17, 472 sticks in the match boxes.

Exercise 3.4

1. A book has 184 pages. How many pages will be there in 35 such books?
2. If a television costs Rs. 25, 500, how much will 120 such televisions cost?
3. A box contains 105 sticks chalk. How many sticks will there in 503 such boxes?
4. Make 2 word problems as given above, exchange problems with your friends and solve.

Teaching Instructions:

Tell the students to make daily life related problems as given above, which include multiplication of three or more than three digit numbers by up to three digit numbers. Ask them to solve.

3.5 Division

Read, discuss and learn

If 768 oranges are divided equally among 96 persons, how many oranges will each person get?

Repeated subtraction	Division method
$\begin{array}{r} 768 \\ -96 \\ \hline 672 \\ -96 \\ \hline 576 \\ -96 \\ \hline 480 \\ -96 \\ \hline 384 \\ -96 \\ \hline 288 \\ -96 \\ \hline 192 \\ -96 \\ \hline 96 \\ -96 \\ \hline 0 \end{array}$	$\begin{array}{r l} 96 & 768 & 1 \\ \hline & -96 & \\ \hline & 672 & 1 \\ & -96 & \\ \hline & 576 & 1 \\ & -96 & \\ \hline & 480 & 1 \\ & -96 & \\ \hline & 384 & 1 \\ & -96 & \\ \hline & 288 & 1 \\ & -96 & \\ \hline & 192 & 1 \\ & -96 & \\ \hline & 96 & 1 \\ & -96 & \\ \hline & 0 & \end{array}$

Thus, subtracting 96 from 768 repeatedly eight times means dividing 768 into 96 equal parts results 8 in each part. In other words, 768 divided by 96 gives quotient 8.

So,
$$\begin{array}{r} 96)768(8 \\ \underline{-768} \\ 0 \end{array}$$

Therefore, division is a short form of regular subtraction of the same number.

Division of five digit number by two digit number (without remainder)

Read, discuss and learn.

Example 1

$$17028 \div 36$$

The divisor consists of two digits. The first two digit of dividend is 17. 17 is smaller than the divisor. So, divide the first three digits 170 of dividend.

$$\begin{array}{r} 473 \\ 36 \overline{) 17028} \\ \underline{- 144} \\ 262 \\ \underline{- 252} \\ 108 \\ \underline{- 108} \\ 0 \end{array}$$

The rounded off number of divisor 36 to the nearest ten is 40.

$40 \times 4 = 160$, it is near to 170. So, let us multiply 36 by 4.

Method of guessing division times

Think, how many times 17 of 170 is divisible by 3 of 36. Five times. 170 is divisible by 36 five times or less one time (four times).

Let's check. $36 \times 5 = 180$ Not divisible.

$36 \times 4 = 144$ Divisible.

To check whether the answer is correct or not, multiply the quotient by divisor.

$$\begin{array}{r} 473 \\ \times 36 \\ \hline 2838 \rightarrow \text{multiplying by 6.} \\ + 14190 \rightarrow \text{multiplying by 30.} \\ \hline 17028 \rightarrow \text{adding to products.} \end{array}$$

$$473 \times 36 = 17028$$

Thus, Quotient \times Divisor = Dividend. So, the answer is correct.

Teaching Instructions:

Teach division through discussion as given in the example 1, and tell the students to write in short form in exercise book.



Exercise 3.5

Divide and check answer.

1. $540 \div 18$
2. $1020 \div 15$
3. $12805 \div 65$
4. $10530 \div 78$
5. $14790 \div 85$
6. $44426 \div 97$

Teaching Instructions:

Make more exercises of division of five digit number by two digit number (without remainder) as given above, and let students solve and check the answer.

Division of five digit number by two digit number (with remainder)

Read, discuss and learn.

Let's divide 98194 by 74.

The divisor consists of two digits. The first two digit of dividend is 98, which is greater than the divisor 74. So, divide 98 by 74. Let's guess by writing 74 to the nearest ten i.e. 70.

Now, $70 \times ? = \text{near to } 98$

$$70 \times 1 = 70$$

Therefore, $74 \times 1 = 74$

$$70 \times ? = 241$$

$$70 \times 3 = 210$$

Therefore, $74 \times 3 = 222$

$$70 \times ? = 199$$

$$74 \times 2 = 148$$

Therefore, $70 \times ? = 514$ near to 514

$$70 \times 7 = 490$$

$$74 \times 7 = 518$$

Therefore, $74 \times 6 = 444$

Now, remainder = 70

$$\begin{array}{r}
 1326 \\
 74 \overline{)98194} \\
 \underline{- 74} \\
 241 \\
 \underline{- 222} \\
 199 \\
 \underline{- 148} \\
 514 \\
 \underline{- 444} \\
 70
 \end{array}$$

near to 199

near to 514

which is greater.

In such a case, to check the answer, multiply the quotient and the divisor and add the remainder.

$$1326 \times 74 + 70 = 98194$$

$$\text{Quotient} \times \text{Divisor} + \text{Remainder} = \text{Dividend}$$

If a dividend is not exactly divisible by the divisor,

$$\text{Quotient} \times \text{Divisor} + \text{Remainder} = \text{Dividend}$$

Example 1

Divide and check division

$$8367 \div 96$$

Division

$$\begin{array}{r} 87 \\ 96 \overline{) 8367} \\ \underline{- 768} \\ 687 \\ \underline{- 672} \\ 15 \text{ Remainder} \end{array}$$

Checking

$$87 \times 96 + 15$$

$$\begin{array}{r} 87 \\ \times 96 \\ \hline 522 \\ + 7830 \\ \hline 8352 \\ + 15 \\ \hline 8367 \end{array}$$

Quotient \times Divisor + Remainder = Dividend, so the division is correct.

Exercise 3.6

Divide and check the answer:

1. $6370 \div 65$

2. $5765 \div 69$

3. $24050 \div 98$

4. $33504 \div 73$

5. $43200 \div 68$

6. $62950 \div 92$

7. $67012 \div 55$

8. $93216 \div 98$

Teaching Instructions:

Tell students to make more problems as given above and solve.

Division of five digit number by three digit number

Read, discuss and learn.

What will be the quotient if 12850 is divided by 225?

$$\begin{array}{r} 57 \\ 225 \overline{)12850} \\ \underline{-1125} \\ 1600 \\ \underline{-1575} \\ 25 \text{ Remainder} \end{array}$$

Therefore, quotient = 57

Remainder = 25

- The divisor consists of three digits.
- The first three digit of dividend is 128 which is lesser than the divisor. So, divide the first four digit of dividend 1285 by 225

Let's guess.

$225 \times 4 = 900$ which is less than 1285.

$225 \times 5 = 1125$

$225 \times 6 = 1350$ which is greater than 1285.

Again,

$225 \times ? = 1600$

$225 \times 7 = 1575$

Checking the answer.

Quotient x Divisor + Remainder

$$\begin{aligned} 57 \quad \times \quad 225 \quad + \quad 25 \\ = 12850 \\ = \text{Dividend (So it is correct)} \end{aligned}$$

$$\begin{array}{r} 225 \\ \times 57 \\ \hline 1575 \\ + 11250 \\ \hline 12825 \\ + 25 \\ \hline 12850 \end{array}$$

Example 1

Divide and check

$$38590 \div 454$$

Division

$$\begin{array}{r} 85 \\ 454 \overline{)38590} \\ \underline{-3632} \\ 2270 \\ \underline{-2270} \\ 0 \end{array}$$

Checking

$$\begin{array}{r} 454 \\ \times 85 \\ \hline 2270 \\ + 36320 \\ \hline 38590 \end{array}$$

$$85 \times 454 = 38590, \text{ so it is correct}$$

Therefore, quotient = 85

Exercise 3.6

Divide and check

1. $1947 \div 205$
2. $3583 \div 527$
3. $24888 \div 366$
4. $80835 \div 951$
5. $61835 \div 305$
6. $93108 \div 472$

3.6 Daily life problems related to division

Example 1

A bag factory can produce 125 bags in a day. How many days will it take to produce 29375 bags?

Here,

29375 need to be divided into 125 parts.

$$\begin{array}{r} 235 \\ 125 \overline{)29375} \\ \underline{-250} \\ 437 \\ \underline{-375} \\ 625 \\ \underline{-625} \\ 0 \end{array}$$

Thus, it will take 235 days to produce 29375 bags.

Exercise 3.7

1. 5,625 oranges are divided equally among 45 persons. How many oranges will each person get?
2. 250 hens can be put in a cage. How many cages will be required to put 4,750 hens?
3. An aircraft flies 380 km per hour. How many hours will it take to fly 15,200 km?
4. A sum of Rs. 5,830 donation is collected from 265 students. If all students donate equal amount, how much money will be donated by each student?
5. A typist can type 65 words in a minute. How many minutes will she take to type 31,200 words?

Teaching Instructions:

Get the students to make more word problems themselves related to division as given above, and solve.

3.7 Simplification

Read, discuss and learn

There are 5 birds in a tree. After a while, 2 birds come in the tree. Then, 3 birds fly away. How many birds will remain in the tree now?



How can we write this in mathematical sentence?

Need to add which came to join and subtract those which left.



So,

$$5 + 2 - 3$$

$$= 7 - 3 \quad \text{Addition sign is in front, so addition is done first.}$$

$$= 4$$

Hence, 4 birds are left in the tree.

Example 1

Simplify:

$$65 - 25 + 17$$

There is minus sign in front, so subtraction is done first and added as plus sign is there behind.

$$= 40 + 17$$

$$= 57$$

Example 2

What will be the remainder when the product of 5 times 10 is deducted from 60?

$$60 - 10 \times 5$$

In the problem written in mathematical language having the signs addition, subtraction and multiplication, first we carry out the operation of multiplication, then addition and subtraction at last.

$$= 60 - 50$$

$$= 10$$

Example 3

What will be the sum when 7 is added to the product of three times 15?

Here, Writing in mathematical sentence.

$$\begin{aligned} 15 \times 3 + 7 & \quad \text{(First multiplication followed by addition.)} \\ = 45 + 7 \\ = 52 \end{aligned}$$

Example 4

Simplify:

$$\begin{aligned} (18+22) - 20 & \quad \text{[Operation of small brackets () followed by subtraction.]} \\ = 40 - 20 \\ = 20 \end{aligned}$$

Example 5

Simplify.

$$\begin{aligned} 70 + (8-2) \\ = 70 + 6 \quad \text{[Operation of small brackets () followed by addition]} \\ = 76 \end{aligned}$$

Thus, to simplify the problems
First do the operation of brackets.
Then, operation of multiplication.
And finally operation of addition or subtraction.

Exercise 3.8

1. Simplify:

(i) $15 - 4 + 5$

(ii) $36 + 45 - 55$

(iii) $54 \times 6 - 48$

(iv) $7 \times 15 + 15$

(v) $15 + (16 - 6)$

(vi) $30 - (7 + 4)$

(vii) $40 - (7 - 2)$

(viii) $73 + (4 + 3)$

2. How much will it become when 45 is subtracted from the product of 9 multiplied by 5?
3. Rima had Rs. 5. Her mother gave her three times more the money she had. How much money did she have altogether?
4. Saugat had Rs. 10, 000. He bought a goat for Rs. 1, 200 and a cow for 7, 300. How much money is left with him?

Teaching Instructions:

Make yourself and tell the students to make more problems as given above, and solve.

4

Fraction, Decimal, Percentage and Unitary Method

4.1 Fraction

Equivalent fractions

Mother gave Shila and Raju two equal pieces of bread. Shila divided that into six equal parts and ate 3 parts of it.

Raju divided his bread into two equal parts and ate 1 of them. Now, say who ate more?

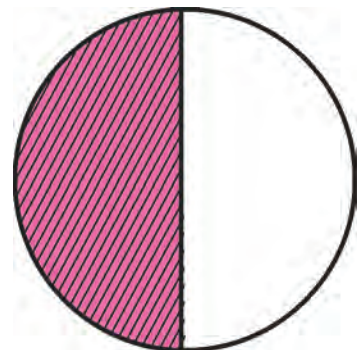
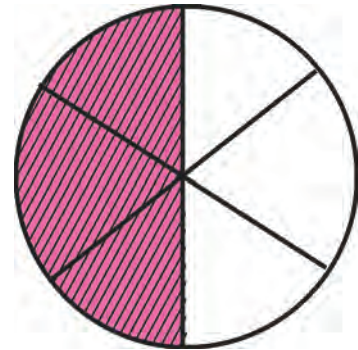
See the figures at the right side. In which figure, shaded part is more?

Trace the shaded part on the transparent paper and overlap the shaded part of another figure. What have you found out?

In this way, a part of an object can be presented with different types of fraction.

In the figure above, $\frac{3}{6}$ and $\frac{1}{2}$ are equal fractions.

Look at the figure below. Which fraction does the shaded part denote?

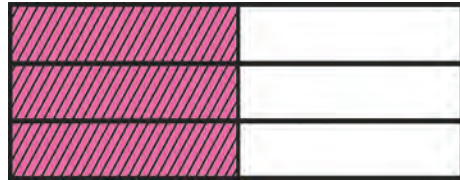


Divide the same figure in 4 equal parts and look at it.



Which fraction does the shaded part denote? Is it bigger or smaller than $\frac{1}{2}$?

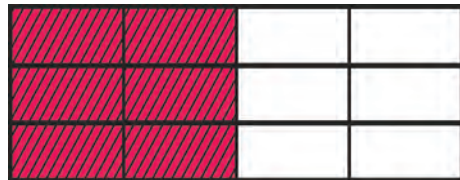
What happens if the same figure is divided into six equal parts, look!



Now, which fraction does the shaded part denote?

Is it greater, lesser or equal to $\frac{1}{2}$?

Again, divide the same figure into 12 equal parts and look.



Now, which fraction is denoted by shaded part? Is it greater or lesser than $\frac{1}{2}$? In all the above four figures, the shaded parts are equal. So $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{6}{12}$ all denote the same fraction $\frac{1}{2}$.

Therefore, $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{6}{12}$

In this way, fractions which are equal to other fraction are called equivalent fractions.

Similarly, can you say other two fractions, which are equal to $\frac{1}{2}$?

In the above examples, we have made three different fractions with the help of pictures which are equal to $\frac{1}{2}$. Now, let's try to make them in another way.

- (a) **Multiplying both numerator and denominator by 2** (b) **Multiplying both numerator and denominator by 3**

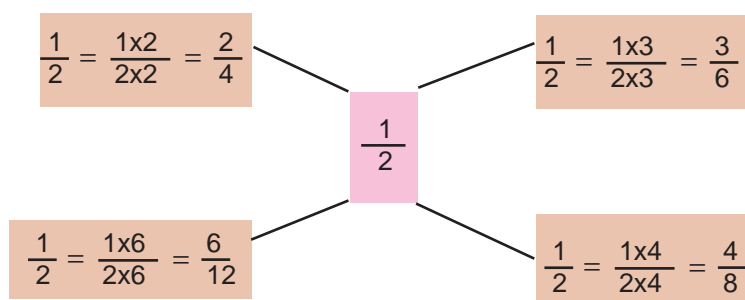
$$\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$$

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

- (c) **Multiplying both numerator and denominator by 6**

$$\frac{1}{2} = \frac{1 \times 6}{2 \times 6} = \frac{6}{12}$$

So, the fraction derived by multiplying the numerator and denominator by the same number of any fraction is equivalent to the given fraction.



- In this figure, can you add other branches of equivalent fraction?
- If you can, how many such branches can you add at most?

Exercise 4.1

1. **Write down the equivalent fraction of the given figure after dividing it into two equal parts.**



2. **Which fraction do we need to write in the following blanks?**

(a) $\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{\square}{\square}$

(b) $\frac{3}{4} = \frac{3 \times 4}{4 \times 4} = \frac{\square}{\square}$

(c) $\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{\square}{\square}$

(d) $\frac{3}{8} = \frac{3 \times 5}{8 \times 5} = \frac{\square}{\square}$

3. Write two equivalent fractions of each fractions.

(a) $\frac{2}{4}$ (b) $\frac{2}{3}$ (c) $\frac{3}{8}$ (d) $\frac{2}{7}$ (e) $\frac{5}{9}$ (f) $\frac{1}{3}$ (g) $\frac{2}{9}$

4. Write equivalent fraction of each of the following having 12 in denominator.

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{4}$ (d) $\frac{5}{6}$ (e) $\frac{3}{4}$

5. Which number should be written in the boxes?

(a) $\frac{7}{8} = \frac{\square}{64}$ (b) $\frac{3}{11} = \frac{\square}{77}$ (c) $\frac{7}{9} = \frac{21}{\square}$ (d) $\frac{3}{8} = \frac{24}{\square}$

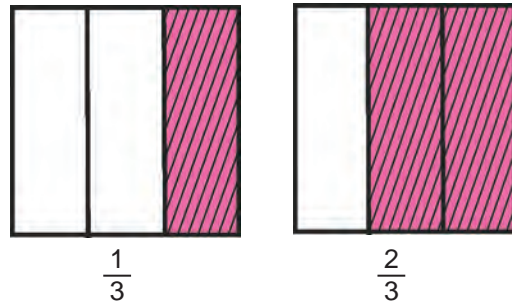
6. Identify the equivalent fraction in the following.

(a) $\frac{1}{4}$ and $\frac{6}{24}$ (b) $\frac{2}{3}$ and $\frac{10}{5}$ (c) $\frac{3}{4}$ and $\frac{18}{24}$

(d) $\frac{5}{20}$ and $\frac{1}{5}$ (e) $\frac{3}{8}$ and $\frac{12}{32}$ (f) $\frac{15}{27}$ and $\frac{10}{18}$

Comparison of fractions

Which figure is shaded more? The figure represented by $\frac{2}{3}$ is shaded more than the figure represented by $\frac{1}{3}$. If so, which fraction is greater?



If the denominators are equal, the fraction having greater numerator is greater. In the fractions $\frac{1}{3}$ and $\frac{2}{3}$ numerator 2 is greater than the numerator 1. So, the fraction $\frac{2}{3}$ is greater. Thus, $\frac{1}{3}$ is smaller and $\frac{2}{3}$ is greater.

Example 1

In order to find out the smallest fraction among $\frac{2}{7}$, $\frac{3}{7}$ and $\frac{4}{7}$, we should draw the figures to represent them. The smallest fraction can be found on the basis of the shaded part. If the fractions have the same denominator, the fraction whose numerator is smaller, the fraction is smaller too.

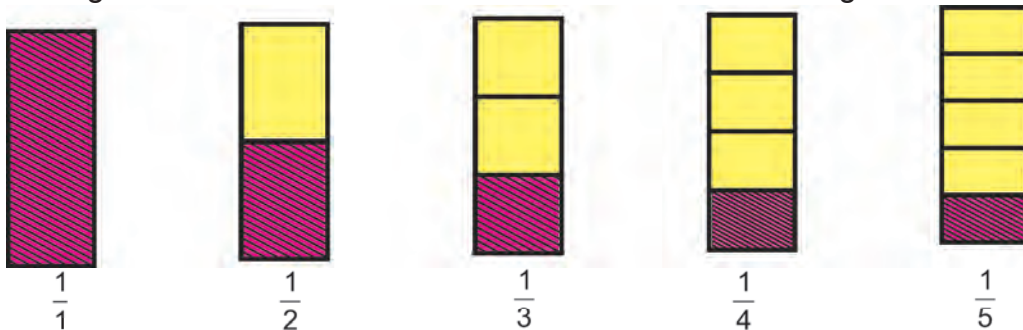


Here, the smallest fraction is $\frac{2}{7}$.

The greatest fraction is $\frac{4}{7}$.

The fractions $\frac{2}{7}$, $\frac{3}{7}$ and $\frac{4}{7}$ should be written in descending order as $\frac{4}{7}$, $\frac{3}{7}$ and $\frac{2}{7}$. It is also clear from the shaded part.

Look at the following figures and find out the smaller and greater fractions having the same numerator but different denominators in figure:



Which fraction representing figure is shaded more?

Which fraction representing figure is shaded least?

It can be said from the above figures that the fraction having small denominator is greater among the fractions with equal numerator. When an object is divided into various parts, it becomes smaller subsequently.

If we write the above fractions in descending order, it will be $\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and $\frac{1}{5}$.

Similarly, in ascending order, it will be $\frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}$ and $\frac{1}{1}$.

Which one is greater $\frac{1}{5}$ or $\frac{1}{8}$? Which one is greater $\frac{2}{3}$ or $\frac{5}{3}$? Why?



$\frac{1}{5}$ is greater and $\frac{1}{8}$ is smaller. $\frac{5}{3}$ is greater and $\frac{2}{3}$ is smaller. Because, the fraction with smaller denominator is greater among the fractions with equal numerator. If the denominators are equal, the fraction having great numerator is greater.



Exercise 4.2

1. Find out the greater fraction in the following fractions.

(a) $\frac{6}{7}, \frac{3}{7}$

(b) $\frac{5}{9}, \frac{7}{9}$

(c) $\frac{3}{8}, \frac{2}{8}, \frac{7}{8}$

(d) $\frac{3}{5}, \frac{4}{5}, \frac{2}{5}$

(e) $\frac{2}{5}, \frac{2}{7}, \frac{2}{3}$

(f) $\frac{3}{8}, \frac{3}{5}, \frac{3}{7}$

2. Write the following fractions in descending order.

(a) $\frac{5}{7}, \frac{4}{7}$

(b) $\frac{3}{11}, \frac{8}{11}, \frac{5}{11}$

(c) $\frac{5}{8}, \frac{7}{8}, \frac{6}{8}$

(d) $\frac{13}{14}, \frac{11}{14}, \frac{12}{14}$

(e) $\frac{5}{6}, \frac{5}{9}, \frac{5}{8}$

(f) $\frac{13}{14}, \frac{11}{14}, \frac{12}{14}$

3. Write the following fractions in ascending order.

(a) $\frac{7}{9}, \frac{6}{9}, \frac{8}{9}$

(b) $\frac{5}{7}, \frac{4}{7}, \frac{6}{7}$

(c) $\frac{4}{6}, \frac{3}{6}, \frac{5}{6}$

(d) $\frac{19}{21}, \frac{16}{21}, \frac{20}{21}$

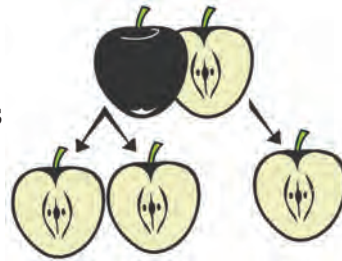
(e) $\frac{2}{7}, \frac{2}{9}, \frac{2}{3}$

(f) $\frac{5}{9}, \frac{5}{7}, \frac{5}{6}$

Mixed Numbers

Sheela said to Raju, "I have one and half apple. How can I write this in a single number?"

Raju said, "Divide that single apple into two parts and look. Now, how many halves are there?"



Sheela said, "3 halves. She has written in this way; $3 \text{ halves} = 3 \times \frac{1}{2} = \frac{3}{2}$

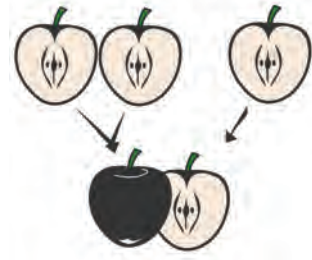
"It's a new kind of fraction. It has greater numerator than the denominator."

Raju said, "The fraction having greater numerator than the denominator is called improper fraction"

Please write 5 improper fractions.

Now, we can make a whole joining two halves among three halves and remain a half.

In the adjoining figure, 2 halves of apples are equal to 1 apple and there remains a half.



Thus, $\frac{3}{2} = 1$ whole and $\frac{1}{2} = 1 + \frac{1}{2} = 1 \frac{1}{2}$ can be written as an apple and half apple

Thus, if a whole number and fraction is combined together, that is called mixed number.

Similarly, how many wholes and halves are there in $3\frac{1}{2}$?

Think for a while and write 5/5 examples of mixed number. We can convert the mixed number into improper fraction and improper fraction into mixed number.

Example 1

(a) Convert $\frac{11}{4}$ into mixed number:

In the given figure $\frac{11}{4}$ denotes 11 pieces of $\frac{1}{4}$ part. Here, 8 pieces of $\frac{1}{4} = 2$ whole and 3 pieces of $\frac{1}{4} = \frac{3}{4}$

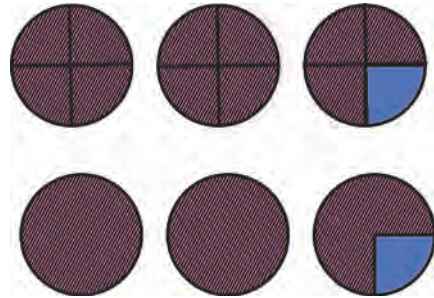
$$\text{So } \frac{11}{4} = 2 + \frac{3}{4} = 2\frac{3}{4}$$

Short method

In $\frac{11}{4}$, when we divide 11 by 4.

$$\begin{array}{r} 2 \\ 4 \overline{) 11} \\ \underline{8} \\ 3 \text{ remainder} \end{array}$$

$$\text{So } \frac{11}{4} = 2 \text{ whole} + \frac{3}{4} = 2\frac{3}{4} \text{ (2 whole and 3 by 4)}$$



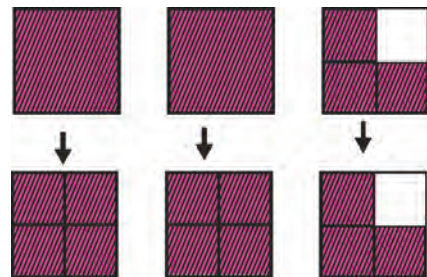
(b) Convert $2\frac{3}{4}$ into improper fraction:

Here, $\frac{3}{4}$ means 3 parts among

4. So, if we divide 2 whole into $\frac{4}{4}$ parts, we get 8 parts, in total. If we add remaining 3 parts,

it becomes 11 parts of $\frac{1}{4}$.

$$\text{So, } 2\frac{3}{4} = \frac{11}{4}$$



Short method –

$$\begin{aligned}2\frac{3}{4} &= \frac{2 \times 4 + 3}{4} \\ &= \frac{8 + 3}{4} \\ &= \frac{11}{4}\end{aligned}$$

Multiply whole number and denominator of fraction and add numerator with the product. Then, write down the denominator of the given fraction.



Exercise 4.3

1. Convert the following improper fractions into mixed number.

(a) $\frac{15}{4}$ (b) $\frac{13}{4}$ (c) $\frac{11}{5}$ (d) $\frac{16}{3}$ (e) $\frac{21}{8}$

2. Convert the following mixed numbers into improper fractions.

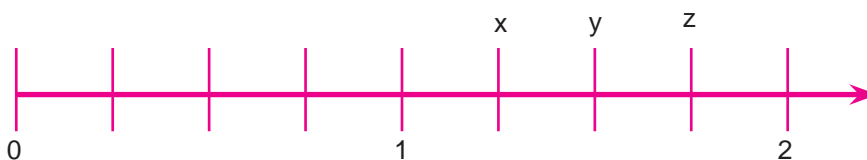
(a) $12\frac{1}{2}$ (b) $33\frac{1}{3}$ (c) $15\frac{1}{4}$ (d) $16\frac{3}{5}$ (e) $9\frac{7}{6}$

3. In the figure, 1 cm is divided into 10 equal parts. What is the length of pencil.

(a) in mixed number? and (b) in improper fraction?



4. What is the value of x, y and z in the number line? Find out both in mixed numbers and in improper fractions.



Fundamental operations on fraction

We can do simple operation in fraction similar as in the whole number.

Addition and subtraction of fractions.

Addition of like fractions

Look at the following figures carefully. The figures show that $\frac{3}{5}$ is the sum of fractions $\frac{1}{5}$ and $\frac{2}{5}$.



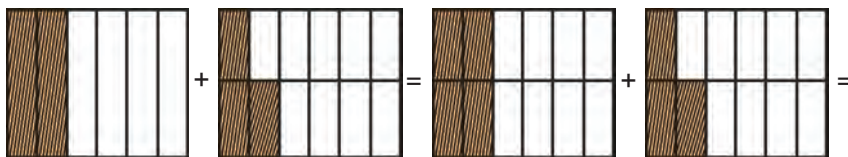
$$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$$

So,

$$\frac{1}{5} + \frac{2}{5} = \frac{1+2}{5} = \frac{3}{5}$$

While adding like fractions, we have to add the numerator only. Denominator remains the same.

Addition of unlike fractions



$$\begin{aligned}\frac{2}{6} + \frac{3}{12} &= \frac{2 \times 2}{6 \times 2} + \frac{3}{12} \\ &= \frac{4}{12} + \frac{3}{12} \\ &= \frac{4+3}{12} \\ &= \frac{7}{12}\end{aligned}$$

To make denominator 12 in $\frac{2}{6}$, we have multiplied numerator and denominator by 2.



Teaching Instructions:

While adding unlike fraction, first make the denominator equal (make equivalent fraction). Then, add numerators. Discuss more about it.

Example 1

$$\begin{aligned} \text{(a)} \quad & \frac{3}{4} + \frac{1}{6} \\ &= \frac{3 \times 3}{4 \times 3} + \frac{1 \times 2}{6 \times 2} \\ &= \frac{9}{12} + \frac{2}{12} \\ &= \frac{11}{12} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & \frac{6}{7} + \frac{5}{8} \\ &= \frac{6 \times 8}{7 \times 8} + \frac{5 \times 7}{8 \times 7} \\ &= \frac{48}{56} + \frac{35}{56} \\ &= \frac{83}{56} \\ &= 1 \frac{7}{56} \end{aligned}$$

Multiples of 4 are 4, 8, 12, 16, 20, ...

Multiples of 6 are 6, 12, 18, 24, 30, ...

Here, 12 is the smallest common multiple of 4 and 6.

So, we have to multiply the denominator and numerator of $\frac{3}{4}$ by 3 and $\frac{1}{6}$ by 2

Multiples of 7 are 7, 14, 21, 28, 35, 42, 49, 56, 63, ...

Multiples of 8 are 8, 16, 24, 32, 40, 48, 56, 64, ...

Here, 56 is the smallest common multiple of 7 and 8.

So, we should multiply the denominator and numerator of $\frac{6}{7}$ by 8 and $\frac{5}{8}$ by 7.

To change unlike fractions into like fractions, we can multiply the denominator and numerator of the first fraction by the denominator of the second fraction, and the denominator and numerator of the second fraction by the denominator of the first fraction.

Example 2

Subtract:

$$\begin{aligned} \text{(a)} \quad & \frac{7}{8} - \frac{5}{8} \\ &= \frac{7-5}{8} \\ &= \frac{2}{8} \\ &= \frac{1}{4} \quad (\text{keeping in the smallest term}) \end{aligned}$$

Similar to the addition of the fraction, while subtracting of like fraction, we should subtract numerator only. If the fraction is unlike, first, we should make the denominator same and then only we can subtract the numerator.



(b)

$$\begin{aligned} & \frac{3}{4} - \frac{2}{5} \\ &= \frac{3 \times 5}{4 \times 5} - \frac{2 \times 4}{5 \times 4} \\ &= \frac{15}{20} - \frac{8}{20} \\ &= \frac{15-8}{20} \\ &= \frac{7}{20} \end{aligned}$$

Making equivalent fraction having the same denominator.

Example 3

$$4\frac{1}{2} + 4\frac{1}{2}$$

$$= \frac{4 \times 2 + 1}{2} + \frac{3 \times 4 + 3}{5} \quad \text{————— Changing mixed number into improper fraction.}$$

$$\frac{9}{2} + \frac{15}{4}$$

$$= \frac{9 \times 4}{2 \times 4} + \frac{15 \times 2}{4 \times 2} \quad \text{————— Making the equivalent fractions having the same denominator.}$$

$$= \frac{36}{8} + \frac{30}{8}$$

$$= \frac{66}{8}$$

$$= \frac{33}{4} \quad \text{————— Changing into the smallest term}$$

$$4 \overline{) \begin{array}{r} 33 \\ -32 \\ \hline 1 \end{array}}$$

$$= 8\frac{1}{4} \quad \text{————— Changing improper fraction into mixed number.}$$

Example 4

Solve

$$7\frac{2}{3} - 5\frac{5}{6}$$

$$= \frac{7 \times 3 + 2}{3} - \frac{5 \times 6 + 5}{6}$$

———— Changing mixed number into improper fraction.

$$\frac{23}{3} - \frac{35}{6}$$

$$= \frac{23 \times 2}{3 \times 2} - \frac{35 \times 1}{6 \times 1}$$

———— Making equivalent fractions having same denominator.

$$= \frac{46}{6} - \frac{35}{6}$$

$$= \frac{46 - 35}{6}$$

———— Subtracting numerators.

$$= \frac{11}{6}$$

———— Changing into least term.

$$= 1\frac{5}{6}$$

———— Changing improper fraction into mixed number.

Exercise 4.4

1. Make the same denominator of the following pair of fractions.

(a) $\frac{1}{2}$ and $\frac{3}{2}$ (b) $\frac{4}{9}$ and $\frac{5}{6}$ (c) $\frac{1}{5}$ and $\frac{3}{8}$ (d) $\frac{2}{5}$ and $\frac{3}{7}$

2. Add.

(a) $\frac{1}{4} + \frac{3}{8}$ (b) $\frac{4}{5} + \frac{2}{15}$ (c) $\frac{5}{9} + \frac{7}{18}$ (d) $\frac{5}{6} + \frac{3}{8}$

(e) $\frac{1}{6} + \frac{2}{7}$ (f) $\frac{3}{10} + \frac{3}{4}$ (g) $\frac{5}{9} + \frac{2}{7}$ (h) $\frac{7}{11} + \frac{7}{12}$

3. Subtract.

(a) $\frac{5}{9} - \frac{5}{9}$ (b) $\frac{1}{5} - \frac{1}{10}$ (c) $\frac{5}{6} - \frac{7}{12}$ (d) $\frac{5}{6} - \frac{2}{5}$

(e) $\frac{8}{15} - \frac{2}{5}$ (f) $\frac{5}{8} - \frac{2}{6}$ (g) $\frac{13}{18} - \frac{5}{12}$ (h) $\frac{11}{15} - \frac{3}{10}$

4. Simplify.

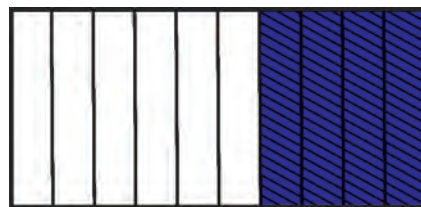
(a) $5\frac{2}{3} + 8\frac{1}{6}$ (b) $3\frac{2}{5} + 5\frac{4}{10}$ (c) $6\frac{1}{9} + 7\frac{1}{2}$ (d) $4\frac{1}{2} + 3\frac{1}{3}$

5. Simplify.

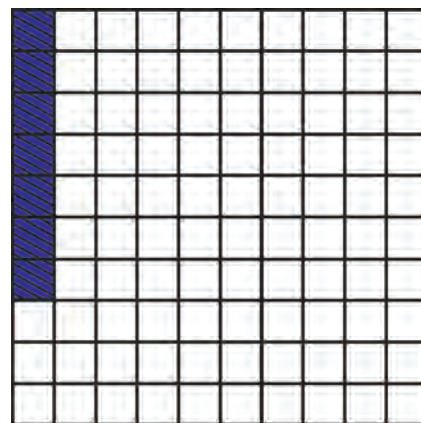
(a) $3\frac{3}{5} - 2\frac{1}{10}$ (b) $8\frac{1}{2} - 6\frac{3}{4}$ (c) $10\frac{1}{3} - 2\frac{1}{6}$ (d) $8\frac{1}{4} - 3\frac{2}{9}$

4.2 Decimal number

Here, a rectangular figure is divided into ten equal parts. Its $\frac{4}{10}$ part is shaded. Which is called 4 tenths. It can be written $\frac{4}{10}$ in fraction and 0.4 in decimal.



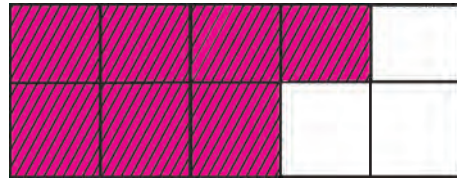
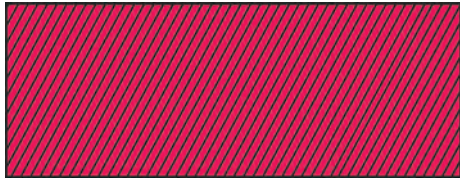
Square of the right side is divided into hundred equal parts. Its $\frac{7}{100}$ parts are shaded. It is called 7 hundredths.



0.07 is written from $\frac{7}{100}$ in decimal,

$\frac{15}{100}$ is written as 0.15.

0.79 is written for $\frac{79}{100}$



In the above figure, a whole rectangle and $\frac{7}{10}$ of the second rectangle is shaded.

Both of them can be written in the same fraction as $1\frac{7}{10}$

For the fraction $1\frac{7}{10}$, we write it as 1.7 in decimal.

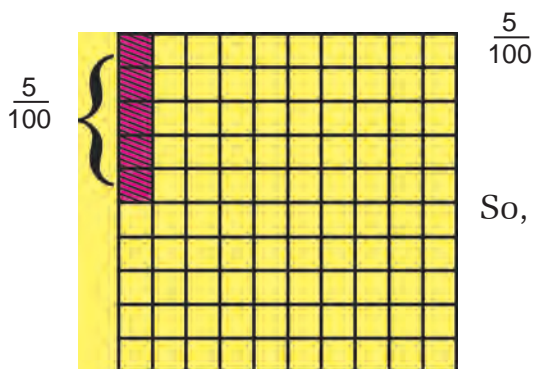
Similarly, $3\frac{7}{100}$ is written as = 3.07 and $5\frac{59}{100}$ is written as = 5.59 in decimal number.



The figure is divided into 10 equal parts. The shaded parts can be written in as $\frac{1}{5}$ or $\frac{2}{10}$

So, $\frac{1}{5} = \frac{2}{10} = 0.2$

The figure is divided into hundred equal parts. The shaded parts can be written in the following way:



So, $\frac{5}{100} = 0.05$

Example 1

1. Write in decimal.

(a) $\frac{3}{5}$

$$\begin{aligned}\frac{3}{5} &= \frac{3 \times 2}{5 \times 2} \\ &= \frac{6}{10} \\ &= 0.6\end{aligned}$$

To make denominator 10, multiply by 2

(b) $\frac{7}{25}$

$$\begin{aligned}\frac{7}{25} &= \frac{7 \times 4}{25 \times 4} \\ &= \frac{28}{100} \\ &= 0.28\end{aligned}$$

To make denominator 100, multiply by 4

Exercise 4.5

1. Write in decimal.

(a) $\frac{8}{10}$

(b) $\frac{5}{10}$

(c) $3\frac{6}{10}$

(d) $9\frac{5}{10}$

(e) $12\frac{7}{10}$

(f) $\frac{89}{100}$

(g) $\frac{45}{100}$

(h) $\frac{9}{100}$

(i) $8\frac{12}{100}$

(j) $30\frac{8}{100}$

2. Write in fraction.

(a) 0.5

(b) 0.9

(c) 3.4

(d) 8.2

(e) 10.8

(f) 0.37

(g) 0.53

(h) 0.77

(i) 12.05

(j) 18.68

3. Write in decimal.

(a) $\frac{2}{5}$

(b) $\frac{4}{5}$

(c) $\frac{1}{2}$

(d) $\frac{7}{50}$

(e) $\frac{13}{20}$

(f) $\frac{1}{4}$

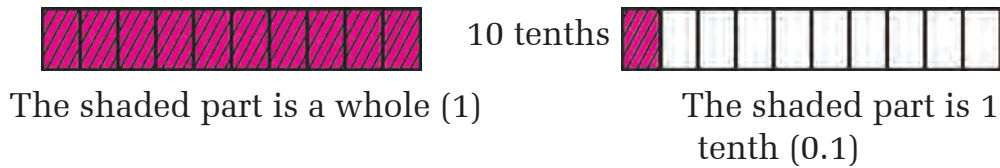
(g) $\frac{4}{25}$

(h) $\frac{3}{4}$

(i) $\frac{9}{25}$

(j) $\frac{15}{20}$

Units, tenths and hundredths

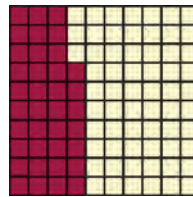
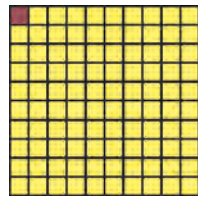


$$1 \text{ whole} = 10 \text{ tenths}$$

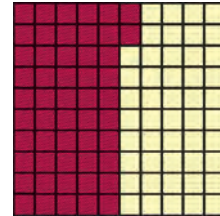
The shaded part is 1 hundredths

$$1 \text{ hundredth} = 0.01$$

Similarly,



0.37



0.52

Example 1

Study the following examples and learn.

(a) 2.3 (b) 0.64

(a) $2.3 = 2 \text{ whole and } 3 \text{ tenths} = 20 \text{ tenths} + 3 \text{ tenths} = 23 \text{ tenths}$
 $= 2.0 + 0.3 = 2.3$

(b) $0.64 = 64 \text{ hundredths} = 60 \text{ hundredths and } 4 \text{ hundredths} = 0.6 + 0.04$
 $= 0.64$

Example 2

Study the following examples and learn.

(a) 35 tenths (b) 26 hundredths

(a) $35 \text{ tenths} = 30 \text{ tenths and } 5 \text{ tenths} = 3 + 0.5 = 3.5$

(b) $26 \text{ hundredths} = 2 \text{ tenths and } 6 \text{ hundredths} = 0.2 + 0.06 = 0.26$

Exercise 4.6

1. Write in tenths.

- (a) 3 ones (b) 7 ones (c) 4 ones (d) 9 ones

2. Do as in example 1.

- (a) 1.8 (b) 4.5 (c) 3.7 (d) 8.0 (e) 0.46
(f) 0.08 (g) 0.67 (h) 1.37 (i) 2.09 (j) 4.84

3. Do as in example 2.

- (a) 52 tenths (b) 49 tenths (c) 30 tenths (d) 80 tenths
(e) 45 hundredths (f) 76 hundredths (g) 28 hundredths

4. $25.67 = 2 \text{ tens, } 5 \text{ ones, } 6 \text{ tenths and } 7 \text{ hundredths}$

Write the followings like the above:

- (a) 5.69 (b) 89.36 (c) 152.87 (d) 220.95

5. $4 \text{ tens, } 6 \text{ ones, } 3 \text{ tenths and } 8 \text{ hundredths} = 46.38$

Write the followings as given above:

- (a) 7 tens, 8 ones, 4 tenths and 9 hundredths
(b) 5 tens, 3 ones, 5 tenths and 7 hundredths
(c) 8 tens, 0 one, 3 tenths and 4 hundredths
(d) 2 hundreds, 0 ten, 6 ones, 0 tenths and 5 hundredths

Addition of decimal number

Example 1

Add: (a)
$$\begin{array}{r} 0.4 \\ + 0.3 \\ \hline \end{array}$$
 (b)
$$\begin{array}{r} 0.9 \\ + 0.8 \\ \hline \end{array}$$

(a)
$$\begin{array}{r} 0.4 \rightarrow 4 \text{ tenths} \\ + 0.3 \rightarrow + 3 \text{ tenths} \\ \hline 0.7 \rightarrow 7 \text{ tenths} \end{array}$$
 (b)
$$\begin{array}{r} 0.9 \rightarrow 9 \text{ tenths} \\ + 0.8 \rightarrow + 8 \text{ tenths} \\ \hline 1.7 \rightarrow 17 \text{ tenths} \end{array}$$

Example 2

Add: (a)
$$\begin{array}{r} 0.43 \\ + 0.35 \\ \hline \end{array}$$
 (b)
$$\begin{array}{r} 0.48 \\ + 0.29 \\ \hline \end{array}$$

(a)
$$\begin{array}{r} 0.43 \rightarrow 4 \text{ tenths } 3 \text{ hundredths} \\ + 0.35 \rightarrow + 3 \text{ tenths } 5 \text{ hundredths} \\ \hline 0.78 \rightarrow 7 \text{ tenths } 8 \text{ hundredths} \end{array}$$

(b)
$$\begin{array}{r} 0.48 \rightarrow 4 \text{ tenths } 8 \text{ hundredths} \\ + 0.29 \rightarrow + 2 \text{ tenths } 9 \text{ hundredths} \\ \hline 0.77 \rightarrow 7 \text{ tenths } 7 \text{ hundredths} \end{array}$$

(17 hundredths = 1 tenth 7 hundredths)

Exercise 4.7

Add:

1. (a)
$$\begin{array}{r} 0.3 \\ + 0.2 \\ \hline \end{array}$$
 (b)
$$\begin{array}{r} 0.6 \\ + 0.2 \\ \hline \end{array}$$
 (c)
$$\begin{array}{r} 0.4 \\ + 0.2 \\ \hline \end{array}$$
 (d)
$$\begin{array}{r} 0.2 \\ + 0.5 \\ \hline \end{array}$$

Example 2

Subtract. (a) 0.98

$$\begin{array}{r} 0.98 \\ - 0.45 \\ \hline \end{array}$$

(a) $0.98 \rightarrow$ 9 tenth and 8 hundredths

$- 0.45 \rightarrow$ 4 tenth and 5 hundredths

$0.53 \rightarrow$ 5 tenth and 3 hundredths

(b) $0.64 \rightarrow$ 6 tenth and 4 hundredths \rightarrow 5 tenth and 14 hundredths

$- 0.28 \rightarrow$ 2 tenth and 8 hundredths \rightarrow -2 tenth and 8 hundredths

$0.36 \rightarrow$ 3 tenth and 56 hundredths

Exercise 4.8

Subtract

1. (a) 0.9 (b) 1.6 (c) 8.6 (d) 40.8

$$\begin{array}{r} 0.9 \\ - 0.4 \\ \hline \end{array} \quad \begin{array}{r} 1.6 \\ - 0.4 \\ \hline \end{array} \quad \begin{array}{r} 8.6 \\ - 0.6 \\ \hline \end{array} \quad \begin{array}{r} 40.8 \\ - 23.6 \\ \hline \end{array}$$

(e) 9.3 (f) 14.2 (g) 64.5 (h) 50.0

$$\begin{array}{r} 9.3 \\ - 0.8 \\ \hline \end{array} \quad \begin{array}{r} 14.2 \\ - 3.7 \\ \hline \end{array} \quad \begin{array}{r} 64.5 \\ - 59.7 \\ \hline \end{array} \quad \begin{array}{r} 50.0 \\ - 34.6 \\ \hline \end{array}$$

2. (a) 0.96 (b) 6.98 (c) 60.83 (d) 0.54

$$\begin{array}{r} 0.96 \\ - 0.32 \\ \hline \end{array} \quad \begin{array}{r} 6.98 \\ - 3.76 \\ \hline \end{array} \quad \begin{array}{r} 60.83 \\ - 43.83 \\ \hline \end{array} \quad \begin{array}{r} 0.54 \\ - 0.28 \\ \hline \end{array}$$

(e) 0.84 (f) 8.82 (g) 16.14 (h) 28.20

$$\begin{array}{r} 0.84 \\ - 0.26 \\ \hline \end{array} \quad \begin{array}{r} 8.82 \\ - 3.43 \\ \hline \end{array} \quad \begin{array}{r} 16.14 \\ - 9.08 \\ \hline \end{array} \quad \begin{array}{r} 28.20 \\ - 19.58 \\ \hline \end{array}$$

3. By how much is 5.28 greater than 3.06 ?

4. By how much is 60 greater than 21.69 ?

5. Simplify.

(a) $36.08 + 7.8 - 14.1$

(b) $6.72 - 9.18 + 5.29$

Using decimal

100 Paisa = 1 Rupees 1 Paisa = $\frac{1}{100}$ Rupees



A meter tape is shown below:



Here, 1 m is divided into 100 cm. Find a similar tape and observe.

$$100 \text{ cm} = 1 \text{ m}$$

1 cm = hundredths of 1 m

$$1 \text{ cm} = \frac{1}{100} \text{ m}$$

Example 1

Write in rupees.

(a) 42 Paisa

(b) Rs. 6 and 63 Paisa

$$(a) \text{ 42 Paisa} = \text{Rs. } \frac{42}{100} = \text{Rs. } 0.42$$

$$(b) \text{ Rs. 6 and 63 Paisa} = \text{Rs. } 6\frac{63}{100} = \text{Rs. } 6.63$$

Example 2

Write in Paisa.

(a) Rs. 0.09 (b) Rs. 0.68

$$(a) \text{ Rs. } 0.09 = 0.09 \times 100 \text{ Paisa} = 9.00 \text{ Paisa} = 9 \text{ Paisa}$$

$$(b) \text{ Rs. } 0.68 = 0.68 \times 100 \text{ Paisa} = 68 \text{ Paisa}$$

Example 3

Write in metre.

(a) 37 cm (b) 7 m and 25 cm

$$(a) 37 \text{ cm} = \frac{37}{100} \text{ m} = 0.37 \text{ m}$$

$$(b) 7 \text{ m and } 25 \text{ cm} = 7 \text{ m} + \frac{25}{100} \text{ m} = 7.25 \text{ m}$$

Example 4

(a) Write in cm. 0.53m

(b) Write in m and cm. 5.63m

$$(a) 0.53\text{m} = 0.53 \times 100 \text{ cm} = 53 \text{ cm}$$

$$(b) 5.63 \text{ m} = 5 \text{ m} + 0.63 \text{ m} = 5 \text{ m} + 0.63 \times 100 \text{ cm} \\ = 5 \text{ m} + 63 \text{ cm} = 5 \text{ m } 63 \text{ cm}$$

Exercise 4.9

1. Write in rupees.

(a) 24 Paisa (b) 93 Paisa (c) 7 Paisa

(d) Rs 5 and 87 Paisa (e) Rs 8 and 75 Paisa (f) Rs 20 and 80 Paisa

2. Write in rupees and paisa.

(a) Rs. 0.56 (b) Rs. 0.50 (c) Rs. 0.09 (d) Rs 0.83

(e) Rs. 8.50 (f) Rs. 12.25 (g) Rs. 3.08 (h) Rs. 35.23

3. Write in meter.

(a) 32 cm (b) 8cm (c) 95 cm

(d) 8 m 45 cm (e) 25 m 28cm (f) 65 m 29cm

4. Write in m and cm.

- (a) 0.87 m (b) 0.6 m (c) 5.50 m (d) 9.73 m
(e) 5.60 m (f) 25.09 m (g) 3.65 m (h) 8.38 m

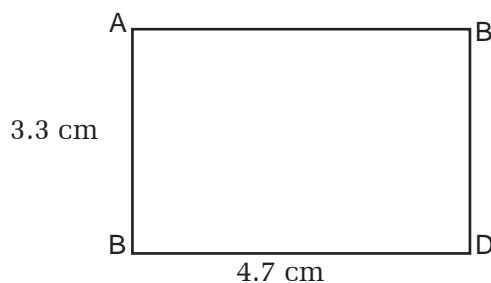
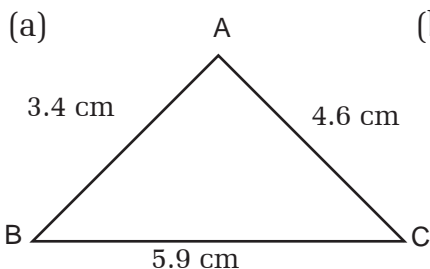
5. Write in rupees and paise.

- (a) 62 paise + Rs. 3.92 + RS. 3.48 + 8 Paise
(b) Rs. 3.65 + 68 Paise + Rs. 1.32 + 15 Paise
(c) Rs. 8.89 + 9 Paise + Rs. 4.86 + Rs. 7.79
(d) Rs. 0.69 + Rs. 3.69 + 50 Paise + Rs. 18.36

6. Write in m and cm.

- (a) 2.41m + 6.0 m + 0.73 m + 22 m
(b) 72 cm + 8 cm + 27.45 m + 26

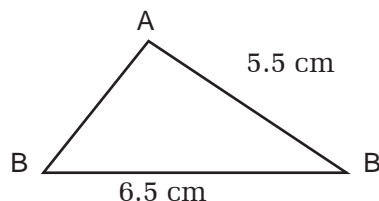
7. Find the perimeter of each figures.

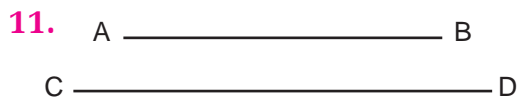


8. Raju bought a copy of Rs. 3.45 and gave Rs. 5 to shopkeeper. How much will he get in return?

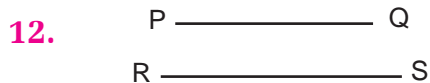
9. If a copy is bought for Rs. 5.25 and pencil for Rs. 1.75, how much will be saved from Rs. 10?

10. This triangle has the perimeter of 16.5 cm., what is the length of AB?





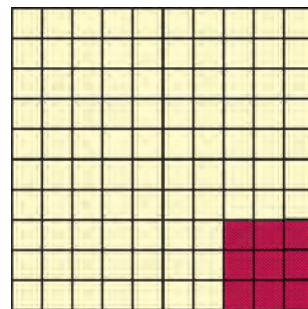
Measure AB and CD in cm. What is the length of the line segment adding both. How longer is CD than AB?



In the figure alongside RS is 4.7cm PQ is shorter than RS. by 2.3cm. Find the length of PQ without using a ruler.

4.3 Percentage

Among different conversions of fractional numbers, percentage is one. What does the shaded part of the alongside figure denote?



The whole figure has been divided into 100 equal parts, and among which 9 parts have been color shaded.

Therefore, the shaded part = $\frac{9}{100} = 0.09$

Here, $\frac{9}{100}$ or 0.09 denotes 9 parts out of 100.

If the denominator of the fraction is 100, the numerator denotes what part out of 100 is shaded. The numerator of the fraction with denominator 100 is known as percentage. The sign % indicates percentage.

In the above figure $\frac{9}{100}$ part has been shaded, so it is 9%. It means 9 out of 100.

When we change a fraction into percentage, we multiply it by 100, and put a sign % . For example, $\frac{9}{100} \times 100\% = 9\%$

Example 4.10

1. Write each of the following fractions in percentage.

(a) $\frac{5}{100}$

(b) $\frac{17}{100}$

(b) $\frac{38}{100}$

(d) $\frac{65}{100}$

2. Write in percentage making each denominator of the following fractions 100.

(a) $\frac{3}{4}$

(b) $\frac{1}{2}$

(c) $2\frac{1}{2}$

(d) $\frac{9}{10}$

(e) $\frac{12}{25}$

3. 5% denotes $\frac{5}{100}$. Likewise, write the following percentage in the form of fraction.

(a) 3%

(b) 13%

(c) 55%

(d) 115%

(e) 63%

4. Change the following decimals in the form of percentage.

(a) 0.33

(b) 0.15

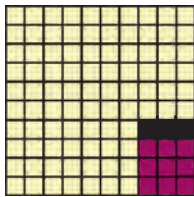
(c) 0.10

(d) 0.08

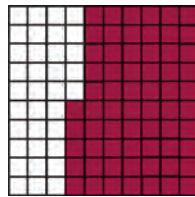
(e) 1.5

5. For the shaded parts of the following figures, first, write in the fraction, then, in percentage.

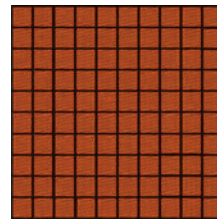
(a)



(b)



(c)



6. In an examination, 10 questions were asked. One question among them was difficult. What part of the whole questions is difficult? Write in fraction. Now, make the denominator 100 and write in percentage.

4.4 Unitary method

Raju paid Rs. 2 to buy 1 orange. How can we find out the price of 10 oranges? To find out the price of 10 oranges using the price of 1 orange, we should multiply the number of oranges by 2, i.e.



$$10 \times \text{Rs } 2 = \text{Rs } 20$$

Let's think of the same question in a different way.

Raju bought 10 oranges for Rs 20. What price did he pay for one orange? Let's divide the total price by the number of items bought, and see what happens?

$$\begin{array}{r} 2 \\ 10 \overline{)20} \\ \underline{20} \\ 0 \end{array}$$

So, it's clear that one orange costs Rs 2.

In this way, if we know the price of certain number of the same thing, we can find out the price of one of them by dividing it the sum the total number of items bought. This is known as a unit price. Similarly, if we know the price of one item, and want to find the total price of a certain number of the same thing, we should multiply the total number by the unit price.

Exercise 4.10

1. If one mango costs Rs 3, what is the price of 15 mangoes?
2. If a dozen of exercise books costs Rs. 60, what is the price of 12 dozens?
3. If a dozen of pencils costs Rs. 24, what is the price of 1 pencil?
4. Ramesh paid Rs 1600 to the shopkeeper buying 2 sarees. What was the price of 1 saree?
5. If the price of 25 books is Rs. 300, what's the price of 1 book?
6. If 5 people ate 15 samosas in equal numbers, how many samosas would a person eat?

Teaching Instructions:

The teachers should make some more problems as given here, or let the students do so and solve the problems.

5

Time, money and measurement

5.1 Day, week, month and year

Look at the following calender and discuss the questions that follow:

Mansir

2074 B.S.

Sun	Mon	Tues	Wed	Thues	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

- Which month's calendar is this?
- How many days are there in a week? What are they?
- How many days are there in this month?
- Are there the same days in all months? Looking in an annual calender, find how many days are there in each month?

Teaching Instructions:

Bring a real calender and discuss on all information available in the calender.

Relation among day, week, month and year

Look at the following table to learn the relation of time.

24 hours = 1 day

7 days = 1 week

30 days = 1 month

12 months = 1 year

Conversion of day and week

Example 1

Convert 25 days into week and day.

There are 7 days in 1 week. So divide the days by 7 to convert the days into week.

Let's divide:

$$\begin{array}{r} 3 \\ 7 \overline{) 25} \\ \underline{- 21} \\ 4 \text{ days} \end{array}$$

Hence, 25 days = 3 weeks and 4 days.

Conversion of day into month

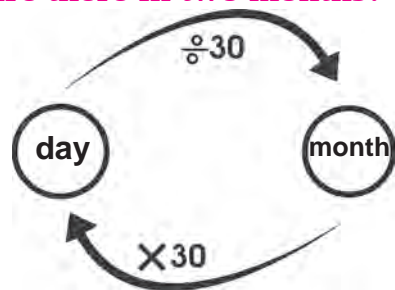
All months do not have 30 days but calculation is carried out assuming 30 days in a month. How many days are there in two months?

1 month = 30 days

2 months = $30 \times 2 = 60$ days

Now, you can say, how many months are in 60 days?

How do we know?



To convert days into month, we should divide by 30.

Example 2

How many months are there in 250 days?

Let's divide 250 by 30,

$$\begin{array}{r} 8 \text{ months} \\ 30 \overline{) 250} \\ \underline{- 240} \\ 10 \text{ days} \end{array}$$

From the above, we know that 250 days = 8 months and 10 days.

Conversion of month into year

There are 12 months in a year and there are $2 \times 12 = 24$ months in 2 years. Here, to convert year into month, we multiply by 12. Now, to convert month into year, what should we do?

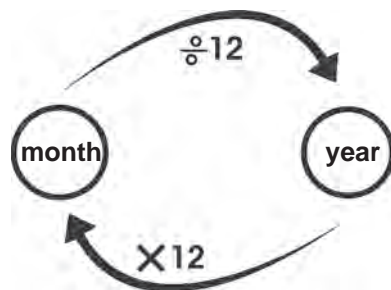
We should divide months by 12 to convert month into year.

Example 3

How many years are there in 124 months?

Dividing 124 months by 12.

$$\begin{array}{r} 10 \text{ years} \\ 12 \overline{) 124} \\ \underline{- 12} \\ 04 \text{ months} \end{array}$$



Thus, 124 months means 10 years and 4 months.

Day and year

Look, read & ILearn

Kartik							2074 B.S.
Sun	Mon	Tues	Wed	Thus	Fri	Sat/	
			1	3	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
19	20	21	22	23	24	25	
26	27	28	29	30			

Above calendar is the calendar of Kartik month of 2074 BS. How many days are there in the above month?

There are 12 months in a year. Generally, there are 30 days in a month. But some of them also have 29, 31, 32 days. What are the days of each year? Find out the days of all months of this year by counting days.

Generally, there are 365 days in a year.

Problems related to day and year.

A year has 365 days, write appropriate number in the box in your exercise book.

1 year = 365 days

In 2 years = 2×365 days = days

In 3 years = 3×365 days = days

In 4 years \times days = days

Exercise 5.1

1. Convert days into months.

- (a) 30 days (b) 60 days (c) 240 days
(d) 300 days (e) 210 days (f) 270 days

2. Convert days into months and days.

- (a) 40 days (b) 76 days (c) 87 days
(d) 125 days (e) 166 days (f) 215 days

3. Convert days into weeks.

- (a) 14 days (b) 21 days (c) 35 days
(d) 63 days (e) 273 days (f) 364 days

4. Convert days into weeks and days.

- (a) 24 days (b) 47 days (c) 83 days
(d) 132 days (e) 240 days (f) 320 days

5. Convert years into days.

- (a) 2 years (b) 4 years (c) 6 years
(b) 14 years (e) 20 years (f) 50 years

6. Convert months into years.

- (a) 48 months (b) 60 months (c) 84 months
(d) 108 months (e) 120 months (f) 144 months

7. Convert months into years and months.

- (a) 50 months (b) 85 months (c) 170 months
(d) 250 months (e) 1224 months (f) 2436 months

Time: Hour and minute

If the minute hand rotates a whole round, it is 60 minutes. There are 60 minutes in an hour. Hour hand crosses a number in an hour.

Look at the following clocks.

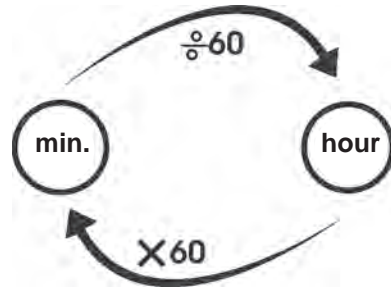


Look and read times in these clocks. Calculate the difference of time between the first and the third clock. Discuss:

Read, discuss and learn.

Look at the right hand side figure, what it says.

Minute can be converted into hour and hour into minute. To convert hours into minute, multiply by 60, and to convert minute into hour, minutes should be divided by 60.



Example 1

Convert 5 hours into minute.

$$\begin{aligned} &5 \text{ hours} \\ &= 5 \times 60 \text{ minutes} \\ &= 300 \text{ minutes} \end{aligned}$$

Example 2

Convert 7 hours and 20 minutes into minute.

7 hrs and 20 minutes

Here, 20 minutes is not converted. So let's convert 7 hrs into minute and add both.

$$\begin{aligned}
 &\text{Here, 7 hrs 20 minutes} \\
 &= 7 \times 60 \text{ minutes} + 20 \text{ minutes} \\
 &= 420 \text{ minutes} + 20 \text{ minutes} \\
 &= 440 \text{ minutes}
 \end{aligned}$$

Example 3

Convert 250 minutes into hours and minutes.

To convert minute into hour, we should divide it by 60

$$\begin{array}{r}
 4 \text{ hrs} \\
 60 \overline{) 250} \\
 \underline{- 240} \\
 10 \text{ min}
 \end{array}$$

Here, 250 minutes = 4 hrs and 10 minutes

Exercise 5.2

1. Convert hour into minutes.

- | | | |
|--------------|---------------|---------------|
| (a) 1 hour | (b) 8 hours | (c) 24 hours |
| (d) 36 hours | (e) 100 hours | (f) 340 hours |

2. Convert minutes into hour.

- | | | |
|-----------------|-----------------|-----------------|
| (a) 120 minutes | (b) 180 minutes | (c) 240 minutes |
|-----------------|-----------------|-----------------|

3. Express minutes into hour and minute.

- | | | |
|-----------------|-----------------|-----------------|
| (a) 110 minutes | (b) 170 minutes | (c) 250 minutes |
| (d) 340 minutes | (e) 420 minutes | (f) 570 minutes |

Time: Second and minute

In the adjoining figure, Rina and Sita are skipping. If you skip quickly for 15 times, how much time do you take? Such little time is less than a minute. Second is used to measure such small amount of time. It takes 15 seconds to skip 15 times. The smallest unit shown by a clock is a second.



There are 60 seconds in 1 minute.

Thin hand of the clock shows time in second. It moves one round in one minute. Hence, 60 seconds is equal to 1 minute.



Activity 1

It is 15 seconds past 10 in the right hand side clock where will second hand reach after 20 seconds?

Activity 2

Using a stop watch or wall clock, find where you will reach in 30 minutes if you run. Get help from your teacher and friends.



Problems related to second.

Example 1

If 60 seconds are equal to 1 minute, how many seconds will be there in 3 minutes?

$$1 \text{ minute} = 60 \text{ seconds}$$

$$3 \text{ minutes} = 3 \times 60 \text{ seconds} = 180 \text{ seconds}$$

Example 2

Convert time into seconds.

2 minutes 15 seconds

= 2 minutes + 15 seconds

= 2×60 seconds + 15 seconds = 120 seconds + 15 seconds = 135 seconds

Exercise 5.3

Convert in second.

(a) 12 minutes

(b) 15 minutes and 20 seconds

(c) 30 minutes and 45 seconds (d) 32 minutes and 10 seconds

(e) 35 minutes and 40 seconds

Read, discuss and learn.

In the given clock, time is 25 minute past 10. Where will the hands of clock reach after 1 hour and 30 minutes? Discuss.



Addition of time

Example 1

Hari started to go to the hospital sharp at 10:30. If he reached there in 1 hr and 17 minutes, at what time would he reach there?

Hari departed to hospital from home = 10:30

Time to reach hospital = 1 hours and 17 minutes.

Can we find out time taken/spent to reach hospital? Let's see:

$$\begin{array}{r} 10 \text{ hrs } 30 \text{ minutes} \\ + 1 \text{ hrs } 17 \text{ minutes} \\ \hline 11 \text{ hrs } 47 \text{ minutes} \end{array}$$

Minute and minute, and hour and hour should be added separately.

Now, the time Hari reached hospital is 47 minutes past 11.



Subtraction of time

Example 2

Subtract 8 hours 15 minutes 10 seconds from 12 hours 30 minutes and 15 seconds.

$$\begin{array}{r} 12 \text{ hours } 30 \text{ minutes } 15 \text{ seconds} \\ - 8 \text{ hours } 15 \text{ minutes } 10 \text{ seconds} \\ \hline 4 \text{ hours } 15 \text{ minutes } 5 \text{ seconds} \end{array}$$

We should subtract seconds from seconds, minutes from minutes and hours from hours.



Exercise 5.4

1. Write an appropriate number in the blank space.

(a) 60 seconds = minute (b) minutes = 1 hour

(c) days = 1 year (d) hours = 1 day

(e) 7 days = week (f) days = 1 month

(g) 1 minute 20 seconds = second

(h) 1 day 5 hours = hour

(i) One year 4 months = months.

2. Look at the along side watch. What time will be after 40 minutes? Calculate.



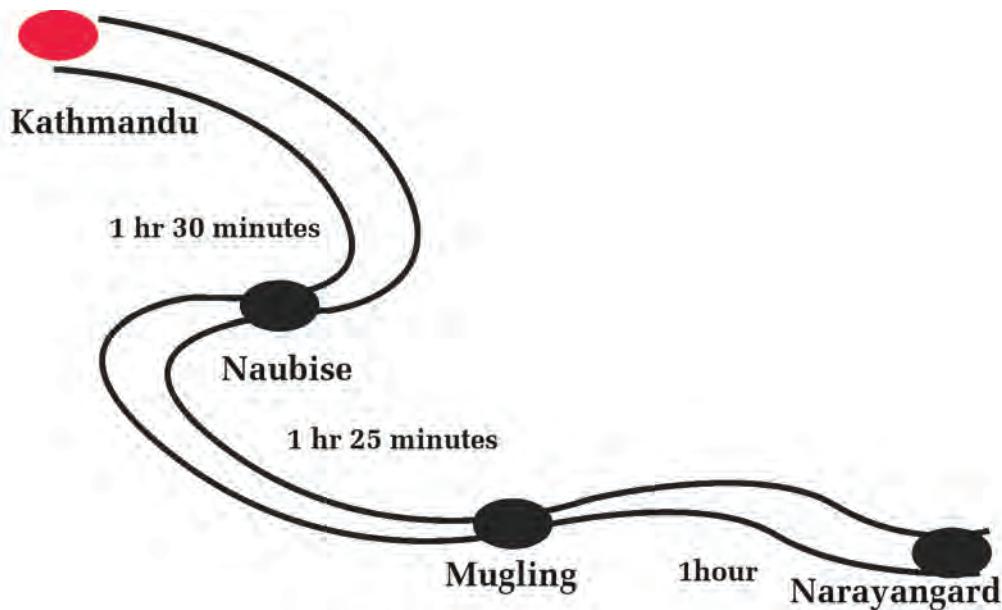
3. What time is in the given clock after 2 hours 15 minutes?



4. Phurwa went to the market at 2:30. He returned home after 1 hour 43 minutes from the time of departure from home, at what time will Phurwa come back to home?

5. Teacher entered into class at 12:15. If he returns from class after 50 minutes, at what time will he return from class?

6. Kailash went home for two months in winter vacation but he returned after 20 days. How many days before did he return?
7. There was a three day travelling program. After traveling 52 hours, how many hours were left to travel?
8. How many months are to be added in 5 years and 7 months to make 8 years and 9 months?
9. Sita made figures in her drawing paper in 3 days. She spent 1 hr. 15 minutes on Sunday, 3 hrs 20 minutes on Monday, 2 hrs 5 minutes on Tuesday. How much time did she spend in drawing the figures?
10. Time taken by a bus to reach Narayangarh from Kathmandu is given below. At what time period will the bus reach to Narayangarh from Kathmandu?



11. A daily wage worker has worked for 3 months 25 days. If he got wages for only 2 months 3 days, how many days, were not paid for him? Calculate.

5.2 Money

Look and recognize.



Re. 1



Rs. 2



Rs. 5



Rs. 10



Rs. 20



Rs. 25



Rs. 50



Rs. 100



Rs. 500



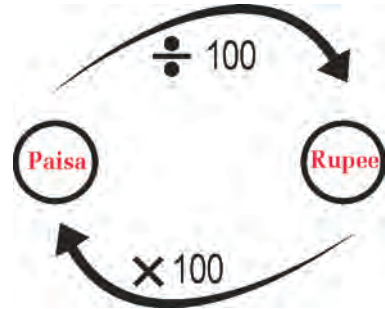
Rs. 1000

Money is in the form of coins and notes. Small unit of money is paisa. There are 100 paisas in 1 rupee. Can you tell, how many rupees will be in 200 paisas?

How do you know? Discuss it.

What does adjoining figure indicate?
Paisa is divided by 100 to convert it into rupee.

Similarly, rupee is multiplied by 100 to change it into paisa.



Example 1

Conversion of money

How much paisa are there in 3 rupees and 25 paisa?

Here, 3 rupees 25 paisa = 3×100 paisa + 25 paisa = 325 paisa.

Example 2

How much rupee and paisa are there in 365 paisa?

$$\begin{array}{r} 3 \\ 100 \overline{) 365} \\ \underline{- 300} \end{array}$$

65 remainder

Hence, 365 paisa is equal to 3 rupee 65 paisa.

Word problems related to money

Example 3

Suresh received 3 rupees and 60 paisa from mother and 2 rupees and 75 paisa from father. Now, how much money does he have?

Adding rupees and paisa separately,

Rs.	Paisa
3	60
+2	75
5	135
= Rs. 6 and 36 Pasia	

Because, 135 paisa =
Rs. 1 and 35 paisa



Example 4

Hamid kept 10 rupees 25 paise in four bags each. How much he had?

Rupees and paise multiplying separately-

$$\begin{array}{r} \text{Rs.} \quad \text{P.} \\ 10 \quad 25 \\ \times \quad 4 \\ \hline 40 \quad 100 \\ = \text{Rs. } 41 \end{array}$$

100 paise = Rs. 1
So, Rs. 40 and Rs. 1
make Rs. 41



Example 5

If Rs 12 and 60 paise is distributed to 4 persons, how much will each one get?




Dividing rupees and paise separately




$$\begin{array}{r} 3 \quad 15 \\ 4 \left\{ \begin{array}{l} \text{Rs.} \quad \text{P.} \\ 12 \quad 60 \\ - 12 \quad 4 \cdot \\ \hline \quad \quad \times \quad 20 \\ \quad \quad - 20 \end{array} \right. \end{array}$$

x Each will get Rs. 3.15 P.

Example 5.5

1. A menu having food items and their prices is given in the following table. Looking at the table and, answer the given problems.

 juice: Rs 15	 milk: Rs 14	momo: Rs 30
 water: Rs 20		chowmen: Rs 20.40 ps
		meat: Rs 20.40 ps



- If one juice and a plate of momo are bought, how much will be paid?
- If 1 bottle of water and 1 plate of chowmin is taken, how much will be paid?

- c. If Rs. 100 is paid for one plate of meat and beaten rice, how much will be returned ?
- d. If 2 plates of chowmin are eaten, how much should be paid?
2. If someone buys similar five books for Rs. 175 and 50 paise, how much a book will cost?
3. The price of a watch is Rs. 750. If a customer has only Rs. 540 and 50 paise, how much more money will he need to buy the watch?

5.3 Distance

Read and learn.



The length of pencil above is more than 3 cm. But its length is not 4 cm. In such situation, small units written between numbers of cm of ruler should be used. These small units are millimeter. There are 10 millimeter units in one centimeter.

Hence, **1 cm = 10 mm**

The length of above pencil reaches 3 cm and 5 mm units. Hence, the length of above pencil is 3 cm and 5 mm.

Activities

1. What cm and mm is your pencil? Tell by measuring it.
2. Find the length of 3 objects that are shorter than 3 cm.
3. What mm is the length of your thumb of left hand? Get help of your friend and measure.

Example 1

There are 10 mm in one cm. How many mm are in 7 cm?

$$1 \text{ cm} = 10 \text{ mm}$$

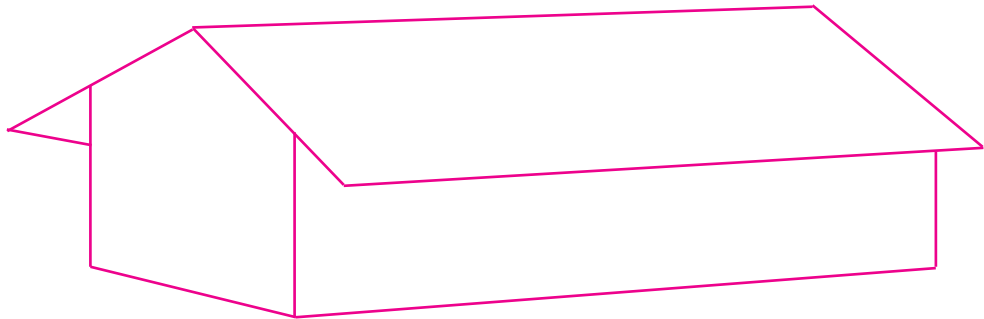
$$7 \text{ cm} = 10 \times 7 \text{ mm} = 70 \text{ mm.}$$

Exercise 5.6

1. Convert into mm.

- (a) 15 cm (b) 25 cm (c) 40 cm
(d) 80 cm 5 mm (e) 92 cm 2 mm (f) 87 cm 7mm.

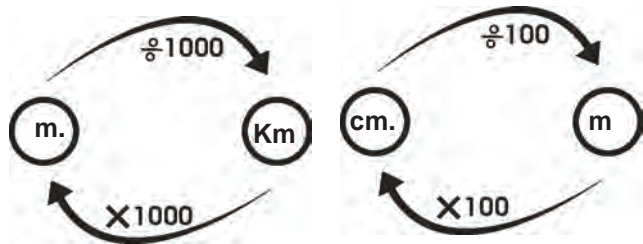
Centimeter, Meter, Kilometer



What is the length of this house? It is difficult to measure in cm. Why? To measure distance from one place to another place in cm is also difficult. Hence, we use small or big unit of measurement according to the size and distance.

Look at the following units of measurement.

10 mm = 1 cm
100 cm = 1 meter
1000 meter = 1 kilometer



The length of your two steps (strides) is approximately 1 meter. How many steps are there in 1 km? Approximately there are 2000 steps in 1 km.

What minutes can you take to walk 1 km?

Which measurement units are appropriate to measure the following distance or length ?

- (a) length of a table (b) length of a class room
(c) length of a pen (d) length of a book

- (e) height of a man (f) height of a tree
 (g) length of duster (h) distance from Pokhara to Birgunj.
 (i) distance from Kathmandu to Narayangadh.
 (j) distance from Mechi river to Mahakali river of Nepal

Exercise 5.7

Make rough estimate and measure in proper scale the distance of the following objects or place the surrounding the school:

- (a) Distance from your classroom to the room of the head teacher.
 (b) Distance from the place where you sit to the place of teacher who is standing in the classroom.
 (c) Distance from the school to the toilet.
 (d) Distance between classroom 1 and 3.
 (e) Distance from the school to the tap.

Example 1

How many units meters and centimeters are there in 142 cm?

Here, $1\text{ m} = 100\text{ cm}$

So, $142\text{ cm} = (100+42)\text{ cm}$
 $= 100\text{ cm} + 42\text{ m}$
 $= 1\text{ m } 42\text{ cm}$

Example 2

Convert 2m and 30 cm into cm.

Here, $2\text{ m} = 2 \times 100\text{ cm} = 200\text{ cm}$

So, $2\text{ m}, 30\text{ cm} = (200+30)\text{ cm} = 230\text{ cm}$

Example 3

How long will be the length of the rope if 1m and 36cm long rope is joined to 2m and 85cm long rope?

Here, adding meter to meter and cm to cm

$$\begin{array}{r} \text{m} \quad \text{cm} \\ \boxed{1} \\ 1 \quad 36 \\ \hline + \cancel{2} \quad 85 \\ \hline 3 \quad 121 \\ = 4 \text{ m } 21 \text{ cm} \end{array}$$

$36 + 85 = 121 \text{ cm}$
 $121 \text{ cm} = 1 \text{ m } 21 \text{ cm}.$
So 1 m is to be added in the column of meter, I understood.



Example 4

Out of 3 m and 15 cm long Pillar 1 m 80 cm is painted. What length of the pillar is not painted?

Here, subtracting meter from meter and cm from cm

$$\begin{array}{r} \text{meter} \quad \text{cm} \\ 2 \quad 115 \\ \hline \cancel{3} \quad 15 \\ - 1 \quad 80 \\ \hline 1 \text{ meter } 35 \text{ cm} \end{array}$$

80 cm , cannot be subtracted from 15 cm . So borrowing 1 m (=100 cm) from 3 m, we add it to 15 cm then, $100 + 15 = 115 \text{ cm}$



Hence, the length not painted = 1 m 35 cm

Exercise 5.8

1. Convert into cm.

- (a) 2 m (b) 3 m (c) 5 m (d) 3m 55 cm

2. Convert into m and cm.

- (a) 200 cm (b) 600 cm (c) 123 cm (d) 225 cm

3. Convert into km and m.

- (a) 1025 m (b) 1500m (c) 2556 m (d) 2000 m.

4. Convert into meter.

- (a) 3 km (b) 5 km
(c) 10 km 230 m (d) 15 km 30 m

5. Add.

(a)	$\begin{array}{r} 15 \text{ m } 75 \text{ cm} \\ + 7 \text{ m } 35 \text{ cm} \\ \hline \end{array}$	(b)	$\begin{array}{r} 9 \text{ m } 75 \text{ cm} \\ + 10 \text{ m } 75 \text{ cm} \\ \hline \end{array}$
-----	--	-----	--

(c)	$\begin{array}{r} 150 \text{ km } 900 \text{ m} \\ + 306 \text{ km } 880 \text{ m} \\ \hline \end{array}$	(d)	$\begin{array}{r} 170 \text{ km } 680 \text{ m } 75 \text{ cm} \\ + 150 \text{ km } 450 \text{ m } 60 \text{ cm} \\ \hline \end{array}$
-----	---	-----	---

6. Subtract.

(a)	$\begin{array}{r} 15 \text{ m } 60 \text{ cm} \\ - 12 \text{ m } 90 \text{ cm} \\ \hline \end{array}$	(b)	$\begin{array}{r} 17 \text{ m } 76 \text{ cm} \\ - 12 \text{ m } 85 \text{ cm} \\ \hline \end{array}$
-----	---	-----	---

(c)	$\begin{array}{r} 100 \text{ km } 700 \text{ m} \\ - 90 \text{ km } 800 \text{ m} \\ \hline \end{array}$	(d)	$\begin{array}{r} 324 \text{ km } 582 \text{ m} \\ - 190 \text{ km } 683 \text{ m} \\ \hline \end{array}$
-----	--	-----	---

7. If a wall is 7 m and 50 cm long and another wall is 2m and 60 cm long, what is the total length of these two walls?
8. A blackboard is 2 m and 15cm long and 1m and 75 cm width, how more is the length than its width?
9. A rubber of 1m and 20 cm long in stretched. Then, its length is 1 m and 55 cm. How many centimeters of rubber is stretched?
10. A road of 200 km is to be constructed. After constructing 120 km and 750 m by local voluntary work, how much is left to construct?
11. How long will be the piece of cloth after sewing four pieces each of 1 m and 76 cm long patches?

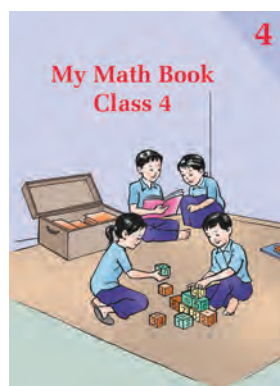
5.4 Perimeter of a rectangle

What is the shape of the upper surface of the table? Measure its length and breadth using meter scale. What is the difference between the length and breadth of the table? How long will be the perimeter of surface of upper part of the table? Make a list of such rectangular objects which are in the classroom.



18 cm

'My Mathematics Book 4' is 24 cm long and 18 cm wide. What will be its perimeter? Measurement of all sides is called perimeter. How many times the length is measured when the perimeter of the book is measured?



24 cm

Should the breadth of the book be measured two times as length was measured or not?

Here, perimeter = $2 \times 24 \text{ cm} + 2 \times 18 \text{ cm}$

$$48 \text{ cm} + 36 \text{ cm} = 84 \text{ cm}$$

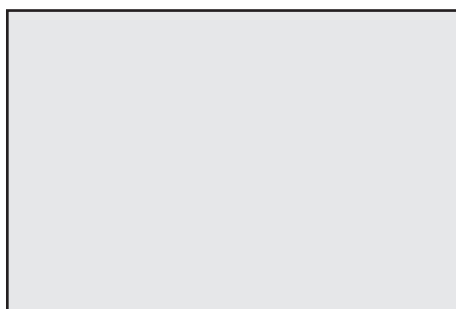
Exercise 5.9

1. Find the perimeter of each rectangular object given below:

(a) A piece of paper

(b) A photo frame

15 cm



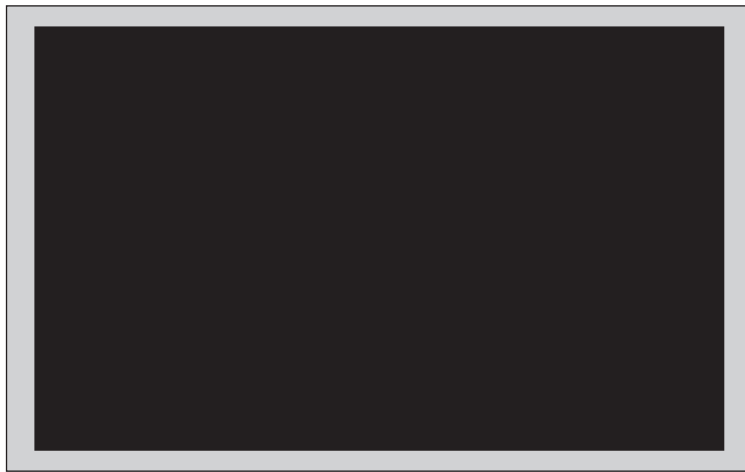
10 cm

25 cm



28 cm

(c) A blackboard 2 m



1 m 50 cm

(d) The length of garden is 20 m and 50 cm and breadth is 18 m and 60 cm.

18 m 60 cm



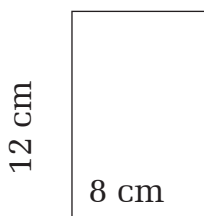
20 m 50 cm

5.5 Area

The place covered by the surface of an object is called the area of surface of the object. Place covered by book and copy is given in the figure. Look at these pictures. Which area is greater?



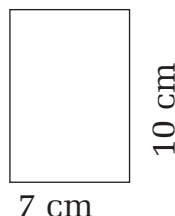
Book



Perimeter of the book

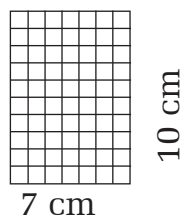
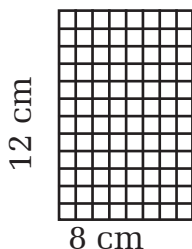


Note copy



Perimeter of the copy

Now, draw lines for length and breadth in 1 cm difference in both pictures.



Let's count the square of book.

There are 12 squares in the length side.

There are 8 squares in the breadth side.

How many total squares are there?

Total $12 \times 8 = 96$ squares

Let's count the square of copy.

There are 10 squares in the length side.

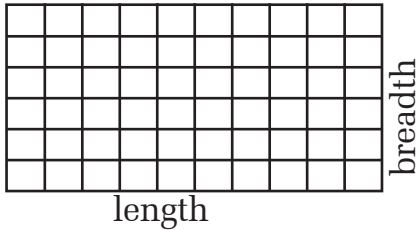
There are 7 squares in the breadth side.

Total $10 \times 7 = 70$ squares

So, the area of the book is 96 square cm, and the area of the copy is 70 square cm. Hence, the area of book is greater than the area of copy.

Example 1

Find out the area of complete figure by counting 1 cm square room in length and breadth.



Number of squares in the length = 10

Number of squares in the breadth = 6.

Therefore, the area of figure = $10 \times 6 = 60$ cm square

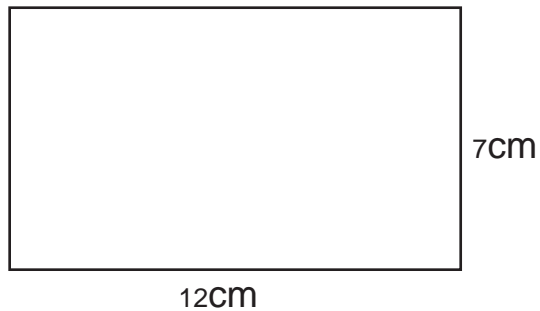
Example 2

Find out the area of rectangular shape given below.

The length of given rectangular = 12 cm

Breadth = 7cm

Area = $12 \times 7 \text{ cm}^2 = 84 \text{ cm}^2$

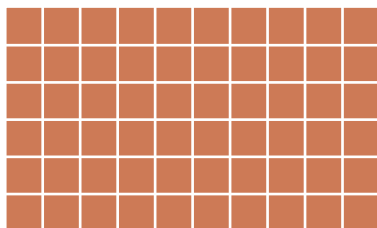


Exercise 5.10

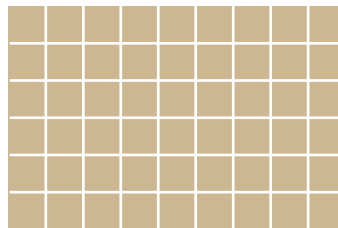
1. Find the area of the rectangles given below by counting square units of length and breadth as given below.

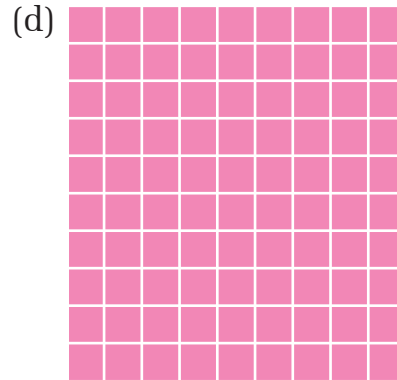
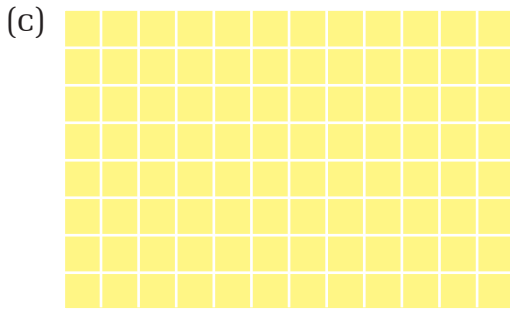
(area of each square is 1 cm^2)

(a)

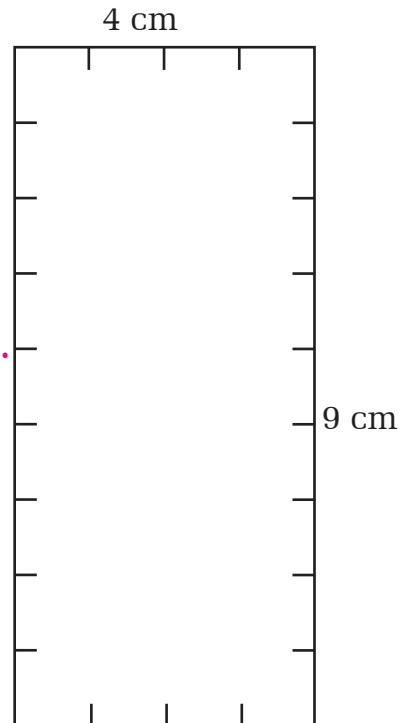
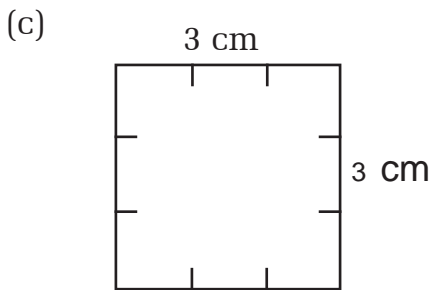
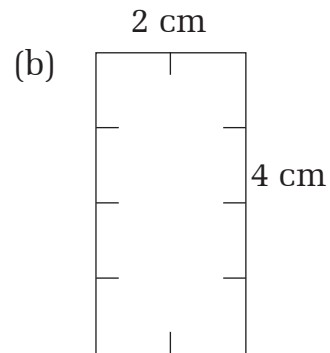
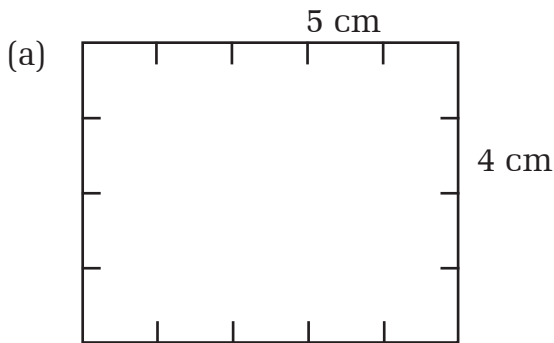


(b)

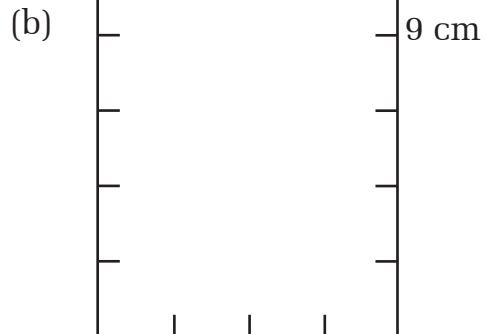
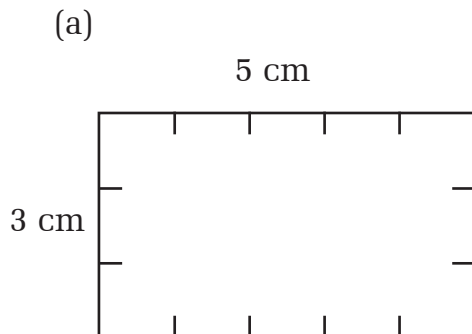




2. Draw the squares unit in each of the following rectangular shapes and find the area.



3. Find the area of rectangular shapes.



5.6 Capacity

In the figure, there are two pots: an Amkhora and a measuring cylinder, when full water of Amkhora is poured into the measuring cylinder, it reaches up to 1.5 litres. Here, the capacity of Amkhora is found to be 1.5 litres of the capacity of liquid is measured in litre (l).



In the adjoining figure, there are measuring cylinder and a test tube. How much water does the test tube contain? Or what is the amount of the water in the test tube? Amount of 1 litre is divided into 1000 equal parts and each part is called 1 millilitre or ml. Now, to know the capacity of the test tube, we pour the water of the test tube into the measuring cylinder.



So, the measurement of the quantity of liquid is litre,

$$1 \text{ litre} = 1000 \text{ millilitre}$$

Example 1

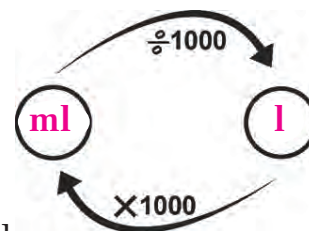
How many milliliters are there in 2 litres and 360 ml?

Here,

$$1 \text{ litre} = 1000 \text{ ml.}$$

$$\text{So, } 2 \text{ litres} = 2 \times 1000 \text{ ml} = 2000 \text{ ml}$$

$$\text{So, } 2 \text{ litres } 300 \text{ ml} = 2000 \text{ ml} + 300 \text{ ml} = 2300 \text{ ml.}$$



Example 2

How many litres and millilitre are there in 3500 millilitre?

1000 ml = 1 litre

So, divide by 1000 ml

3500 ml = 3 litre 500 ml

500 ml = 0.5 litre

so, 3500 ml = 3.5 litres = $3\frac{1}{2}$ litres

$$\begin{array}{r} 3 \\ 1000 \overline{) 3500} \\ \underline{- 3000} \\ 500 \end{array}$$

Example 3

Add 3 litres 720 ml and 5 litres 630 ml.

	litres	ml
	3	720
+	5	630
<hr/>		
	8	1350
	= 9 l 350 ml	

Example 4

Subtract 2 litres and 500 ml from 4 litres and 325 ml.

	litres	ml
	4	325
-	2	500
<hr/>		
	1	825 ml

500 ml cannot be subtracted from 325 ml. So, we borrow 1 litre from 4 litre and add it to 325 ml. Then we have 1325 ml. and subtract from 500 ml. from it.



Exercise 5.11

1. Convert into millilitres.

- (a) 2 litres (b) 3 litres
(c) 2 litres 500 ml (d) 2 litres 750 ml.

2. Convert into litre and millilitre.

- (a) 2 litres (b) 3 litres
(c) 2 litres 500 ml (d) 2 litres 750 ml

3. Add.

$$\begin{array}{r} \text{(a) } 3 \text{ litres } 750 \text{ ml} \\ + 5 \text{ litres } 200 \text{ ml} \\ \hline \end{array} \qquad \begin{array}{r} \text{(b) } 6 \text{ litres } 390 \text{ ml} \\ + 8 \text{ litres } 715 \text{ ml} \\ \hline \end{array}$$

$$\begin{array}{r} \text{(c) } 4 \text{ litres } 126 \text{ ml} \\ + 9 \text{ litres } 900 \text{ ml} \\ \hline \end{array} \qquad \begin{array}{r} \text{(d) } 13 \text{ litres } 678 \text{ ml} \\ + 17 \text{ litres } 588 \text{ ml} \\ \hline \end{array}$$

4. Subtract.

$$\begin{array}{r} \text{(a) } 9 \text{ litres } 315 \text{ ml} \\ - 6 \text{ litres } 500 \text{ ml} \\ \hline \end{array} \qquad \begin{array}{r} \text{(b) } 5 \text{ litres } 600 \text{ ml} \\ - 3 \text{ litres } 875 \text{ ml} \\ \hline \end{array}$$

$$\begin{array}{r} \text{(c) } 17 \text{ litres } 750 \text{ ml} \\ - 9 \text{ litres } 900 \text{ ml} \\ \hline \end{array} \qquad \begin{array}{r} \text{(d) } 8 \text{ litres } 28 \text{ ml} \\ - 7 \text{ litres } 588 \text{ ml} \\ \hline \end{array}$$

5. Shila went to the shop with bottle of 750 ml and she bought 1 litre oil. How much is exceeded?

6. How many bottles of 500ml are needed to hold 2 litre oil?
7. Four persons drank 1 litre and 200ml milk equally. How much milk did each drink?
8. A kettle contains 1250 ml tea. How much tea will be held in 4 such kettles?
9. Look at the pots and their capacities in the figure. Answer the following questions.



265 ml



385 ml



563 ml



1 l 250 ml

- (a) If filled, how many litres and millilitres of liquid will be there in all pots?
- (b) How much water in the kettle is less or more than the collective amount of water in the cup, glass and Amkhora?
- (c) If water from the kettle is poured into the glass, what amount of water is left in the kettle?
- (d) How many cups can be filled with the water of the kettle, and how much water will be left in the kettle?

5.7 Volume

Adjoining length, breadth and height of block of wood is 1/1 cm.

So, its volume is 1 cubic cm.

Objects having equal length, breadth and height is called cubic object.

Look at the adjoining block of wood. What is the volume of the block of wood? To know the volume of block of wood, add 1 cm length, breadth and height by marking line. In this way, we get a figure given here.

Now, draw the lines dividing into peices. How many small blocks of 1 cubic cm can be made?

Solve it,

number of small blocks in the length = 6

number of small blocks in the breadth = 3

number of small blocks in the height = 2

Total numbers of small blocks = $6 \times 3 \times 2 = 36$

So, the volume of above block = 36 cubic cm.



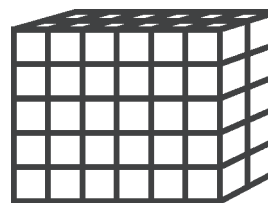
Exercise 5.12

1. What is the volume of the following cuboids, and find out the volume by counting the unit cubes.

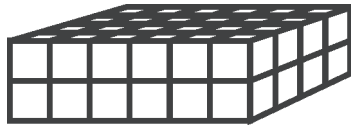
(a)



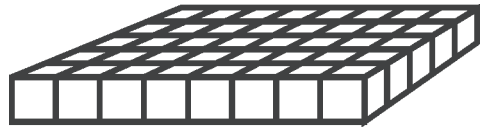
(b)



(c)



(d)



2. Observe by multiplying length, breadth, height of each objects given in question no 1. Is the product and volume of the objects equal?

5.8 Weight

Look carefully at the following units of weights.



1 kg



500 gram



200 gram



100 gram



50 gram

Using balance, determine how many weights of 100 grams would be in 1 kilogram. Similarly, determine how many weights of 500 grams are there in 1 kg? Check it by using the balance, from these experiments, you have learnt that $1 \text{ kg} = 1000 \text{ grams}$.



Now, which types of measuring weights will be used to measure the weights of the following objects. Think forwhile.

(a)



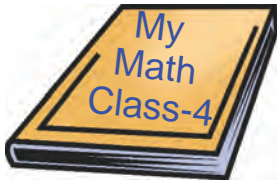
(b)



(c)



(d)



(e)



We have known that we should use proper grams to measure the mass of the given objects. 1 kilogram contains 1000 grams. Hence, units of gram and kg can be converted into each other.

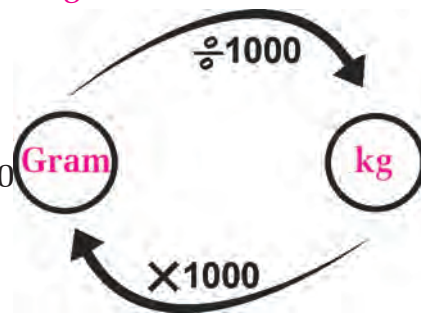
Example 1

How many grams are there in 3 kg and 600 gram?

$$1 \text{ kg} = 1000 \text{ grams}$$

$$\text{So, } 3 \text{ kg} = 3 \times 1000 \text{ grams} = 3000 \text{ grams}$$

$$\begin{aligned} \text{Then, } 3 \text{ kg } 600 \text{ grams} &= 3000 \text{ grams} + 600 \text{ grams} \\ &= 3600 \text{ grams} \end{aligned}$$



Example 2

How many kilograms and grams are there in 2780 grams?

Here, 1 kg = 1000 grams

So,

$$\begin{array}{r} 2 \\ 1000 \overline{) 2780} \\ \underline{- 2000} \\ 780 \end{array}$$

$$2780 \text{ grams} = 2\text{kg } 780 \text{ grams}$$

Another method-

$$2780 = 2000 + 780$$

$$= 2 \times 1000 + 780$$

$$= 2780 \text{ gms} = 2\text{kg } 780 \text{ gms.}$$

Why?



Example 3

How many kilograms and grams will be there while mixing 3 kg and 700 grams to 5 kg and 600 grams?

$$\begin{array}{r} \text{kg} \quad \text{gram} \\ 3 \quad 700 \\ + \quad 5 \quad 600 \\ \hline 9 \quad 300 \end{array}$$

= 9 kg 300 gram

Why?



Example 4

What is the difference between 5 kilograms and 700 gram and 2 kilograms and 870 grams?

$$\begin{array}{r} \text{kg} \quad \text{gram} \\ 4 \quad 5 \quad 700 \\ - \quad 2 \quad 890 \\ \hline 2 \quad 810 \end{array}$$

Difference = 2 kg 810 gram.

890 grams cannot be subtracted from 700 grams. So, we borrow 1 kg (1000 grams) add it to 700 grams and the sum is 1700 grams. Now, when subtracted 890 from 1700 grams, the difference is 810 grams.



Exercise 5.13

1. Convert into grams.

- (a) 2 kg (b) 5 kg (c) 12 kg 50gm
(d) 3 kg 250 g (e) 7 kg 750 gm

2. Convert into kg and grams.

- (a) 1170 grams (b) 1755 grams (c) $3\frac{1}{4}$ kg

3. Add.

- (a) 3 kg 300 grams (b) 8 kg 690 grams
 + 2 kg 550 grams + 7 kg 580 grams
 ————— —————

$$\begin{array}{r} \text{(c)} \quad 350 \text{ grams} \\ + 2 \text{ kg } 690 \text{ grams} \\ \hline \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 12 \text{ kg } 986 \text{ grams} \\ + \quad 894 \text{ grams} \\ \hline \end{array}$$

4. Subtract.

$$\begin{array}{r} \text{(a)} \quad 8 \text{ kg } 300 \text{ grams} \\ - 3 \text{ kg } 520 \text{ grams} \\ \hline \end{array}$$

$$\begin{array}{r} \text{(b)} \quad 12 \text{ kg } 375 \text{ grams} \\ - 10 \text{ kg } 650 \text{ grams} \\ \hline \end{array}$$



$$\begin{array}{r} \text{(c)} \quad 7 \text{ kg } 600 \text{ grams} \\ - 5 \text{ kg } 776 \text{ grams} \\ \hline \end{array}$$

5. How many grams should be added to 720 grams to make it 1 kg?
6. The weight of a pair of shoes was 910 grams. When it was repaired changing the sole, its weight reached 1 kg and 120 grams. What was the weight of sole added to it?
7. Raju bought 5 kg apples out of which 2 kg and 270 grams were rotten. How much fresh apples did Raju have?
8. Ghee produced by banspati company is available in plastic bag. If 1 kg ghee is packed in a plastic bag weighing 70 grams, what will be the total weight of ghee with plastic bag?
9. How many apple are needed to distribute 5 people 1 kg 250 grams each?
10. 1 kg and 200 gms grapes are divided among four persons. How many grams of grapes will each get?
11. A shopkeeper bought 350 kg sugar, out of which $189\frac{1}{2}$ kg was sold. How much sugar was left then? Give your answer in kg and grams.

6

Bill and Budget

Puspa bought rice, pulse, sugar, and pen from a shop. Shopkeeper gave a bill to her. The bill was as follow:

 PASHANG GENERAL STORES Kusma, Parbat Bill #: 0061				
Puspa Poudel				Date: 063/08/05
Chuwa - 1, Parbat				
s.#	Particular	Qty.	Rate (Rs)	Amount
1.	Rice	5 kg	30.00	150.00
2.	Sugar	1 kg	30.00	30.00
3.	Dal	2 kg	65.00	130.00
4.	Pen	2 peace	30.00	60.00
Total				370.00
 For: Pradeep Lama				

Look at the above bill and answer the following questions:

- What was the name of the shop where Puspa bought goods?
- Who did sell the goods to Puspa?
- What goods did she buy?
- How much did she pay altogether?
- What parts are included in a simple bill?
- What are the advantages of taking a bill?

Teaching Instructions:


Collect yourself or get students to collect original bills. Show the bills and make clear about the parts mentioned in the bill. Make students discuss the method of calculating total price from quantity and rate, information available in the bill and advantages of taking bills in the class.

Exercsie 6.1

1. Read the following bill and answer the questions.

- Who did purchase the goods?
- Who was the seller of the goods?
- How many copies did Anjana buy?
- What was the price of one pencil?
- What was the name of the shop?
- How much money did Anjana pay?


SIDDHIKALI STATIONARY CENTER				Bill #: 0065
Taksar, Bhojpur				Date: 063/08/25
Anjana Rai				
Dawa - 6, Bhojpur				
s.#	Particular	Qty.	Rate	Amount
1.	copy	1 dozen	Rs. 105	Rs. 105
2.	Pencil	6 piece	Rs. 3	Rs. 18
3.	Rural	1 piece	Rs. 12	Rs. 12
Total Rs.				135


 For : Shyam Manandhar

2. Read the following bill and answer the questions.

- What was the name of the shop where Rita bought fruit?
- Which fruits did she purchase?
- What was the total price of fruits?
- How much did Rita pay to shopkeeper?
- Why did the shopkeeper take lesser amount than total price?
- How much discount did the shopkeeper give to Rita?

SIRJANA FRUIT SHOP				Bill #: 0070
Mahendrapoul, Pokhar				Date: 064/08/04
Reeta Gurung				
Ghandruk, Pkhara				
s.#	Particular	Qty.	Rate	Amount
1.	Apple	2 kg	Rs. 55	Rs. 110
2.	Orange	1 kg	Rs. 40	Rs. 40
3.	Banana	1 dozen	Rs. 30	Rs. 30
3.	Junar	1 kg	Rs. 35	Rs. 35
Total Rs.				215
Discount Rs.				15
Grand Total Rs.				200


 For : Rabin Shrestha

Teaching Instructions:

Show real bills (discount, vat, tax not included ones), and practise to take and give information from the bills.

7

Statistics

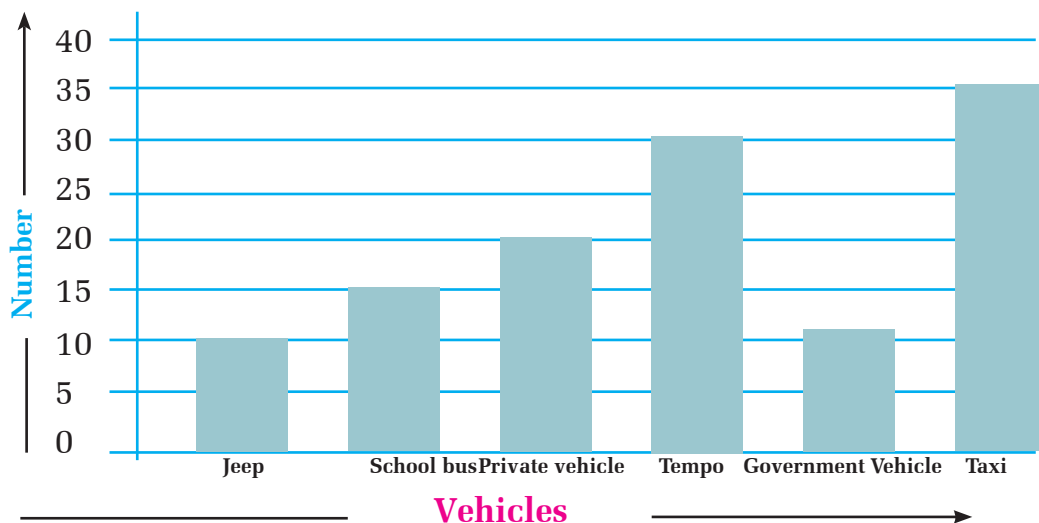
7.1 Bar graph

10 jeeps, 15 school buses, 20 private vehicles, 30 tempos, 12 government vehicles and 35 taxis passed through New Road in Kathmandu in the morning, between 9 to 10 am. How can this information be presented so that it is easier to understand for all? Making a table is one of the ways. The above information can be presented in the table as follow:



Jeeps	School Buses	Private Vehicles	Tempos	Government Vehicles	Taxis
10	15	20	30	12	35

It is easier to understand various information from the table. If the above information is presented in bar graph, it is very easy to compare the facts. The information can be presented in bar graph as below:



Try to answer the following questions on the basis of the above bar graph.

- Which vehicles run most within an hour?
- Which vehicles run the least?
- What does the height of the bar graph represent?
- What do the vertical and the horizontal lines represent in the bar graph?
- How many vehicles are represented by one square unit in the vertical line?

Thus, the bar graph is very useful to compare the objects having the same characteristics. We can get various information at a glance. The bargraph is used to show and compare height and weight of members of a family; class wise number of students in a school; investment and return of government offices; rainfall and temperature in seven days etc. In which tasks can bar graph be used besides the above mentioned tasks? Discuss in class.

Exercise 7.1

- There were 100 students in a school. When asked "Which subject do you like most?", we got the following responses.**

Favourite Subjects	Nepali	Mathematics	English	Science	Health	Geography
Number of Students	15	30	10	25	15	5

Draw a bar graph to represent the above information taking 1 room = 10 students in vertical axis.

- The number of students who did not do homework among 50 students in class 4 last week is given in the table below. Draw a bar graph taking 1 room = 10 students in vertical axis.

Days	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Number of students	6	7	10	3	6	2

Answer the following questions from your bar graph.

- Which day did most of the students do homework?
- Which day did least of the students not do homework?
- How many students did not do homework in a week?

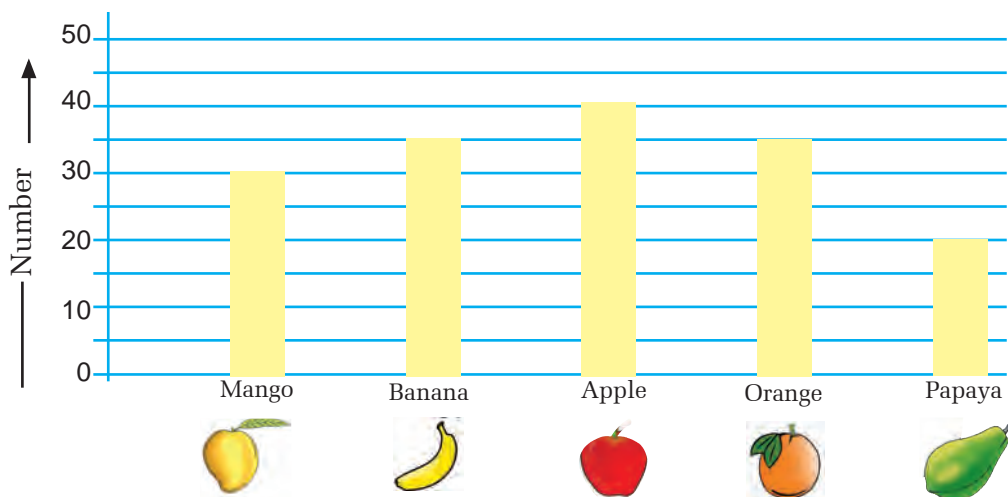
3. The height of students of class 4 is given in cm in the following table.

Height	102 cm	103 cm	104 cm	105 cm	106 cm
Number of students	5	10	15	12	8

4. Draw a bar graph to represent the height of students and answer the following questions.

- What is the height of the maximum number of students?
- Which height students are least in number?
- If the students with more than 104 cm are considered taller, how many students are taller in the class?
- What is the percentage of the students whose height is 102 cm?
- How many students are there whose height is lesser than 105 cm?

4. Students had fruits in a picnic as follow.



Answer the following questions from the above bar graph.

- How many kinds of fruits were taken in the picnic?
- Which fruits were used the most and the least?
- Which two fruits were used in equal number?
- If each student had eaten only one fruit, how many students were there altogether in the picnic?

7.2 Reading a thermometer

Sometimes, we feel severe cold. Sometimes, it is scorching hot and we sweat a lot. Temperature is high and low according to the changes in weather. You might have heard about the temperature of various places from Radio or Television at the end of news broad casting. One who listens to radio or watches television knows where it is too hot or cold in the various places of Nepal. The instrument used to measure temperature is called thermometer.

The adjoining figure is of thermometer. What does the black shaded portion indicate in the figure? The black shaded portion indicates mercury in the thermometer. Its height changes according to temperature. The height increases in the hot temperature and decreases in cold. The serial numbers are written vertically in both sides. In the left side of the vertical scale, temperature is read in Celsius scale. In the right side, temperature is read in Fahrenheit scale. The unit of temperature is $^{\circ}\text{C}$ (degree Celsius) or $^{\circ}\text{F}$ (degree Fahrenheit). Look at the figure carefully and answer the following questions.

- What $^{\circ}\text{F}$ is represented by 4°C in the thermometer?
- What is the lowest temperature shown in Fahrenheit scale of the thermometer?



Look at the thermometer given below. It shows 36.5°C temperature. What is the temperature in Fahrenheit scale?

Look at the figure.



The above thermometer is used to measure the body temperature of people. The mercury shows 98°F . When we suffer from fever, body temperature rises up to 100°F and even to, 104°F , 108°F . Have you ever seen a doctor measuring the body temperature of patients? Measuring temperature means knowing the temperature of body. It is not good to have body temperature higher or lower than 98°F .

Exercise 7.2

1. Keep a thermometer in the classroom and read the temperature at 10 o'clock and 3 o'clock every day. Does the thermometer show the same or different temperature in the morning and afternoon? List the temperature.
2. Do the above activity (ex. 1) for a week. Draw two bar graphs to show the temperature in the morning and afternoon in a week. Can you show this in one bar graph?
3. If you have a clinical thermometer in your house, measure your temperature early in the morning and note in a paper. See body temperature for a week. Is the temperature same or different?

7.3 Ordered pairs

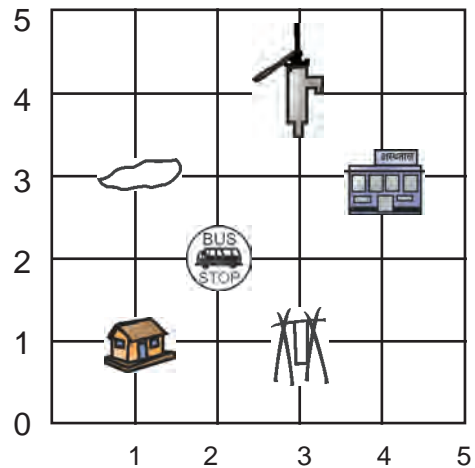
Look at the following figure carefully. Vertical and horizontal lines are crossed at point O in the figure. There is written 1, 2, 3, 4 and 5 numbers towards the right from O. Similarly, there is written 1, 2, 3, 4 and 5 numbers upwards in the vertical line.

If we are at O and want to reach at swing, we have to move 3 units to the right and then 1 unit up. We denote this by ordered pair (3, 1). The ordered pair (3, 1) means 3 units towards right horizontally and 1 unit upward. If the order is taken as horizontal first and vertical second for all points in the figure, the ordered pair for house is (1, 1). The ground is denoted by the order pair (1, 3).

Similarly, can you write the ordered pair for the following places?

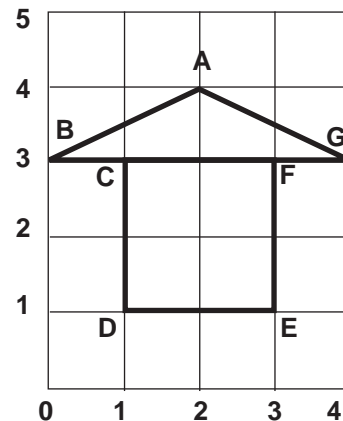
- The location of water pump
- The location of bus stop
- The location of hospital

The order of numbers is very important in ordered pair. In the above figure, if we take ordered pair (1, 3), we reach at lawn but if we take ordered pair (3, 1), we reach at swing. Therefore, ordered pairs (1, 3) and (3, 1) denote quite different places. Ordered pair is used to represent the situation of points in plain surface.



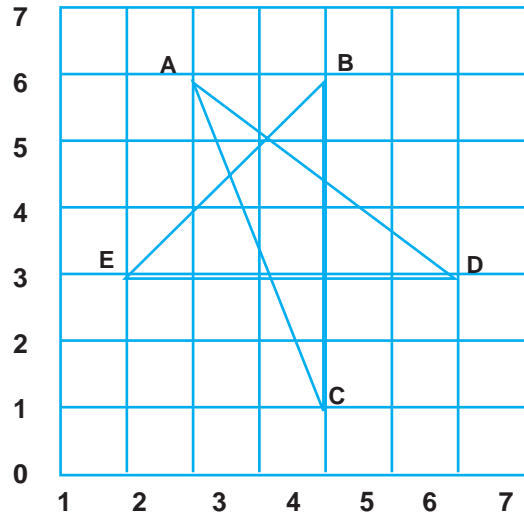
In the adjoining figure, if the ordered pair (2, 4) represents point the A. then,

- What is the ordered pair to denote point B?
- What is the ordered pair to denote point F?
- Which point does the ordered pair (3, 1) denote?
- Which point does the ordered pair (4, 3) denote?

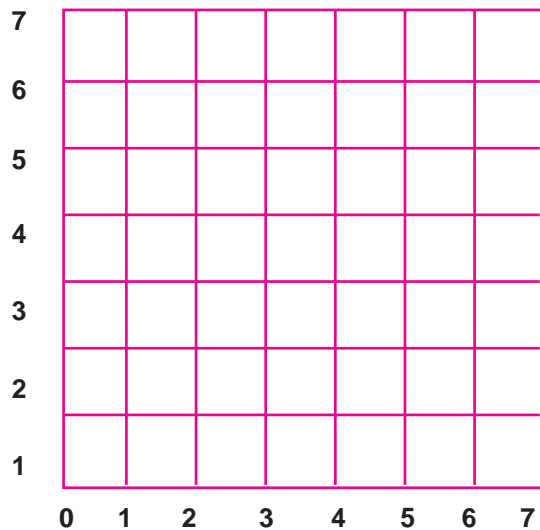


Exercise 7.3

- Write down the ordered pair to denote the points A, B, C, D, E in the adjoining figure.



- Plot the following points A, B, C, D, E, F, G, H, I, J, K having ordered pairs (0, 4), (2, 5), (4, 5), (5, 4), (6, 6), (5, 3), (4, 2), (2, 2), (1, 3), (2, 4) respectively. Join the points in order and also join points A and K. What figure have you made?



Teaching Instructions:

The above activities are just symbolic activities to make the students able to read information from graph and to develop skill of representing information in graph while teaching statistics. In addition to above examples, let students collect data, make table and graph to represent class-wise students in a school, student's attendance and absence in a week, and other familiar events in their surroundings. Similarly, make exercise in ordered pair to represent various shapes and tell them to read and plot the ordered pair.

8

Sets

8.1 Introduction

Read and learn.



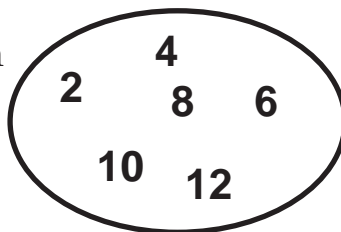
This set can be called a 'set of children' because Ram, Gopi and Sita are members of the set. Can this set be called as 'set of taller people'?

In the figure above, Ram is taller than Sita and shorter than Gopi. If we name the set as 'set of taller people', Ram belongs to the set because he is taller than Sita. Ram does not belong to the set because he is shorter than Gopi. Thus, Ram belongs to that set in the first case and he does not belong to the set in the second case. It means the members of the set are not well defined. So, this type of collection is not a set.

Example 1

In this collection, there are only even numbers from 2 to 12. This set is called a set of even numbers, which are smaller than 13.

3 does not belong to the set. Why? The reason is that 3 is an odd number. 14 also does not belong to the set because although it is an even number, the set consists even numbers smaller than 13. Thus, it should be clear that which items belong to the set and which do not.



A set is a well defined collection of objects.

Objects, which belongs to a set, are members of the set. Ram's family has seven members, viz. Hari, Bhagawati, Ram, Rambilas, Shila, Shiva and Pasang. Ram's family is a set. Hari is a member of the set and Bhagawati is also a member. Similarly, who are the other members of the set? But Bhunte is not a member of the set.

Exercise 8.1

1. Identify whether the following statement are set or not and name the members of the set.

- (a) The set of seven days of a week
- (b) The set of numbers from 1 to 10
- (c) The set of taller students of class 4
- (d) The set of students of class 4
- (e) The set of girls having black hair
- (f) The set of vowels of English alphabets
- (g) The set of English alphabets
- (h) The set of instruments in geometry box
- (i) The set of students who can jump higher

2. Identify whether the following statements about the set are right or wrong.

- (a) Sunday is a member of the set of seven days of a week.
- (b) Saturday is a member of the set of office opening days.
- (c) 3 is a member of the set of even numbers.
- (d) Triangle is not a member of the set of geometrical shapes.
- (e) Raju's family has Shila, Krishna, Shiva and Kailash. Krishna is a member of the set of the family.
- (f) Number of members of a set may be one, two or more than two.
- (g) Blackboard is not a member of the set of furniture.

8.2 Methods of writing sets

Look at the following figure.



Figure 'A'

Figure 'B'

In the figure A, (Falgun 7 gate, Women day and Bhanu jayanti) are written in a circle. Falgun 7 gate, Women day and Bhanu jayanti represent the set of national festival days. Similarly, in the figure B, flowers are enclosed in a circle. Thus, objects are enclosed within a circle and are taken as members of the set. This is one of the methods of writing a set.

Next method of writing a set is listing all its members enclosed within curly brackets { } with each member separated by commas. Look at the following examples:

The set of school opening days can be written as {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday}

The set of sense organs = {eyes, nose, ears, tongue, skin}

Thus, the method of writing set by listing its all members within curly brackets { } and separating each elements by commas is called listing method.

Exercise 8.2

Write the following members of each set by listing method.

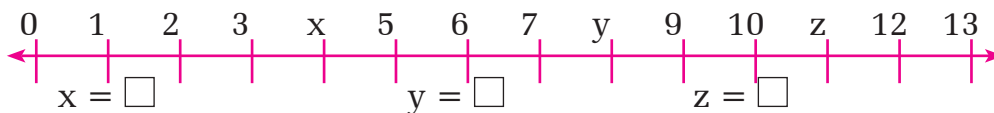
1. The set of all zones of Nepal
2. The set of all subjects taught in class four
3. The set of odd numbers from 1 to 10
4. The set of the last three alphabets of English
5. The set of metropolitan cities of Nepal
6. The set of Roman numerals from 1 to 10
7. The set of vowels of English alphabets
8. The set of the last five alphabets of Nepali
9. The set of the first three vowel alphabets of English
10. The set of colours used in Nepalese national flag

9

Algebra

9.1 Variable and Value

In the following number line, which numbers should be written in place of x, y and z. Write in your exercise book.



In algebra, we can use letters or other symbols in place of numbers. The letter or symbol which is used in place of numbers is called variable.

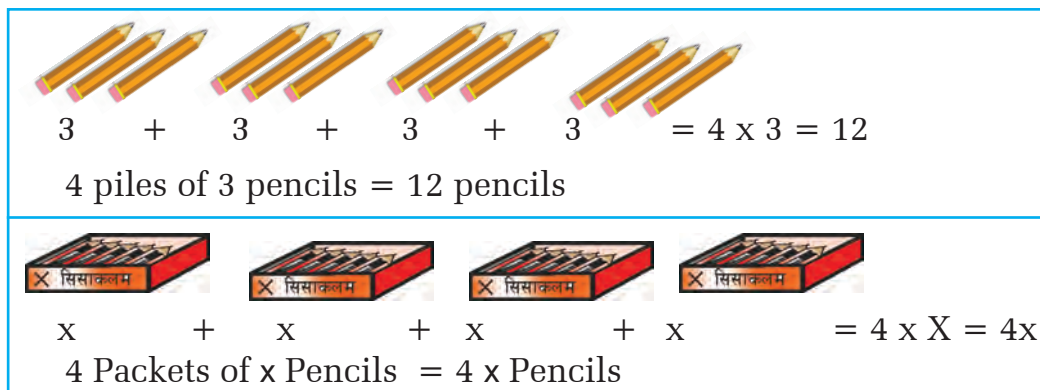
$3 + 3 + 3 + 3$
 $= 4 \times 3 = 12$
 but
 $x + x + x + x = ?$



It is also similar. Here 3 is added 4 times. So, $3 + 3 + 3 + 3 = 4 \times 3 = 12$. Similarly, in $x + x + x + x$, x is added 4 times. So, $x + x + x + x = 4 \times x = 4x$. Do you understand?



Look at the following figure.



Similarly, $y + y + y = 3 \times y = 3y$

Here, y is added three times. The repeated times is written in front of y . In $3y$, 3 which is written in front of y , is called the coefficient.

What is the coefficient of the following terms? Write in the boxes.

The coefficient of m in $6m = \square$ The coefficient of p in $4p = \square$

The coefficient of x in $7x = \square$ The coefficient of a in $5a = \square$

Example 1

If $a = 3$, find the value of $a + 4$.

Here,

$$\begin{aligned} a + 4 \\ = 3 + 4 \text{ (putting 3 in place of a)} \end{aligned}$$

$$\text{Ans} = 7$$

Example 2

If $p = 7$, what is the value of $13 - p$?

Here,

$$\begin{aligned} 13 - p \\ = 13 - 7 \text{ (putting 7 in place of p)} \end{aligned}$$

$$\text{Ans} = 6$$

Example 3

If $a = 3$ and $b = 4$, what is the value of $2a + 5b$?

Here,

$$\begin{aligned} 2a + 5b \\ = (2 \times a) + (5 \times b) \text{ [} 2a = 2 \times a \text{ and } 5b = 5 \times b \text{]} \\ = (2 \times 3) + (5 \times 4) \text{ (putting 3 in place of a and 4 in place of b)} \\ = 6 + 20 \end{aligned}$$

$$\text{Ans} = 26$$

Exercise 9.1

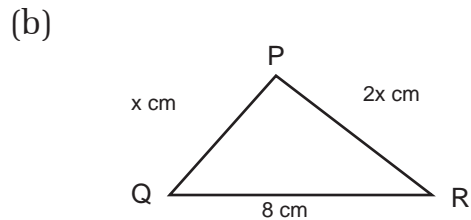
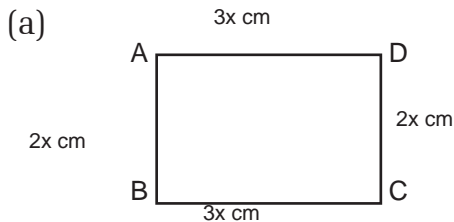
1. If $a = 5$, $b = 3$, $c = 4$ and $d = 0$. find the value of followings.

- (a) $a + 3$ (b) $b + c$ (c) $6 - a$ (d) $3b + 2$ (e) $2b - 3d$
 (f) $ab - bc$ (g) ab (h) bc (i) cd (j) $a + b + c$
 (k) $a - b + c$ (l) $2a - (b + c)$

2. If $x = 5$, find the length of the following line segments.



3. If $x = 3$, find the perimeter of the followings.



9.2 Algebraic terms and expressions

Raju had x marbles. His mother gave him 5 marbles. Now, Raju had $x + 5$ marbles. Shila had Rs. y . She bought a pen for Rs. 10. Then she had Rs. $(y - 10)$ left. Here, x , 5, y , 10 are known as algebraic terms.

When algebraic terms are connected by '+' or '-' sign, it is called algebraic expression. In the above examples, $x + 5$ and $y - 10$ are algebraic expressions. How many terms are there in these two expressions?

When term 5 is added to term X, it becomes $X + 5$. In $X + 5$, two terms are added so it is binomial. Similarly, $y - 10$ is also binomial.



Thus, binomial is formed when one term is added to or subtracted from another term, isn't it?



Suraj has x marbles and Saurav has $3x$ marbles. They have $4x$ marbles altogether. x , $3x$ and $4x$ are monomials.

So, there may be one, two or more than two terms in algebraic expressions.

- (a) x , y , $5x$, $3z$, 4 etc. are monomials.
- (b) $x + y$, $x - y$, $3a + 4b$ etc. are binomials.
- (c) $x + y + z$, $2a + 3b + 4c$, $p + 2q + 3r$ etc are trinomials.

Example 9.2

How many terms are there in the following algebraic expressions?

- (a) $3x$ (b) $5y$ (c) m (d) $2x + y$ (e) $4z - z$
- (f) $5m - 3n$ (g) $x + y + z$ (h) $3 - 2x + 5y$
- (i) $10 - p - q$ (j) $a - b + c + d + e$

9.3 Like and unlike terms

Look, read and discuss



5 apples



7 apples

There are 5 apples in the first basket.

There are 7 apples in the second basket.
 There are same objects in two baskets. These are like objects.
 Now, writing variable 'a' in place of apple,
 Apples in the first basket = $5a$
 Apples in the second basket = $7a$
 What types of terms are $5a$ and $7a$?

Apples in the both baskets are the same objects or like objects. Terms $5a$ and $7a$ used to represent the objects are like terms. isn't it?



5 Apples

4 Oranges



Here, there are 5 apples in the first basket.
 There are 4 oranges in the second basket.
 There are two different types (unlike) of fruits in the two baskets.
 If we write variable 'a' in place of apple and variable 'b' in place orange,
 we get.

Apples in the first basket
 = $5a$

Oranges in the second basket
 = $4b$

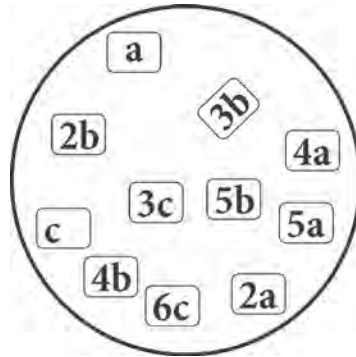
Apples in the first basket and oranges in the second basket are different types (unlike) of fruits. So, terms $5a$ and $4b$ used to represent them are unlike terms.

What types of terms are $5a$ and $4b$?



Objects having the same characteristics are known as like objects. Objects having different characteristics are known as unlike objects. Similarly, terms having same variable are called like terms and terms having different variables are called unlike terms.

Cards having like terms and unlike terms are displayed randomly in the following figure. How many terms are there having a, b and c?



Addition of like terms

Example 1

add $3a$ and $4a$.

We know that,

$$3a = a + a + a \text{ (three a) and}$$

$$4a = a + a + a + a \text{ (four 'a's)}$$

$$\text{So, } 3a + 4a = a + a + a + a + a + a + a = 7a \text{ (seven a)}$$



Example 2

Addition of $3a$ and $3b$.

Here,

$$3a = a + a + a \text{ (three a) and}$$

$$3b = b + b + b \text{ (three b)}$$

$$\text{So, } 3a + 3b = a + a + a + b + b + b$$

$$= (3 \times a) + (3 \times b)$$

$$= 3a + 3b$$

Thus, $3a$ and $4a$ are like terms. So, these terms can be added but $3a$ and $3b$ are unlike terms, So these terms can not be added. Only operation of addition can be shown.

Like terms can be added in short way too. Look at the following example.

Example 3

$$4x + 7x = (4 + 7) x = 11 x$$

The coefficients of $4x$ and $7x$ are 4 and 7 respectively.

On adding 4 and 7, we get $4 + 7 = 11$.

x is the symbol of variable.

While adding like terms, we should add only the coefficients of the terms and the variable is written only once.



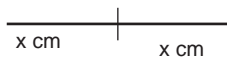
Exercise 9.3

1. Calculate the sum of the following like terms.

- (a) $a + 3a$ (b) $3a + 4a$ (c) $2b + 3b$ (d) $3c + 7c$
 (e) $4d + 5d$ (f) $9t + 3t$ (g) $11x + 12 x$ (h) $15y + 12 y$
 (i) $9z + 9z$ (j) $5a + 3b + 4a + 3b$ (k) $3x + 4y + 3x + 7y$
 (m) $a + a + a + 2a + 3b$

2. Find the length of the following line segments.

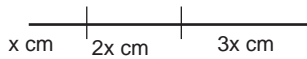
(a)



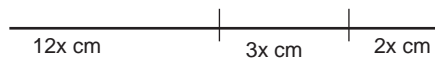
(b)



(c)



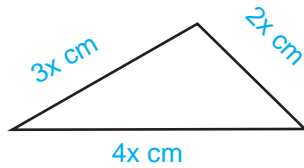
(d)



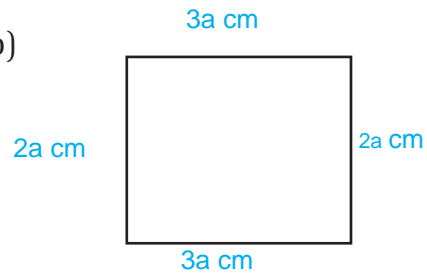
3. If $x = 2$, find the actual length of the line segments in the above question No. 2.

4. Find the perimeter of each of the following geometrical shapes.

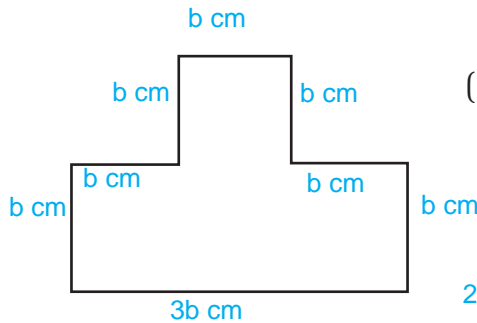
(a)



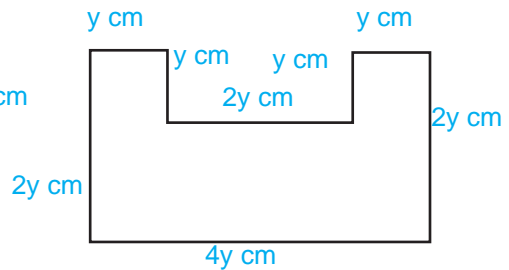
(b)



(c)

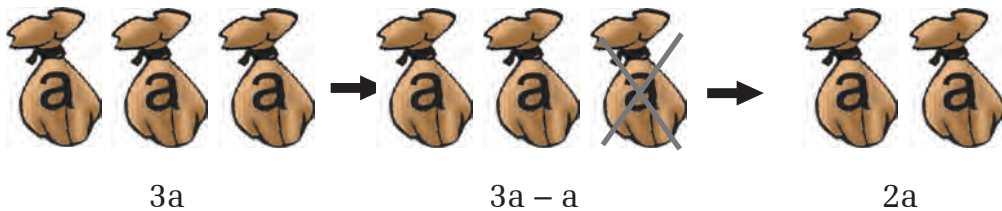


(d)



Subtraction of like terms

Look, discuss and learn.



$$3a - a = \overbrace{a + a} + \overbrace{a} - a \quad \left[\text{one 'a' has to be removed from '3a', so it is written as '-a'} \right]$$

$$= a + a + \cancel{a} - \cancel{a} \quad \left[\text{cancelling like terms having equal quantity with opposite sign.} \right]$$

$$= 2a$$

Example 1

$$3a - 2a = a + \cancel{a} + \cancel{a} - \cancel{a} - \cancel{a} = a$$

Example 2

$$3a - 3a = \cancel{a} + \cancel{a} + \cancel{a} - \cancel{a} - \cancel{a} - \cancel{a} = 0$$

Example 3

$$3a - 2b = a + a + a - b - b = (3 \times a) - (2 \times b) = 3a - 2b$$

Like terms can be subtracted but unlike terms can not.

Example 4

$$12a - 7a$$

Can you subtract this making short? Think for a while.



Subtract the coefficients of like terms only as it is done for addition and write the variable or sign letter.

$$\text{So, } 12a - 7a = (12 - 7) a = 5a$$

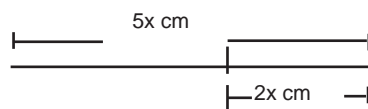
Exercise 9.4

1. Subtract the following like terms.

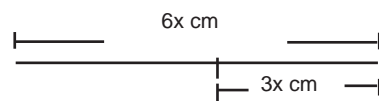
- (a) $6a - 4a$ (b) $3a - 2a$ (c) $4b - 3b$ (d) $5e - 2e$
(e) $17p - 13p$ (f) $15x - 3x$ (g) $7x - 7x$ (h) $12y - 9y$
(i) $-b + 9b$ (j) $12x - 3x - 2x$ (k) $14y - 4y - y$

2. Whole length and partial length of the line segments are given in the following figures. Find the length of the remaining portions.

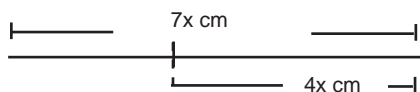
(a)



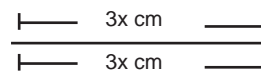
(b)



(c)



(d)



3. If $x = 3$ in the above question No. 2, find the length of each whole and partial line segments.

9.4 Algebraic equation

Mathematical sentences

When 2 is added to 5, the sum is 7.

This is a mathematical sentence. It is written as $5 + 2 = 7$ in mathematical form. Similarly, the difference of 15 and 9 is 6. It is written mathematically as $15 - 9 = 6$.

Look at the following mathematical sentences.

- (a) 5 is an odd number.
- (b) 12 is exactly divisible by 5.
- (c) Cows have legs.

Are these sentences true, false or open? Let's think.

The first sentence is true sentence. The second sentence is a false one. The third sentence is not a clear sentence. If we put 1 or 2 or 3 in the place of the box, the sentence gives false meaning but if we put 4 in the true meaning the box, the sentence gives true meaning.



So, those sentences which are not separated as true and false are called open sentence.

Now, let your friend who is next to you, make mathematical sentences one by one and try to find whether the sentences they say are true or false or open sentences.

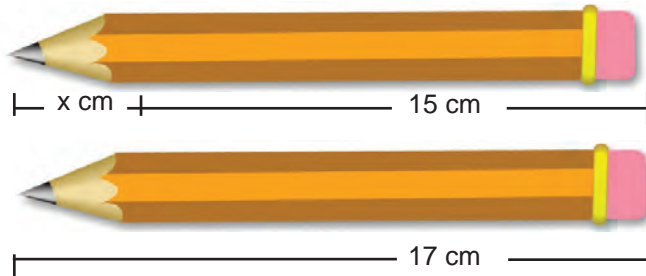
Exercise 9.5

State whether each of the following mathematical sentences is true, false or open.

1. The sum of 12 and 15 is 27.
2. 5 lies between 3 and 5.
3. The difference of 15 and 12 is 13.
4. 31 is an odd number.
5. There are \square sides in a triangle.
6. The half of 12 is \square .
7. There is \square centimeter in a meter.
8. 121 is exactly divisible by 12.
9. $\square \times \square = 9$
10. \square is greater than 6.
- 11. What number should be written in the box to make a true sentence for each of the following open sentences?**
 - a. \square is a number greater than 5 and smaller than 7.
 - b. \square is a square number among 2, 3, 4, 5.
 - c. \square is the remainder when 5 is subtracted from 8.
 - d. \square is a positive number smaller than 5.
 - e. 12 is exactly divisible by \square .

Solving equation

Raju and Shila bought one pencil each having equal lengths. Raju said, "Shila, length of my pencil is $(x + 15)$ cm, what is yours?"



Shila said, "How clever you are brother. As you say open sentence, it may be true or false. I can say only after measuring the length of my pencil." Shila measured her pencil. Her pencil was 17 cm long. She said "Your and my pencils are equal, hence $x + 15 = 17$, aren't they? It was another open sentence. It is different type of open sentence than previous one. Yes, there is equal sign in the open sentence. Let's think for a while."

Raju said, "Open sentence can be converted into true sentence. $x + 15 = 17$ means 15 is added to x to get 17. What should be added to 15 to get 17?"

"2", Shila answered quickly. So, we put $x = 2$ in open sentence. $x + 15 = 17$ to get true sentence, isn't it? Shila said, $2 + 15 = 17$

Thus, Raju and Shila found a new mathematical method. They said,

Open sentences having equal sign like $x + 5 = 15$, $3x \square = 12$, $x - 9 = 1$ are called equation. The method of calculating the value of the variable to make the open sentence true is called solution of equation.

Write three open sentences to represent equations and show your teacher.

Example 1

What number should be written in the box?

$$15 + \square = 19$$

Here,

$15 + \square = 19$ means how much should be added to 15 to make 19. 4 needs to be added to 15 to make 19. Therefore, 4 needs to be written in the box.

Example 2

What number should be written in the box?

$$9 - \square = 6$$

Here, $9 - \square = 6$ means what should be subtracted from 9 to get 6. 3 needs to be subtracted from 9 to get 6. Therefore, 3 needs to be written in the box. This can be done following another method, 3 needs to be added to 6 to make 9. So, 3 should be subtracted from 9 to get 6. Therefore, 3 needs to be written in the box.

$$9 - \square = 6$$

Example 3

What is the value of x in $5 + x = 8$?

$5 + x = 8$ means what should be added to 5 to make 8. 3 needs to be added to 5 to make 8. Therefore, 3 needs to be written in the place of x to get $5 + 3 = 8$.

3 is written in the place of x. So, the value of x is 3.

Example 4

Solve: $3 \times y = 15$

Here, $3 \times y = 15$ means how many times of 3 is 15.

Let's recall multiplication table of 3.

$$3 \times 1 = 3 \text{ Not correct}$$

$$3 \times 2 = 6 \text{ Not correct}$$

$$3 \times 3 = 9 \text{ Not correct}$$

$$3 \times 4 = 12 \text{ Not correct}$$

$$3 \times 5 = 15 \text{ Correct}$$

Thus, when 5 is multiplied by 3 we get 15. Therefore, $y = 5$.

Example 5

What is the value of x in $\frac{21}{x} = 3$?

Here,

$\frac{21}{x} = 3$ means what is the divisor of 21 so that quotient is 3. How to find it?

There is 3 in the right side of equal sign, 3 needs to be multiplied by 7 to get 21. If we divide 21 by 7, we get 3. I found this method easier to find the value of x .



Yes, correct.

$\frac{21}{x} = 3$ what is divisor of 21 so that quotient is 3. When 3 is multiplied by 7 we get 21. 21 divided by 7 gives 3. Therefore, the value of x is 7.

Exercise 9.6

1. Fill appropriate number in each box.

(a) $4 + \square = 9$

(b) $12 - \square = 8$

(c) $\square + 7 = 10$

(d) $\square - 5 = 15$

(e) $3 \times \square = 15$

(f) $7 \times \square = 21$

(g) $\square \times 6 = 48$

(h) $\frac{21}{\square} = 3$

(i) $\frac{125}{\square} = 25$

(j) $\frac{4 \times 15}{\square} = 3$

2. Solve

(a) $x + 7 = 12$ (b) $x - 6 = 15$ (c) $16 + x = 20$ (d) $8 - y = 7$

(e) $15 = x + 5$ (f) $3x = 27$ (g) $4y = 36$ (h) $9z + 6 = 60$

(i) $\frac{36}{x} = 12$ (j) $\frac{125}{y} = 25$

3. If $x - 10 = 16$, $x = ?$

4. If $5y + 3 = 23$, $y = ?$

5. If $\frac{6z}{4} = 12$, $z = ?$

6. $25 - y = 18$, $y = ?$

7. If the following two line segments are equal in length, find the value of x and y .

(a) $(3x + 1)$ cm

13 cm

(b) $(2y + 2)$ cm

20 cm

(c) $(2x + 2)$ cm

$(x + 5)$ cm
