A 'Teacher's book' has been prepared for teachers and parents (separately) kindly use this.

MATHEMATICS

Standard 6

(Semester I)

PLEDGE

India is my country.

All Indians are my brothers and sisters.

I love my country and I am proud of its rich and varied heritage.

I shall always strive to be worthy of it.

I shall respect my parents, teachers and all my elders and treat everyone with courtesy.

I pledge my devotion to my country and its people.

My happiness lies in their well-being and prosperity.

Price : ₹ **24.00**

Preparation and Planning :

Dr T. S. Joshi   Haresh Chaudhari
Iqbal Vora   Chandresh Palia

Convener :

Dr Vijay Patel

Co-convener :

Dr Sanjay Shah   M. A. Shekh
Jagdish Patel   Rashmikant Patel
Jivan Ramani

Authors :

Parimal Patel   Suketu Yagnik
Bharat Prajapati   Suchit Prajapati
Chintan Shah   Jignesh Shah
Hitesh Prajapati   Gaurang Patel
Radhaben Yadav   Pratik Patel
Prakash Prajapati   Sanjay Patel
Dhruv Desai   Ashok Parmar
Pankajgir Goswami   Diptiben Ghodasara
Ketan Patel   Pragnesh Upadhaya
Nilesh Nathani   Sonuben Gohel
Rajendrasingh Parmar   Dhirubhai Panchal
Komalben Zabuavala

Reviewers :

Dr R.D. Muliya   Dr Kanjibhai Patel
Dr Dipuba Devada   M. S. Jajal
Dr Satish Pathak

Translator :

Hemant R. Shah

Artist :

Jayant Pranami   Smitaben Rana
Kanjibhai Parmar   Gaurishankar Mehta
Jyoti Khatri   Manish Parekh

Title Design :

Dharmesh Chavada

Lay-out and Planning

Shri Haresh S. Limbachiya
(Dy. Director : Production)

PREFACE

The National Curriculum Framework (NCF) 2005 and the Right to Education Act (RTE) 2009 recommends connecting knowledge that is provided in school to the life outside the school. This principle marks a departure from the legacy of book is learning which continues to shape our education system and is creating removes a huge gap between the school, home and community.

The syllabi and textbook developed on the basis of above principle signify an attempt to implement it with a considerable change in the textbooks, teaching learning methods, approaches etc. Such textbooks will provide the scope to the students to learn individually, in pair, in group and as a whole class and provide self- learning, improve the application and consolidation abilities of the children. In such a scenario, the teacher will be just an initiator, facilitator and guide and will create learner dominant classes.

During the process of designing and developing the textbooks, the core group personnel coordinators, writers and reviewers got a lot of inspiration and motivation from the Chief Secretary of Elementary Education.

Also, the guidance from IGNUS-erg and co-operation of UNICEF was easily and continuously available to the group during the entire process of developing the textbooks. After implementing the textbooks as a part of the pilot study, due efforts were done to make it faultless. Now, it is in the hands of the users and beneficiaries.

GCERT welcomes constructive and creative comments and suggestions which will be useful to undertake further revision and refinement.
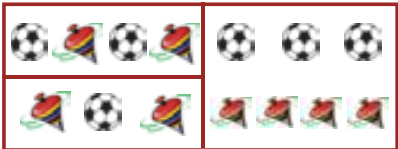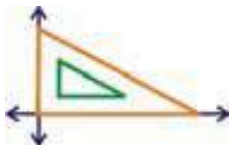
FUNDAMENTAL DUTIES

It shall be the duty of every citizen of India :

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage or our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

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1 Bar Graph

◆ **Let us learn new :**

Activity 1 :

● Do you have fun while doing activity, given by your teacher. Let us do another activity like that. Dear friends, make a list of articles kept in your school bag as shown in following table and note down in the table with sign.

e.g. Two pens are there in my school bag, then do two ■ in pen column.

■ ■					
Pen	**Textbook**	**Compass Box**	**Pencil**	**Notebook**	**Workbook**

Activity 2 : Dear friends, you have done good job ! Now, fill up the information about your family members in the following table. For this use colours. Fill up colour memberwise, in each box :

Colours→	Red	Green	Blue	Orange	Light Blue	Yellow
5						
4						
3						
2						
1						
No. of Members ↑	**Brother**	**Sister**	**Uncle**	**Aunty**	**Maternal Uncle**	**Maternal Aunty**

Activity 3 :

Dear friends, below approximate lifecycle of different animals are given in years, fill up different colours as shown in the table :

Lifecycle of animals (in years) :

Cat	➤	10
Dog	➤	8
Rabbit	➤	6
Monkey	➤	12

Colour	Red	Green	Blue	Orange
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				
Animals				

Bar Graph :

We can easily understand the data (information) by pictures then by digits. But, pictorial representation of every data takes much time. Instead of pictures we show the same data in different way. From the given data, we can draw bars of equal breadth, equal rectangles. The graph which is represented by bars is called **Bar graph**.

Graph paper :

In graph paper, horizontal and vertical lines are drawn at right angles, distance between them is equal. In graph paper some lines are shown 'bold' and some lines are shown 'light' in colour. The distance between two consecutive bold coloured lines is 1 cm. 1 cm is divided into 5 or 10 equal parts. Here, we use the graph paper in which 1 cm is divided into 5 parts. Study the following graph paper :

Heading : In government primary shool, presence of students of std. 5 to 8 on Dt. 1-4-2012

Scale : On Y-axis 1 cm = 5 students
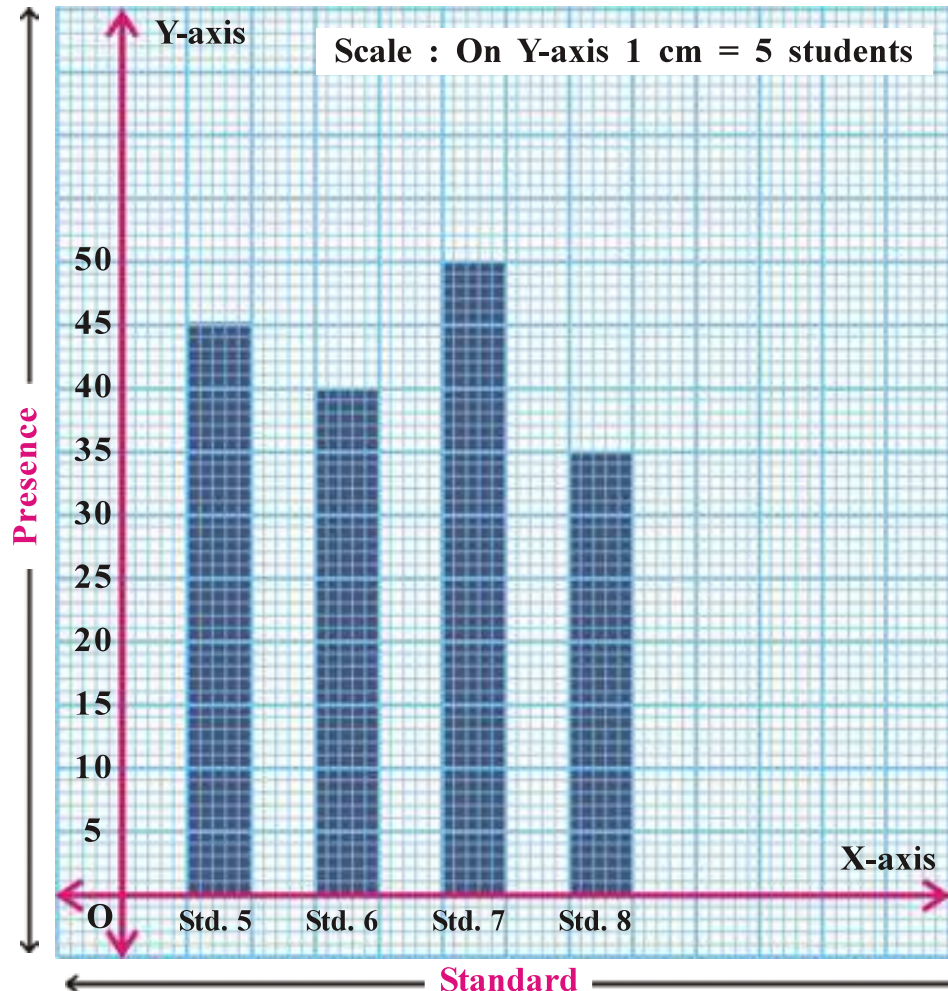
Graph 1

Advantages of Bar graph :
- Representation of the data is very short.
- We can remember the data for a long time.
- We can easily compare between two datas.
- We can understand the data easily.
- Data of more than one factors are easily available.

Uses :

In our daily life, we often come across bar graphs and tables relating to some data like birthrates, deathrates, cold, temperature, monsoon, percentage of literacy, industrial production, crop production, cricket match, export-import position of country, educational results and its achievement rank in newspaper, magazines and information bulletins on T.V.

Scale : Measurement of the data to decide 1 cm length or breadth is called scale. e.g. In graph-1, 1 cm = 5 students. It is the scale of Y-axis.

Activity 4 :

Dear friends, you have done activities 2 and 3. Now, same way fill up the data of runs scored by Indian cricketers with given colours :

Cricketer	Sachin	Sehwag	Raina	Dhoni	Gambhir
Runs	35	30	20	25	15

Here, maximum run is 35.

Scale : 1 box = 5 runs

Similarly, 5 runs means, fill up the colour in 1 ☐ box.

Colours → Runs ↓	Red	Green	Blue	Orange	Light Blue
35					
30					
25					
20					
15					
10					
5					
Cricketers →	Sachin	Sehwag	Raina	Dhoni	Gambhir

Activity 5 :

Trees	No. of trees
Neem	
Ashok	
Banyan	
Babool	
Peepel	

Dear friends, from our school ground or from nearby area list out the following trees :

Neem, Ashok, Banyan, Peepel

Scale : 1 box = 2 trees

Here, fill up the colours in whole box for 2 trees.

= 2 trees

Now, what should we do if number of trees is **odd number** ?

Here, Scale : 1 box = 2 trees

Therefore, 1 tree = $\frac{1}{2}$ box. So, fill up the colour in half box = 1 tree.

= 1 tree

Suppose, from our school ground or from nearby area number of neem trees is 9, then 2 trees = 1 box. i.e. take 4 boxes for 8 trees and half box for 1 tree. Therefore, to show 9 trees, take 4 full boxes and a half box.

Nos.					
18					
16					
14					
12					
10					
8					
6					
4					
2					
Trees	Neem	Ashok	Banyan	Babool	Peepel
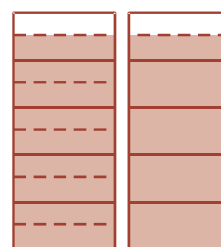
Half Boxes **Full Boxes** **Graph-paper**
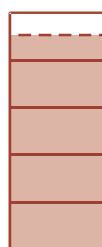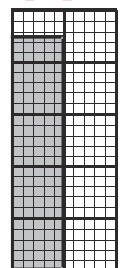
Let us understand :

- Horizontal line drawn on graph-paper is called X-axis.
- Vertical line drawn on graph-paper is called Y-axis.
- Bar graph is used to compare 2 datas.
- Suitable heading is given to each graph.
- For each data vertical rectangle is drawn on X-axis.
- Width of each bar should kept equal but their respective height depends on value of given data. If the value is more, height of the bar is more and if the value is less, height of the bar is less.
- Always, distance between two nearby bars should kept equal. So, scale is not necessary on X-axis, but on Y-axis it is necessary to take suitable scale.
- Scale is decided according to the limitations of graph-paper. Everytime, scale is taken according to necessity.
- Generally, qualitative information is denoted on X-axis, while quantitative information is denoted on Y-axis.

Illustration 1 : The bar graph given shows rainfall of a week in month of July in five cities. Answer the following questions from that :

One week rainfall of 5 cities of July month

Scale : Y-axis : 1 cm = 5 cm rainfall
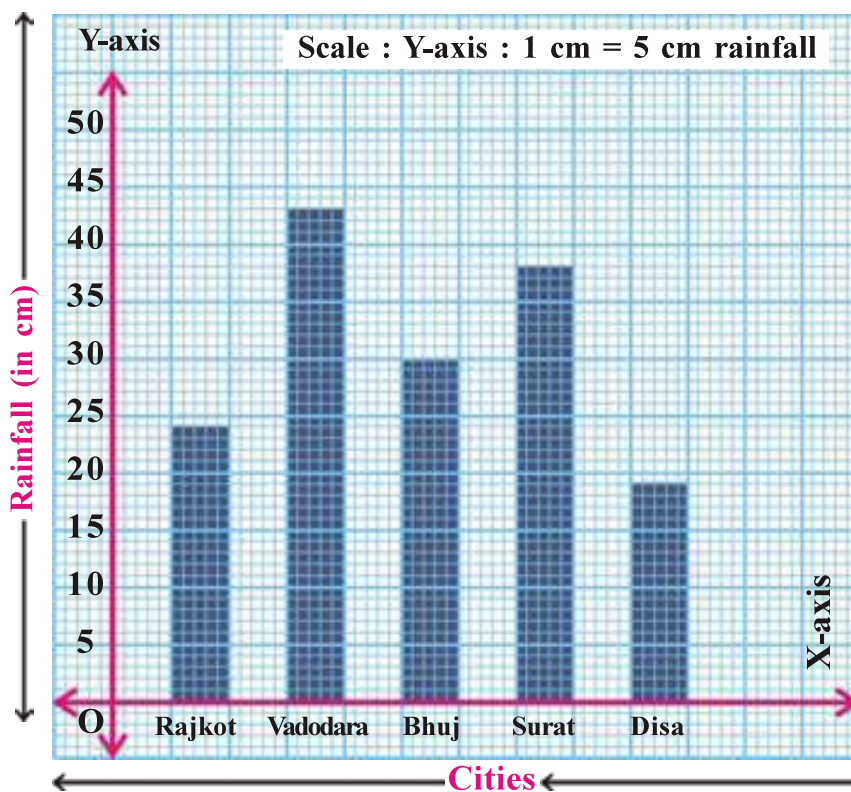
Graph 2

Questions :

(1) What information does the given bar graph give ?

(2) What is shown on X-axis ?

(3) What is shown on Y-axis ?

(4) What is the scale of this graph ?

(5) In which city does the maximum rain fall ? How much ?

(6) How much centimeter of rain falls in Bhuj city ?

(7) In which city does the minimum rain fall ? How much ?

Answers :

(1) Given bar graph shows total rain fall in one week of July month in five cities.

(2) Cities, name are shown on X-axis.

(3) Rain fall is shown (in cm) on Y-axis.

(4) Scale is 1 cm = 5 cm rainfall.

(5) Maximum rain falls in Vadodara city and it is 43 cm.

(6) 30 cm rain falls in Bhuj city.

(7) Minimum rain 19 cm falls in Disa city.

Do it yourself : By taking suitable scale, draw bar graph showing following information.

Standard	1	2	3	4	5
No. of students present					

Show today's no. of students present in std. 1 to 5 of your shool and fill up the above boxes.
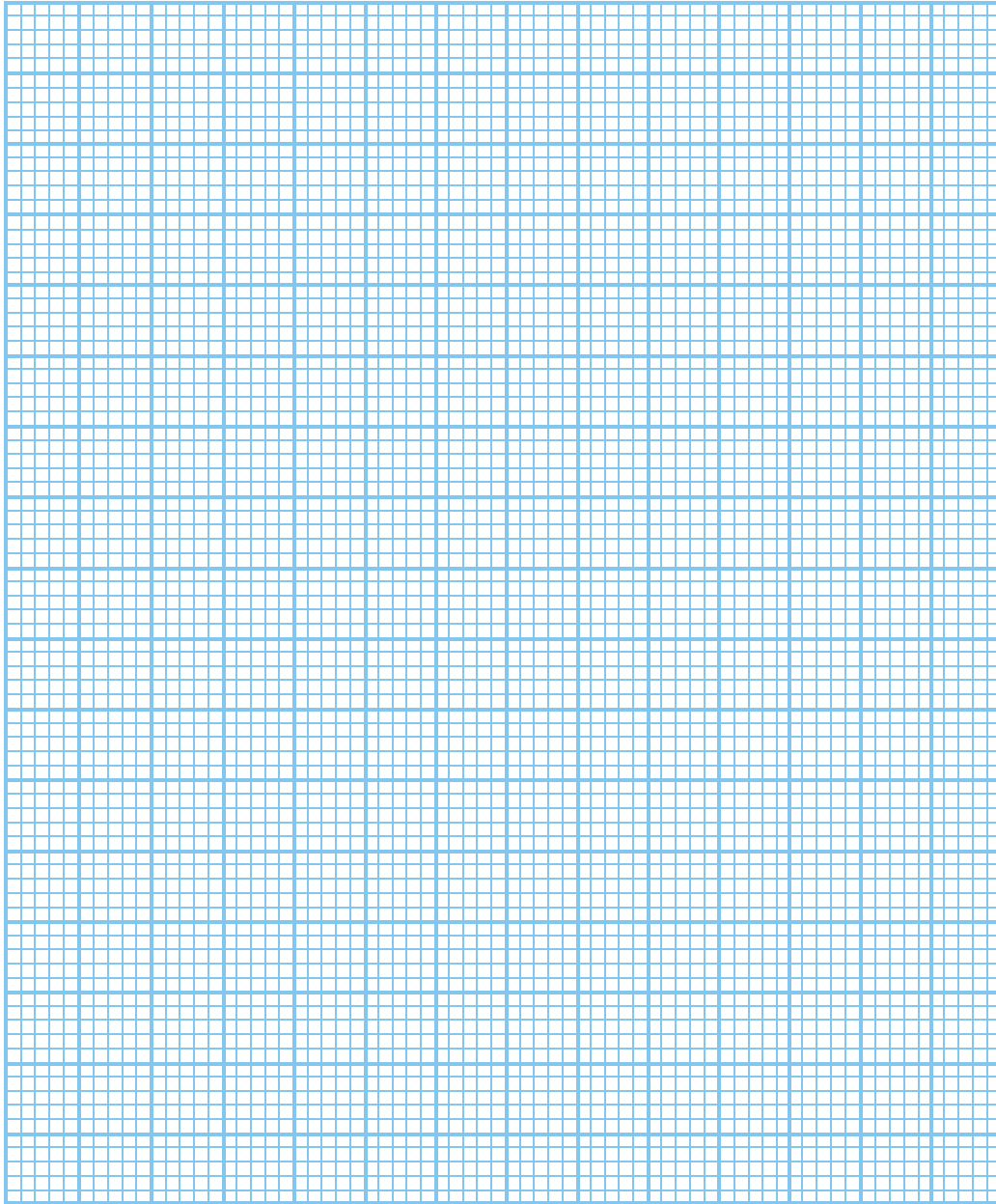
Instruction to prepare graph :

(1) Draw horizontal line X-axis and draw vertical line Y-axis at right angle, on the graph paper by leaving specific space. Intersection point (origin) is given the name 'O'.

(2) Show standard on X-axis.

(3) Show no. of students on Y-axis.

(4) To show maximum 60 students on Y-axis, take scale 1 cm = 5 students. On Y-axis, start from O, write 5, 10, 15, 20, ..., 60 at each cm interval.

(5) On X-axis leave 1 cm box and draw 1st bar of 5 cm width. Same way draw other bars. Keep equal distance between each box.

(6) Give heading to the graph paper and also proper scale on the graph paper.

Exercise 1

1. Prepare bar graph and fill up the table from the following picture :
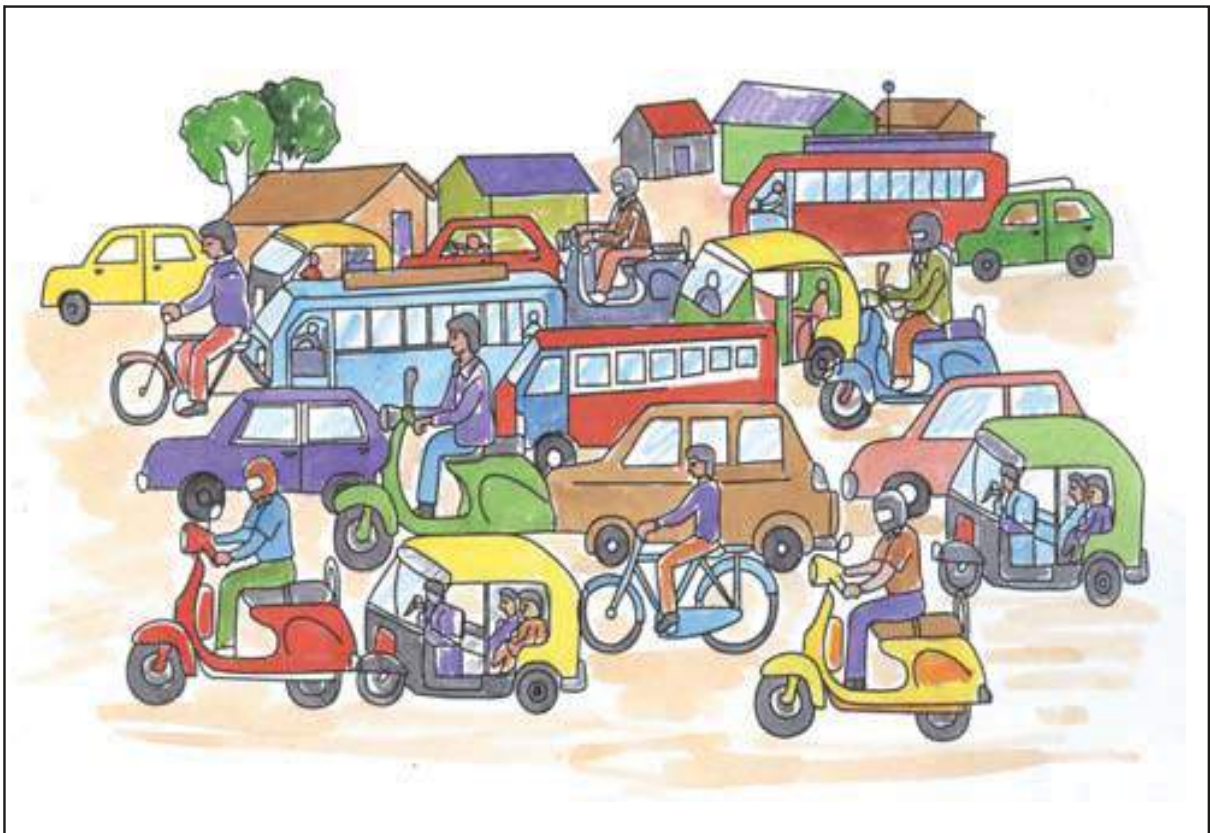
Vehicles	Bus	Scooter	Bicycle	Rickshaw	Car
Numbers					
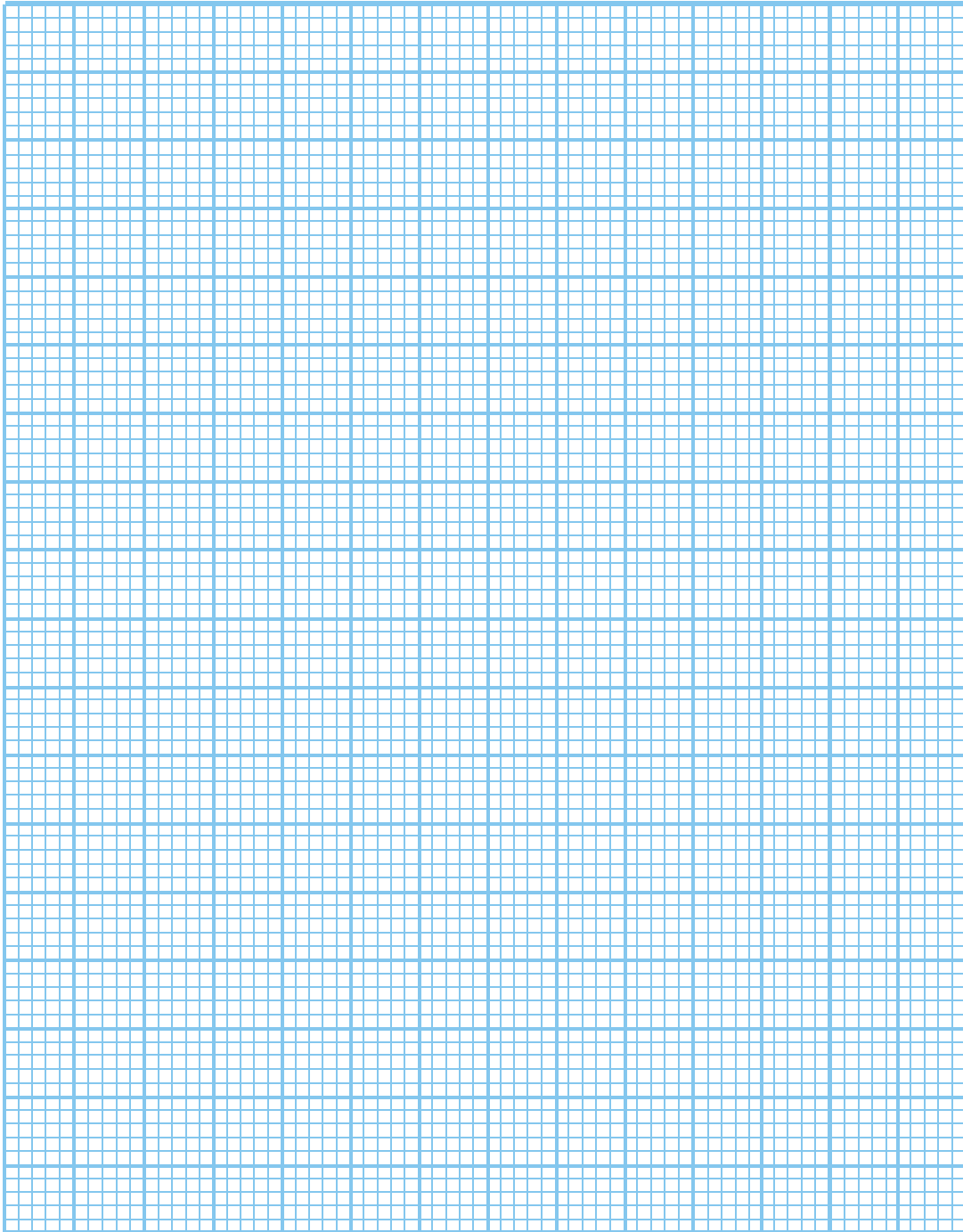
2. Answer the following from given below bar graph :

Information of crops in Ramjibhai's field

Scale : Y-axis : 1 cm = 10 kg
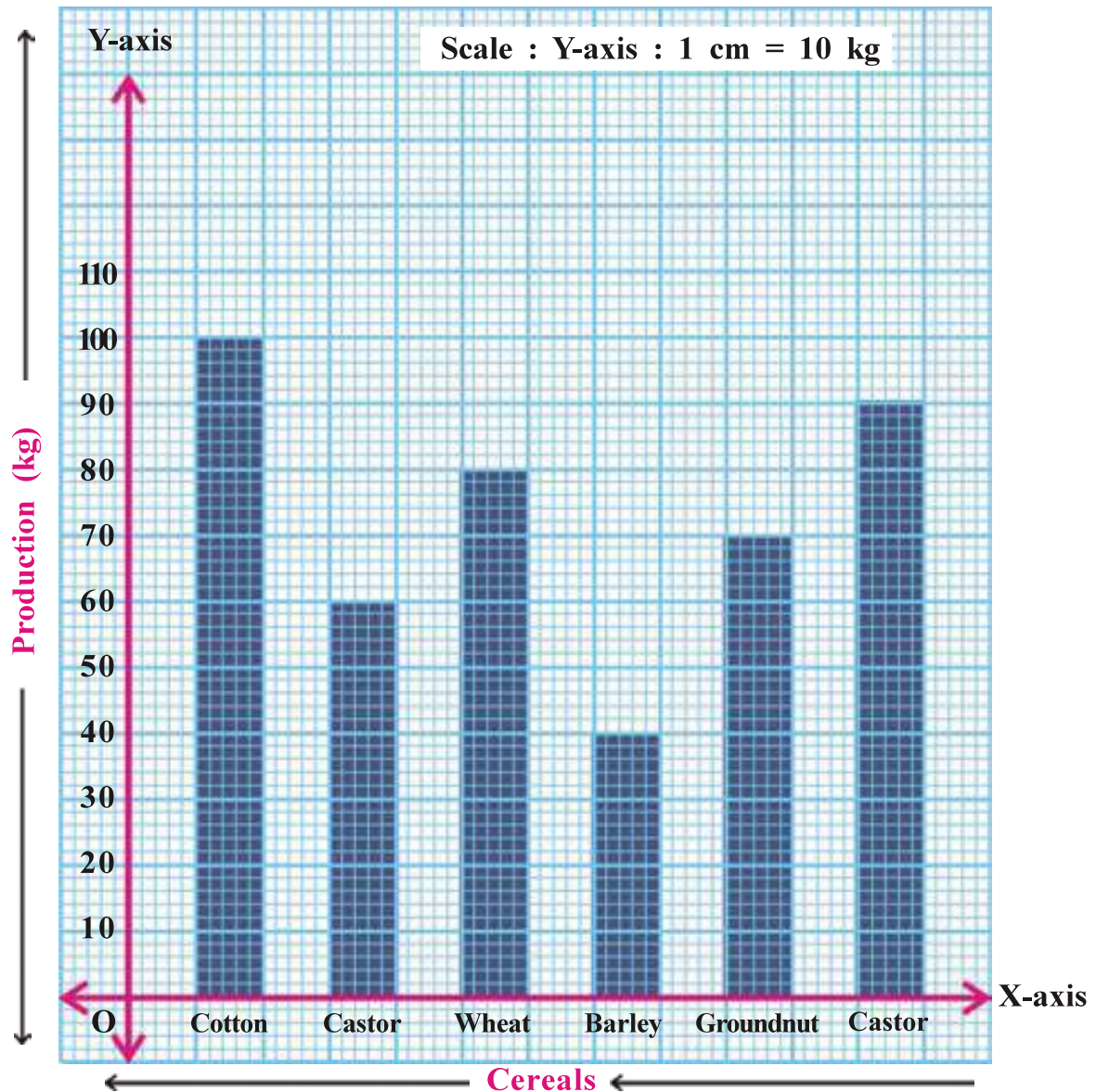
Questions :

(1) What is shown in X-axis ?

(2) What is shown in Y-axis ?

(3) How much production occurs of Wheat ?

(4) Which crop has maximum production ? How much ?

(5) Which crop has minimum production ? How much ?

3. Complete the table from given data and prepare bar graph :

President	Dr. Rajendra Prasad	Dr. S. Radhakrishnan	Dr. Zakir Hussain	V. V. Giri	Fakruddin Ali Ahmed
Working Period	1950-1962	1962-1967	1967-1969	1969-1974	1974-1977
Total Years					
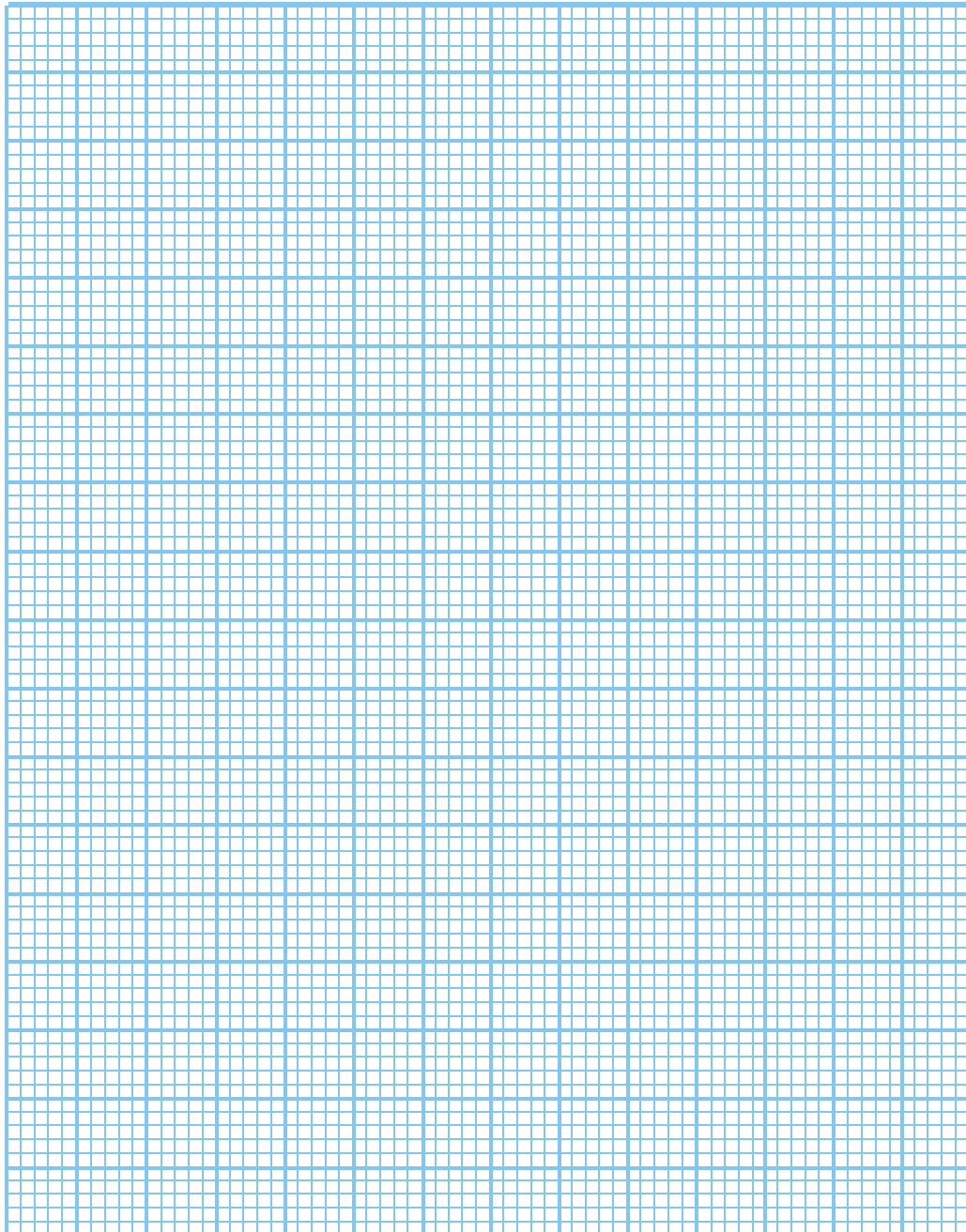
4. Prepare bar graph by collecting information :

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
No. of students present in std. 6 and std. 7 in your school						

5. Prepare bar graph from the following data :

Crop	Wheat	Bajra	Corn	Rice	Groundnut
Height	50 cm	150 cm	160 cm	40 cm	20 cm
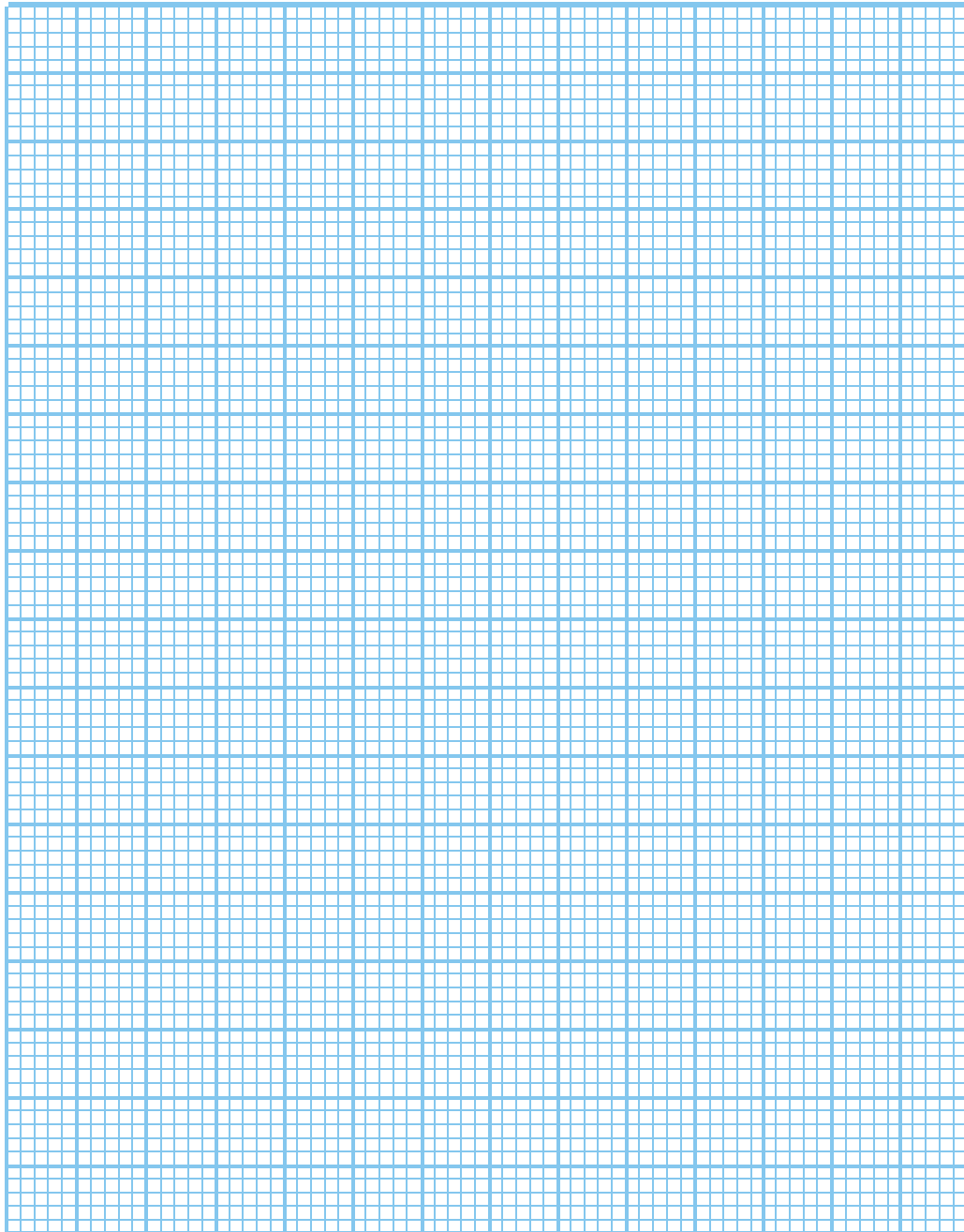
6. Note down the height of your five friends in the following table and on the basis of this prepare bar graph :

Name of friend					
Height (in cm)					
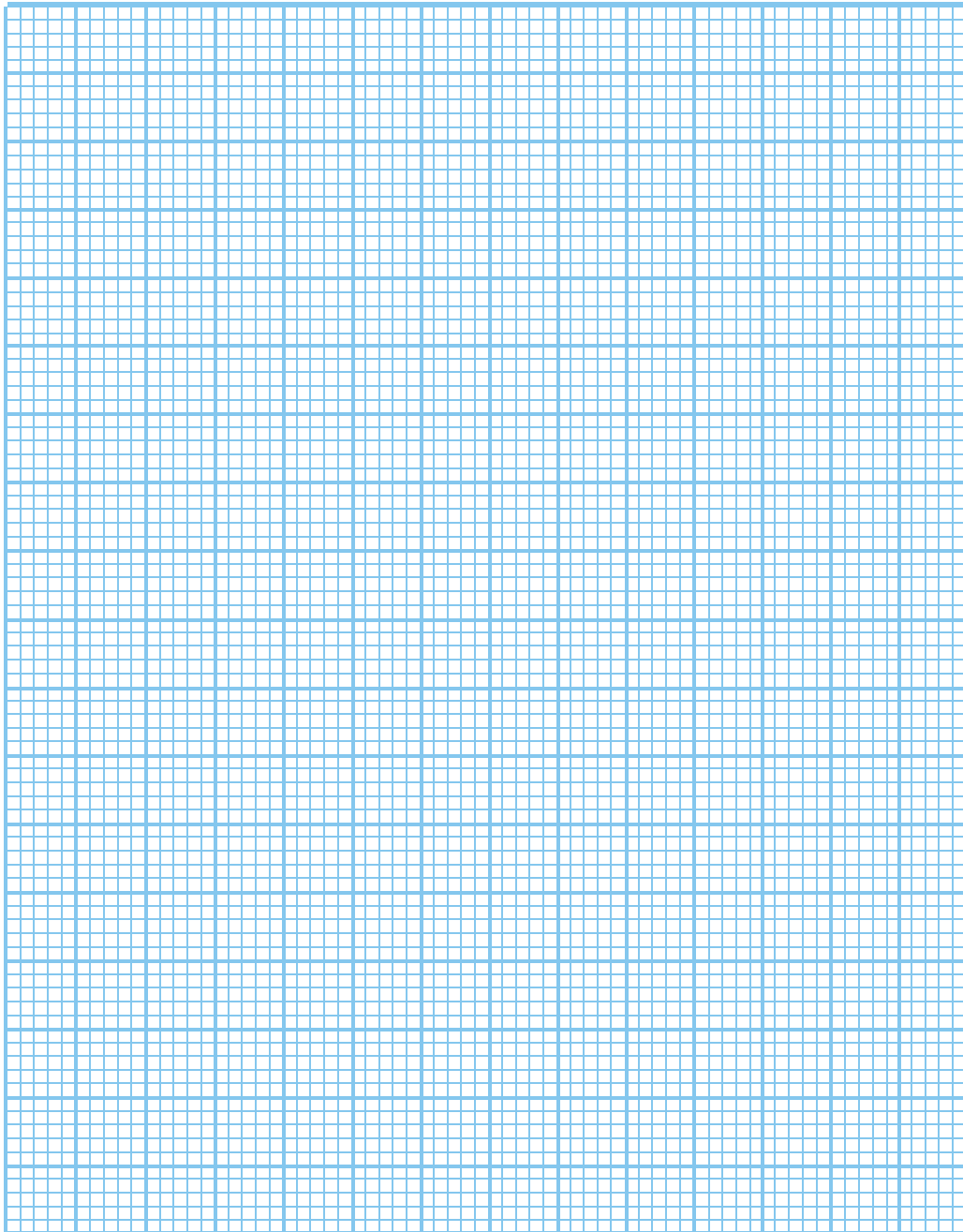
2 | Perimeter and Area

◆ **Let us remember :**

Activity 1 :

(1) Draw square and rectangle on graph paper and find its perimeter and area.

(2) Draw a triangle and a circle on graph paper and find its area.

◆ **Let us learn new :**

Magin game : Tell measure of any side of a square to your teacher, he will tell you the perimeter of a square.
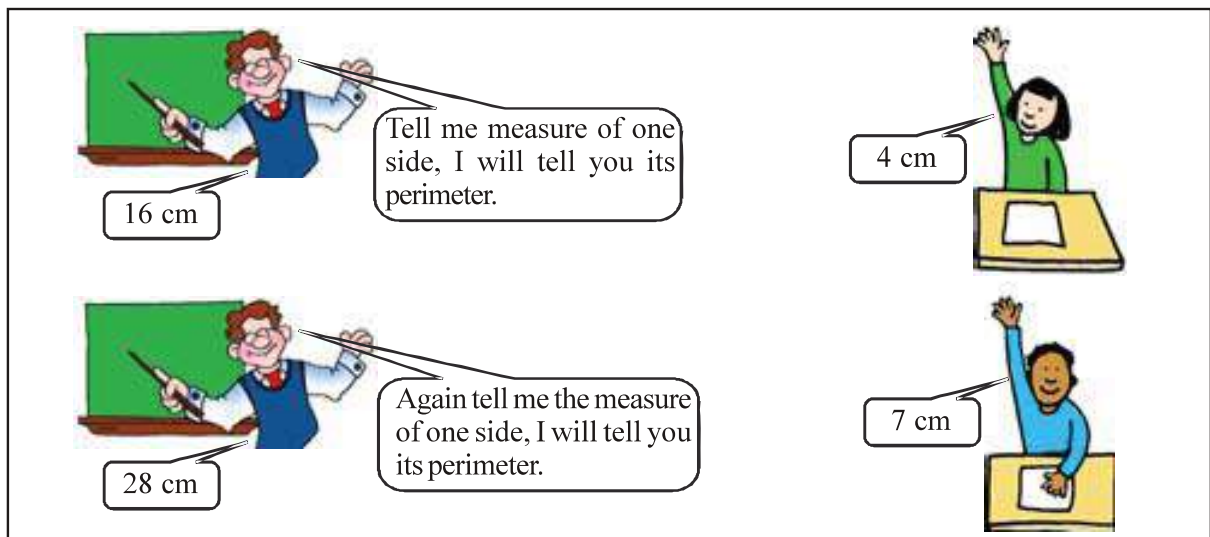
◆ **Think :** How does teacher tell you the perimeter without measuring it ?

Let us find answer, with the help of graph paper. To find answer, find perimeter of given diagram in graph paper-1 :
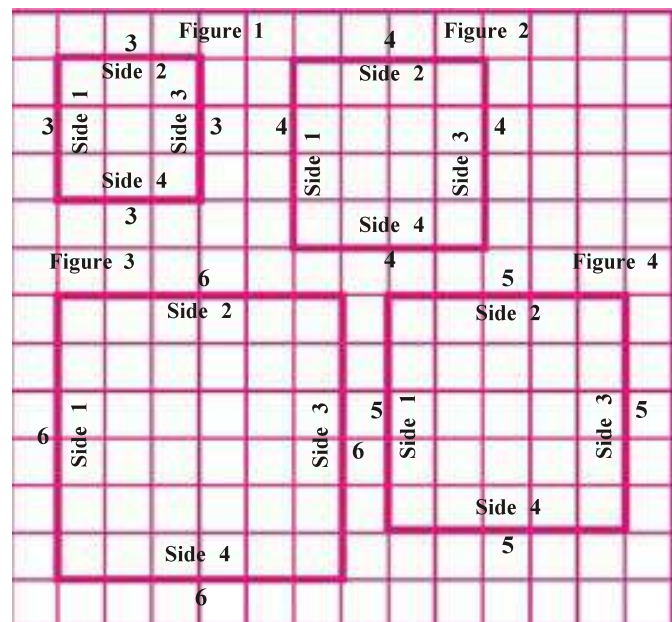
Graph paper 1

◆ **Fill up the table from graph paper-1 :**

No.	Subject	Side 1	Side 2	Side 3	Side 4	Sum of measure of four sides = Perimeter
1.	Figure 1					...... + ... + ... + ... = ... cm
2.	Figure 2					...... + ... + ... + ... = ... cm
3.	Figure 3					...... + ... + ... + ... = ... cm
4.	Figure 4					...... + ... + ... + ... = ... cm

◆ **Perimeter of Square :**

length

From the above table, which formula do you derive to find out perimeter of a square ?

length

length

Perimeter of square = Sum of measure of four sides

$$= \text{length} + \text{length} + \text{length} + \text{length}$$

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

$$= 4\,l$$
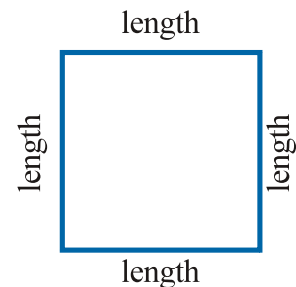
length

Length is denoted as 'l'.

Measure of four sides in a square, remains same.

So, Perimeter of a square = **4** × length

$$= 4\,l$$

◆ **Try to understand :**

Illustration 1 : What is the perimeter of a square, whose length is 2 cm ?

2 cm

Measure of each side of a square is same.

Here, length of a side of the square is given 2 cm.

Perimeter of a square = 4 × length

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

$$= 8 \text{ cm}$$

∴ Perimeter of a square is 8 cm.
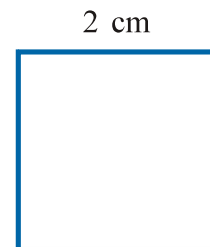
Illustration 2 : What is the perimeter of square handkerchief having length 15 cm ?

15 cm

$$\text{Perimeter of square} = 4 \times \text{length}$$
$$= 4 \times 15 \text{ cm}$$
$$= 60 \text{ cm}$$

∴   Perimeter of square handkerchief is 60 cm.

Dear students, now you can easily understand the magic of your teacher !

Practice 1
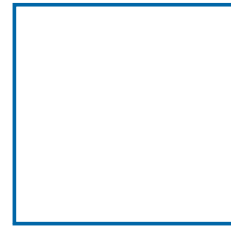
◆   **Find perimeter :**

(1) A square drawing paper of 25 cm length   (2) A square of 14 cm length

(3) A square piece of cloth of length 8 meter   (4) A square plot of length 18 meter

(5) A square space of length 9 meter   (6) A square tile of length 10 cm

Perimeter of Rectangle :

Complete the table from the following figures :

6 cm
Side 2
3 cm   Side 1   Side 3   3 cm
Side 4
6 cm

Figure 5

4 cm
Side 2
2 cm   Side 1   Side 3   2 cm
Side 4
4 cm
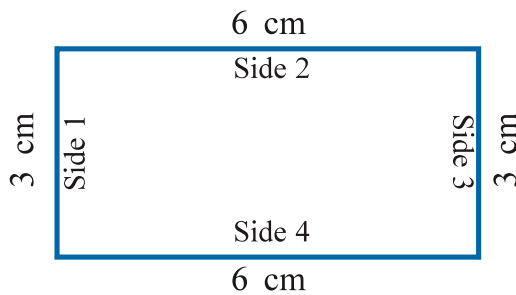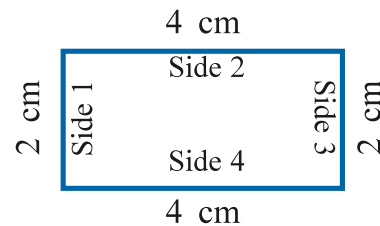
Figure 6

No.	Figure	Side 2	Side 4	Side 1	Side 3	Perimeter
1.	Figure 5					
2.	Figure 6					

Now, answer the following :

(1) Which two sides in a rectangle, having same measures ? ....

(2) In figure 5 measurement of which two sides are same ?

(i) .... and ....   (ii) .... and ....

(3) In figure 6 measurement of which two sides are same ?

    (i) .... and ....   (ii) .... and ....

In a rectangle, the two sides having more measures is called length and the two sides having less measures is called breadth. Length is denoted as '*l*' and breadth is denoted as '*b*'.

Arrange the previous table in the following :

No.	Figure	*l*	*l*	Total length	*b*	*b*	Total breadth	Perimeter
1.	Figure 5	6 cm	6 cm	12 cm	3 cm	3 cm	6 cm	18 cm
2.	Figure 6							

Opposite sides of a rectangle are same.

Perimeter of a rectangle

    = length + breadth + length + breadth

    = 2 length + 2 breadth

    = 2(length + breadth)
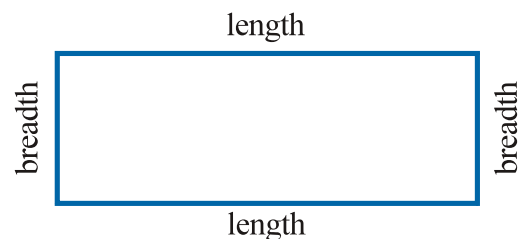
Therefore,   Perimeter of a rectangle = 2(length + breadth)

Perimeter of a rectangle = Total length + Total breadth

                    $= l + l + b + b$

                    $= 2l + 2b$

                    $= 2(l + b)$

                    = 2(length + breadth)

Illustration 3 : What is the perimeter in cm, of a rectangle whose length is 6 cm and breadth is 4 cm ?

    Perimeter of a rectangle = 2(length + breadth)

                           = 2 × (6 cm + 4 cm)

                           = 2 × (10 cm)

                           = 20 cm
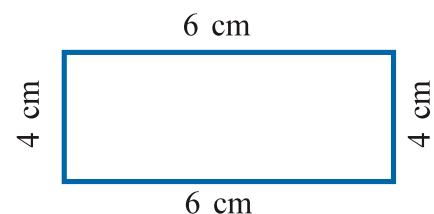
Illustration 4 : What is the perimeter of a rectangular ground, whose length is 50 m and breadth is 40 m ?

Perimeter of a rectangular ground = 2(length + breadth)

$$= 2 \times (50 \text{ m} + 40 \text{ m})$$

$$= 2 \times (90 \text{ m}) = 180 \text{ m}$$

∴   Perimeter of the rectangular ground is 180 m.

Illustration 5 : Find the perimeter of a field whose length is 80 m and breadth is 70 m.

Perimeter of a rectangular field = 2(length + breadth)

$$= 2 \times (80 \text{ m} + 70 \text{ m})$$

$$= 2 \times (150 \text{ m}) = 300 \text{ m}$$

∴   Perimeter of a rectangular field is 300 m.

Illustration 6 : Find the perimeter of a hall having 4 m length and 300 cm breadth.

Here, length = 4 meter and breadth = 300 cm

So, both measurement must keep in one unit.

∴   100 cm = 1 meter

∴   300 cm = 3 meter

∴   breadth = 3 meter

Perimeter of a rectangular hall = 2(length + breadth)

$$= 2 \times (4 \text{ m} + 3 \text{ m})$$

$$= 2 \times (7 \text{ m}) = 14 \text{ m}$$

∴   Perimeter of a rectangular hall is 14 m.

Practice 2

1.   **Find perimeter :**

(1) A rectangle having length 18 cm and breadth 16 cm, then find its perimeter.

(2) A rectangular wooden piece having length 40 cm and breadth 30 cm, then find its perimeter.

(3) A computer lab having length 15 m and breadth 13 m, then find its perimeter.

(4) A play ground having length 30 m and breadth 25 m, then find its perimeter.

(5) A field having length 45 m and breadth 35 m, then find its perimeter.

(6) A rectangular garden having length 20 m and breadth 1700 cm, then find its perimeter.

2. Complete the table from the following square or rectangular figures :

No.	Name of figure	Breadth	Length	Perimeter
(1)	Square	6 m	6 m	24 m
(2)	Rectangle	5 cm	7 cm	24 cm
(3)	Square	8 cm	....	....
(4)	....	7 cm	8 cm	....
(5)	Square	12 m	....	....
(6)	....	14 m	16 m	....
(7)	....	15 cm	15 cm	....
(8)	....	13 cm	14 cm	....
(9)	Square	17 m	....	....
(10)	....	10 m	20 m	....

◆ **Read and try to understand :**

Illustration 7 : Length of a square cloth is 3 meter. We want to knit their edges. What is the cost of knitting the edges at ₹ 6 per 1 meter ?

Here, first find out perimeter of a cloth.

Perimeter of a square cloth = 4 × length

$$= 4 \times 3 \text{ m} = 12 \text{ m}$$

∴ Perimeter of a square cloth is 12 m.

Now, cost of knitting of 1 m cloth = ₹ 6

∴ Cost of knitting 12 m cloth = ₹ (12 × 6) = ₹ 72

∴ Total cost of knitting the edges of cloth is ₹ 72.

Illustration 8 : Length of a field is 80 m and breadth is 60 m. Find the cost of preparing fencing surround the field at the rate of ₹ 13 per 1 meter ?

Perimeter of a rectangular field = 2(length + breadth)

$$= 2(80 \text{ m} + 60 \text{ m})$$

$$= 2(140 \text{ m}) = 280 \text{ m}$$

Cost of 1 meter wire fencing = ₹ 13

∴ Cost of 280 meter wire fencing = ₹ (280 × 13) = ₹ 3640

∴ Total cost of wire fencing is ₹ 3640.

Illustration 9 : Length of a showroom is 50 meter and breadth is 4000 cm. What is the cost to fix the coloured stripe on the edges of glass wall of this showroom at the rate of ₹ 50 per meter ?

Here, length of showroom is 50 m and breadth is 4000 cm. So we have to convert the measure of breadth into meter.

100 cm = 1 meter

∴ 4000 cm = 40 meter

Perimeter of a rectangular showroom = 2(length + breadth)

= 2(50 m + 40 m)

= 2(90 m) = 180 m

Cost to fix the coloured stripe on the edges of glass wall per meter = ₹ 50

Cost to fix the 180 meter coloured stripe on the edges of glass wall = ₹ (180 × 50)

= ₹ 9000

∴ Total cost to fix the coloured stripe on the edges of glass wall of showroom is ₹ 9000.

Practice 3

1. Length of a square garden is 35 meter. What is the cost of drawing stripes of lime surrounding the garden at the rate of ₹ 7 per 1 meter ?

2. Length of square classroom is 15 m. Find the cost of fixing coloured tiles on classroom at the rate of ₹ 20 per 1 meter ?

3. Length of rectangular plot is 40 m and breadth is 30 m. What is the cost of wire fencing surround the plot at the rate of ₹ 20 per 1 meter ?

4. A rectangular table having length 4 m and breadth 3 m. It is to be covered with a stripe. The cost to cover the table with stripe is ₹ 5 per 1 meter. Find the total cost.

5. Length and breadth of a prayer hall is 19 m and 17 m respectively. A carpet is fixed in it. A stripe is knitting surrounding the carpet. Find the cost at the rate of ₹ 30 per 1 meter.

6. A cloth is having 8 m length and 300 cm breadth. What is the cost of knitting a stripe surrounding the cloth at the rate of ₹ 30 per meter ?

◆ **Area :**

(1) Area of Square :
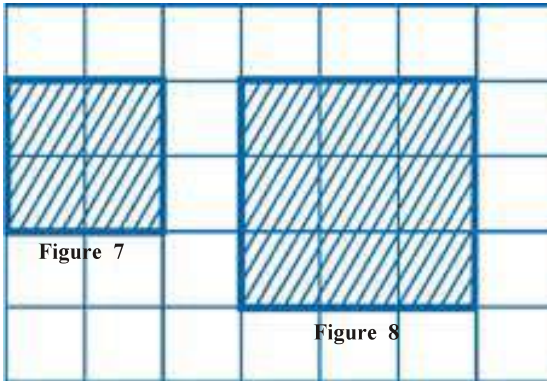
Figure 7

Figure 8

Complete the following table on the basis of figures 7 and 8 :

No.	Length	No. of square boxes covered by figures	Area Result 1	Other method of Area : Result 2
Figure 7	2 cm	4	4 sq cm	2 cm × 2 cm
Figure 8	3 cm	9	9 sq cm	3 cm × 3 cm
Dear friends, here some length of square figures are given, from these complete the table :				
(1)	4 cm		16 sq cm	
(2)	5 cm			
(3)	6 cm			

Can you say area of square from last two columns ? Which formula you use ? Think !

Here, answer of result 1 and result 2 are same.

i.e. no. of square boxes covered by figures = length × length, which gives area of figure.

Therefore, | Area of square = length × length

$$= l \times l$$

Illustration 10 : Find area of square of length 8 cm.

Area of square = length × length

$$= 8 \text{ cm} \times 8 \text{ cm}$$

$$= 64 \text{ sq cm}$$

∴ Area of square = 64 sq cm

Illustration 11 : Length of a square sheet is 12 m, then find its area.

Area of square sheet = length × length

= 12 m × 12 m = 144 sq m

∴ Area of square sheet is 144 sq m.

Practice 4

◆ **Do the following sums :**

(1) What is the area of square of length 5 cm ?

(2) What is the area of square ground of length 15 m ?

(3) What is the area of square piece of cloth of length 8 m ?

(4) What is the area of square plot of length 35 m ?

(5) What is the area of square handkerchief of length 20 cm ?

Area of Rectangle :

Figure 9
Figure 10
Figure 11
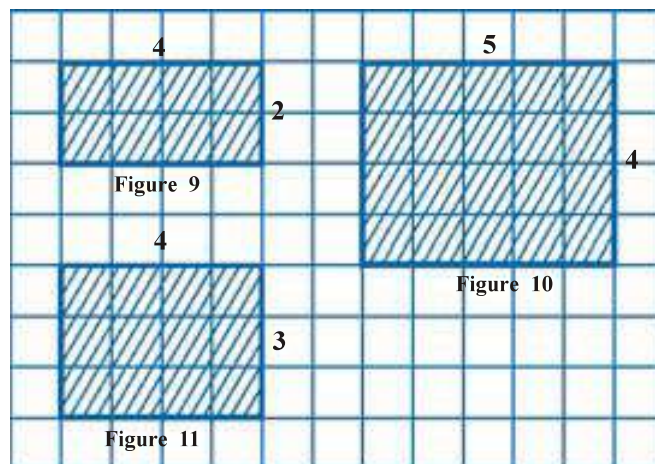
Complete the following table from above figures :

No.	Figure number	No. of boxes covered by figures Result 1	Length (cm)	Breadth (cm)	Length × Breadth	Area (sq cm) Result 2
1.	Figure 9	8	4 cm	2 cm	4 cm × 2 cm	8 sq cm
2.	Figure 10					
3.	Figure 11					

Here, answer of result 1 and result 2 are same.

i.e., Total no. of boxes covered by figures = length × breadth which shows area of figure.

Therefore, | Area of rectangle = length × breadth
            | = $l \times b$

◆ **Read and understand :**

Illustration 12 : Find area of rectangle of length 8 cm and breadth 6 cm.

Area of rectangle = length × breadth
= 8 cm × 6 cm = 48 sq cm

∴ Area of rectangle is 48 sq cm.

Illustration 13 : What is the area of a rectangular piece of cloth having 5 m length and 4 m breadth ?

Area of rectangle cloth = length × breadth
= 5 m × 4 m = 20 sq m

∴ Area of rectangle cloth is 20 sq m.

Practice 5

1. **Find area :**
   (1) Calculate the area of rectangle of length 19 cm length and breadth 17 cm ?
   (2) What is the area of top of the table of length 90 cm and breadth 70 cm ?
   (3) Find area of the ground having length 55 m and breadth 50 m.
   (4) What is the area of the floor of library having length 10 m and breadth 4 m ?
   (5) What is the area of classroom of length 12 m and breadth 8 m ?

2. **Below the measure of square and rectangle is given. From these complete the following table :**

No.	Name of figure	Length	Breadth	Area
(1)	Square	11 m	....	....
(2)	....	14 m	12 m	....
(3)	Square	15 m	....	....
(4)	....	26 cm	24 cm	....
(5)	....	12 m	12 m	....
(6)	....	17 m	16 m	....
(7)	Square	13 cm	....	....
(8)	....	21 cm	19 cm	....

Mutual relation of units of area :

1 sq m = 1 m × 1 m

= 100 cm × 100 cm

1 sq m = 10,000 sq cm

◆ **Read and understand :**

Illustration 14 : How many square cm equal to 3 sq m ?

1 sq m = 10,000 sq cm

3 sq m = 3 × 10,000 sq cm

= 30,000 sq cm

∴ 3 sq m = 30,000 sq cm

Illustration 15 : How many sq m equals to 50,000 sq cm ?

10,000 sq cm = 1 sq m

50,000 sq cm = $\frac{50,000}{10,000}$ × 1

= 5 sq m

∴ 50,000 sq cm = 5 sq m

Practice 6

1. **Do it yourself :**

   (1) Convert into sq cm : (i) 5 sq m   (ii) 20 sq m   (iii) 30 sq m

   (2) Convert into sq m : (i) 10,000 sq cm (ii) 80,000 sq cm (iii) 6,00,000 sq cm

◆ **Read and understand :**

Illustration 16 : Length of the prayer room is 20 m and breadth is 18 m. Find the cost to fix tiles on the floor at the rate of ₹ 7 per sq m.

Here, final area of rectangle floor...

Area of rectangular floor = Length × Breadth

= 20 m × 18 m

= 360 sq m

∴ Area of rectangular floor is 360 sq m.

Now, cost to fix tiles in 1 sq m space = ₹ 7

∴ Cost to fix tiles in 360 sq m = 360 × 7 = ₹ 2520

∴ Cost to fix tiles on the floor is ₹ 2520.

Illustration 17 : Length of a square garden is 70 m. Find the cost of spreading soil in the garden at the rate of ₹ 5 per sq m.

Here, first find out area of garden.

Area of square garden = length × length

= 70 m × 70 m

= 4900 sq m

∴   Area of square garden = 4900 sq m

Now, cost of spreading soil in the garden per sq m = ₹ 5

∴   Cost of spreading soil in 4900 sq m = 4900 × 5

= ₹ 24,500

∴   Cost of spreading soil in the garden is ₹ 24,500.

Illustration 18 : How many square pieces of length 40 cm is prepared from the cloth of 10 m length and 2 m breadth ?

Area of rectangular cloth = length × breadth

= 10 m × 2 m

= 20 sq m

Area of a square piece = length × length

= 40 × 40

= 1600 sq cm

Area of rectangular cloth is in sq m, whereas area of square piece is in sq cm.

Therefore, convert area of rectangular cloth in sq cm,

20 sq m = 20 × 10,000 sq cm

= 2,00,000 sq cm

Now, number of square pieces = $\frac{200000}{1600}$

= 125

∴   125 square pieces are formed.

Practice 7

Do it yourself :

1. Length of the school ground is 25 m and breadth is 20 m. What is the cost of levelling the ground at the rate of ₹ 9 per sq m ?

2. In a mess, length of a square dining table is 4 m. What is the cost to prepare the dining cloth on the table at the rate of ₹ 30 per sq m ?

3. A rectangular swimming pool having length 16 m and breadth 4 m. Find the cost to fix tiles at floor of the pool at the rate of ₹ 22 per sq m.

4. Length of coloured card paper is 60 cm and breadth is 40 cm. How many square boxes can be formed in this card paper of length 5 cm ?

5. In a school, length of the prayer hall is 14 m and breadth is 11 m. Square tiles are to be fixed of length 50 cm on its floor, then how many tiles are needed ?

Exercise

1. **Fill in the blanks with proper method :**

    (1) 1 sq m = _____ sq cm   (2) 40,000 sq cm = _____ sq m

    (3) Perimeter of the square of length 4 cm = _____ cm

    (4) Perimeter of the rectangle of length 3 m and breadth 2 m = _____ m

2. **Do the following sums :**

    (1) In a field, length is 45 m and breadth is 4000 cm, then find the cost of tilling the field at the rate of ₹ 12 per sq m.

    (2) On the wall of science exhibition room, square part of length 12 m is to be painted. What is the cost of painting the wall, with labour at the rate of ₹ 10 per 1 sq m ?

    (3) Card paper of length 80 cm and 40 cm breadth, then how many squares are made from card paper of length 10 cm ?

    (4) Length of the dining hall is 15 m and breadth is 12 m. Square tiles are to be fixed of length 30 cm in the floor of the hall, then how many tiles are needed ?

    (5) How many square pieces are formed of length 20 cm, from the cloth of 8 m length and 6 m breadth ?

Answers

Practice 1

(1) 100 cm   (2) 56 cm   (3) 32 m   (4) 72 m   (5) 36 m   (6) 40 cm

Practice 2

1. (1) 68 cm   (2) 140 cm   (3) 56 m   (4) 110 m   (5) 160 m   (6) 74 m

2. (3) 8 cm, 32 cm   (4) rectangle, 30 cm   (5) 12 m, 48 m

   (6) rectangle, 60 m   (7) square, 60 cm   (8) rectangle, 54 cm

   (9) 17 m, 68 m   (10) rectangle, 60 m

Practice 3

1. ₹ 980   2. ₹ 1320   3. ₹ 2800   4. ₹ 70   5. ₹ 2160   6. ₹ 660

Practice 4

1. 25 sq cm   (2) 225 sq m   (3) 64 sq m   (4) 1225 sq m   (5) 400 sq cm

Practice 5

1. (1) 323 sq cm   (2) 6300 sq cm   (3) 2750 sq m   (4) 40 sq m   (5) 96 sq m

2. (1) 11 m, 121 sq m   (2) rectangle, 168 sq m   (3) 15 m 225 sq m

   (4) rectangle, 624 sq cm   (5) square, 144 sq m   (6) rectangle, 272 sq m

   (7) 13 cm, 169 sq cm   (8) rectangle, 399 sq cm

Practice 6

1. (1) 50,000 sq cm   (2) 2,00,000 sq cm   (3) 3,00,000 sq cm

2. (1) 1 sq m   (2) 8 sq m   (3) 60 sq m

Practice 7

1. ₹ 4500   2. ₹ 480   3. ₹ 1408   4. 96   5. 616 tiles

Exercise

1. (1) 10,000   (2) 4   (3) 16   (4) 10

2. (1) ₹ 21,600   (2) ₹ 1,440   (3) 32 boxes   (4) 2000 tiles   (5) 1200 pieces

Activity :

   Measure length and breadth of the rectangle things that you find surrounding and calculate their perimeter and area and show to your teacher.

◆ **Let us remember :**

(1) Fraction :

There are 5 equal boxes in the figure, out of this, three boxes are shaded.

So, these cross line boxes are represented as $\frac{3}{5}$ in fraction.

(2) Reduced Form : To make the reduced form of given fraction, find prime factors of numerator and denominator and simplify it.

Illustrations : (1) $\frac{5}{15} = \frac{1 \times 5}{3 \times 5} = \frac{1}{3}$

(2) $\frac{120}{60} = \frac{2 \times 2 \times 2 \times 3 \times 5}{2 \times 2 \times 3 \times 5} = \frac{2}{1} = 2$

(3) $\frac{51}{68} = \frac{3 \times 17}{2 \times 2 \times 17} = \frac{3}{4}$

(3) Equal Fractions : Reduced form of fractions are equal, then the fractions are called equal fractions.

Illustrations : (1) $\frac{4}{8}$, $\frac{6}{12}$, $\frac{17}{34}$ are equal fractions, because reduced form of each fraction is $\frac{1}{2}$.

(2) $\frac{9}{21}$, $\frac{12}{28}$, $\frac{21}{49}$ are equal fractions, because reduced form of each fraction is $\frac{3}{7}$.

◆ **Let us learn new :**

See and count : See the following figure 1 and fill up the table 1 from this figure :
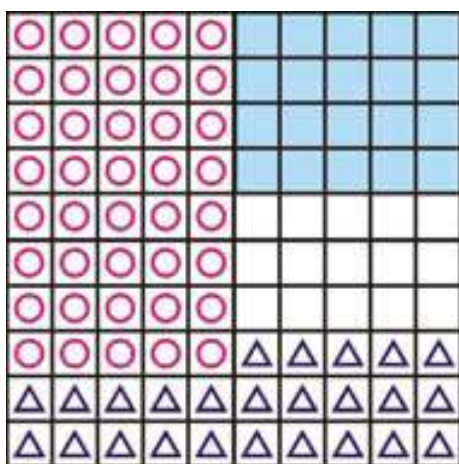
Figure 1

In this fig. .... boxes are there.

Shape	No. of boxes in the figure	Fraction form with respect to total figure
○		
△		
▬		

Table 1

Understanding of Percentage :

The word 'Percentage' is derived from Latin word 'Per Centum'. Centum means 100. e.g. Century means 100 years, 100 runs etc.

Percentage means - 'Value of the given ratio on the base of 100.'

Symbol for percentage is % which is used at the place of the value on the base of 100.

Percentage is the numerator of a fraction whose denominator is 100.

- 50 % means, 50 out of 100 = $\frac{50}{100}$ half part

- 25 % means, 25 out of 100 = $\frac{25}{100}$ fourth part

- 100 % means, 100 out of 100 = $\frac{100}{100}$ full part

According to the previous Table 1,

- ▭ occupy $\frac{40}{100}$ means 40 % part.

- ▮ occupy $\frac{20}{100}$ means 20 % part.

- △ occupy $\frac{25}{100}$ means 25 % part.

Activity 1 : As per given illustration of Figure 2, write English alphabets F, L and H and complete the Figure 2.

Illustration :
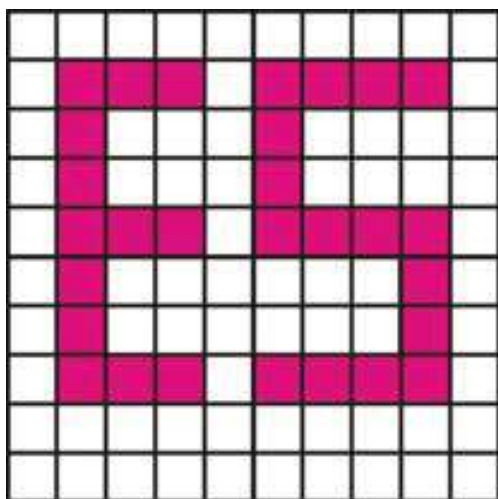
Figure 2

Alphabet	Occupied boxes	Fraction form	Percentage
E	13	$\frac{13}{100}$	13 %
S	16	$\frac{16}{100}$	16 %
F			
L			
H			

Table 2

As per Illustration (Figure 2) write F, L and H :
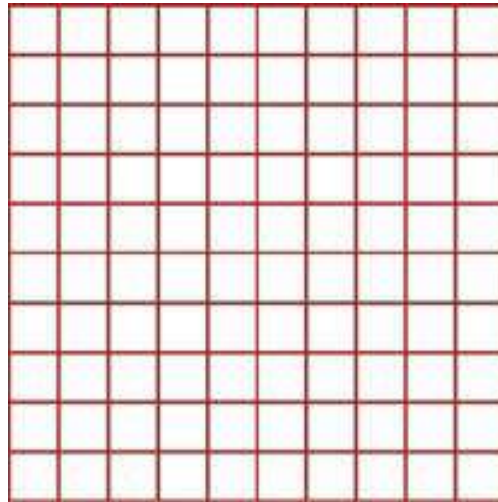
Figure 3

Complete the following Table 3 from Figure 1, 2 and 3 :

Symbol	Fraction	Percentage	Reduced form	Conversion of reduced form into percentage
⊚	$\frac{40}{100}$	40 %	$\frac{2\times2\times2\times5}{2\times2\times5\times5} = \frac{2}{5}$	$\frac{2}{5} \times 100 = 40$ %
△				
■				
□				
E	$\frac{13}{100}$	13 %	$\frac{13}{100}$	$\frac{13}{100} \times 100 = 13$ %
S	$\frac{16}{100}$	16 %	$\frac{2\times2\times2\times2}{2\times2\times5\times5} = \frac{4}{25}$	$\frac{4}{25} \times 100 = 16$ %
L				
H				
F				

Table 3

Illustration 3 : 20 out of 50 means how much percentage ?

Solution : 20 out of 50 is written as $\frac{20}{50}$ in fraction form.

To get percentage, multiply it by 100.

Percentage = Fraction form $\times$ 100

$= \frac{20}{50} \times 100$

$= \frac{(2 \times 2 \times 5) \times (2 \times 2 \times 5 \times 5)}{2 \times 5 \times 5}$

$= 40 \%$

Thus, 20 out of 50 means 40 %.

Illustration 4 : 4500 out of 7500 means how much percentage ?

Solution : 4500 out of 7500 is written as $\frac{4500}{7500}$ in fraction form.

Percentage = Fraction form $\times$ 100

$= \frac{4500}{7500} \times 100$

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

$= 60 \%$

Thus, 4500 out of 7500 means 60 %.

$= \frac{45\cancel{00}}{75\cancel{00}} \times 100$

$= \frac{3 \times \cancel{15}}{5 \times \cancel{15}} \times 100$

$= \frac{3}{\cancel{5}} \times 20 \times \cancel{5}$

$= 3 \times 20$

$= 60 \%$

Illustration 5 : In a village, total population is 2000. Out of these 600 are children, then how much percentage children are there of total population ?

Solution : Method 1 : 600 children out of 2000 total population.

It is written as $\frac{600}{2000}$ in fraction form.

Percentage of children $= \frac{600}{2000} \times 100$

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

$= 30 \%$ children

Thus, 30 % children are there of total population.

$= \frac{6\cancel{00}}{20\cancel{00}} \times 10\cancel{0}$

$= \frac{6}{2} \times 10$

$= \frac{3 \times \cancel{2}}{\cancel{2}} \times 10$

$= 3 \times 10$

$= 30 \%$

Method 2 : No. of children out of 2000 population = 600

No. of children out of 100 population $= \frac{100 \times 600}{2000} = 30 \%$ children

Zero percent and hundred percent of the given data :

Illustration 6 : In a class 80 students are there, if all students are present in the exam, then (1) How much percentage students are present ?

(2) How much percentage students are absent ?

Solution : (1) Percentage of present students :

Total no. of students = 80

All students are present, therefore present no. of students = 80

Percentage of present no. of students = Fraction form × 100

$$= \frac{\text{Present no. of students}}{\text{Total no. of students}} \times 100$$

$$= \frac{80}{80} \times 100$$

$$= 100 \ \%$$

If all students are present, then 100 % students are said to be present.

(2) Percentage of absent students :

Total no. of students = 80

All students are present, therefore absent no. of students = 0

Percentage of absent no. of student = Fraction form × 100

$$= \frac{\text{Absent no. of students}}{\text{Total no. of students}} \times 100$$

$$= \frac{0}{80} \times 100$$

$$= 0 \times 100 = 0 \ \%$$

No student is absent so 0 % student is said to be absent.

Fill up the following Table, as per the given data, with method :

No.	Total	Given from total	Percentage	No.	Total	Given from total	Percentage
1	10	10	$\frac{10}{10} \times 100 = 100 \ \%$	5	10	0	$\frac{0}{10} \times 100 = 0 \ \%$
2	20	20		6	20	0	
3	25	25		7	25	0	
4	50	50		8	50	0	

Thus, Total numbers from the given numbers means 100 %.

Not a single (zero) from the given numbers means 0 %.

- Value of excess is more than given figure then the value of percentage is more than 100.
- Rise in price, increase in number of students of school, in all these, value of excess could be more than 100 %.

Practice 1

1. **Find the percentage from given data :**

   (1) 240 out of 600   (2) 900 out of 1200   (3) 42 out of 70   (4) 285 out of 300

2. Disha got 35 marks out of 50 in Maths. Then how much percentage did Disha get ?

3. Bindu has total Rs. 500, out of this, she bought a jacket of Rs 450, then Bindu spent how much percentage of total ?

4. Ishwarbhai has total 800 kg rice, out of this he sold 520 kg rice, then how much percentage did Ishwarbhai sell ?

5. Total 1500 sportsmen took part in sports competition, half in Anand district, out of this 630 sportsmen took part in race, then how much percentage did sportsmen take part in race ?

6. A cloth merchant has total 1700 meter silk cloth. If total cloth has to be sold in one month, then how much percentage cloth did the merchant sell ?

◆ **Conversion of simple fraction into percentage :**

Illustration 7 : Convert $\frac{3}{4}$ in percentage.

Solution :

Percentage of $\frac{3}{4} = \frac{3}{4} \times 100$

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

$$= 75 \%$$

Illustration 8 : Convert $\frac{5}{8}$ into percentage.

Solution :

Percentage of $\frac{5}{8} = \frac{5}{8} \times 100$

$$= \frac{5}{4 \times 2} \times 25 \times 4$$

$$= \frac{125}{2}$$

$$= 62.5 \%$$

Practice 2

Convert the following fractions into percentage :

(1) $\frac{1}{4}$ (2) $\frac{12}{40}$ (3) $\frac{4}{10}$ (4) $\frac{4}{5}$ (5) $\frac{7}{14}$ (6) $\frac{15}{50}$ (7) $\frac{18}{90}$ (8) $\frac{70}{100}$ (9) $\frac{35}{140}$ (10) $\frac{45}{60}$

Conversion of decimal fraction into percentage :

Illustration 9 : Convert 0.7 into percentage.

Percentage of $0.7 = 0.7 \times 100$

$$= \frac{7}{10} \times 100 = 70 \%$$

Illustration 10 : Convert 0.137 into percentage.

Method 1 :

$0.137 = 0.137 \times 100$ (Multiply by 100 to get percentage)

$$= \frac{137}{1000} \times 100$$

$$= \frac{137}{10}$$

$$= 13.7 \%$$

Method 2 :

$$0.137$$
$$\downarrow$$
$$01.37$$
$$\downarrow$$
$$13.7 \%$$

Which method is applied to get percentage ? Displace decimal sign on right side upto two digits and write % symbol.

● To convert decimal fraction into percentage multiply by 100 and write % symbol.

Illustration 11 : Convert 0.32 into percentage.

Solution : Percentage of $0.32 = 0.32 \times 100$

$$= \frac{32}{100} \times \cancel{100}$$

$$= 32 \%$$

Practice 3
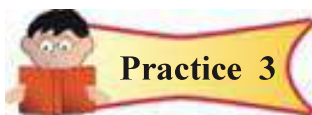
Convert the following decimal fractions into percentage :

(1) 0.25   (2) 0.238   (3) 0.3   (4) 0.1272   (5) 0.376

(6) 0.475   (7) 0.819   (8) 0.4576   (9) 0.3751   (10) 0.9812

◆ **Calculation of percentage :**

Illustration 12 : 20 % of 300.

Solution : 20 % means 20 out of 100 :   100 - 20

300 - (?)

$$= \frac{300 \times 20}{100}$$

$$= 60$$

Method 2 :

(1) 20 % of 300

(2) Remove the symbol of percentage and place 100 in denominator. (Division by 100)

$$= \frac{300 \times 20}{100}$$

(3) Give reduced form :

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

$$= 60$$

Illustration 13 : 15.5 % of 200.

Solution : 15.5 % of 200.

$$= 200 \times \frac{15.5}{100}$$

$$= \frac{200 \times 155}{100 \times 10}$$

$$= 31$$

Illustration 14 : In a class of Standard 6 of a school, total number of students is 40. If today's present is 80 %, then find number of present students.

Solution : Method 1 : Out of 100 students, present students = 80

Out of total 40 students, present students = (?)

$$= \frac{80 \times 40}{100}$$

$$= 32$$

∴ 32 students are present.

Method 2 : 80 % of 40.

$$= 40 \times \frac{80}{100}$$

$$= \frac{40 \times 80}{100}$$

$$= 32$$

∴ **32 students are present.**

Illustration 15 : Total 1600 sarees are prepared in a saree factory. Out of these, a merchant buys 52.5 % sarees, then how much sarees does the merchant buy ?

Solution : Sarees bought = 52.5 % of 1600.

$$= \frac{1600 \times 52.5}{100}$$

$$= \frac{1600 \times 525}{100 \times 10}$$

$$= 840$$

∴ **The merchant buys 840 sarees.**

Practice 4

1. **Calculate the following :**
   (1) 7 % of 1200   (2) 12 % of 550   (3) 45 % of 620
   (4) 75 % of 100   (5) 8.5 % of 2000

2. In a competition test of a school 85 % students are passed from 60 students, then find the no. of students passed.

3. In an election of 'Gram panchayat', 83 % voting is done out of 3000 people, then how much people did give vote ?

4. In a book-fair 49.5 % discount on a book of ₹ 600, then find the discount.

5. Out of 600 students of a school, 88.5 % students can read clearly, then find no. of that students.

Exercise

1. **Find percentage from the following data :**

   (1) 910 out of 2600   (2) 0.76   (3) 0.601   (4) $\frac{7}{8}$ (5) $\frac{29}{40}$

2. **Find numbers from the following percentage :**
   (1) 16 % of 250   (2) 17.5 % of 1600   (3) 15 % of 2000
   (4) 20 % of 5000   (5) 25 % of 6000   (6) 12.5 % of 8000

3. In a field of 7200 sq m area, groundnut is sowing in 4500 sq m area, then how much percentage field is used to sow groundnut ?

4. Out of 9000 population of a village, 6300 are voters then how many percentage of voters are there in the village ?

5. A builder has total 460 houses, out of these 75 % houses sold out, then find the number of houses sold.

6. In a village, fund raising for blind person is ₹ 6000. Out of these, 42.5 % fund is collected by school children, then how much rupees fund is collected by school children ?

7. In Gir sanetuary there were 12000 animals in 2001. In 2011 there was 25.5 % rise in number of animals, then how many animals were added new ?

Answers

Practice 1

1. (1) 40 %   (2) 75 %   (3) 60 %   (4) 95 %
2. 70 % marks   **3.** Expense is 90 %   **4.** Sell is 65 %
5. 42 % sportsmen has taken part   **6.** 100 % cloth is sold

Practice 2

(1) 25 %   (2) 30 %   (3) 30 %   (4) 80 %   (5) 50 %
(6) 30 %   (7) 20 %   (8) 40 %   (9) 25 %   (10) 25 %

Practice 3

(1) 25 %   (2) 23.8 %   (3) 30 %   (4) 12.72 %   (5) 37.6 %
(6) 47.5 %   (7) 81.9 %   (8) 45.76 %   (9) 37.51 %   (10) 98.12 %

Practice 4

1. (1) 84   (2) 66   (3) 279   (4) 75   (5) 170
2. 51 students   **3.** 2490 people   **4.** ₹ 297   **5.** 531 students

Exercise

1. (1) 35 %   (2) 76 %   (3) 60.1 %   (4) 87.5 %   (5) 72.5 %
2. (1) 40   (2) 280   (3) 300   (4) 1000   (5) 1500   (6) 1000
3. In 62.5 % field groundnut is sown.   **4.** 70 % voters are there
5. Builder sold 345 houses.   **6.** Children collected ₹ 2550 fund.   **7.** 3060 animals

- Percentage means value obtained of given ratio on the base of 100.
- Symbol of percentage is %.
- To find percentage from given data, we should do fraction form × 100.
- Total numbers from given numbers means 100 %.
- No numbers from given numbers means 0 %.
- To show percentage into fraction, divide the figure which shows percentage by 100.

◆ **Let us remember :**

Percentage form	Fraction form	Decimal-fraction form
1 %	$\frac{1}{100}$	0.01
2 %	$\frac{2}{100}$ or $\frac{1}{50}$	0.02
12.5 %	$\frac{1}{8}$	0.125
20 %	$\frac{1}{5}$	0.2
25 %	$\frac{1}{4}$	0.25
50 %	$\frac{1}{2}$	0.50
75 %	$\frac{3}{4}$	0.75
80 %	$\frac{4}{5}$	0.8
99 %	$\frac{99}{100}$	0.99
100 %	$\frac{100}{100}$	$1.00 = 1$

Let us play a game

$\frac{1}{2}$	0.25	12.5 %	$\frac{3}{4}$	$\frac{1}{5}$
0.2	75 %	0.5	$\frac{1}{4}$	$\frac{1}{8}$
50 %	25 %	0.75	0.125	20 %

Write down the above figures on a paper or a card board. Keep it on a table. Now, you and your friends find out numbers which show fraction, decimal fraction and percentage such that their values remain same. For this, keep 1 minute time. Those who find maximum numbers of triplets give him 1 mark or declare that he is the winner.

Note : ▪ You can take more than these numbers.

▪ Divide the class in two teams, play with one student from each team.

▪ To become winner of this game, three cards are necessary. If a team gets two cards, then there is no marks.

4 Profit-Loss

◆ **Let us remember :**

We have learnt profit and loss in Std. 5. Let us remember what we have learnt.

(1) Complete the following Table :

Item	Cost price	Selling price	Profit or loss ?	How much ?
Bicycle	₹ 1980	₹ 1800		
Bat	₹ 150	₹ 150		
Fan	₹ 995	₹ 830		

(2) A merchant purchased an old electronic weighscale for ₹ 2225. Its repairing cost is ₹ 525. If the merchant sold the weighscale for ₹ 2780, then he makes profit or loss ? How much rupees ?

(3) Out of 500 students in the school, 475 students got scholarship. How much percentage students got the scholarship ?

(4) Sanjay had ₹ 760. He bought book of ₹ 190. So, he spent how much percentage ?

◆ **Let us learn new :**

Calculation of profit and loss in percentage :

We have learnt to find profit or loss from cost price (C.P.) or net price (N.P.) or selling price (S.P.). We have also learnt to find percentage of given figures. Now, let us understand the calculation of profit-loss in percentage.

Illustration 1 : C.P. = ₹ 50, S.P. = ₹ 60, then find profit or loss. How much percentage ?

Solution : Here, selling price is more than cost price, so it makes profit.

$$\text{Profit} = \text{S.P.} - \text{C.P.}$$
$$= ₹ 60 - ₹ 50 = ₹ 10$$

∴ Profit = ₹ 10

Now, let us calculate how much percentage profit is made.

Profit on ₹ 50 C.P.   = ₹ 10

∴   Profit on ₹ 100 C.P. = ₹ (?)

$$= \left(\frac{10 \times 100}{50} \right)$$

$$= ₹ 20$$

∴   **Profit = 20 %**

Second method :

Profit on ₹ 50 C.P. = ₹ 10

Profit on ₹ 100 C.P. = ₹ (?)

$$= \left(\frac{10}{50} \times 100 \right)$$

$$= ₹ 20$$

Illustration 2 : C.P. = ₹ 700, S.P. = ₹ 665, then find profit or loss. How much percentage ?

Solution : Here, selling price is less than cost price, so it makes loss.

Loss = C.P. − S.P.

= ₹ 700 − ₹ 665 = ₹ 35

∴   Loss = ₹ 35

Now, let us calculate percentage loss,

Loss on ₹ 700 C.P. = ₹ 35

∴   Loss on ₹ 100 C.P. = ₹ (?)

$$= \left(\frac{35 \times 100}{700} \right)$$

$$= ₹ 5$$

∴   **Loss = 5 %**

Illustration 3 : C.P. = ₹ 1050, expense ₹ 50, S.P. = ₹ 1210, then find profit or loss. Also find its percentage.

Solution : Here, first we find net price because expense is given.

N.P. = C.P. + expense

= ₹ 1050 + ₹ 50

= ₹ 1100

Here, selling price is more than net price, so it makes profit.

Profit = S.P. − N.P.

= ₹ 1210 − ₹ 1100 = ₹ 110

∴   **Profit = ₹ 110**

Now, let us calculate percentage profit,

Profit on ₹ 1100 N.P. = ₹ 110

∴ Profit on ₹ 100 N.P. = ₹ (?)

$$= \left(\frac{110 \times 100}{1100}\right)$$

$$= ₹ \ 10$$

∴ **Profit = 10 %**

Friends, here, '10 % profit' means '₹ 10 profit on ₹ 100 C.P.' or '₹ 10 profit on ₹ 100 C.P.' means '10 % profit'.

% has no unit.

Profit or loss occurs on ₹ 100 cost price or net price is the percentage of profit or loss.

Profit (in percentage) % = $\dfrac{\text{Profit}}{\text{C.P. or N.P.}} \times 100$

Loss (in percentage) % = $\dfrac{\text{Loss}}{\text{C.P. or N.P.}} \times 100$

Practice 1

◆ **Find profit or loss in rupees and in percentage from given information. (Calculation necessary) :**

No.	Cost price (in rupees)	Expense (in rupees)	Selling price (in rupees)	Profit / loss (in rupees)	Profit / loss (in %)
(1)	235	15	225		
(2)	930	70	850		
(3)	2300	-	2760		
(4)	3150	250	4250		
(5)	5350	150	5390		

Let us play a game
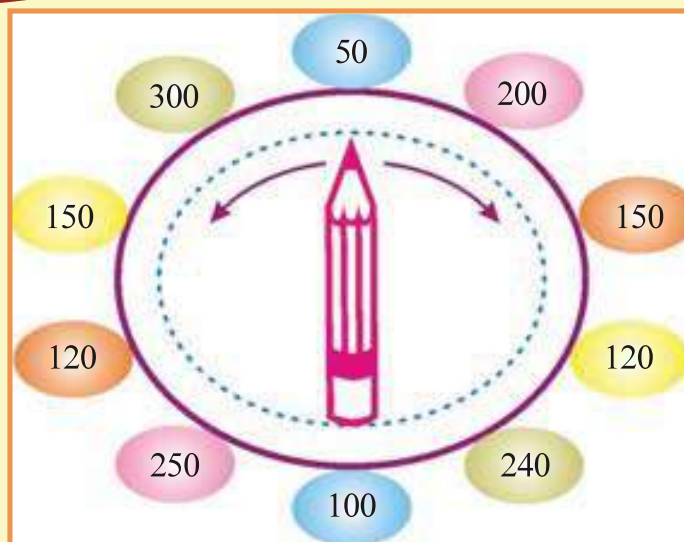
Rules :

- Rotate the pencil, as per figure on the given circular card.
- Take cost price, towards sharp end of pencil and take selling price value, towards blunt end of pencil.
- Now, find out profit or loss on the basis of these values.
- Also find out profit or loss in percentage.
- **Note :** Keep the length of the pencil such that it covers both the opposite digits.

Practical use of profit-loss :

Illustration 4 : A TV company prepares a small colour TV at the cost of ₹ 2500. If the company sold the TV for ₹ 2850, then it makes profit or loss ? How much percentage ?

Solution : N.P. of TV = ₹ 2500, S.P. = ₹ 2850

Here, S.P. is more than N.P., so profit occur.

Profit = S.P. − N.P.

= ₹ 2850 − ₹ 2500 = ₹ 350

∴ Profit = ₹ 350

Calculation of profit in percentage :

Profit on ₹ 2500 N.P. = ₹ 350

∴ Profit on ₹ 100 N.P. = ₹ (?)

$$= \left(\frac{350 \times 100}{2500} \right) = ₹ \ 14$$

∴ **Profit = 14 %**   The company makes 14 % profit

Illustration 5 : Ritaben bought a dining set in ₹ 5000. Cover for the table and seat for the chair costing ₹ 1000. After some time, she sold this dining set in ₹ 6360 as she has to go to foreign. So, she makes profit or loss ? How much percentage ?

Solution : C.P. of dining table = ₹ 5000, Expense = ₹ 1000, S.P. = ₹ 6360

$$\text{N.P.} = \text{C.P.} + \text{Expense}$$

$$= ₹\ 5000 + ₹\ 1000 = ₹\ 6000$$

Here, S.P. is more than N.P., so profit occur.

$$\text{Profit} = \text{S.P.} - \text{N.P.}$$

$$= ₹\ 6360 - ₹\ 6000 = ₹\ 360$$

Calculation of profit in percentage :

Profit on ₹ 6000 N.P. = ₹ 360

∴ Profit on ₹ 100 N.P. = ₹ (?)

$$= \left(\frac{360 \times 100}{6000}\right) = ₹\ 6$$

∴ **Profit = 6 %**   **Ritaben got 6 % profit**

Illustration 6 : Dhruvkumar bought 10 swings for ₹ 12,000. Rent to bring it upto shop is ₹ 2000. If he sells 1 swing at ₹ 980, then find profit or loss. How much percentage ?

Solution : C.P. of swing = ₹ 12,000, Expense = ₹ 2,000

$$\text{N.P.} = \text{C.P.} + \text{Expense}$$

$$= ₹\ 12,000 + ₹\ 2,000 = ₹\ 14,000$$

Dhruvkumar sells a swing at ₹ 980. So, to find profit or loss, we should find N.P.

N.P. of 10 swings = ₹ 14,000

∴ N.P. of 1 swing = ₹ (?)

$$= \left(\frac{14000 \times 1}{10}\right) = ₹\ 1400$$

N.P. of 1 swing = ₹ 1400, S.P. = ₹ 980

Here, N.P. is more than S.P, so loss occur.

$$\text{Loss} = \text{N.P.} - \text{S.P.}$$

$$= ₹\ 1400 - ₹\ 980$$

$$= ₹\ 420$$

Now, find out the loss.

Second Method :

Selling price of a swing is ₹ 980

∴ S.P. of 10 swing = 980 × 10

$$= ₹\ 9800$$

∴ S.P. of 10 swing = ₹ 9800

$$\text{Loss} = 14000 - 9800$$

$$= 4200$$

$$\text{Loss percentage} = \frac{4200 \times 100}{14000}$$

$$= 30\ \%$$

Loss on ₹ 1400 N.P. = ₹ 420

Loss on ₹ 100 N.P. = ₹ (?)

$$= \left(\frac{420 \times 100}{1400}\right) = \frac{420}{14} = ₹ \ 30$$

∴ **Loss = 30 %**

Dhruvkumar suffers 30 % loss

Practice 2

(1) Pankajbhai bought a buffalo at ₹ 25,000. After some time he sold the buffalo at ₹ 22,500. Find profit or loss. Also find its percentage.

(2) A merchant bought jaggery (gud) of ₹ 1225. For this, he gave ₹ 25 labour. Merchant gets ₹ 1325 on selling of this jaggery in loose. Find profit or loss and its percentage.

(3) Rubi bought a digital camera at ₹ 6000. After sometime she sold it at ₹ 5580. Find profit or loss in this transaction. Also find its percentage.

(4) John bought cloth at ₹ 225, out of it, to make a pants he spent ₹ 75. Now he sells this pants to his friend for ₹ 285. Find profit or loss and its percentage.

(5) A mobile repairer bought an old mobile at ₹ 1575. After repairing at ₹ 225, he sold it at ₹ 2160. Then find profit or loss and its percentage.

(6) Nasim bought a water tank, to store water at ₹ 1200. He spends ₹ 300 to cover it with metal sheet. After sometime, they need a big tank, so he sold old tank at ₹ 1200. Find profit or loss and its percentage.

(7) Mayur buys 10 score (cori) kites (1 score = 20 nos.) at ₹ 640. He paid ₹ 60 to bring it to the home, for rickshow. If he got ₹ 770 on selling of total kites, then did he make profit or suffer loss ? How much percentage ?

(8) Rakesh buys a bicycle at ₹ 3000. He sold this bicycle to his friend Mahesh at ₹ 2550. Find profit or loss and its percentage.

(9) Bhupendrabhai bought a packet of sarees at ₹ 6000. He sold this packet to other merchant at ₹ 7200. Find profit or loss and its percentage.

Exercise

(1) Jitubhai buys a T-shirt at ₹ 500 and sold it to his friend at ₹ 500. Did he get profit or loss ? How much percentage ?

(2) Ramila buys a scooty at ₹ 38,000. After 2 years she sold it at ₹ 30,400. Then, how much percentage profit or loss Ramila gets ?

(3) Aarati bought 10 dresses at ₹ 6300. She paid ₹ 200 extra as expenses. If she sold all the dresses at the cost of ₹ 780 per dress, how much percentage profit or loss does she make ?

(4) Aasifbhai bought a refrigerator at ₹ 10,000. After sometime he sold it to his friend at ₹ 9000, then how much percentage profit or loss does he make ?

(5) Namrataben bought 20 sarees at the cost of ₹ 200 per saree. She got ₹ 5000 on selling of these sarees. Then how much percentage profit or loss does she make ?

Answers

Practice 1

(1) ₹ 25 Loss, 10 % Loss   (2) ₹ 150 Loss, 15 % Loss   (3) ₹ 460 Loss, 20 % Profit

(4) ₹ 850 Loss, 25 % Profit   (5) ₹ 110 Loss, 2 % Loss

Practice 2

(1) 10 % Loss   (2) 6 % Profit   (3) 7 % Loss   (4) 5 % Loss   (5) 20 % Profit

(6) 20 % Loss   (7) 10 % Profit   (8) 1.5 % Loss   (9) 20 % Profit

Exercise

(1) No profit - no loss, 0 % profit or loss

(2) 20 % loss   (3) 20 % profit   (4) 10 % loss   (5) 25 % profit

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◆ **Project work :** Calculate profit or loss and its percentage of the activity of co-operative society running in your school. (Teacher should give information about the activity of co-operative society, running in the school.)

Profit or loss on C.P. or N.P. of ₹ 100 is the percentage of profit or loss.

When we write profit or loss in percentage (%) unit is not written.

◆ **Let us remember :**

Dear friends, in earlier classes we have studied that multiplication is recurring addition. So, let us recall the knowledge.

$$4 + 4 + 4 + 4 + 4 = 20$$

Here, 4 is added five times.

It is written as 4×5 in short.

See the following Table, understand it and complete it :

Recurring addition	Meanings	Multiplicative form
$5 + 5 + 5$	Addition of 5, three times	5×3
$3 + 3 + 3 + 3 + 3$	Addition of 3, five times	3×5
$7 + 7 + 7 + 7$	Addition of 7, four times	$7 \times$ ....
$8 + 8 + 8 + 8 + 8 + 8 + 8$	....	.... $\times 7$
....	Addition of 1, ten times	.... $\times$ ....
$9 + 9 + 9 + 9 + 9 + 9$	....	.... $\times$ ....

Thus, addition of a number with same number is called recurring addition. Recurring addition of numbers means multiplication.

◆ **Let us learn new :**

Form of Power :

As recurring addition is called multiplication, same way recurring multiplication is called exponent form.

$$4 = 2 \times 2 = 2^2$$
$$8 = 2 \times 2 \times 2 = 2^3$$
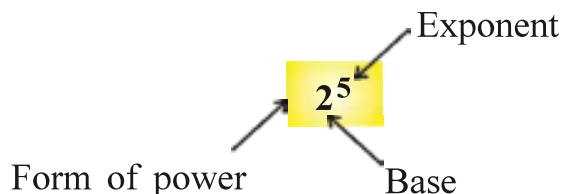$$16 = 2 \times 2 \times 2 \times 2 = 2^4$$
$$32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$$

The number, which multiplies many times is written as base and the number multiply how many times is written as its power.

e.g. $32 = 2 \times 2 \times 2 \times 2 \times 2$ is written in power form as 2^5.

where,

$$2^5$$

Exponent

Form of power

Base

2^5 is a form of power, where 2 is base and 5 is exponent. (Read : Two raised to five) e.g. $10^2 \rightarrow$ Ten raised to two or Ten square.

$5^3 \rightarrow$ Five raised to three or five cube.

Thus, recurring multiplication of a number with same number is called form of power. If a number repeats only one time then its exponent is not written.

e.g. $5 = 5^1 = 5$

Table 1 : Read, understand and complete :

Recurring multiplication	Form of power	Base	Exponent	Read as
$3 \times 3 \times 3 \times 3$	3^4	3	4	Three raised to 4
$5 \times 5 \times 5 \times 5 \times 5 \times 5$	5^6	....	....	Five raised to 6
....	6^5	....	....	....
....	....	7	6	....
$1 \times 1 \times 1 \times 1 \times 1$	....	....	....	....

Illustration 1 : Convert into form of power : $2 \times 2 \times 2 \times 5 \times 5$

$$\underline{2 \times 2 \times 2} \times \underline{5 \times 5}$$

$$= 2^3 \times 5^2$$

Illustration 2 : Convert into form of power : $2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 2 \times 7 \times 7$

$$\underline{2 \times 2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7 \times 7 \times 7}$$

$$= 2^3 \times 3^2 \times 7^4$$

Practice 1

1. **Write the following recurring multiplication into form of power :**

   (1) $2 \times 2 \times 5 \times 5 \times 12 \times 12$

   (2) $5 \times 5 \times 5 \times 14 \times 14 \times 14 \times 3 \times 3 \times 3$

   (3) $4 \times 4 \times 6 \times 6 \times 6 \times 7 \times 7 \times 7 \times 7$

   (4) $3 \times 3 \times 5 \times 3 \times 5 \times 3$

2. **Fill in the blanks, to make the statement correct :**

   (1) $8 \times 8 \times 8 \times 8 \times 8 \times 8$ is written as .... in form of power.

   (2) In 5^9, base is .... and exponent is ....

   (3) 'Ten raised to four' is written as .... in form of power.

To find the value of the form of power :

We have seen that, how recurring multiplication is written in the form of power. Now, we have to find the value of the form of power.

Illustration 1 : Find the value of 4^3.

$$4^3 = 4 \times 4 \times 4$$
$$= 16 \times 4$$
$$= 64$$

Same way, we have to find the value of the form of power :

Illustration 2 : Find the value of 10^3.

$$10^3 = 10 \times 10 \times 10$$
$$= 100 \times 10$$
$$= 1000$$

Illustration 3 : Find the value of 1^4.

$$1^4 = 1 \times 1 \times 1 \times 1$$
$$= 1$$

Illustration 4 : Find the value of 1^{10}.

$$1^{10} = 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1$$
$$= 1$$

Illustration 5 : Find the value of 1^{100}.

$$1^{100} = 1 \times 1 \times 1... \text{ hundred times}$$

Thus, if base is 1 and for any number in exponent, the answer is always 1.

Find mistake

Tick mark ✓ against the right sum and tick mark ✗ against the wrong sum :

(1)
$$2^3 = 2 \times 3 = 6$$

$$2^3 = 2 \times 2 \times 2 = 8$$

(2)
$$1^5 = 1 \times 1 \times 1 \times 1 \times 1 = 1$$

$$1^5 = 1 \times 5 = 5$$

(3)
$$3^3 = 9$$

$$3^3 = 27$$

Illustration : Find the value of following form of power :

(1) $4^2 \times 2^2$

$= 4 \times 4 \times 2 \times 2$

$= 16 \times 4$

$= 64$

(2) $3^4 \times 5^2$

$= 3 \times 3 \times 3 \times 3 \times 5 \times 5$

$= 81 \times 25$

$= 2025$

(3) $2^3 \times 3^2$

$= 2 \times 2 \times 2 \times 3 \times 3$
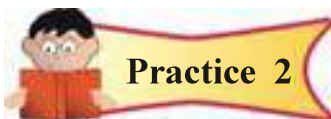
$= 8 \times 9$

$= 72$

(4) $2^3 \times 9^2$

$= 2 \times 2 \times 2 \times 9 \times 9$

$= 8 \times 81$

$= 648$

Practice 2

Find value :

1. (1) 3^4 (2) 10^3 (3) 11×9^2 (4) $1^5 \times 4^3 \times 5$ (5) 6^3

    (6) $7^2 \times 3^4$ (7) $2^4 \times 3^2$ (8) $8^3 \times 6^2$ (9) $2^3 \times 4^3$ (10) $2^5 \times 4$

2. (1) $2^4 \times 3^2$ (2) $3^2 \times 7^2$ (3) $2^2 \times 3^2 \times 4^2$
    (4) $1^7 \times 5^2 \times 6$ (5) $2^2 \times 3^4 \times 4^2$ (6) $3^2 \times 5^3 \times 6^2$

◆ **Know these :**

Here, some figures are given differently in the form of power :

(1) $64 = 8 \times 8 = 8^2$

   $64 = 4 \times 4 \times 4 = 4^3$

   $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$

(2) $16 = 4 \times 4 = 4^2$

   $16 = 2 \times 2 \times 2 \times 2 = 2^4$

(3) $125 = 5 \times 5 \times 5 = 5^3$

(4) $216 = 6 \times 6 \times 6 = 6^3$

   $216 = 2 \times 3 \times 2 \times 3 \times 2 \times 3 = 2^3 \times 3^3$

(5) $343 = 7 \times 7 \times 7 = 7^3$

(6) Show 81 in different ways as form of power :

   $81 = \ldots\ldots \times \ldots\ldots = \ldots\ldots^2$

   $81 = \ldots\ldots \times \ldots\ldots \times \ldots\ldots \times \ldots\ldots = \ldots\ldots^4$

Dear friends, think about more than 7 number.

When recurring multiplication is written in short, then it is called form of power.

Exponent

2^5

Form of power   Base

Exercise
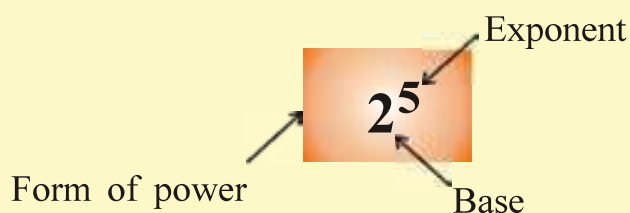
1. **Write the following recurring multiplication into the form of power :**

   (1) $13 \times 13 \times 13 \times 13 \times 13 \times 13 \times 13$

   (2) $27 \times 27 \times 27 \times 27 \times 27 \times 27 \times 27 \times 27$

   (3) $11 \times 11 \times 6 \times 6 \times 6 \times 11 \times 7 \times 7 \times 7$

2. **Find value :**

   (1) 4^4 (2) $6^3 \times 1^6$ (3) $2^3 \times 8^2$ (4) $2^5 \times 3^2 \times 5$

   (5) $2^4 \times 5^2$ (6) $7^2 \times 5^2$ (7) $8^2 \times 9^2$ (8) $5^3 \times 2^4$

   (9) $3^3 \times 5^3$ (10) $6^3 \times 3^2$ (11) $3^3 \times 2^4 \times 5^2$ (12) $3^2 \times 6^2 \times 5^2$

☞ Answers ☜

Practice 1

1. (1) $2^2 \times 5^2 \times 12^2$ (2) $5^3 \times 14^3 \times 3^3$ (3) $4^2 \times 6^3 \times 7^4$ (4) $3^4 \times 5^2$

2. (1) 8^6 (2) 5, 9   (3) 10^4

Practice 2

1. (1) 81 (2) 1000 (3) 891 (4) 320 (5) 128 (6) 144 (7) 216 (8) 512 (9) 3969 (10) 18432

1. (1) 144   (2) 441   (3) 576   (4) 150   (5) 5184   (6) 40500

Exercise

1. (1) 13^7 (2) 27^8 (3) $11^3 \times 6^3 \times 7^3$

2. (1) 256   (2) 216   (3) 512   (4) 1440   (5) 400   (6) 1225

    (7) 5184   (8) 2000   (9) 3375   (10) 1944   (11) 10800   (12) 8100

Extra knowledge :

♦ If difference between two consecutive numbers is same, then to know addition of those numbers :

$$\frac{(\text{First number} + \text{Last number}) \times \text{Total numbers}}{2}$$

e.g., Find sum of $3 + 6 + 9 + ... + 90$:

As per formula :

$= \dfrac{(3+90) \times 30}{2}$ $\text{Total numbers} = \dfrac{\text{Last number}}{\text{Difference between two numbers}}$

$= \dfrac{93 \times 30}{2}$

$= 1395$

♦ Think... with the help of this formula, sum of consecutive numbers, consecutive odd numbers and consecutive even numbers is possible ?

◆ **Let us remember :**

In Standard 5, we have learnt to write mathematical statement into symbolic form.
e.g. 3 is added to 'a' is written as $a + 3$.

● '6 is subtracted from four times of y' is written as $4y - 6$. Now, like this write the following mathematical statement into symbolic form.

No.	Mathematical statement	Symbolic form
1.	7 is subtracted from a	
2.	4 is subtracted from 5 times of y	
3.	5 is added to third part of x	
4.	b is divided by 6 and then add 15	
5.	A number is subtracted from 13	

● $6x - 5$ is the symbolic form of mathematical statement. Its mathematical statement is written as '5 is subtracted from six times of x' or '6 is multiplied by x and then 5 is subtracted from it.'

● $\frac{y}{2} + 3$, its mathematical statement is '3 is added on dividing y by 2' or '3 is added to half of y.'

Now, write the following symbolic form into mathematical statement :

No.	Symbolic form	Mathematical statement
1.	$5x + 6$	
2.	$7x - 8$	
3.	$2x + 3$	
4.	$\frac{x}{2} + 1$	
5.	$\frac{x}{3} + 2$	
6.	$\frac{a}{5} - 7$	

◆ **Let us learn new :**

Monomial, Binomial and Trinomial :

- Polynomial $18abc$ has only one term. (It is understood that ($18abc + 0$) is monomial but it is polynomial.)
- In polynomial $5x^2 - 12xy$ there are two terms : $5x^2$ and $12xy$.
- $12x^2 + 3xy - 4x^2yz$ is also a polynomial. There are three terms : $12x^2$, $3xy$ and $4x^2yz$.

Terms of polynomial is joined with $+$ (plus) or $-$ (minus) sign.

Practice 1

1. **Write the number of terms in following polynomials :**

   (1) $7x^3 + 8x^2 + 9xy + 4y^2$ (2) $2xy + 3x^2 - 25y^3$

   (3) a^2bc (4) $6a + 5b - 10ab - a^2 - b^2$

2. **Write six polynomials having different terms :**

(1)	(2) ....
(3)	(4) ....
(5)	(6) ....

3. **Classify the polynomial written in Question 2 into monomial, binomial and trinomial :**

Monomial	Binomial	Trinomial
....	....	....
....	....	....
....	....	....

◆ **Let us remember :**

- A polynomial contains one term is called monomial.

  e.g., $2x$, $3a^2bc$, p^2q, $3q$

- A polynomial contains two terms is called binomial.

  e.g., $x^2 + 2$, $a - 3$, $xy + 10$

- A polynomial contains three terms is called trinomial.

  e.g., $a^2 + 2a + 3$, $2xy - 3 + y^2$, $a^2 + 2ab + b^2$

Practice 2

1.

$8ab$, $a^2b + 3$, $-9x^2$, $-4x + y$, $-9xy + 5$, $6p^2 - 5$, $-7x^2y^2$, $6xy + 3x - 3$, $9abc$

Classify polynomials given in the box and write only monomial in your notebook.

2. **Dear students, write three-three illustrations each of monomial, binomial and trinomial in the following Table :**

Monomial	Binomial	Trinomial
(1)	(1)	(1) ....
(2)	(2)	(2) ....
(3)	(3)	(3) ....

Power of Terms :

We have learnt in Power and Exponent that $4 \times 4 = 4^2$, where 4^2 is the form of power. Where 4 is base and 2 is exponent, same way in x^4, x is base and 4 is exponent. Here x is variable.

See and understand :

No.	Term	Variable	Power of variable
1	$5x^2$	x	2
2	$-3y^5$	y	5
3	$8a$	a	1
4	$12b^4$	b	4
5	a^3	a	3
6	$7m^6$	m	6

Like (15) is also a monomial; it is constant term. In constant term exponent of variable is zero.

e.g. $15 = 15 \times x^0$

In 7th Standard we will learn that $x^0 = 1$.

$\therefore$ $15 \times 1 = 15$

Thus, exponent of variable in constant term is zero. Thus, 23, -5 and 18 etc. are constant term. Now, we will know the sum of exponent of variable as power of term. (or degree of term.)

See, understand and complete :

No.	Term	Variable	Exponent of variable	Power of term
1	$4x^3y^2$	x	3	3 + 2 = 5
		y	2	
2	$-5a^2b^3c^4$	a	2	2 + 3 + 4 = 9
		b	3	
		c	4	
3	$7x^2y^2z^2$			
4	$-2x^3y^4$			

In the given term, sum of the exponent of variable is called power of term. e.g. in the term $4x^3y^2$, power of the variable x is 3 and power of variable y is 2. So, the power of the term $4x^3y^2$ is $3 + 2 = 5$.

Numerical co-efficient of Terms :

We know that, $2 + 2 + 2 = 2 \times 3$, $3 + 3 + 3 + 3 = 3 \times 4$, $5 + 5 = 5 \times 2$

Similarly, $a + a = a \times 2 = 2a$

$b + b + b = b \times 3 = 3b$

$xy + xy + xy + xy = xy \times 4 = 4xy$

$a^2b^2 + a^2b^2 + a^2b^2 + a^2b^2 + a^2b^2 = a^2b^2 \times 5 = 5a^2b^2$

Here, $2a$, $3b$, $4xy$ and $5a^2b^2$ are polynomials. In polynomial $2a$, 2 is multiplied with variable 'a'. So, it is called co-efficient of variable 'a'. In polynomial $3b$, 3 is multiplied with variable 'b', it is called co-efficient of variable 'b'. In polynomial $4xy$, 4 is the co-efficient of variable 'xy' and in $5a^2b^2$, 5 is the co-efficient of variable a^2b^2. Thus, in the term, the constant number which is multiplied with the term is called co-efficient of term.

◆ **See and understand :**

No.	Term	Variable	Co-efficient of term
1.	$10x$	x	10
2.	$-3y$	y	-3
3.	a^2	a	1
4.	$6b^2$	b	6
5.	$-ab$	a and b	-1
6.	$7m^3n$	m and n	7

Practice 3
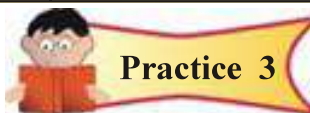
1. Make five terms by using different variables. Give variable of each term and co-efficient of terms.

2. Write variable of the term, power of the term, co-efficient of the term and exponent of the term : $4x^2$, $-y^3$, $3x^2y^3z^6$, $-15abc^2$

3. **Think :**

   (1) Which co-efficient is there in the term x^2 ?

   (2) How many power has the term $3abc$?

   (3) In $12x + 7$, power of the term 7 is what ?

Like Terms and Unlike Terms

Activity 1 :

$4x^2$, $-y^3$, $8x^4$, $7x^2$, $2x^2$,
$8y^2$, $-y^3$, $3y^3$, $2xy^2$, $3xy^2$,
$6x^7$, $9x$, $7y$, x^7

> Make a pair of same variable and power of same variable.

Activity 2 :

$5x$, $-3x$, $7x^2$, $3y^2$, $2x^2$,
$5x^2$, $8xy^3$, $8yx^3$, a^2b^2,
$-x^2$, x^2, $7ab$

> Make a pair of same variable and different power of variable.

Activity 3 :

$4x^2$, $-y^2$, $5x$, $-3x$,
$8x^4$, y^3, $3ab$, $4b^2$,
p^2, $3p^2$

> Make a pair of different variable and same power of variable.

- The terms having same variable and exponent of the same variable is same, then the terms are called like terms.

  e.g. $4x^2$ and $7x^2$, $-y^3$ and $3y^3$, abc and $9abc$

- The terms having equal variable or unequal variable but power of variable is not same, then the terms are called unlike terms. In short, the terms which are not like terms are called unlike terms.

  e.g., $7x^2$ and $3y^2$, x^2 and x^3, $4ab$ and $-7a^2b^2$

Practice 4

1. **Make a pair of like terms from the given terms :**

   $5x$, $7x^2$, $-3y^2$, $-5x^2$, $7ab$, $3a^2b^2$, xy, $3xy$, $6a^2b^2$, $-10y^2$, a^7, $14x^7$

2. **Write unlike terms from question 1 in the given box :**

To find the value of polynomial :

We know that $4x$ is a polynomial. If a value of variable is placed in it, then we get the value of polynomial. If variable $x = 3$ is taken, then,

$$4x = 4 \times x$$
$$= 4 \times 3$$
$$= 12$$

Illustration 1 : Find the value of $5m^2$ by taking $m = 2$.

$$5m^2 = 5 \times m \times m \qquad \textbf{or} \qquad 5m^2 = 5(2)^2$$
$$= 5 \times 2 \times 2 \qquad\qquad\qquad\qquad = 5 \times 4$$
$$= 20 \qquad\qquad\qquad\qquad\qquad = 20$$

Illustration 2 : If $y = 1$, then find the value of $5y^2 - 1$.

$$5y^2 - 1 = 5 \times y \times y - 1 \qquad \textbf{or} \qquad 5y^2 - 1 = 5(1)^2 - 1$$
$$= 5 \times 1 \times 1 - 1 \qquad\qquad\qquad\qquad = 5 \times 1 - 1$$
$$= 5 - 1 \qquad\qquad\qquad\qquad\qquad\quad = 5 - 1$$
$$= 4 \qquad\qquad\qquad\qquad\qquad\qquad = 4$$

Illustration 3 : If $x = 2$ and $y = 3$, then find the value of $x^2 + xy + y^2$

$$x^2 + xy + y^2 = x \times x + x \times y + y \times y$$
$$= 2 \times 2 + 2 \times 3 + 3 \times 3$$
$$= 4 + 6 + 9$$
$$= 19$$

$$x^2 + xy + y^2 = (2)^2 + (2)(3) + (3)^2$$
$$= 4 + 6 + 9$$
$$= 19$$

Practice 5

1. **Find the value of the following polynomials by taking $x = 1$, $y = 3$ and $a = 2$:**

(1) $x + y$ (2) $x + y - a$ (3) $4x - y$ (4) $a^2 - x$ (5) x^2 (6) $3a + xy$

(7) $y^2 - a^2$ (8) $x^2 - 6xy + x^2$ (9) $4x^2 + 2xy + 9y^2$ (10) $a^2 - 6ax + 9x^2$

Exercise

1. **Write co-efficient and power of each term of the following polynomials :**

(1) $5x^3 + 2xy + 3$ (2) $12x^4 - 6xy^2 + 4$ (3) $8a^6 - 13$

2. **Write the polynomial having constant term from the given polynomials :**

$2x^2 + 3xy$, $4x^2 + 2x - 3$, $x + 4$, $12x^2 + ab$, $6a^2 + 5ab + 7$, $-9x$,

16, $6x^2 - 6x + 5$, $12p^2 + 9p$

3. **Make pairs of like terms from given polynomials :**

(1) $4x^2 - x + 5$ and $3x^2 - 2x + 7$

(2) $7x + 3y - 8x^2$ and $7x^2 - 2x - y$

(3) $a^2 + 2ab + b^2$ and $3b^2 - ab + 2$

4. **If $m = 2$ and $n = 1$, then find the value of following polynomials :**

(1) $m + 3$ (2) $4m^2$ (3) $m^2 + 6$ (4) $3n^2$ (5) $5m - 6n$ (6) $mn - n$

(7) $n^2 + 3mn$ (8) $2m - 3n^2$ (9) $3m^2 - 12mn + 4n^2$ (10) $3n - 2m^2 + 3$

Answers

Practice 1

1. (1) 4   (2) 3   (3) 1   (4) 5

Practice 2

1. $8ab$, $-9x^2$, $-7x^2y^2$, $9abc$

Practice 3

2.

Term	Variable	Power of variable	Co-efficient of terms	Power of term
$4x^2$	x	2	4	2
$-y^2$	y	3	-1	3
$3x^2y^3z^6$	x, y, z	2, 3, 6	3	11
$-15abc^2$	a, b, c	1, 1, 2	-15	4

Practice 4

1. $7x^2$ and $-5x^2$, $-3y^2$ and $-10y^2$, $3a^2b^2$ and $6a^2b^2$, xy and $3xy$

Practice 5

(1) 4 (2) 2 (3) 1 (4) 3 (5) 1 (6) 9 (7) 5 (8) (-8) (9) 49 (10) 1

Exercise

4. (1) 5 (2) 16 (3) 10 (4) 3 (5) 4 (6) 1 (7) 7 (8) 1 (9) (-8) (10) (-2)

Extra knowledge :

- In daily life of common people, there is practical and important use of maths. On the basic elements of maths one can live his routine life. Vegetables vendors, hawkers they are nearly illiterate but they do perfect calculation.
- Main aim of maths teaching is that the students think perfectly and logically.
- In maths teaching, for practice, oral work and short calculation, mind development is important.

You have seen the building under construction. In it you have seen the worker used a string and a top. Do you know, with the help of a string and a top, what he would see ? With the help of top he decided that the wall and the floor is exactly at right angle or not.
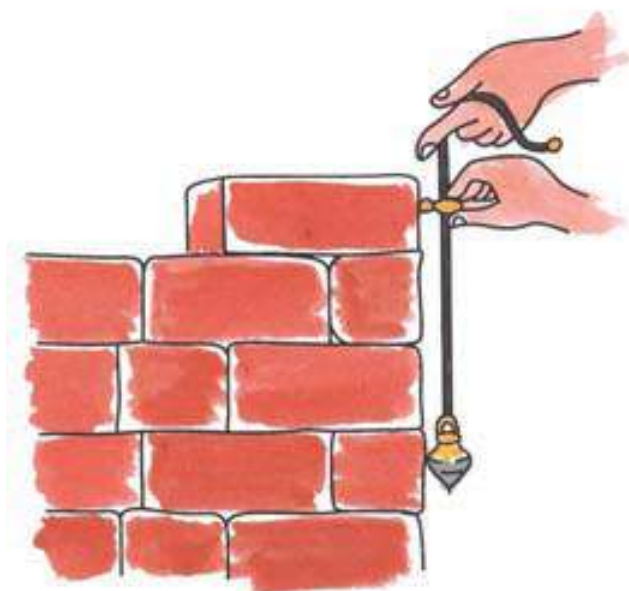
Activity 1 :

Take a rectangular paper. As shown in the figure, fold it vertically from the middle so that it makes a half. Unfold the paper and the point at which the paper folds, give names A and B. Again fold the paper horizontally so that paper is divided into another two parts. Again unfold the paper and the point at which paper folds give names P and Q.
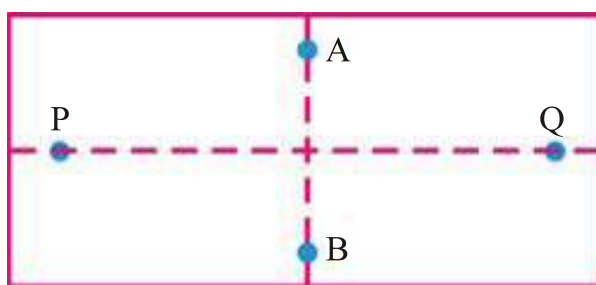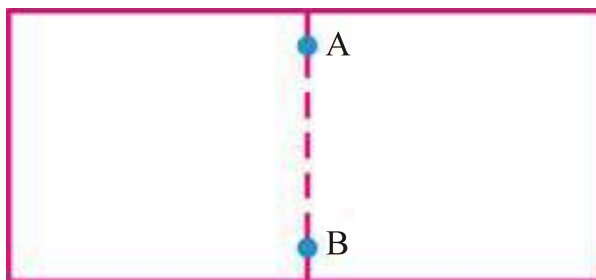
You can see that both folded part intersects each other at right angle. i.e. $\overline{AB}$ and $\overline{PQ}$ are mutually perpendicular.
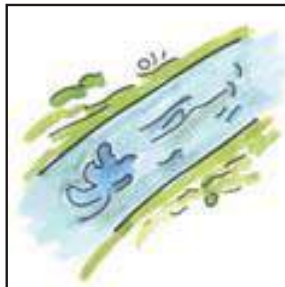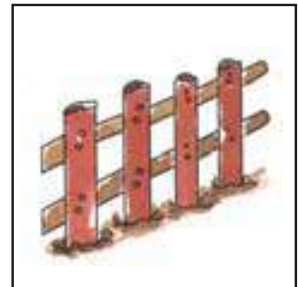
Activity 2 :

On the given graph paper, draw lines so that it intersects each other at right angle and name it.
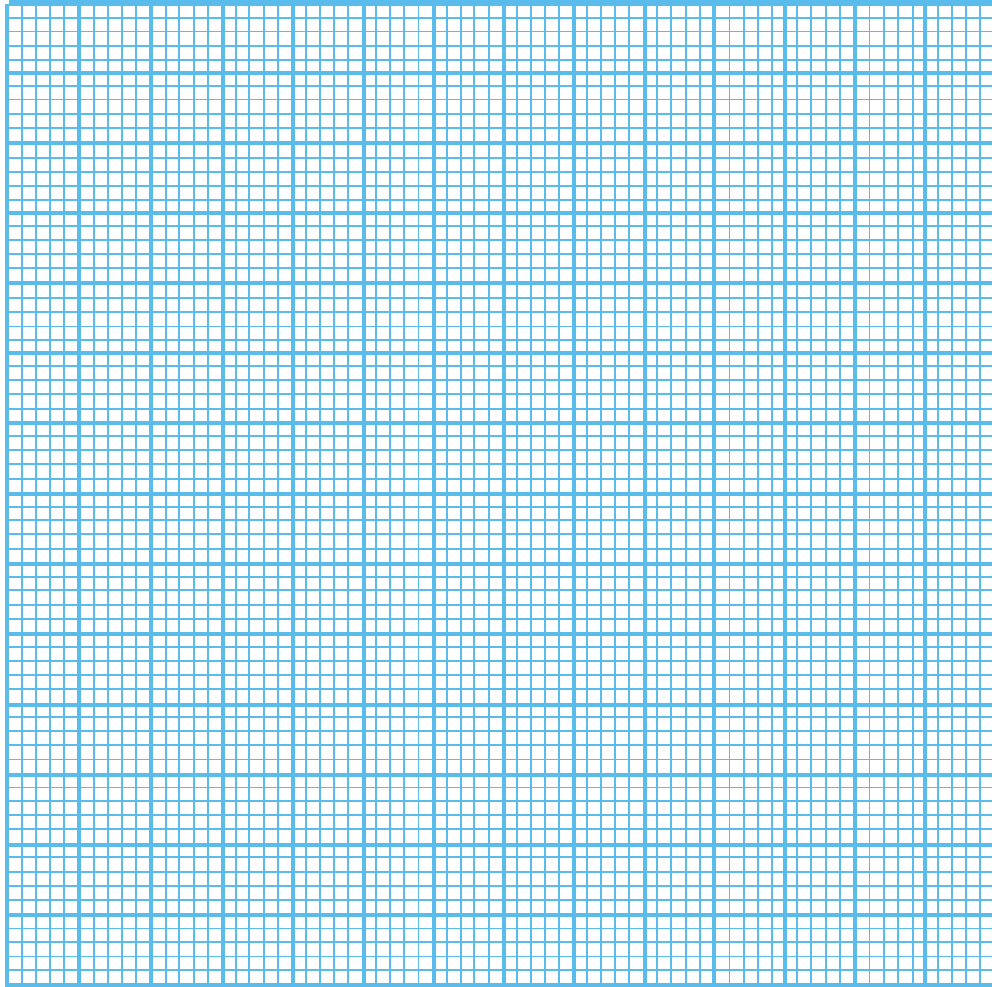
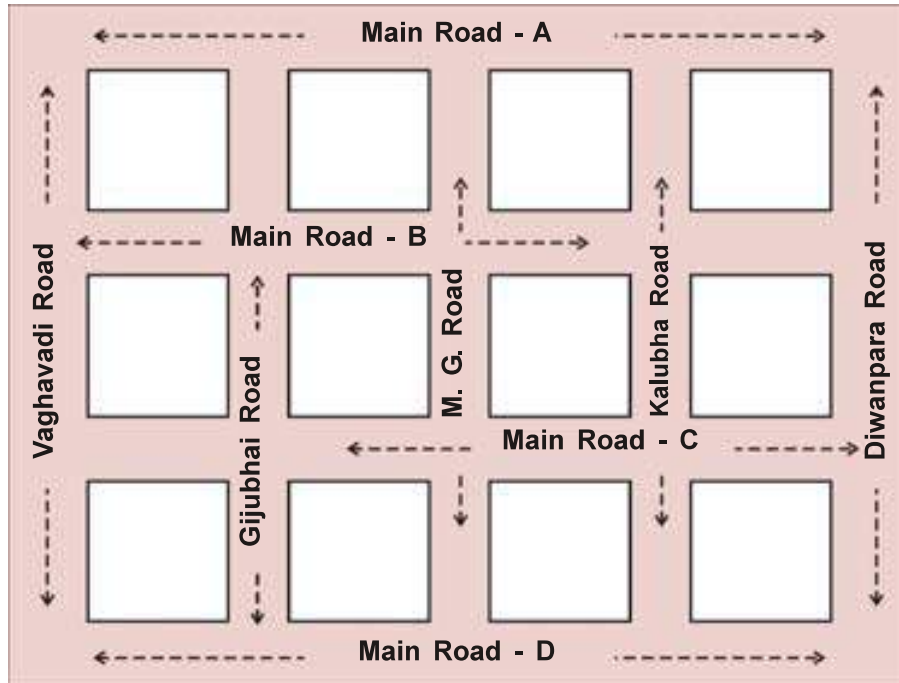**Practice 1**

1. See the following pictures, from these pictures, tick mark (✔) which has mutually perpendicular :
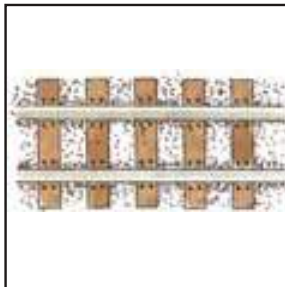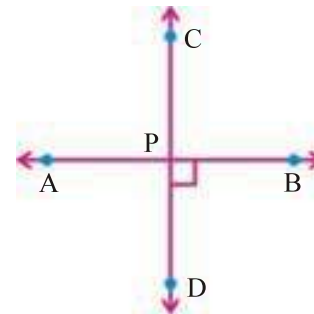
2.

In the above picture, think that which roads are mutually perpendicular to each other ?
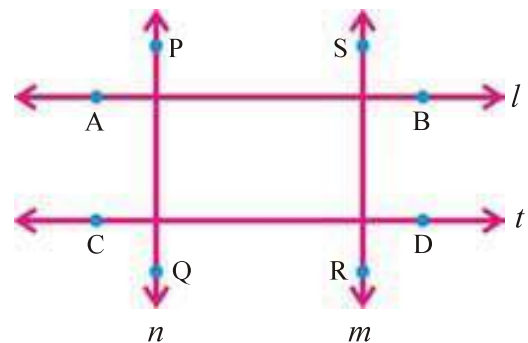
Perpendicular lines :

See the adjoining figure carefully. In it, two lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersects each other at point P, in which ∠P is right angle. Thus, both lines intersect each other at right angles.

- **Two lines intersecting at right angle is called perpendicular lines.**

$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are mutually perpendicular lines in above figure. Symbolically it is written as $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ or $\overleftrightarrow{CD} \perp \overleftrightarrow{AB}$. (Read : Line AB perpendicular to line CD or line CD perpendicular to line AB.)

Activity 3 : Which lines are perpendicular to each other in the given figure ? Write symbolically.
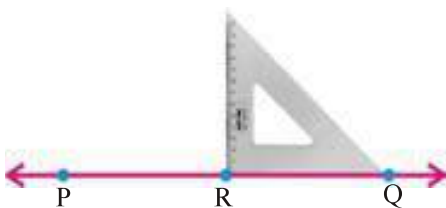
Activity 4 : Think

    (1) In your classroom, where do you see perpendicular lines ?

    (2) In your notebook, two adjacent lines seems perpendicular or not ?

To draw perpendicular lines with set square :

Illustration 1 : Point R is given on $\overleftrightarrow{PQ}$. Draw perpendicular line through point R.
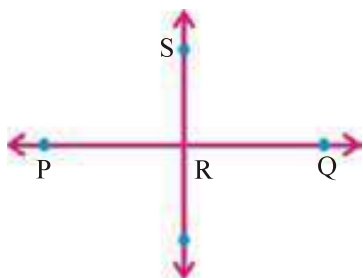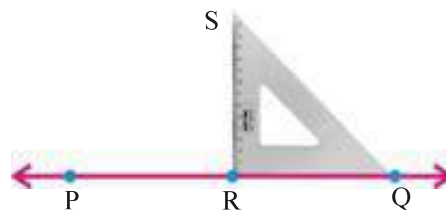
Steps :

- Take point R on a line $\overleftrightarrow{PQ}$.

- Now, adjust the set square on $\overleftrightarrow{PQ}$ such that its right angle point touches point R and edge is exactly on the line.

- Take a point S, on vertical edge of set square, on the paper.
- Now, take away set square.

- By joining the point R, which is on $\overleftrightarrow{PQ}$ and a point S, which is outside the line, draw $\overleftrightarrow{SR}$.

Thus, with the help of set square, a perpendicular $\overleftrightarrow{SR}$ is drawn through point R of $\overleftrightarrow{PQ}$.

Practice 2

1. Point P is given on $\overleftrightarrow{AB}$. With the help of set square, draw line $\overleftrightarrow{PQ}$ passing through point P and perpendicular to $\overleftrightarrow{AB}$.
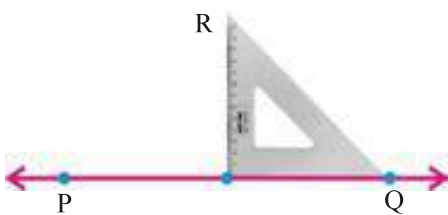
2. Take a point R on $\overleftrightarrow{XY}$ and with set square draw perpendicular line $\overleftrightarrow{RN}$ passing through point R of $\overleftrightarrow{XY}$.

Illustration 2 : $\overleftrightarrow{PQ}$ is given. Point R is outside it. With the help of set square draw $\overleftrightarrow{RS}$ which is perpendicular to $\overleftrightarrow{PQ}$ and passing through point R.
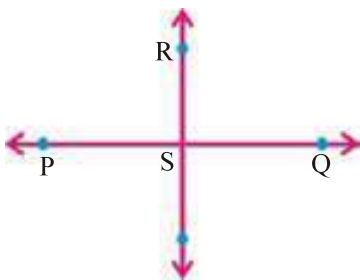
Steps :

- First of all, draw $\overleftrightarrow{PQ}$ and take a point R outside it.

- Arrange the set square, such that one edge is on $\overleftrightarrow{PQ}$ and second edge is on point R.

- Give the name S at the point where right angled portion of set square touches.

- Now, take away set square.

- With the help of scale, draw the line passing through point R, outside the $\overleftrightarrow{PQ}$ and point S, on the $\overleftrightarrow{PQ}$.

Thus, perpendicular $\overleftrightarrow{SR}$ is drawn through a point R, outside the $\overleftrightarrow{PQ}$ with set square.
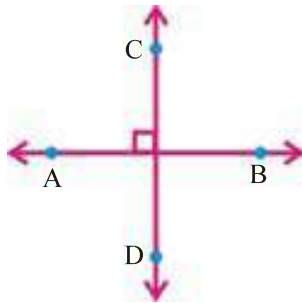
Practice 3

1. Point P is given outside $\overleftrightarrow{XY}$. With the help of set square draw $\overleftrightarrow{PQ}$, perpendicular to $\overleftrightarrow{XY}$.

2. Take a point J outside the $\overleftrightarrow{AB}$, draw perpendicular $\overleftrightarrow{JK}$ on $\overleftrightarrow{AB}$ with the help of set square.

Exercise

1. **Write in symbol, the following figures in the form of perpendicular :**

(1)

(2)
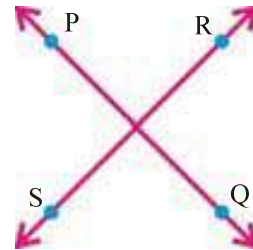
2. Point O is given on $\overleftrightarrow{MN}$. Draw perpendicular line to $\overleftrightarrow{MN}$ and passing through point O with set square.

3. Point J is given outside $\overleftrightarrow{RS}$. Draw perpendicular $\overleftrightarrow{JK}$ to $\overleftrightarrow{RS}$ with set square.

- **No, maths is not hard :** Generally, students believed that, maths is hard subject. But it is not true.
  - Maths teaching is making easier with the help of mathematics tools, entertainment activities, games on logic, mathematics magic box, etc.

1. **Give answer of the questions, by preparing bar graph on the basis of registered number of students of Standard 1 to 5 of your school :**

Scale : On Y-axis : 1 cm = 5 students

Y-axis

No. of students

50
45
40
35
30
25
20
15
10
5

O   1   2   3   4   5   X-axis
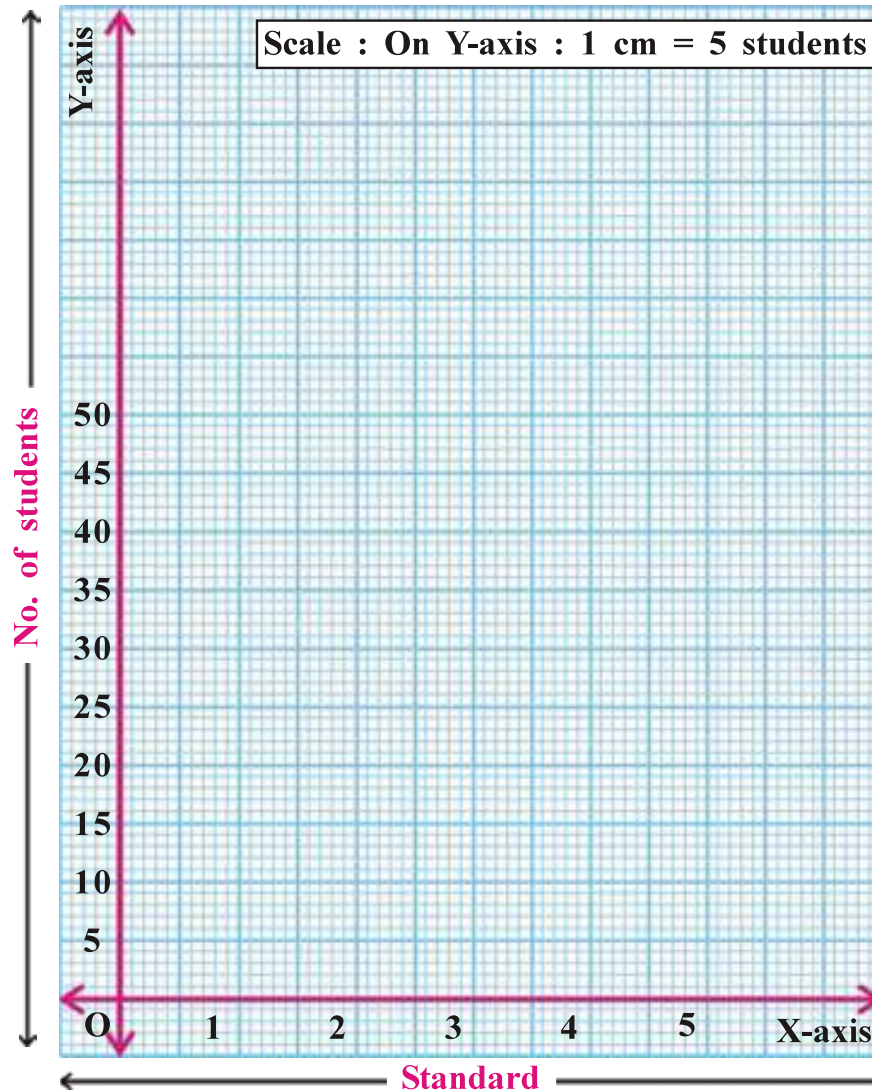
Standard

(1) Which information is given by the graph ?

(2) What is shown on X-axis ?

(3) What is shown on Y-axis ?

(4) What is the scale on Y-axis ?

(5) In which standard, there are maximum students ?

2. Note down the information about weight of 6 students of your class and on that basis draw the following bar garph : (Note down the weight in complete integer.)

Name of students						
Weight (kg)						
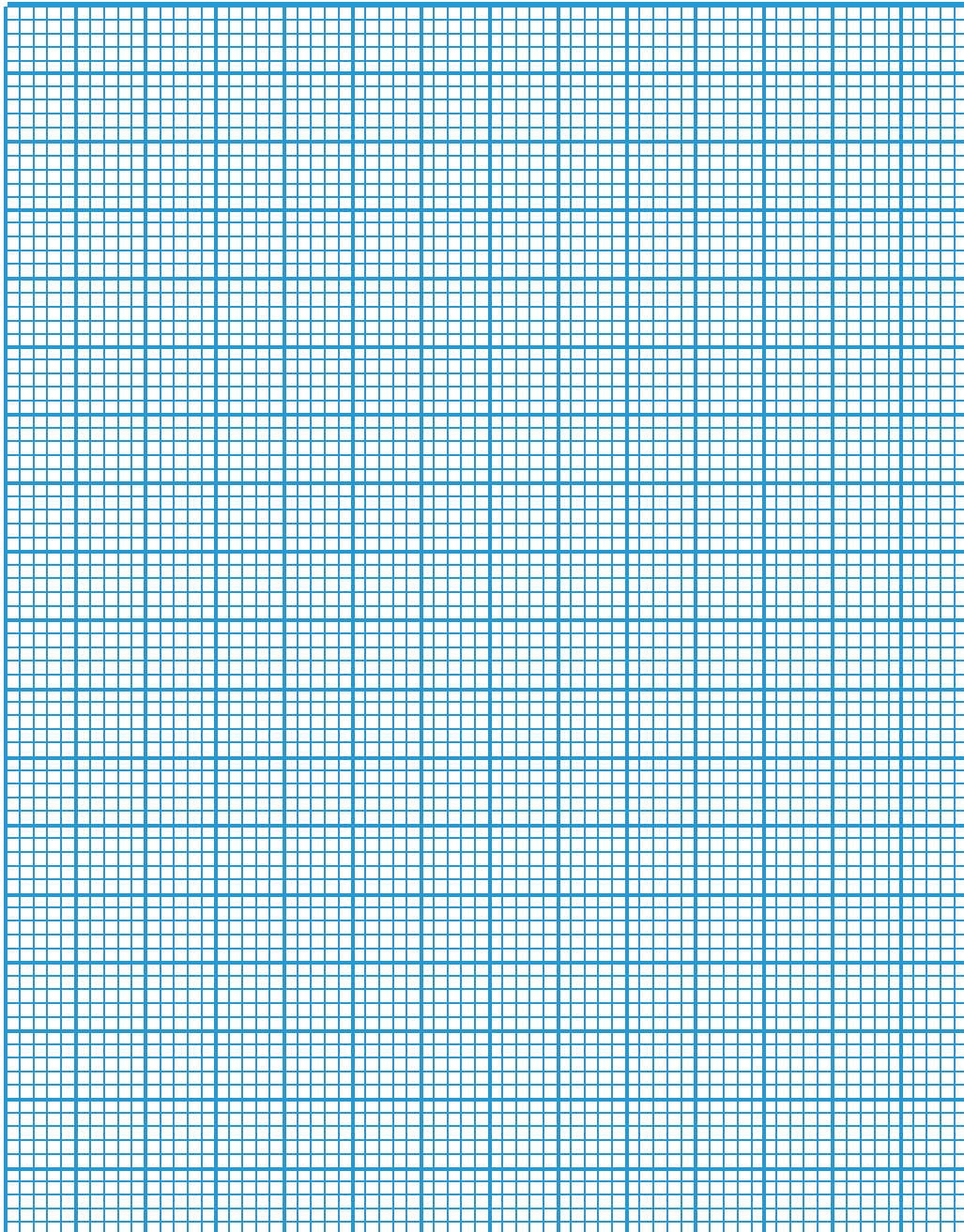
3. Note down the information in the Table, about number of trees found in your school garden or surroundings and prepare bar graph from that :

Name of trees						
No. of trees						

4.   Fill in the blanks to make the sentence correct :

(1) 8 sq m = ... sq cm

(2) 10,000 sq cm = ... sq m

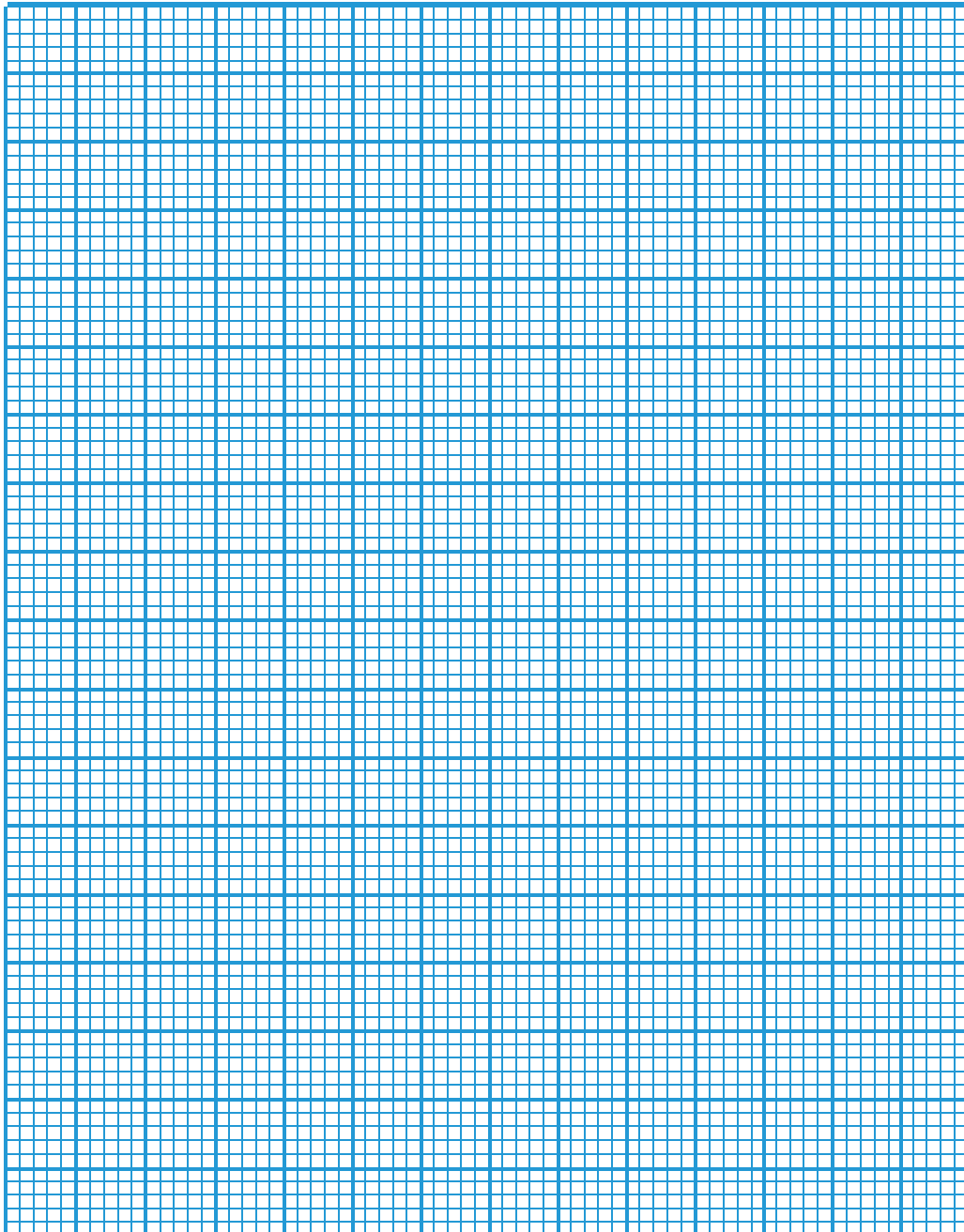(3) Perimeter of a square, whose length of the side is 10 cm, is .... cm.

(4) Perimeter of a rectangle, whose length is 6 m and Breadth is 4 m, is .... m.

(5) 0.18 = ... %

(6) $\frac{7}{8}$ = ... %

(7) 0.19 = ... %

(8) 0.125 = ... %

(9) $\frac{2}{3}$ = ... %

(10) $\frac{4}{7}$ = ... %

5.   Fill up the colour in the given boxes as directed :

(1) Fill up red colour in 30 % boxes.

(2) Fill up green colour in 10 % boxes.

(3) Fill up yellow colour in 17.5 % boxes.

(4) Fill up orange colour in 2.5 % boxes.

(5) Fill up black colour in 12.5 % boxes.

(6) Fill up blue colour in 27.5 % boxes.
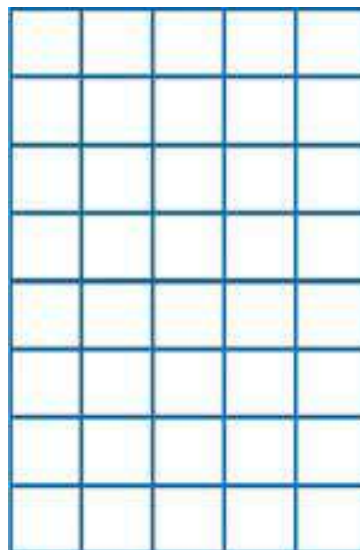
6.   Do the following sums :

(1) In a school, classroom length is 10 meter and breadth is 8 meter. To polish the tiles of floor of this classroom, find the cost at the rate of ₹ 12 per 1 sq meter.

(2) Length of the square garden is 80 meter. To prepare after tilling the field what is the cost at the rate of ₹ 3 per 1 square meter ?

(3) In an annual function of a school 860 students are present out of 2000 students, then find the percentage of presence.

(4) A merchant has total 4600 chocolates. Out of these, he distributed 851 chocolates among the children, then how many percentage chocolates are distributed among children ?

(5) (a) Convert 0.9 into percentage.

(b) Convert 0.24 into percentage.

Answers

1. (1) Registered students of Std. 1 to 5   (2) Standard   (3) No. of students

(4) 1 cm = 5 students

4. (1) 80,000 (2) 1 (3) 40 (4) 20 (5) 18 (6) 87.5 (7) 19 (8) 17.5

(9) $66\frac{2}{3}$ (10) $57\frac{2}{7}$

6. (1) ₹ 960   (2) ₹ 19,200   (3) 43 %   (4) 18.5 %   (5) (a) 90 % (b) 24 %

Extra knowledge :

- Maths education starts with knowledge of numbers.
- Maths is related with calculation.
- A compiled subject of methodical calculation is called Mathematics.
- In calculation knowledge is necessary.
- Mathematics means statistical part of human's knowledge.
- Hypothesis of Maths includes logic, statistics, meanings and solution.
- Learning of Maths is an important aspect of personality development.

Revision : 2

1(A) Fill in the blanks :

(1) In the graph paper, horizontal line is called ....

(2) Area of rectangle = ...

(3) Conversion of $\frac{3}{8}$ into percentage is ....

(4) Conversion of 1 into percentage is ....

(5) C.P. = ₹ 250, S.P. = ₹ 285, then Profit = ... %

(6) C.P. = ₹ 1260, Expense = ₹ 240, S.P. = ₹ 1365, then Loss = ... %

(7) $(-1) \times (-1) \times (-1) \times (-1) \times (-1)$ is written as .... in exponent form.

(8) Value of $7^2 \times 2^4$ is ....

(9) Exponent form of $3 \times 3 \times 3 \times 7 \times 7$ is ....

(10) Lines l and m are perpendicular lines. Symbolically it is written as ....

1(B) Do the following sums :

(1) C.P. = ₹ 300 S.P. = ₹ 350, then how much rupees profit or loss occur ?

(2) Find the value of $2 \times 2 \times 3 \times 3 \times 3$ and show them in exponent form.

(3) Length of a side of carrom is 110 cm, then find perimeter of the carrom.

Convert the following percentage into numbers :

2. Tick the sign in the given boxes as per that numbers :

(1) Tick + sign in 20 % boxes :   (2) Tick ● sign in 12.5 % boxes :

3. **Complete the following Table :**

No.	Exponent form	Base	Exponent	Read as
(1)	$(-2)^6$			
(2)	5^{10}			
(3)	$(-3)^4$			
(4)	7^5			
(5)	$(-11)^8$			

(Teacher should check the Table filled up by students.)

4. **Match the following :**

Section A	Section B
(1) Profit	(i) 50 %
(2) Loss	(ii) 1 %
(3) Net price	(iii) C.P. − S.P.
(4) $\frac{6}{12}$	(iv) C.P. + Expense
(5) 0.01	(v) S.P. − N.P.

5. **Classify the following polynomials into monomial, binomial and trinomial :**

$11a^2 - a, \quad a^3, \quad 2a^2 - 2a + 5, \quad 3ab^2 - 2a + 6, \quad 12x^2 - 3x, \quad -8,$

$2x^2 - 3, \quad x, \quad a^3 + 1, \quad 4 - 2y^3z^4$

6. **Complete the following Table :**

No.	Term	Variable	Exponent of variable	Exponent of term	Coefficient of term
1.	$7y^2$				
2.	$-3a^2b^2c^4$				
3.	$8xy^2z^8$				
4.	$-3x^3y^4$				
5.	18				

(Teacher should check the Table filled up by students.)
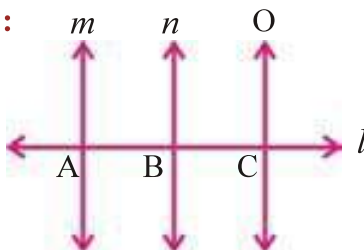
7. **Find the value of following polynomials by taking** $x = 1$, $y = 3$ **and** $a = 2$:

   (1) $y^2 - xy + y$ (2) $x^3 + ay + 10$ (3) $2x^2 - x + 2$

   (4) $x^3 + y^2$ (5) $3x^4 - ax^3 + 5x - 3$

8. **In the following diagram which three lines are perpendicular to line** *l* ?
   Show them symbolically :

9. Take a point J on $\overleftrightarrow{HG}$, with the help of set square draw perpendicular line $\overleftrightarrow{JM}$, passing through point J and perpendicular to $\overleftrightarrow{HG}$.

10. Take a point H, outside the $\overleftrightarrow{KR}$. With the help of set square draw $\overleftrightarrow{HT}$ perpendicular to $\overleftrightarrow{KR}$.

11. Length and breadth of a ground is 20 m and 15 m respectively. Find the cost to prepare lawn in it, at the rate of ₹ 5 per square meter.

12. Meenaben is preparing *Papad*. To prepare 20 kg *Papad*, raw material of ₹ 2000 is necessary. She spent ₹ 500 on her workers. If she sells all *Papads* in ₹ 2750, then how much percentage profit did she get ?

Answers

1(A) (1) X-axis   (2) length × Breadth   (3) 37.50 %   (4) 100 %

        (5) 14   (6) 9   (7) $(-1)^5$ (8) 784

        (9) $3^3 × 7^2$ (10) $l \perp m$

1(B) (1) Profit ₹ 50   (2) 324 and $2^2 × 3^4$ (3) 440 cm

4.   (1) (v)   (2) (iii)   (3) (iv)   (4) (i)   (5) (ii)

5.   **Monomials :** a^3, -8, x

      Binomials : $11a^2 - a$, $12x^2 - 3x$, $2x^2 - 3$, $a^3 + 1$, $4 - 2y^3z^4$

      Trinomials : $3ab^2 - 2a + 6$, $2a^2 - 2a + 5$

7.   (1) 9   (2) 17   (3) 3   (4) 10   (5) 3

8. $l \perp m$, $l \perp n$, $l \perp o$ **11.** ₹ 1500   **12.** 10 %