9 Data Handling

9.1 Introduction

You must have observed your teacher recording the attendance of students in your class everyday, or recording marks obtained by you after every test or examination. Similarly, you must have also seen a cricket score board. Two score boards have been illustrated here :

Name of the bowlers	Overs	Maiden overs	Runs given	Wickets taken
A	10	2	40	3
B	10	1	30	2
C	10	2	20	1
D	10	1	50	4

Name of the batsmen	Runs	Balls faced	Time (in min.)
E	45	62	75
F	55	70	81
G	37	53	67
H	22	41	55

You know that simply winning or losing a game is not only information that is recorded. In the score board, you will also find some very useful information about the game which is equally important. For instance, you may find out the time taken and number of balls faced by the highest run-scorer.

Similarly, in your day to day life, you must have seen several kinds of tables consisting of numbers, figures, names etc.

These tables provide 'Data'. *A data is a collection of numbers gathered to give some information*.

9.2 Recording Data

Let us take an example of a class which is preparing to go for a picnic. The teacher asked the students to give their choice of fruits out of Banana, Apple, Orange or Guava. Uma is asked to prepare the list. She prepared a list of all the children and wrote the choice of fruit against each name. This list would help the teacher to distribute fruits according to the choice.

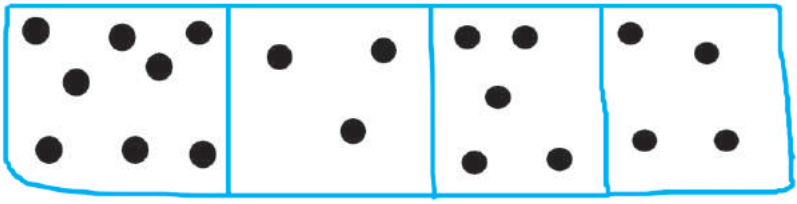
Raghav	-	Banana	Bhawana	-	Apple
Preeti	-	Apple	Manoj	-	Banana
Amar	-	Guava	Donald	-	Apple
Fatima	-	Orange	Maria	-	Banana
Amita	-	Apple	Uma	-	Orange
Raman	-	Banana	Akhtar	-	Guava
Radha	-	Orange	Ritu	-	Apple
Farida	-	Guava	Salma	-	Banana
Anuradha	-	Banana	Kavita	-	Guava
Rati	-	Banana	Javed	-	Banana

If the teacher wants to know the number of bananas required for the class, she has to read the names in the list one by one and count the total number of bananas required. To know the number of Apples, Guavas and Oranges seperately she has to repeat the same process for each of these fruits. How tedious and time consuming it is! It might become more tedious if the list has, say, 50 students.

So, Uma writes only the names of these fruits one by one like, Banana, Apple, Guava, Orange, Apple, Banana, Orange, Guava, Banana, Banana, Apple, Banana, Apple, Banana, Orange, Guava, Apple, Banana, Guava, Banana.

Do you think this makes the teacher's work easier? She still has to count the fruits in the list one by one as she did earlier.

Salma has another idea. She makes four squares on the floor. Every square is kept for fruit of one kind only. She asks the students to put one pebble in the square which matches their choices. That is, a student opting for banana will put a pebble in the square marked for banana and so on.



Banana Orange Apple Guava

By counting the pebbles in each square, Salma can quickly tell the number of each kind of fruit required. She can get the required information quickly by systematically placing the pebbles in different squares.

Try to perform this activity for 40 students and with names of any four fruits. Instead of pebbles you can also use bottle caps or some other token.

9.3 Organisation of Data

To get the same information which Salma got, Ronald needs only a pen and a paper. He does not require pebbles. He also does not ask students to come and place the pebbles. He prepares the following table.

Banana	✓✓✓✓✓✓✓✓	8
Orange	✓✓✓	3
Apple	✓✓✓✓✓	5
Guava	✓✓✓✓	4

Do you understand Ronald's table?

What does one (✓) mark indicate?

Four students preferred guava. How many (✓) marks are there against guava?

How many students were there in the class? Find out all these information. Discuss about these methods. Which is the best? Why?

Which method is more useful when the information from a much larger data is required?

Example 1 : A teacher wants to know the choice of food of each student as part of the mid-day meal programme. The teacher assigns the task of collecting this information to Maria. Maria does so using a paper and a pencil. After arranging the choices in a column, she puts the choice of food for students using one stick (|) as a mark.

Choice	Number of students
Rice only	||||||||||||||||
Chapati only	||||||||||||
Both rice and chapati	||||||||||||||||||||

Umesh, after seeing the above table suggested a better method to count the students. He asked Maria to organise the marks (|) in a group of ten as shown below :

Choice	Number of students
Rice only	|||||||||| ||||||
Chapati only	|||||||||| |||
Both rice and chapati	|||||||||| ||||||||||

Rajan made it simpler by asking her to make groups of five instead of ten, as shown below :

Choice	Number of students	
Rice only	||||| ||||| ||||| ||	17
Chapati only	||||| ||||| |||	13
Both rice and chapati	||||| ||||| ||||| |||||	20

Teacher suggested that the fifth mark in a group of five marks should be used as the cross, as shown by '𝍸 '. These are tally marks. Thus, 𝍸 || shows the count to be five plus two (i.e. seven) and 𝍸 𝍸 shows five plus five (i.e. ten).

With this, the table looks like :

Choice	Number of students	
Rice only	𝍸 𝍸 𝍸 ||	17
Chapati only	𝍸 𝍸 |||	13
Both rice and chapati	𝍸 𝍸 𝍸 𝍸	20

Example 2 : Ekta is asked to collect data for size of shoes of students in her Class VI and she records her finding in the manner shown below :

5	4	7	5	6	7	6	5	6	6	5
4	5	6	8	7	4	6	5	6	4	6
5	7	6	7	5	7	6	4	8	7	

Javed wanted to know (i) the size of shoes worn by maximum number of students. (ii) the size of shoes worn by least number of students. Can you find this information?

Ekta prepared a table using tally marks.

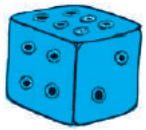
Shoe size	Tally marks	Number of students
4	𝍸	5
5	𝍸 |||	8
6	𝍸 𝍸	10
7	𝍸 ||	7
8	||	2

Now the questions asked earlier could be answered easily.

You can also do some such activity in your class using tally marks.

Do This

1. Catherine used a dice and noted the number which appeared after throwing it. She repeated the exercise 40 times and noted the number everytime as shown below:



1	3	5	6	6	3	5	4	1	6
2	5	3	4	6	1	5	5	6	1
1	2	2	3	5	2	4	5	5	6
5	1	6	2	3	5	2	4	1	5

Make a table and enter the data using tally marks.

Now, can you find out the number (or numbers)

(a) Which appeared the minimum number of times?

(b) Which appeared the maximum number of times?

(c) Which appeared same number of times?

Numbers	Tally marks	How many times
1 2 3 4 5 6		

2. Collect information regarding the number of family members of your classmates and represent it in the form of a table. Find to which group most students belong.

Number of family members	Tally marks	Number of students with that many family members

9.4 Pictograph

A cupboard has five compartments. In each compartment a row of books is arranged. The details are indicated as follows :

	-1Book
Row 1	
Row 2	
Row 3	
Row 4	
Row 5	

Which row has the greatest number of books? Which row has the least number of books? Is there any row which does not have books?

You can answer these questions by just studying the diagram. The picture visually helps you to understand the data. It is a **pictograph**.

A pictograph represents data in the form of pictures, objects or parts of objects. It helps answer the questions on the data at a glance.

Do This

Pictographs are often used by dailies and magazines to attract the attention of the readers .

Collect one or two such published pictographs and display them in your class. Try to understand what they say.

It requires some practice to understand the information given by a pictograph.

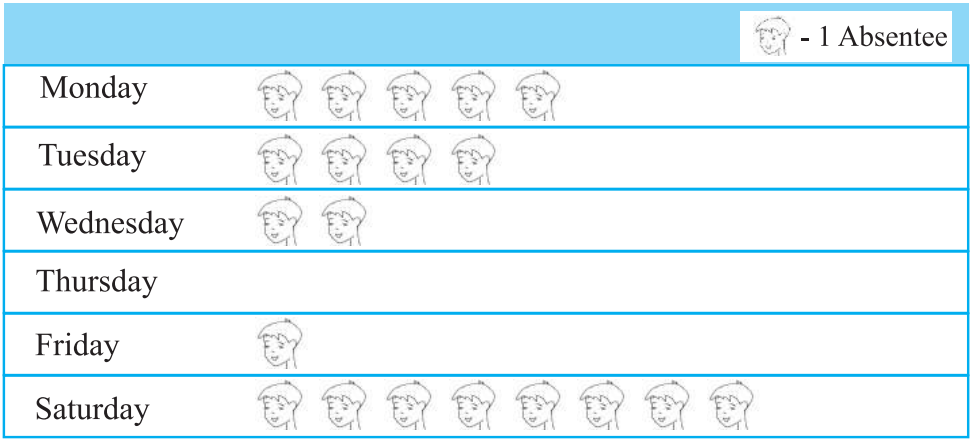
9.5 Interpretation of a Pictograph

Example 3 : The following pictograph gives details of the number of absentees in a particular class of 30 students during the previous week :

(a) On which day were the maximum number of students absent?

(b) Which day saw 100% attendance?

(c) What was the total number of absentees in that week?



Solution : (a) Maximum number of absentees were on Saturday. (There are 8 pictures in the row of Saturday representing this data; on all other days, the number of pictures are less).

(b) Against Thursday, there is no picture. This means, on that day there were no absentees. Thus, on that day the class had 100% attendance.

(c) There are 20 pictures in all. So, the total number of absentees in that week were 20.

Example 4 : The colours of Fridges preferred by people living in a locality are shown by the following pictograph :

(a) Find the number of people preferring blue colour.

(b) How many people liked red colour?

	- 10 People
Blue	
Green	
Red	
White	

Solution : (a) Blue colour is preferred by 40 people.

[= 10, so 4 such pictures indicate 4 × 10 people].

(b) Deciding the number of people liking Red colour is tricky.

For 5 complete pictures, we get 5 × 10 = 50 people.

For the last incomplete picture, we may roughly take it as 5.

So, number of people preferring Red colour is nearly 55.

Think, discuss and write

In the above example, the number of people who like Red colour was taken as 50 + 5. If your friend wishes to take it as 50 + 8, is it acceptable?

Example 5 : A survey was carried out in a certain school to find about different modes of transport used by students to travel to school each day. 30 students of class VI were interviewed and the data obtained was displayed in the form of a pictograph.

Mode of Travelling	Number of Students ☺ - 1 Student
Scooter	☺ ☺ ☺ ☺
Public bus	☺ ☺ ☺ ☺ ☺
School bus	☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺
Cycle	☺ ☺ ☺
Walking	☺ ☺ ☺ ☺ ☺ ☺ ☺

Looking at the above pictograph, quickly answer the following questions:

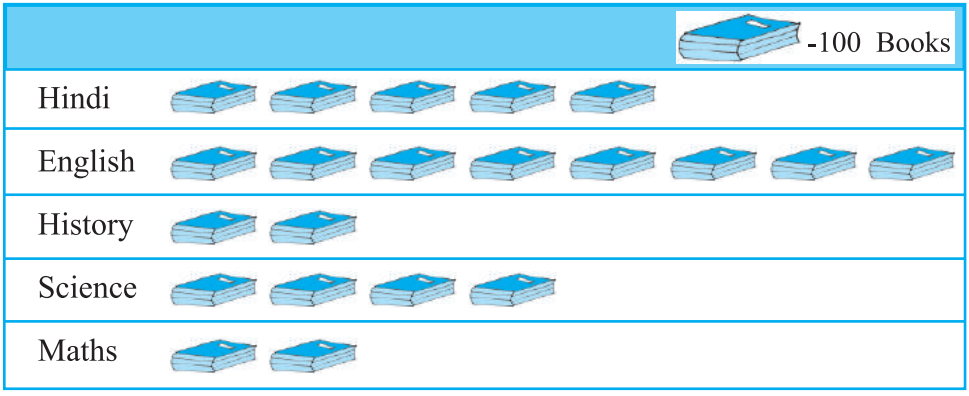
Solution :

(a) What is the number of students who use scooter as a mode of travel? Since one symbol represents one student, so 4 symbols represent four students who are using scooter as a mode of transport.

(b) Similarly can you find the number of students using cycle or walking as mode of travel?

(c) Which is the most popular mode of travel?

Example 6 : This pictograph shows different subject books which are kept in a library.



(a) How many English books are there in this library?

(b) How many Maths books are there?

(c) Which books are maximum in number?

(d) Which books are minimum in number?

Solution :

(a) Since one symbol represents 100 books, so 8 symbols will represent 8 x 100 = 800 books.

(b) It is somewhere between 100 and 200 (i.e., more than 100. How)?

By looking at this pictograph a Librarian may decide which subject books need to be ordered.

If one almirah can accommodate 300 books, he may place an order for almirahs by counting the number of books.

This pictograph can help him to decide how many almirahs would be needed.

Example 7 : Following is the pictograph of the number of wrist watches manufactured by a factory, in a particular week.

	⌚ - 50 Wrist watches
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

(a) On which day were the least number of wrist watches manufactured?

(b) On which day were maximum number of wrist watches manufactured?

(c) Find out the approximate number of wrist watches manufactured in this particular week?

We can complete the following table and find the answers.

Days	Number of wrist watches manufactured
Monday	300
Tuesday	More than 350 and less than 400
Wednesday	.....
Thursday	.....
Friday	.....
Saturday	.....

EXERCISE 9.1

1. In a Mathematics test, the following marks were obtained by 40 students. Arrange these marks in a table using tally marks.

8	1	3	7	6	5	5	4	4	2
4	9	5	3	7	1	6	5	2	7
7	3	8	4	2	8	9	5	8	6
7	4	5	6	9	6	4	4	6	6

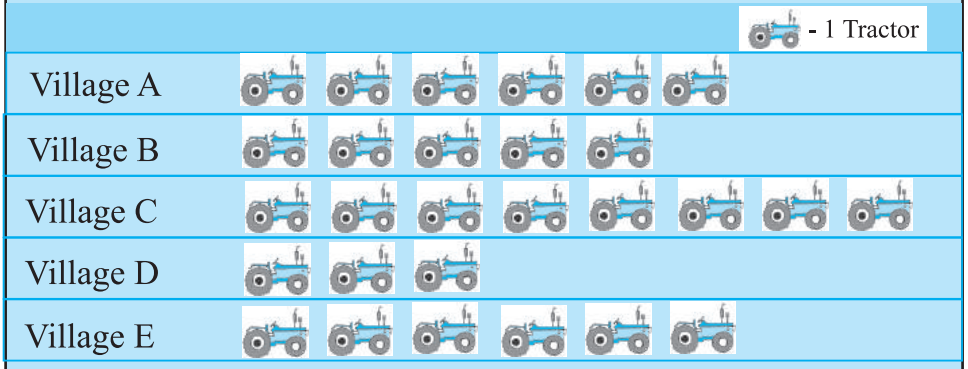
   (a) Find how many students obtained marks equal to or more than 7?
   (b) How many students obtained marks below 4?

2. Following is the choice of sweets of 30 students of Class VI.

   Ladoo, Barfi, Ladoo, Jalebi, Ladoo, Rasgulla
   Jalebi, Ladoo, Barfi, Rasgulla, Ladoo, Jalebi
   Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo
   Rasgulla, Ladoo, Ladoo, Barfi, Rasgulla, Rasgulla, Rasgulla
   Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo.

   a) Arrange the names of sweets in a table using tally marks.
   b) Which sweet is preferred by most of the students?

3. Following pictograph shows the number of tractors in five villages:



   Observe the pictograph and answer the following questions.
   (i) Which village has the minimum number of tractors?
   (ii) Which village has the maximum number of tractors?

(iii) How many more tractors village C has as compared to village B.

(iv) What is the total number of tractors in all the five villages?

4. The sale of electric bulbs on different days of a week is shown below:

	- 2 Bulbs
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	

Observe this pictograph and answer the following questions :

(a) How many bulbs were sold on Friday?

(b) On which day were the maximum number of bulbs sold?

(c) If one bulb was sold at the rate of ₹10. What was the total sale on Sunday?

(d) Can you find out the total sale of the week?

(e) If one big carton can hold 9 bulbs. How many carton were needed in the given week?

5. The number of girl students in each class of a co-educational middle school is depicted by the pictograph :

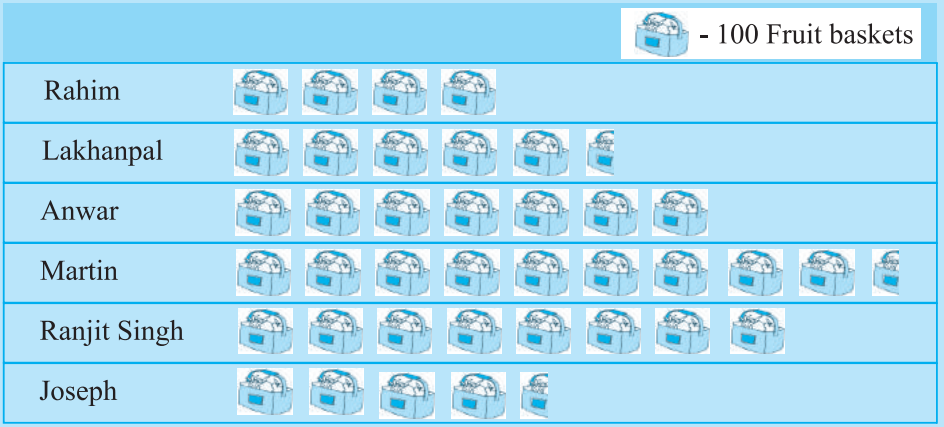
Observe this pictograph and answer the following questions :

(a) Which class has the minimum number of girl students?

(b) Is the number of girls in Class VI less than the number of girls in Class V?

(c) How many girls are there in Class VII?

6. In a village six fruit merchants sold the following number of fruit baskets in a particular season :



Observe this pictograph and answer the following questions :

(a) Which merchant sold the maximum number of baskets?

(b) How many fruit baskets were sold by Anwar?

(c) The merchants who have sold 600 or more number of baskets are planning to buy a godown for the next season. Can you name them?

9.6 Drawing a Pictograph

Drawing a pictograph is interesting. But sometimes, a symbol like  (which was used in one of the previous examples) may represent multiple units and may be difficult to draw. Instead of it we can use simple symbols.

If  represents say 5 students, how will you represent, say, 4 or 3 students?

We can solve such a situation by making an assumption that -

 represents 5 students,  represents 4 students,

 represents 3 students,  represents 2 students,

 represents 1 student,

and then start the task of representation.

Example 8 : The following are the details of number of students present in a class of 30 during a week. Represent it by a pictograph.

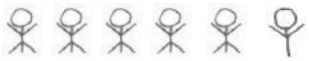
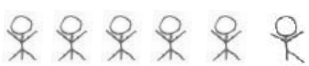
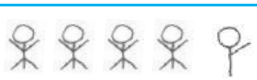
Days	Number of students present
Monday	24
Tuesday	26
Wednesday	28
Thursday	30
Friday	29
Saturday	22

Solution : With the assumptions we have made earlier,

24 may be represented by 

26 may be represented by 
and so on.

Thus, the pictograph would be

Days	Number of students present
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

We had some sort of agreement over how to represent 'less than 5' by a picture. Such a sort of splitting the pictures may not be always possible. In such cases what shall we do?

Study the following example.

Example 9 : The following are the number of electric bulbs purchased for a lodging house during the first four months of a year.

Months	Number of bulbs
January	10
February	13
March	15
April	17

Represent the details by a pictograph.

Solution : Let  represent 5 bulbs.

January 

February 

March 

April 

Picturising for January and March is not difficult. But representing 13 and 17 with the pictures is not easy.

However, we have shown this detail somewhat roughly.

Note that, when studying such pictographs, interpretations may differ from person to person. However, a 'general' view of the situation can be guessed.

EXERCISE 9.2

1. Total number of animals in five villages are as follows :

Village A	:	80
Village B	:	120
Village C	:	90
Village D	:	40
Village E	:	60

Prepare a pictograph of these animals using one symbol ⊗ to represent 10 animals and answer the following questions :

(a) How many symbols represent animals of village E?

(b) Which village has the maximum number of animals?

(c) Which village has more animals : village A or village C?

2. Total number of students of a school in different years is shown in the following table

Years	**Number of Students**
1996	400
1998	535
2000	472
2002	600
2004	623

A. Prepare a pictograph of students using one symbol 🧍 to represent 100 students and answer the following questions:

(a) How many symbols represent total number of students in the year 2002?

(b) How many symbols represent total number of students for the year 1998?

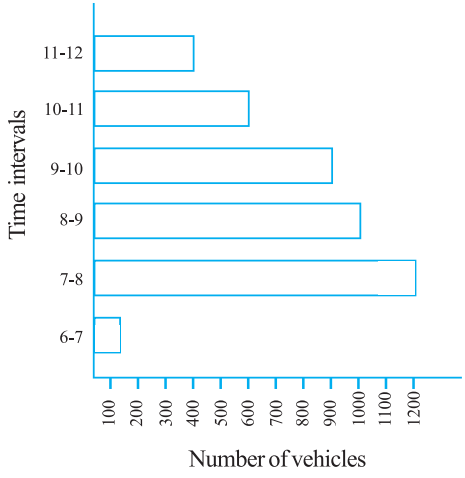
B. Prepare another pictograph of students using any other symbol each representing 50 students. Which pictograph do you find more informative?

9.7 A Bar Graph

Representing data by pictograph is not only time consuming but at times difficult too. Let us see some other way of representing data visually. Bars of *uniform width* can be erected horizontally or vertically with *equal spacing* between them and then the length of each bar represents the given number. Such method of presenting data is called a *bar diagram* or a *bar graph*.

9.7.1 Interpretation of a Bar Graph

Let us look at the example of vehicular traffic at a busy road crossing in Delhi, which was studied by the traffic police on a particular day. The number of vehicles passing through the crossing every hour from 6 a.m. to 12.00 noon is shown in the bar graph. One unit is symbolically shown as a box. [unit = one]



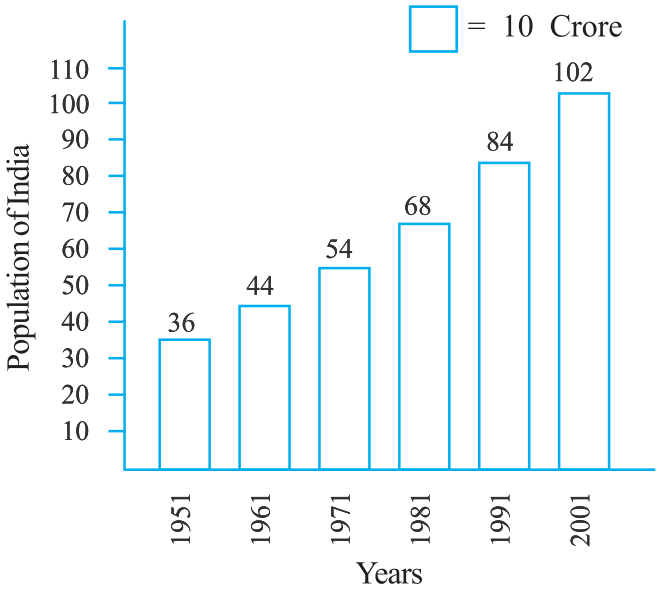
The scale is "1 unit length equal to 100 vehicles".

We can see that maximum traffic is shown by the longest bar (i.e., 1200 vehicles) for the time interval 7-8 a.m. The next longer bar is between 8-9 a.m.

Similarly, minimum traffic is shown by the smallest bar (i.e., 100 vehicles) for the time interval 6-7 a.m. The bar next to the smallest bar is between 11-12.

The total traffic during the two peak hours (8.00-10.00 am) (for schools, offices and business establishments) as shown by the two long bars is 1000+900 = 1900 vehicles.

If the numbers in the data are large, then you may need a different scale. For example, take the case of the growth of the population of India. The numbers are in crores. So, if you take 1 unit length to be one person, drawing the bars will not be possible. Therefore, choose the scale as 1 unit to represents 10 crores. The bar graph for this case is shown in the figure given below.



So, the bar of length 5 units represents 50 crores and of 8 units represents 80 crores.

Example 10 : Read the following bar graph of a particular class of a school.

Answer the following questions :

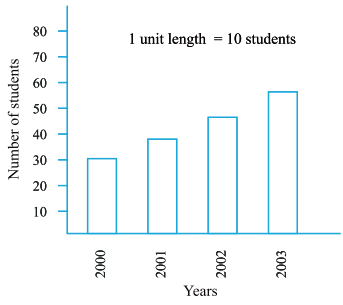
(a) What is the scale of this graph?

(b) How many new students are added every year?

(c) Is the number of students in the year 2003 twice that in the year 2000?

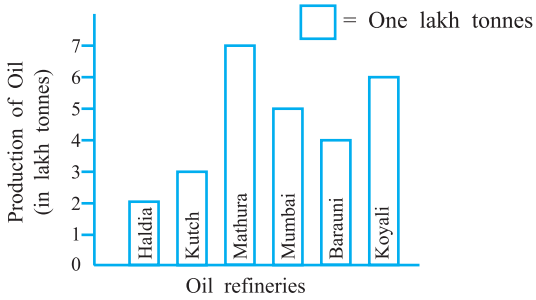
Solution : (a) The scale is 1 unit length equals 10 students.

Try (b) and (c) for yourself.



Do This

Read the following bar graph.



Now answer the following questions :

(a) What is the information given by the bar graph?

(b) Which oil refinery produces maximum oil?

(c) Name refineries which produce oil less than 4 lakh tonnes.

(d) How much oil is produced by Mumbai oil refinery?

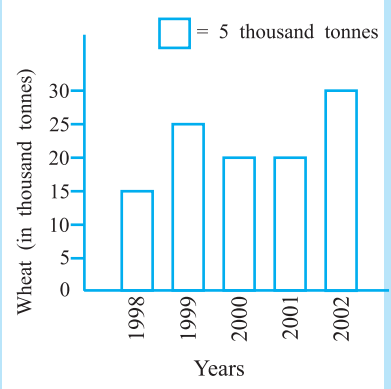
EXERCISE 9.3

1. Bar graph given alongside shows the amount of wheat purchased by government during the year 1998-2002.

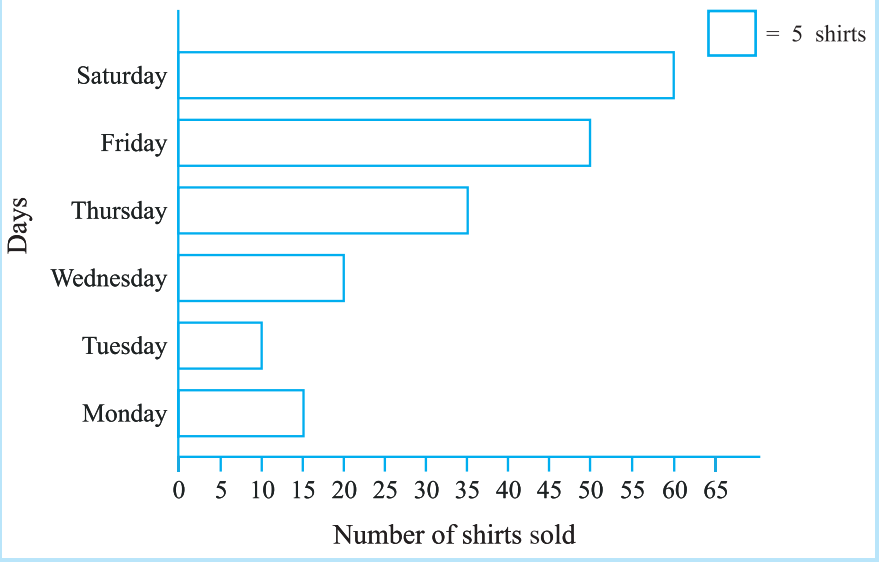
   Read the bar graph and write down your observations.

   (a) In which year was the wheat production maximum?

   (b) In which year was the wheat production minimum?



2. Observe this bar graph which is showing the sale of shirts in a ready made shop from Monday to Saturday. Now answer the following questions :



(a) What information is given by the above bar graph?

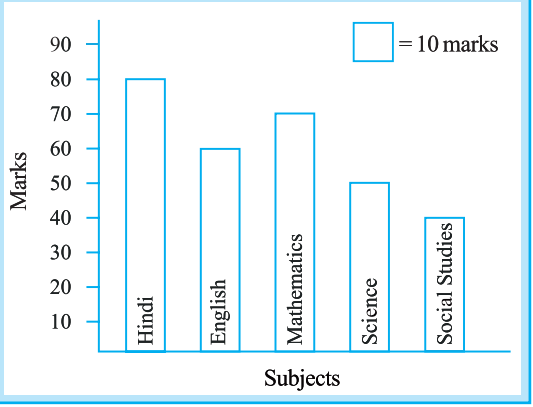
(b) Mention the scale chosen on the horizontal line representing number of shirts?

(c) Mention the day on which maximum number of shirts were sold and also mention the number of shirts sold.

(d) Mention the day on which minimum number of shirts were sold.

(e) How many shirts were sold on Thursday?

3. Observe this bar graph which is showing the marks obtained by Aziz in half yearly examination in different subjects.



Answer the questions given .

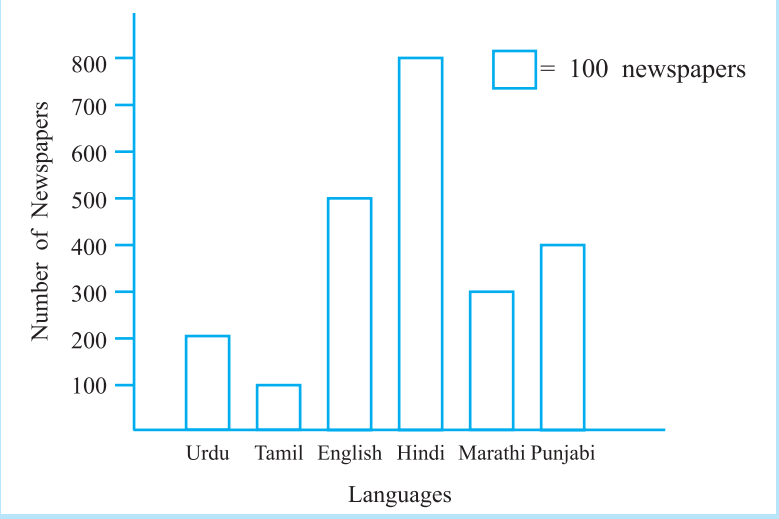
(a) What information is given by the bar graph?

(b) Name the subject in which Aziz has scored maximum marks.

(c) Name the subject in which he has scored minimum marks.

(d) State the name of the subjects and marks obtained in each of them.

4. Following is a bar graph of circulation of newspapers (dailies) in a town in six languages. Study the bar graph and answer the following questions:



(a) Find the number of newspapers circulated in Hindi, Punjabi, Urdu, Marathi and Tamil.

(b) Name the language in which the least number of newspapers are circulated.

(c) What is the difference between the number of Hindi and English paper being read?

(d) Write the number of newspapers circulated in different languages in ascending order.

9.7.2 Drawing a Bar Graph

Recall the example where Ronald had prepared a table representing choice of fruits made by his classmates.

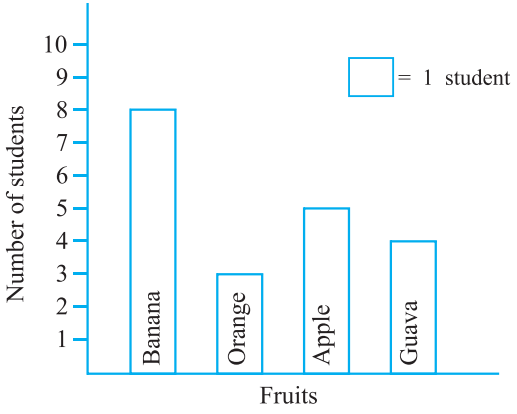
Name of fruit	Banana	Orange	Apple	Guave
Number of Students	8	3	5	4

First of all draw a horizontal line and a vertical line. On the horizontal line we will draw bars representing each fruit and on vertical line we will write numerals representing number of students.

Let us choose a scale. It means we first decide how many students will be represented by unit length of a bar.

Here, we take 1 unit length to represent 1 student only.

We get a bar graph as shown below.



Example 11 : Following table shows the monthly expenditure of Imran's family on various items.

Items	Expenditure (in ₹)
House Rent	3000
Food	3400
Education	800
Electricity	400
Transport	600
Miscellaneous	1200

To represent this data in the form of a bar diagram, here are the steps.

(a) Draw two perpendicular lines, one vertical and one horizontal.

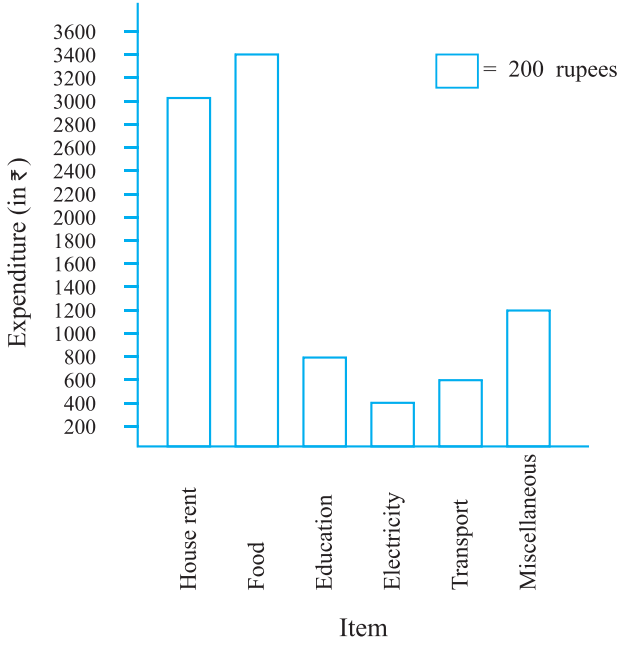
(b) Along the horizontal line mark the 'items' and along the vertical line mark the corresponding expenditure.

(c) Take bars of same width keeping uniform gap between them.

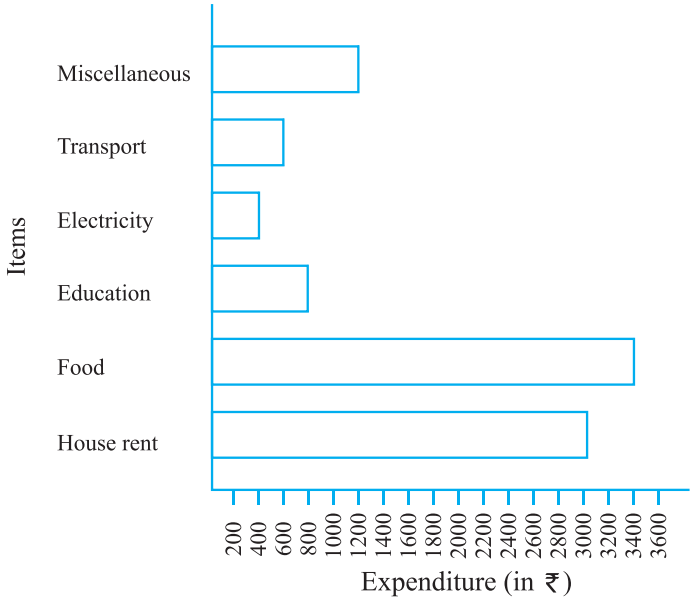
(d) Choose suitable scale along the vertical line. Let 1 unit length = ₹ 200 and then mark the corresponding values.

Calculate the heights of the bars for various items as shown below.

House rent	:	3000 ÷ 200	=	15 units
Food	:	3400 ÷ 200	=	17 units
Education	:	800 ÷ 200	=	4 units
Electricity	:	400 ÷ 200	=	2 units
Transport	:	600 ÷ 200	=	3 units
Miscellaneous	:	1200 ÷ 200	=	6 units



Same data can be represented by interchanging positions of items and expenditure as shown below :



Do This

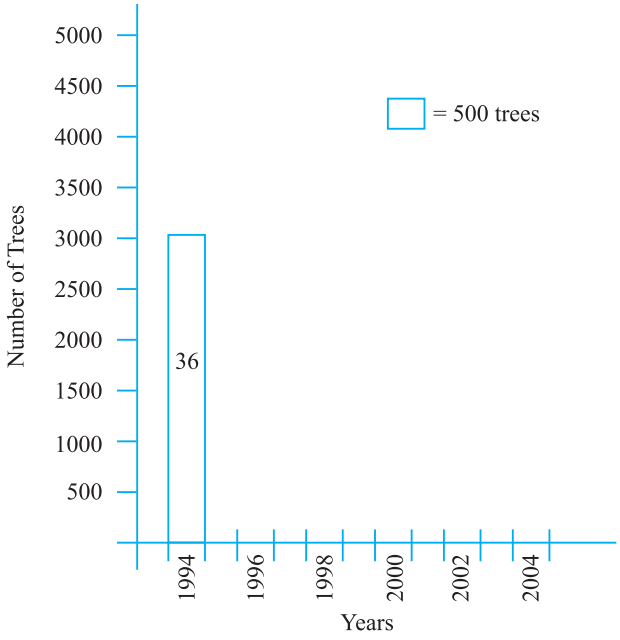
Following table shows the number of trees planted after every two years in a city during the year 1994-2004.

Years		Number of trees planted
1994	-	3000
1996	-	2000
1998	-	4000
2000	-	5000
2002	-	6000
2004	-	3000

Express this data in the form of a bar graph, taking 1 unit length = 500 trees.

Solution : Mark information 'Years' along horizontal line and the number of trees along the vertical line. Now find heights of the bars.

1994	-	3000 ÷ 500	=	6 units
1996	-	2000 ÷ 500	=	4 units
1998	-	4000 ÷ 500	=	.....
2000	-	5000 ÷ 500	=	.....
2002	-	.....	=	.....
2004	-	.....	=	.....



Complete the bar graph by drawing remaining bars. From this bar graph locate, (i) the year in which maximum number of trees were planted (ii) the year in which minimum number of trees were planted.

Do This

1. The number of mathematics books sold by a shopkeeper on six consecutive days is shown below:

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Number of books sold	65	40	30	50	20	70

Draw a bar graph to represent the above information choosing the scale of your choice.

2. Along with your friends think of 5 more situations where we can have data. Construct the table with numbers and represent them using bar graph.

EXERCISE 9.4

1. A survey of 120 school students was done to find which activity they prefer to do in their free time.

Preferred activity	Number of students
Playing	45
Reading story books	30
Watching TV	20
Listening to music	10
Painting	15

Draw a bar graph to illustrate the above data taking scale of 1 unit length = 5 students.

Which activity is preferred by most of the students other than playing?

2. Following table shows the number of bicycles manufactured in a factory during the years 1998 to 2002. Illustrate this data using a bar graph. Choose a scale of your choice.

Years	Number of bicycles manufactured
1998	800
1999	600
2000	900
2001	1100
2002	1200

(a) In which year were the maximum number of bicycles manufactured?

(b) In which year were the minimum number of bicycles manufactured?

3. Number of persons in various age groups in a town is given in the following table.

Age group	1-14	15-29	30-44	45-59	60-74	75 and above
Number of persons	2 lakhs	1 lakh 60 thousand	1 lakh 20 thousand	1 lakh 20 thousand	80 thousand	40 thousand

Draw a bar graph to represent the above information and answer the following questions. (take 1 unit length = 20 thousands)

(a) Which two age groups have same population?

(b) All persons in the age group of 60 and above are called senior citizens. How many senior citizens are there in the town?

What have we discussed?

1. We have seen that data is a collection of numbers gathered to give some information.
2. To get a particular information from the given data quickly, the data can be arranged in a tabular form using tally marks.
3. We learnt how a pictograph represents data in the form of pictures, objects or parts of objects. We have also seen how to interpret a pictograph and answer related questions. We have drawn pictographs using symbols to represent a certain number of items or things. For example,  = 100 books.

4. We have discussed how to represent data by using a bar diagram or a bar graph. In a bar graph, bars of uniform width are erected horizontally or vertically with equal spacing between them. The length of each bar gives the required information.
5. To do this we also discussed the process of choosing a scale for the graph. For example, 1 unit = 100 students. We have also practised reading a given bar graph. We have seen how interpretations from the same can be made.