9 Data Handling

In this unit students will learn to:

- find and describe average of given quantities in the data
- solve real life situations involving average
- organise the given data using bar graph
- read and interpret a bar graph given in horizontal and vertical form
- draw horizontal and vertical bar graphs for given data
- solve real life situations using data presented in bar graphs

MATH FLASH

You have already learnt:

- that block graphs are used to represent data
- that in a block graph and a line graph, types of items are indicated on the horizontal axis and the number of items are presented on the vertical axis
- to read and interpret bar graphs in vertical and horizontal form
- to read and interpret line graphs

KEY VOCABULARY

average, block, column, bar, graph, data, information, tally marks, vertical axis, horizontal axis, scale

Averages

Here are the exam results of three students of class 5:

Ahsan	
Maximum marks of each subject: 100	
Math	92%
English	74%
Science	68%
History	22%
Geography	58%
Urdu	16%

Bilal	
Maximum marks of each subject: 100	
Math	75%
English	43%
Science	100%
History	49%
Geography	53%
Urdu	64%

Taha	
Maximum marks of each subject: 100	
Math	86%
English	64%
Science	72%
History	90%
Geography	30%
Urdu	88%

The teacher wants to find out which of these students have done the best work, overall. She first adds up the total marks of each student.

Ahsan scores: 92 + 74 + 68 + 22 + 58 + 16 = 330 marks

Bilal scores: 75 + 43 + 100 + 49 + 53 + 64 = 384 marks

Taha scores: 86 + 64 + 72 + 90 + 80 + 88 = 480 marks

From this, the teacher sees that Taha has got the highest **total** marks. She now divides each total by the number of subjects to arrive at the **average** marks scored by each student.

Ahsan: $\frac{330}{6}$ Average marks = 55%

Bilal: $\frac{384}{6}$ Average marks = 64%

Taha: $\frac{480}{6}$ Average marks = 80%

$$\text{Average} = \frac{\text{Sum of values}}{\text{Number of values}}$$

The term average refers to the middle or central point in a data. It help us make sense of the information and data we see all around us.

For example, a doctor may wish to know the height of children aged 10 years. He can do this by measuring and writing down the heights of some children.

Rabia's height: 145 cm

Ayesha's height: 148 cm

Maria's height: 143 cm

Saher's height: 147 cm

Arif's height: 150 cm

There is a difference in height between Maria and Arif, despite the fact that they are of the same age. The data is not very useful to the doctor until he works out the average.

$$\text{Average height} = \frac{\text{Total height}}{\text{Number of children}} = \frac{733 \text{ cm}}{5} = 146.6 \text{ cm}$$

The doctor gets the useful information that the **average height** of children aged 10 is 146.6 cm. He can then see how many children are **above** the average height and how many are **below** the average height.

Example:
Find the average of 12, 6, 21, and 13.

Solution:
12 + 6 + 21 + 13 = 52
Total number of quantities = 4
Average = 52 ÷ 4
= 13

REMEMBER

To find the average of a set of quantities, add them together, then divide the total by the number of quantities.

Exercise 9a

1. Fill in the blanks.
   a. An average is obtained by adding the quantities together and dividing the sum by _____ .
   b. Average tells about the central value of _____ .
   c. The average of 7, 9, 10 and 18 is _____ .
   d. The average of 1000, 1000, and 1000 is _____ .
   e. To find the average of 18, 14, 15, and 17 we divide _____ by 4.

2. State whether the following are true or false.
   a. The average of the first five numbers is 3. (_____)
   b. The average is the largest value in a data. (_____)
   c. To find the average we divide the sum of data by the number of quantities. (_____)
   d. The average of 2.5, 4.5 and 6.5 is not 4.5. (_____)
   e. If the sum of the heights of 20 girls is 2640 cm, their average height will be 132 cm. (_____)

3. Select the correct answer from the given options.

a. The average of 10, 20, and 30 is
Ⓐ 60 Ⓑ 6 Ⓒ 20 Ⓓ 180

b. To find the average of 2.5, 3.5, 4.5, and 5.5, we divide their sum by
Ⓐ 2 Ⓑ 4 Ⓒ 8 Ⓓ 10

c. If each of the 5 logs is 5 m long, then the average length is
Ⓐ 30 m Ⓑ 125 m Ⓒ 25 m Ⓓ 5 m

d. To find the average of a set of quantities, the quantities are
Ⓐ added Ⓑ multiplied Ⓒ subtracted Ⓓ divided

e. The average of a data will be
Ⓐ the highest value Ⓑ the lowest value
Ⓒ the mean value Ⓓ an odd number

4. Work out the average of these sets.

a. 14, 27, 5, 19, 10

b. Rs 36, Rs 14, Rs 17, Rs 42, Rs 101

c. 8 cm, 25 cm, 15 cm, 32 cm, 10 cm

5. Below are the weights recorded for four 10 year old children. Work out the average weight of the children.

Name	Weight
Mona	34.0 kg
Kashif	36.2 kg
Aslam	35.8 kg
Insia	40.0 kg

▶ Real-life Story Sums

1. Saad buys a kilogram of the biscuits from a bakery on 6 different days. The prices he pays are Rs 8, Rs 10, Rs 7.50, Rs 12, Rs 11.75, and Rs 9.25. Find the average price.
2. Over a 4-month period, Moiz's monthly income was Rs 5000, Rs 4000, Rs 2500, and Rs 1000. What was his average income for that period?
3. Study the table given below. It shows the number of girls and boys studying at a primary school.

Class	Girls	Boys
KG I	24	20
KG II	21	23
1	26	20
2	25	19
3	18	26
4	20	24
5	27	22

Find

a. The average number of girls in each class.
b. The average number of boys in each class.
c. The total number of children in the school.
d. The average number of children in each class.

Block graph

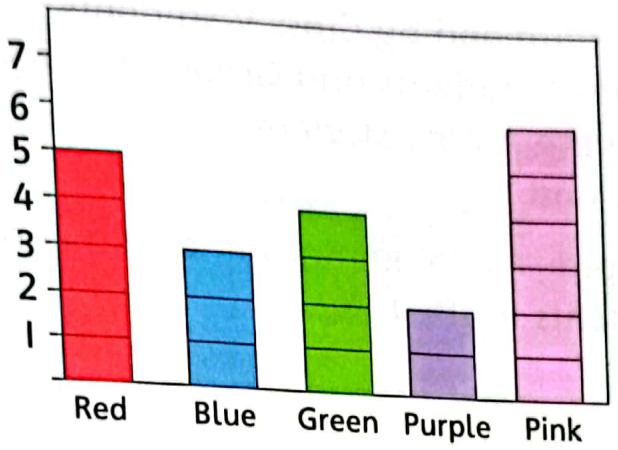
We have already learnt that block graphs are used to represent data. In a block graph, types of items are indicated on the horizontal axis and the number of items are presented on the vertical axis.

For example, children in a group of 20 may be asked to compile the data of their favourite colours like, red, blue, green, purple and pink. First, they will have to keep a tally of the colours liked by different children in the group.

Colours	Number of children
Red	☐☐☐☐☐
Blue	☐☐☐
Green	☐☐☐☐
Purple	☐☐
Pink	☐☐☐☐☐☐

Key: ☐ = 1 child

The above data can now be represented on a chart made up of squares as given below.

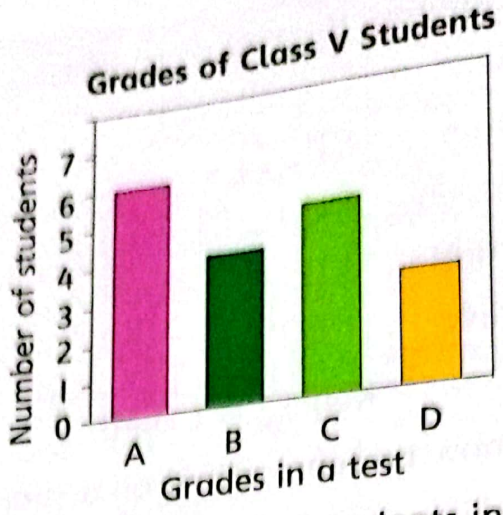


Column graph and bar graph

A column graph displays data in vertical bars.
Graphs have four components.

1. Title: It gives us the information displayed on the graph.
2. Labels: They are displayed on the horizontal and vertical axes to tell what is shown on each axis.
3. Scales: These are the numbers representing the units used. They increase from bottom to top by an equal amount.
4. Categories: Categories are represented by the bars and labeled under each bar.

Example:



Title: Grades obtained by Class V students in a test.
Labels: Number of students and Grades in a test.
Scale: One square = One student
Categories: A, B, C, and D

The above chart displays a column graph displaying the grades obtained by 18 students in the test.

Bar graph

A bar graph or bar chart is a representation of data which helps us compare information.

For example, the number of people travelling by car, bus, and on foot.

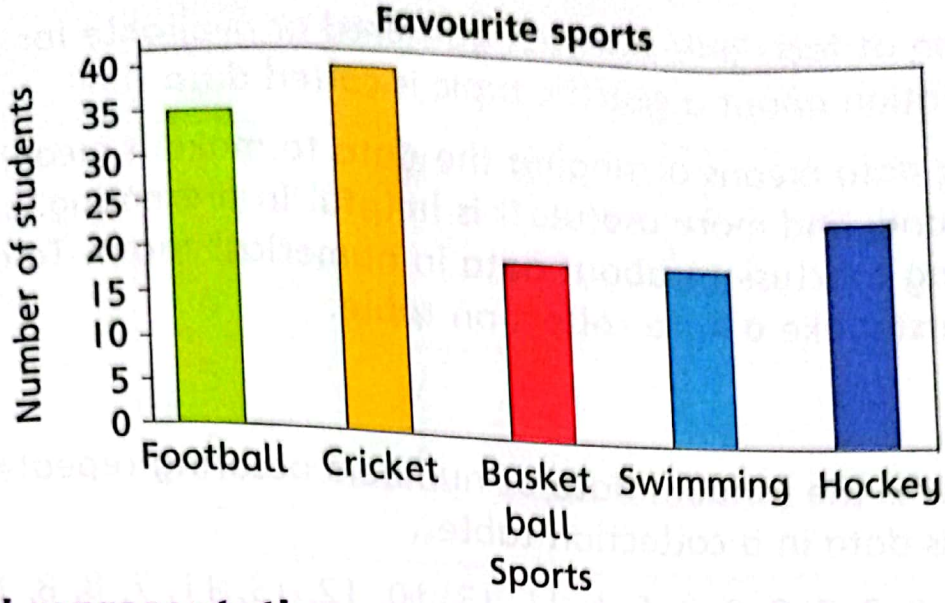
In a column and bar graph, the numerical data is represented by rectangles, called **bars**, of equal width and with equal spacing between each bar. Remember each bar represents one numerical data, therefore, there will be as many bars as the number of values in the numerical data.

Data can be displayed vertically and horizontally through bar graphs.

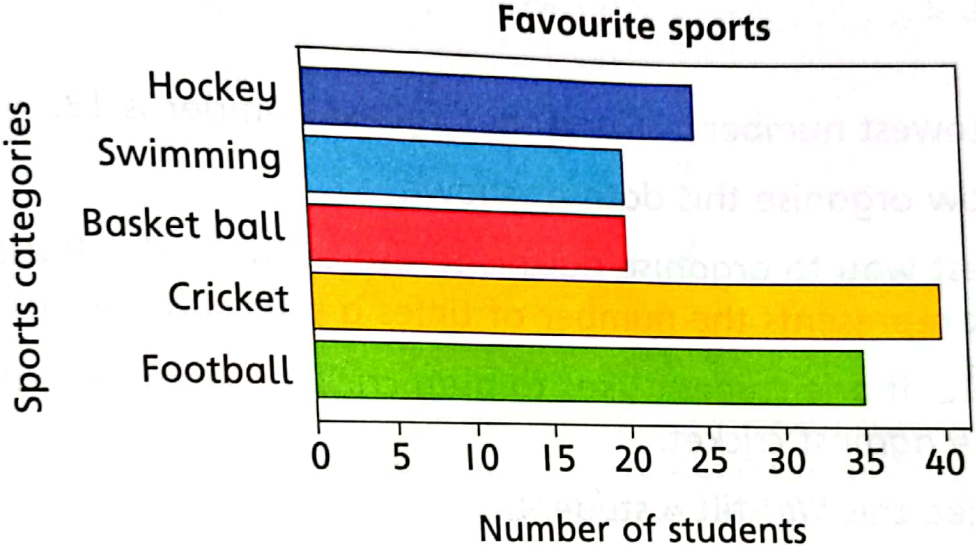
Example:

A PE teacher wants to know which game the students like the most. He conducted a survey, taking information from 140 students about their favourite sports. This information was then represented on a bar graph.

Vertical representation



Horizontal representation



Now, carefully go through the following questions and their answers.

1. What does the title of the given bar graph show?
   Favourite sports by a group of students.
2. How many students have been surveyed?
   35 + 40 + 20 + 20 + 25 = 140 students
3. What sport is liked most?
   Cricket
4. Which sports are liked least?
   Swimming and basketball.
5. Cricket and football are liked by how many students altogether?
   35 + 40 = 75 students

Data

A collection of facts and statistics gathered or available for analysis and calculation about a specific topic is called **data**.

Organising data means arranging the data to make it meaningful, easy to understand, and more useful. It is helpful in presenting, analysing and drawing conclusions about data in numerical forms. To organise data, we first make a data collection table.

Example:

Given below is the random data of numbers occuring repeatedly. Arrange this data in a collection table.

4, 3, 5, 9, 5, 2, 2, 7, 8, 9, 8, 6, 4, 11, 13, 10, 12, 13, 11, 7, 8, 8, 10, 1, 8, 2, 3, 12, 2, 4, 2

Solution:

Here the lowest number is 1 and the highest number is 13.

We can now organise this data as shown.

The simplest way to organise data is to use **tally marks**. Basically a tally mark represents the number of times a particular situation occurs.

For example, if one student likes to play cricket, we mark one tally '/' in the table against cricket.

We mark like this '////' till 4 students.

When the fifth student says he likes cricket, we do not write '/////'.

Instead we mark a line diagonally or horizontally across the four tally marks like ~~////~~ or ~~////~~ to form a group of 5.

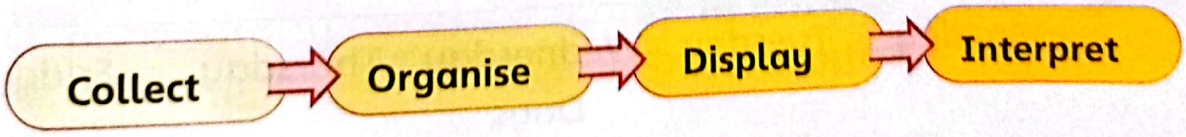
The addition becomes easier when we add in 5s.

For example, 7 values will be expressed as ~~////~~ // and 10 values will be written as ~~////~~ ~~////~~ and so on.

Data	Tally marks	Number of occurance
1	/	1
2	𝍸	5
3	//	2
4	///	3
5	//	2
6	/	1
7	//	2
8	𝍸	5
9	//	2
10	//	2
11	//	2
12	//	2
13	//	2
		31

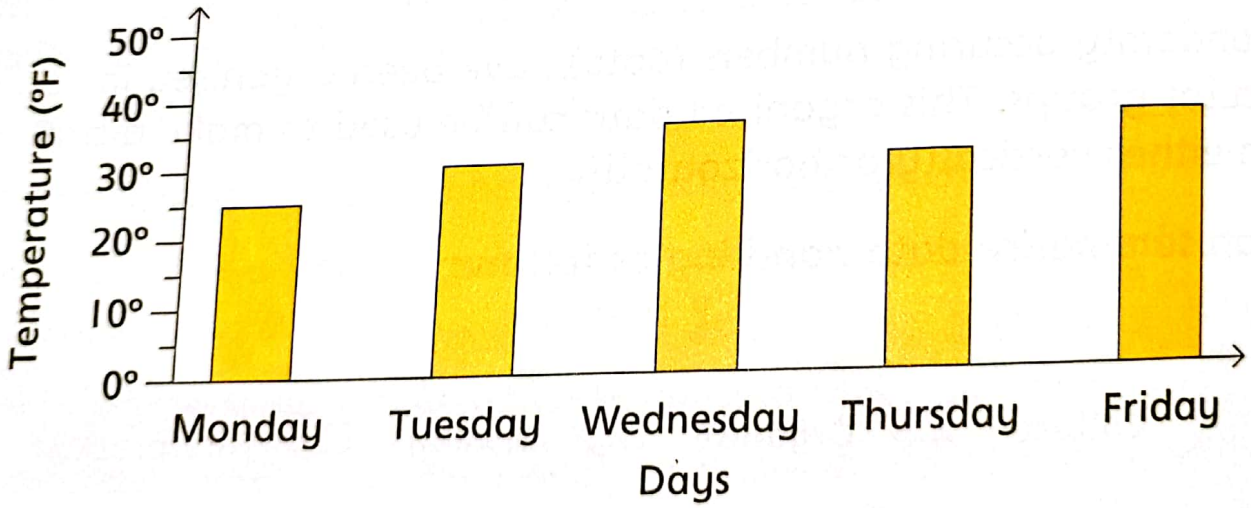
The randomly occuring numbers (data) have been organised in particular groups. This organised data can be used to make a bar graph either vertically or horizontally.

We can summarise data handling as follows:



▶ Exercise 9b

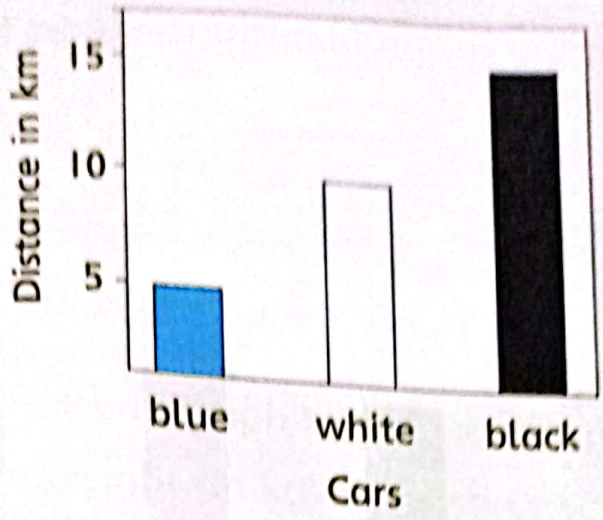
1. Fill in the blanks.
   a. The randomly collected information about an event or category is known as _____.
   b. Bar graphs can be represented horizontally or _____.
   c. The topic of the graph is known as _____.
   d. Graphs are made on two axis _____ and _____.
   e. Graph represented in blocks is known as _____ graph.
2. State whether the following are true or false.
   a. Bar graphs have space between the bars. (_____)
   b. In a column graph, columns are drawn horizontally. (_____)
   c. A vertical bar graph can also be represented horizontally. (_____)
   d. Title of the graph means unit taken on horizontal axis. (_____)
   e. The information shown on the horizontal and vertical axes are known as labels. (_____)
3. Select the correct answer from the given options.
   a. A record of the temperature from Monday to Friday is given in the bar graph below.



By how many degrees is the temperature on Monday less than the temperature on Wednesday?

Ⓐ 60°F Ⓑ 35°F Ⓒ 10°F Ⓓ 25°F

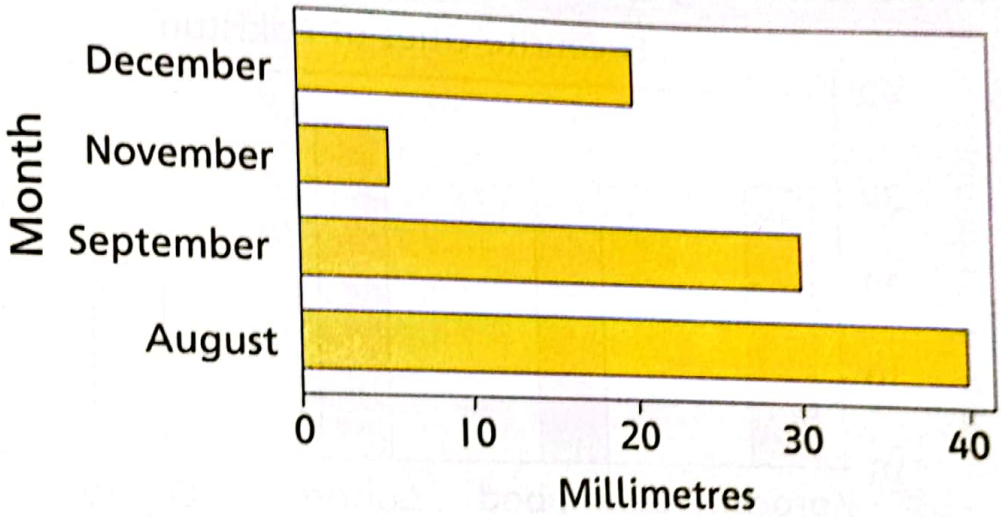
b.



The total distance covered by all three cars is

Ⓐ 15 km Ⓑ 20 km Ⓒ 30 km Ⓓ 10 km

c. The following graph shows the record of rainfall in August, September, November, December.



The rainfall in December is

Ⓐ double of November Ⓑ more than September

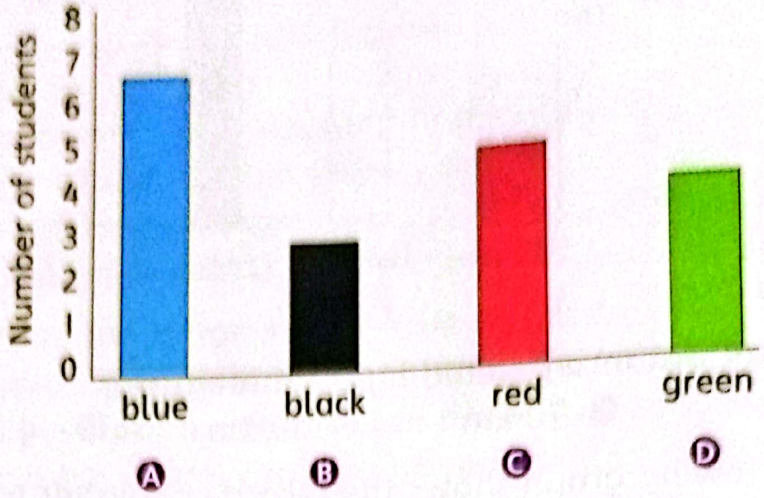
Ⓒ half of August Ⓓ equal to September

d. Column graphs are represented

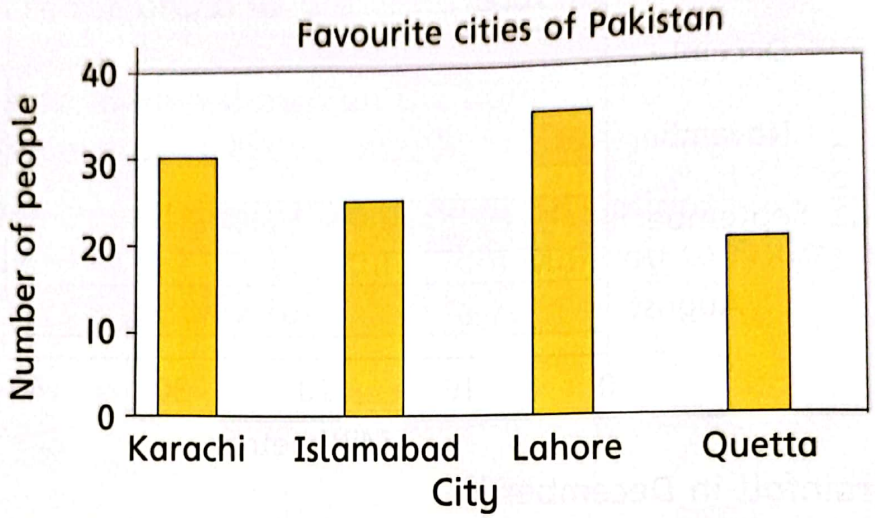
Ⓐ horizontally Ⓑ in boxes

Ⓒ in a line Ⓓ vertically

e. In the following bar graph identify the least favourite colour of students of class 5.



4. Interpret the following bar chart.



Answer the following questions.

a. How many people like Islamabad?
b. How many people like Lahore?
c. Which is the most liked city?
d. What is the total number of people who liked Karachi and Islamabad?
e. What is the total number of people surveyed for this data?

5. The data given below indicates the number of children engaged in different activities.

Activities	Sketching	Singing	Dancing	Outdoor games	Video games
No. of children	15	12	14	20	25

Draw a horizontal bar graph to display the given data.

6. Following is the weight (in kg) of 20 students of Class V.
20, 15, 12, 14, 14, 15, 12, 12, 16, 16, 13, 12, 20, 18, 18, 16, 15, 14, 14, 19

Construct a table and draw a vertical bar graph for the data given above.