INFORMATION HANDLING

9.1 Average

In everyday life average is commonly used word / term. A large information can be expressed in a simple way by the term average. There are three averages in common use i.e. (i) arithmetic mean (ii) median and (iii) mode. The average is the popular term used for arithmetic mean. It is used to compare two or more groups in terms of performance.

9.1.1 Define an Average (Arithmetic Mean)

Average is a quantity which represents the given several quantities or numbers.

Average is the sum of the quantities divided by the number of quantities i.e.,

$$\text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

9.1.2 Finding an average of given numbers

This is explained with the help of following examples.

Example 1

Find the average of the numbers 10, 35, 50, 75 and 60

Solution

Given numbers are 10, 35, 50, 75, 60

Sum of the given numbers $= 10 + 35 + 50 + 75 + 60$

$= 230$

Total given numbers $= 5$

$$\therefore \quad \text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

$$= \frac{230}{5}$$

$$= 46$$

∴   The average of the given numbers is 46.

Example 2

Find the average of the following numbers 239, 310, 225, 285, 250, 369, 360 and 474

Solution

Given numbers = 239, 310, 225, 285, 250, 369, 360, 474

Total given numbers = 8

$$\therefore \quad \text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

$$\text{Average} = \frac{239 + 310 + 225 + 285 + 250 + 369 + 360 + 474}{8}$$

$$= \frac{2512}{8}$$

$$= 314$$

∴   The average of the given numbers is 314.

We observed in the above examples that the average is not the given number. It is a point (number) which may or may not be a given number. In the formula:

$$\text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

There are three unknown quantities: average, sum of quantities and number of quantities. We can find anyone of these unknown quantities if

we are given the value of the other two quantities. For example:

(a)   To find the sum of quantities, the above formula will take the form as:

$$\text{Sum of quantities} = \text{Average} \times \text{Number of quantities}$$

It is illustrated with the example.

Example 1

Average of 5 quantities is 50. Find the sum of the quantities.

Solution

$$
\begin{aligned}
\text{Average} \quad &= \quad 50 \\
\text{Number of quantities} \quad &= \quad 5 \\
\therefore \quad \text{Sum of quantities} \quad &= \quad \text{Average} \times \text{Number of quantities} \\
&= \quad 50 \times 5 \\
&= \quad 250
\end{aligned}
$$

(b)   To find the number of quantities, the formula will be of the form:

$$\text{Total Number of quantities} = \frac{\text{Sum of the quantities}}{\text{Average}}$$

Example 2

If the sum of quantities is 250 and the average of the quantities is 50, then find the number of quantities.

Solution

$$
\begin{aligned}
\text{Sum of quantities} \quad &= \quad 250 \\
\text{Average} \quad &= \quad 50 \\
\text{Number of quantities} &= \frac{\text{Sum of the quantities}}{\text{Average}} \\
&= \frac{250}{50} \\
&= \quad 5
\end{aligned}
$$

9.1.3 Solution of the real life problems involving average

Example 1

Saud obtained the following marks in different subjects. Find his average marks in the subjects.

Subjects	English	Mathematics	Urdu	Science
Marks	70	80	64	50

Solution

$$\text{Marks obtained in English} = 70$$

$$\text{Marks obtained in Mathematics} = 80$$

$$\text{Marks obtained in Urdu} = 64$$

$$\text{Marks obtained in science} = 50$$

$$\text{Sum of the obtained marks} = 70 + 80 + 64 + 50 = 264$$

$$\text{Number of subjects} = 4$$

$$\therefore \quad \text{Average marks} = \frac{\text{Sum of marks}}{\text{Number of subjects}}$$

$$= \frac{264}{4}$$

$$= 66 \text{ marks}$$

$$\therefore \quad \text{The average marks of the subjects are 66.}$$

Example 2

The daily income (in Rs.) of a worker is given below. Find the average daily income of the worker.

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Income (Rs)	400	450	350	500	475	375

Solution

$$
\begin{aligned}
\text{Sum of daily income} \ &= \ 400 + 450 + 350 + 500 + 475 + 375 \\
&= \ \text{Rs. } 2550 \\
\text{Number of days} \ &= \ 6 \\
\therefore \ \text{Average daily income} \ &= \ \frac{2550}{6} \\
&= \ \text{Rs. } 425
\end{aligned}
$$

Example 3

A player's average score in 4 one-day matches is 48 runs. Find his total score in 4 one day matches.

Solution

$$
\begin{aligned}
\text{Total one day matches} \ &= \ 4 \\
\text{Average score} \ &= \ 48 \text{ runs} \\
\therefore \ \text{Total score} \ &= \ \text{Average score} \times \text{Number of matches} \\
&= \ 48 \times 4 \\
&= \ 192 \text{ runs}
\end{aligned}
$$

Example 4

Azeem obtained total 264 marks in his test in different subjects. His average marks are 66 in each subject. Find the number of subjects in which he took test.

Solution

$$
\begin{aligned}
\text{Azeem scores total marks} &= \ 264 \\
\text{Average marks} &= \ 66 \\
\text{Number of subjects} &= \ \frac{\text{Total marks}}{\text{Average}} \\
&= \ \frac{264}{66} \\
&= \ 4 \\
\therefore \ \text{He took test in 4 subjects.}
\end{aligned}
$$

Exercise 9.1

1. Find the average of the following numbers:

    i.   125, 145, 80, 124, 102, 144

    ii.   150, 200, 250, 300, 350, 400, 450

    iii.   200, 300, 250, 260, 210, 0, 280, 108

    iv.   220, 320, 0, 250, 240, 0, 260, 6

    v.   250, 312, 224, 288, 230, 270, 260, 310, 340

2. If the average of 5 numbers is 76, then find the sum of all the numbers.

3. Sum of few numbers is 350 and the average of these numbers is 50. Find the total numbers.

4. Samina's monthly savings of last six months is given below:

Months	July	August	September	October	November	December
Savings (Rs.)	2000	2500	1650	1500	1750	1502

    Find her average monthly savings for each month.

5. Ali paid the electricity bills of last five months as given below. Find his average monthly electricity bill of each month.

Months	March	April	May	June	July
Bill (Rs.)	575	1253	1675	1893	2004

6.   Six students of class 5 obtained marks in a Mathematics test which are given below:

Students	Ali	Asad	Saad	Saud	Hamza	Shafiq
Marks	96	47	89	93	75	68

Find the average marks of each student obtained.

7.   The temperature of seven days of a city is given below. Find the average temperature of each day.

Days	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temperature	31º	36º	41º	38º	42º	40º	38º

8.   A player scored runs in T-20 matches as given below:

Matches	1st	2nd	3rd	4th	5th	6th
Runs	56	49	32	74	99	62

Find his average runs scored for each match.

9.   Aslam obtained marks in 5 different Mathematics tests as follows:

Test	1st	2nd	3rd	4th	5th
Marks	93	87	96	58	46

Find his average marks for each test.

10.   Prices of the books of different subjects are given below:

Subjects	English	Urdu	Science	Mathematics	S. Studies
Price (Rs.)	95	92	76	89	68

Find the average price of each book.

11.　A player scored runs on average of 62 runs per match. He played 6 matches. Find total runs he scored in these matches.

12.　Amina's total monthly savings of few months is Rs. 12,600. Her monthly average savings is Rs. 1,800. Find the number of months of her savings.

9.2　Block, column and bar graph

A bar graph and a column graph are really the same thing. Both provide a graphical representation of data using rectangles/bars of equal width to compare quantities. The bar graphs are drawn vertically or horizontally with equal spacing between them.

9.2.1　Drawing block graph or column graph

We use graph paper to draw block or column graph. We learn to draw the graph with the help of following examples:

Example 1

Forty students of class 5 use different means to travel from school to their homes. The tabulated information is given below:

Means	Bicycle	Bus	Pedestrian	Car
Number of students	20	8	10	2

　　Represent this information through column graph.

Solution

i.   Draw $\overrightarrow{OX}$ and $\overrightarrow{OY}$ perpendiculars to each other and intersecting at a point O.

ii.   Write the means of travelling along X-axis and the number of students along Y-axis.

Scale
1 square = 2 students

No. of students

Bicycle   Bus   Pedestrian   Car

Means of travelling
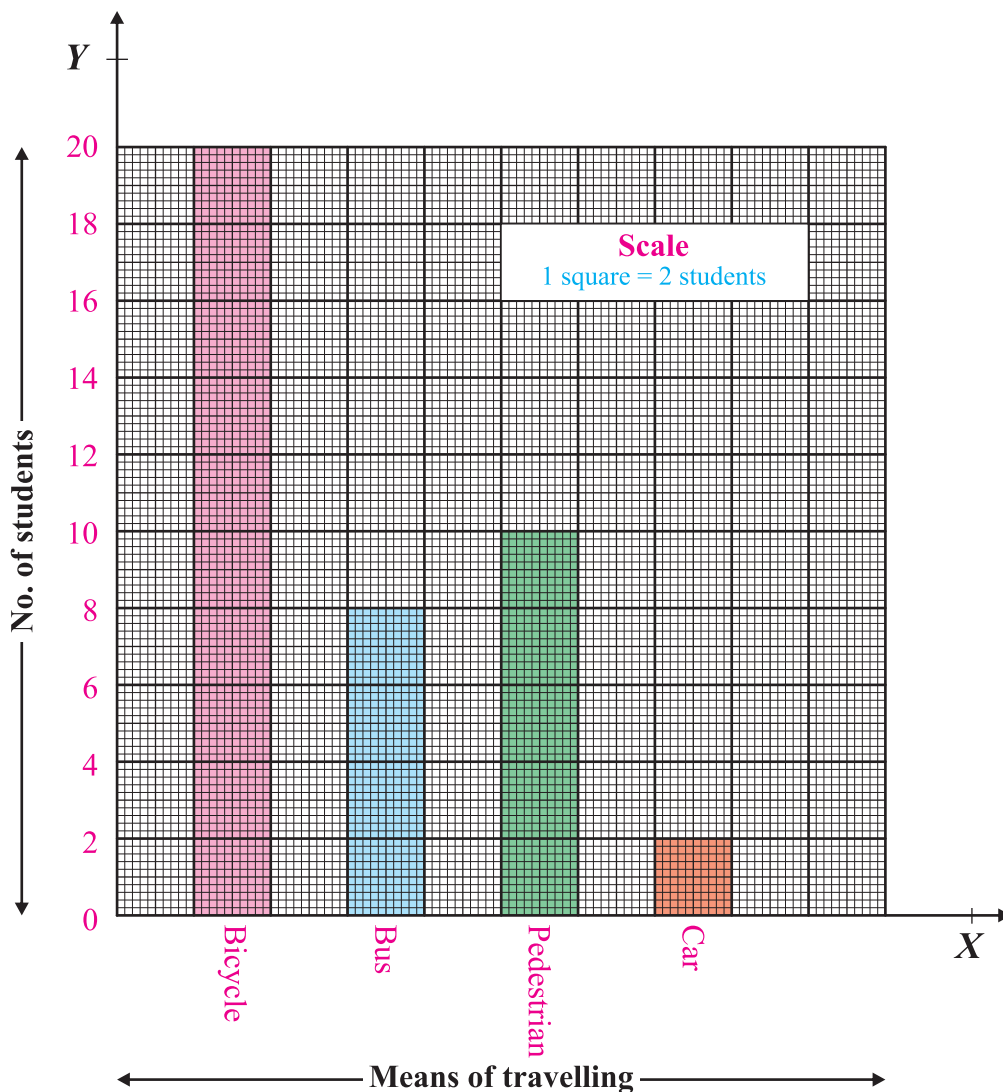
iii.   One square represents two students along *Y*-axis.

iv.   20 students use bicycle. Since one square represents 2 students, 10 squares are taken as length and which is selected to make the graph look attractive. The width is the same for each means throughout the graph.

v.   8 students use bus, so we take 4 squares along *Y*-axis as length and same width as for first block.

vi.   Similarly for pedestrian, we take 5 squares as length and for car users we take one square as length whereas the width will be equal in each case.

Thus this is the required graph.

Example 2

Five students received Eidi as given in table below. Represent the given information by a column graph.

Names	Fatima	Ayesha	Amina	Maryam	Sania
Eidi (Rs.)	25	30	35	25	45

Solution

i.   Draw *X*-axis and *Y*-axis.

ii.   Write the names of students along *X*-axis and Eidi received along *Y*-axis.

iii.   One square represents 5 rupees along *Y*-axis.

iv.   5 squares will represent 25 rupees along *Y*-axis of Fatima's Eidi.

v.   6, 7, 5 and 9 squares will represent Eidi of Ayesha, Amina, Maryam and Sania respectively.

vi.   The width will be the same for each column.

Thus this is the required column graph.
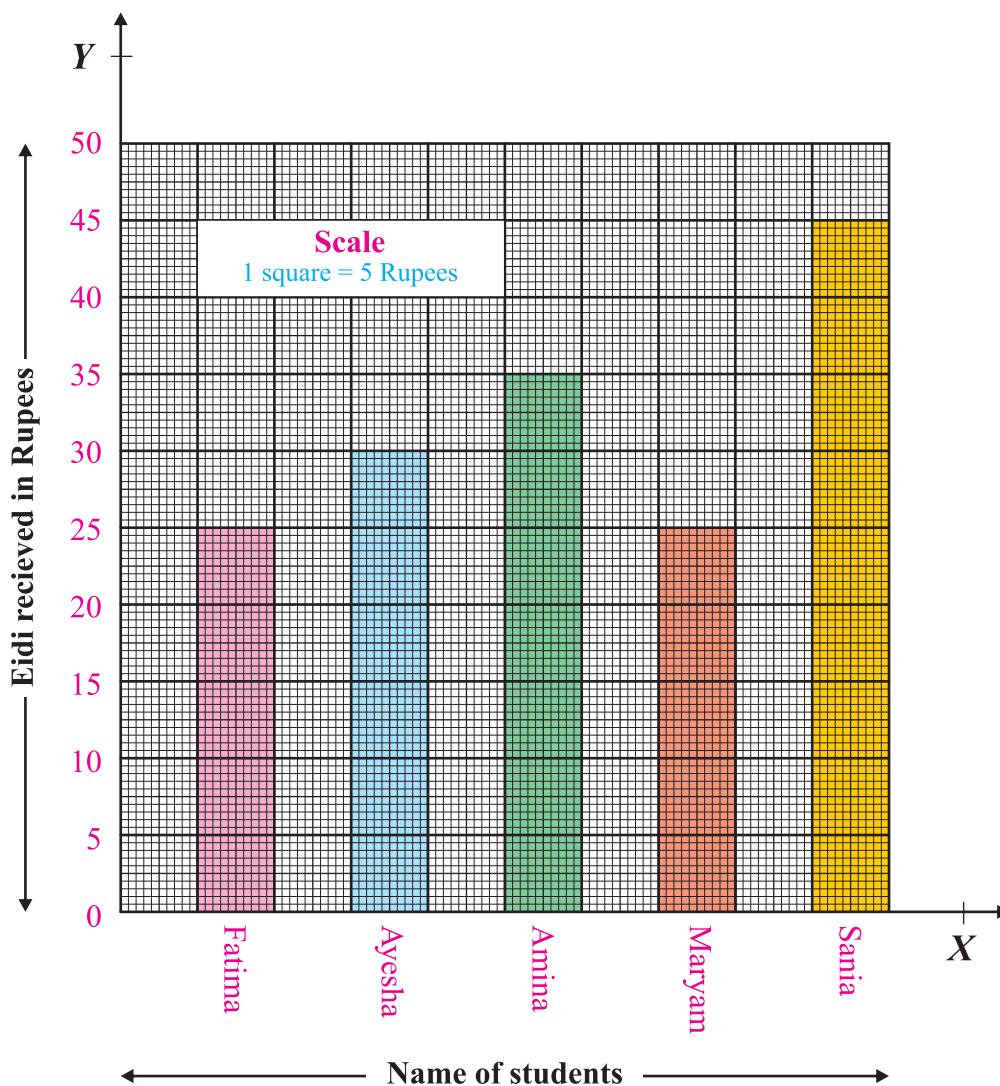
Exercise 9.2

1. On Eid day four friends collected Eidi in rupees as given in the following table:

Names	Saud	Ammar	Ali	Usman
Eidi (Rs.)	1000	600	800	400

Hint: One square represents 100 rupees.

Represent the given information by a column graph.

2. Saud obtained marks out of 100 in the annual examination of class 5 in the different subjects as given in the following table. Represent the information by a column graph.

Subjects	Mathematics	Urdu	Islamiat	English
Marks	90	70	80	60

Hint: Take one square as 10 marks.

3. In a table given below, the likings of class 5 students in games are:

Games	Football	Hockey	Cricket	Volleyball
Number of students	25	30	45	20

Draw a column graph representing the above information.

Hint: One square represents 5 students.

4.   Amina's result out of 100 marks is given below:

Subjects	English	Urdu	Islamiat	Mathematics	Science
Marks	90	70	90	80	70

Draw a column graph with the help of above information.

Hint: One square represents 10 marks.

5.   The sales of a store is given below in a table:

Days	Monday	Tuesday	Wednesday	Thursday	Friday
Sales (Rs.)	3,000	4,500	2,500	3,500	4,000

Draw a column graph representing the above information.

Hint: One square represents Rs. 500.

9.2.2 Read a simple bar graph given in horizontal and vertical form

We know that in a bar graph the quantities are represented by rectangles or bars. These bars have uniform width. These bar graphs can be drawn horizontally or vertically as required.

We have learnt to draw a column graph in the last article. Now, we will study the given graph in horizontal or vertical form.
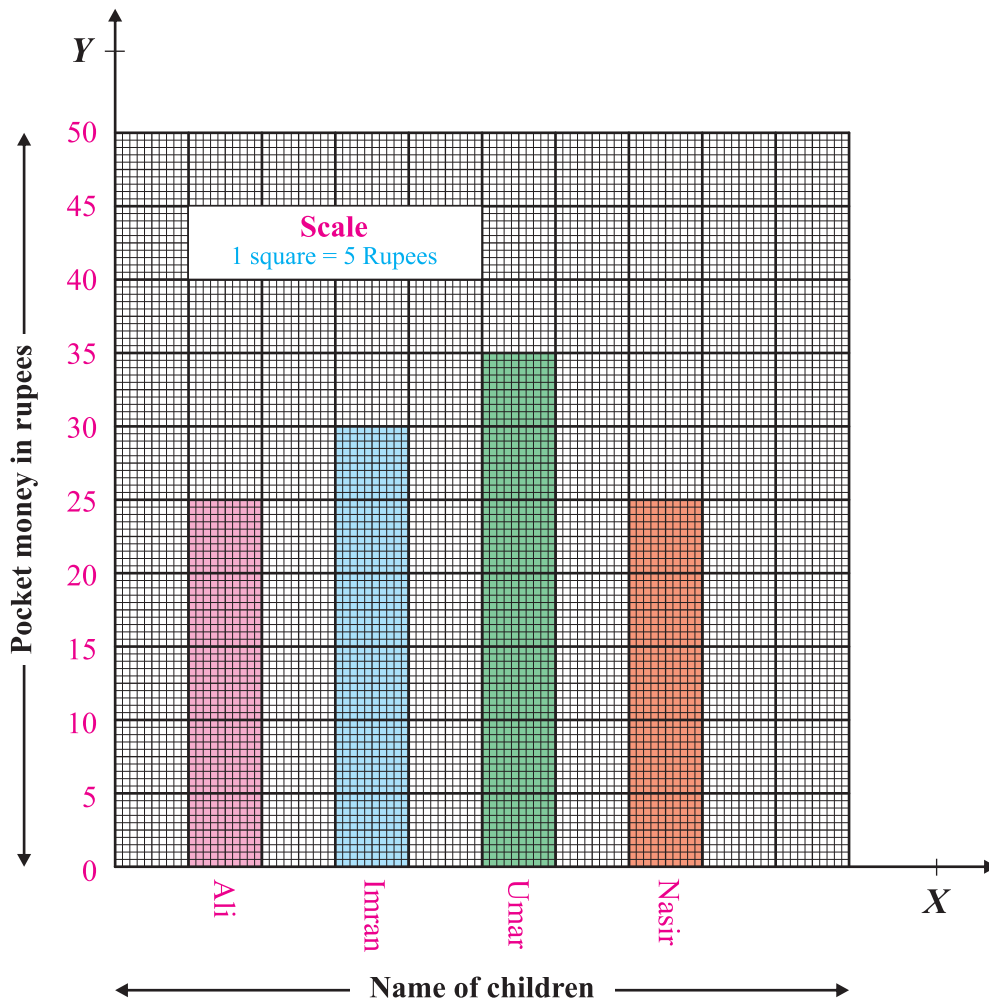
(a)   Horizontal bar graph

Example 1

Look at the graph given below and read the graph:
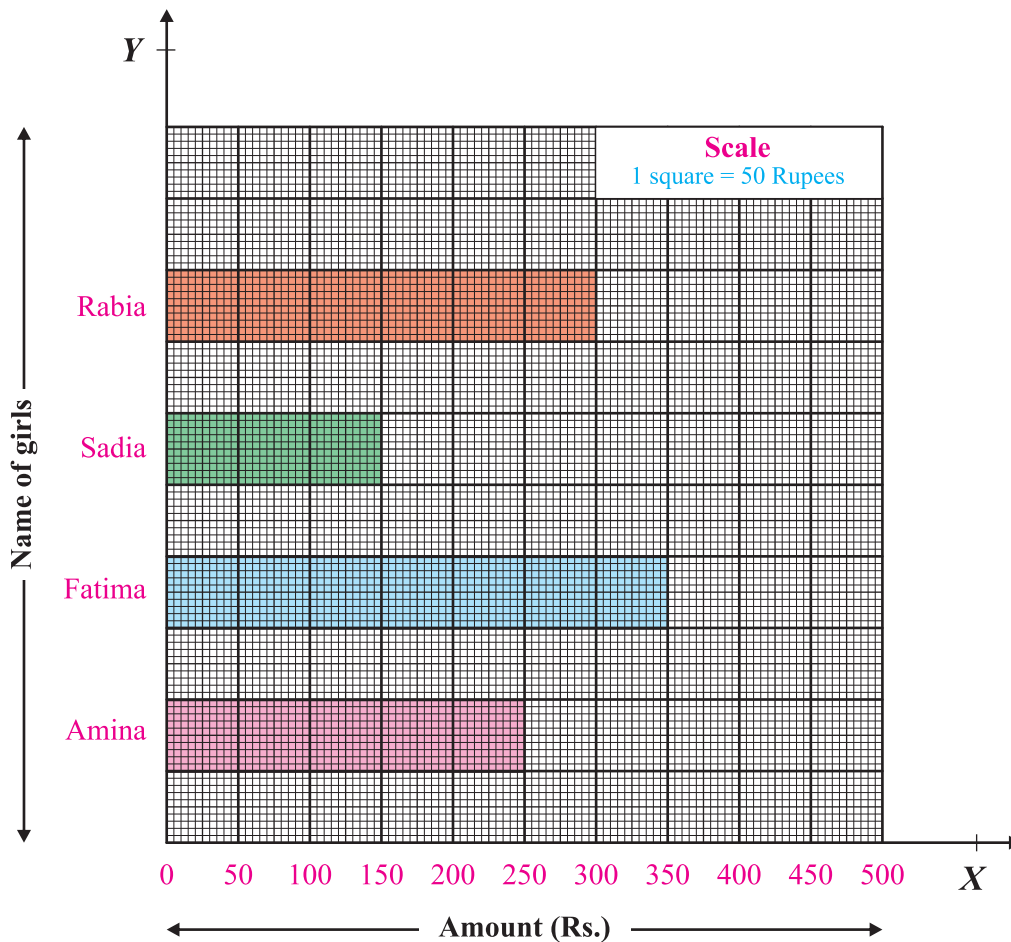
Solution

i.   Rabia has Rs. 300.

ii.   Sadia has Rs. 150.

iii.   Fatima has Rs. 350.

iv.   Amina has Rs. 250.

v.   Fatima has the maximum amount i.e., Rs. 350.

vi.   Sadia has the minimum amount i.e., Rs. 150.

(b)   Vertical bar graph

Example 2

The following vertical bar graph represents the pocket money of some children. Read the vertical bar graph.

Scale
1 square = 5 Rupees

Pocket money in rupees

Ali   Imran   Umar   Nasir

Name of children

Solution

i.   Umar has maximum pocket money i.e., Rs. 35.

ii.   Ali and Nasir both have the minimum pocket money i.e. Rs. 25.

iii.   Imran has pocket money Rs. 30.

9.2.3 Interpret a simple bar graph given in horizontal and vertical form

(a)   Horizontal simple bar graph

Example 3

Look at the horizontal bar graph given below which represents the marks obtained in monthly tests by a student. Interpret the graph.
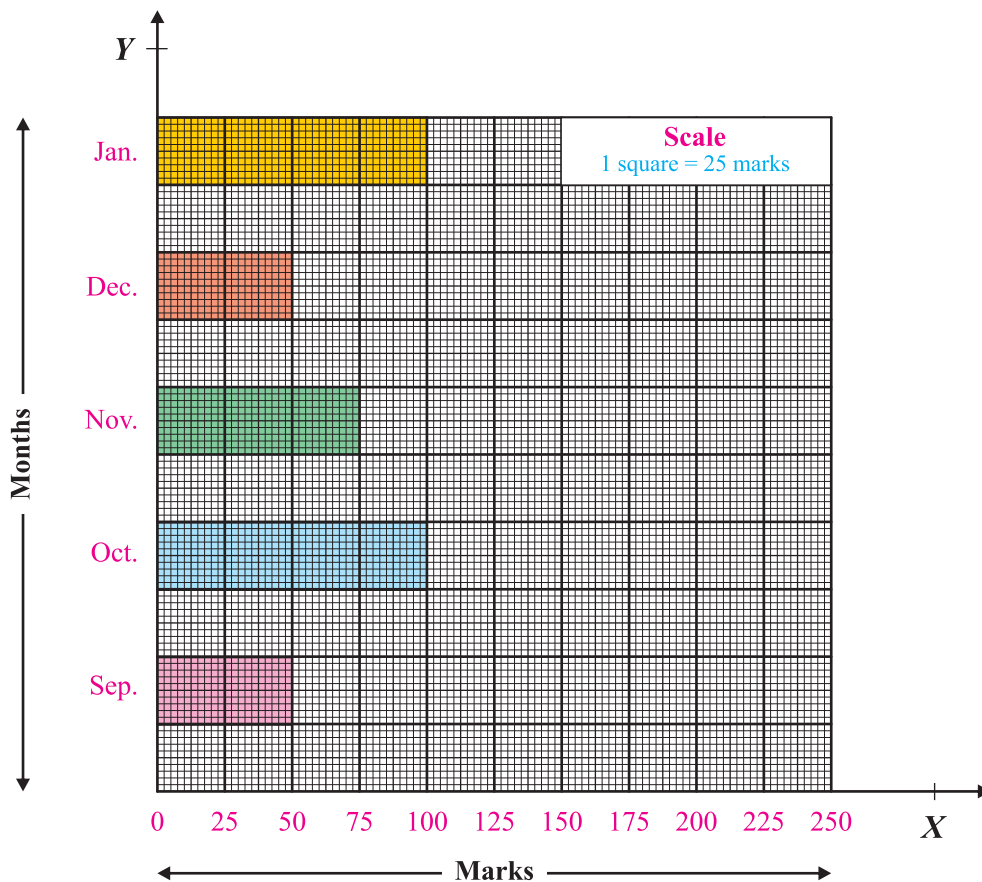
Solution

From the above horizontal bar graph, we interpret that:

     i.   Marks in January test are 100.

     ii.   Marks in December test are 50.

     iii.   Marks in November are 75.

iv.   Marks in October test are 100.

v.   Marks in September are 50.

vi.   Maximum marks are in January and October tests.

vii.   Minimum marks are in September and December tests.

viii.   Minimum marks are 50.

ix.   Difference between maximum and minimum marks is 50.

(b)   Vertical simple bar graph

Example 4

Look at the following vertical bar graph which represents pocket money of the friends. Interpret the vertical bar graph.
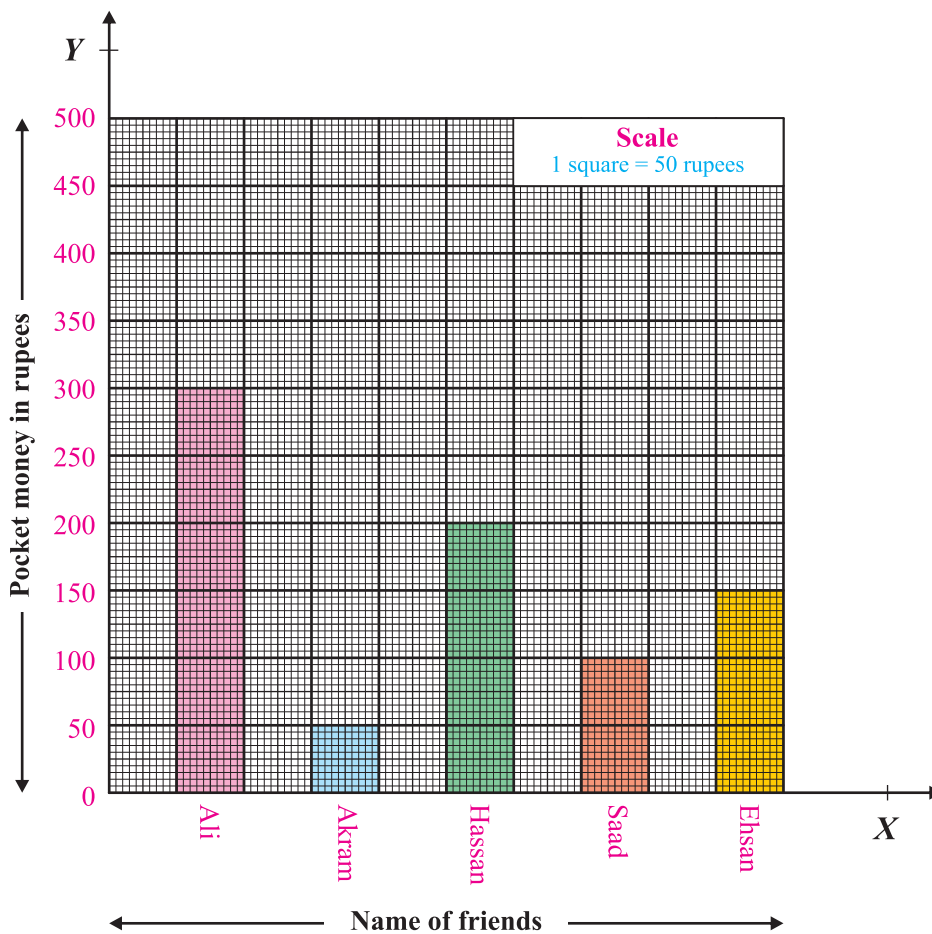
Solution

From the given vertical simple bar graph we interpret that:

    i.   Ali has Rs. 300.

    ii.   Akram has Rs. 50.

    iii.   Hassan has Rs. 200.

    iv.   Saad has Rs. 100.

    v.   Ehsan has Rs. 150.

    vi.   Ali has the maximum amount i.e., Rs. 300.

    vii.   Akram has the minimum amount i.e., Rs. 50.

    viii. Ali has Rs. 250 more than Akram.

    ix.   Ali has Rs. 100 more than Hassan.

    x.   Ali has Rs. 200 more than Saad.

    xi.   Ali has Rs. 150 more than Ehsan.

    xii.   Hassan has Rs. 50 more than Ehsan.

    xiii. Hassan has Rs. 100 more than Saad.

    xiv. Saad has Rs. 50 more than Akram.

# Exercise 9.3

1.   Read the following vertical simple bar graph. The graph represents the daily pocket money of five children.

Scale
1 square = 5 rupees
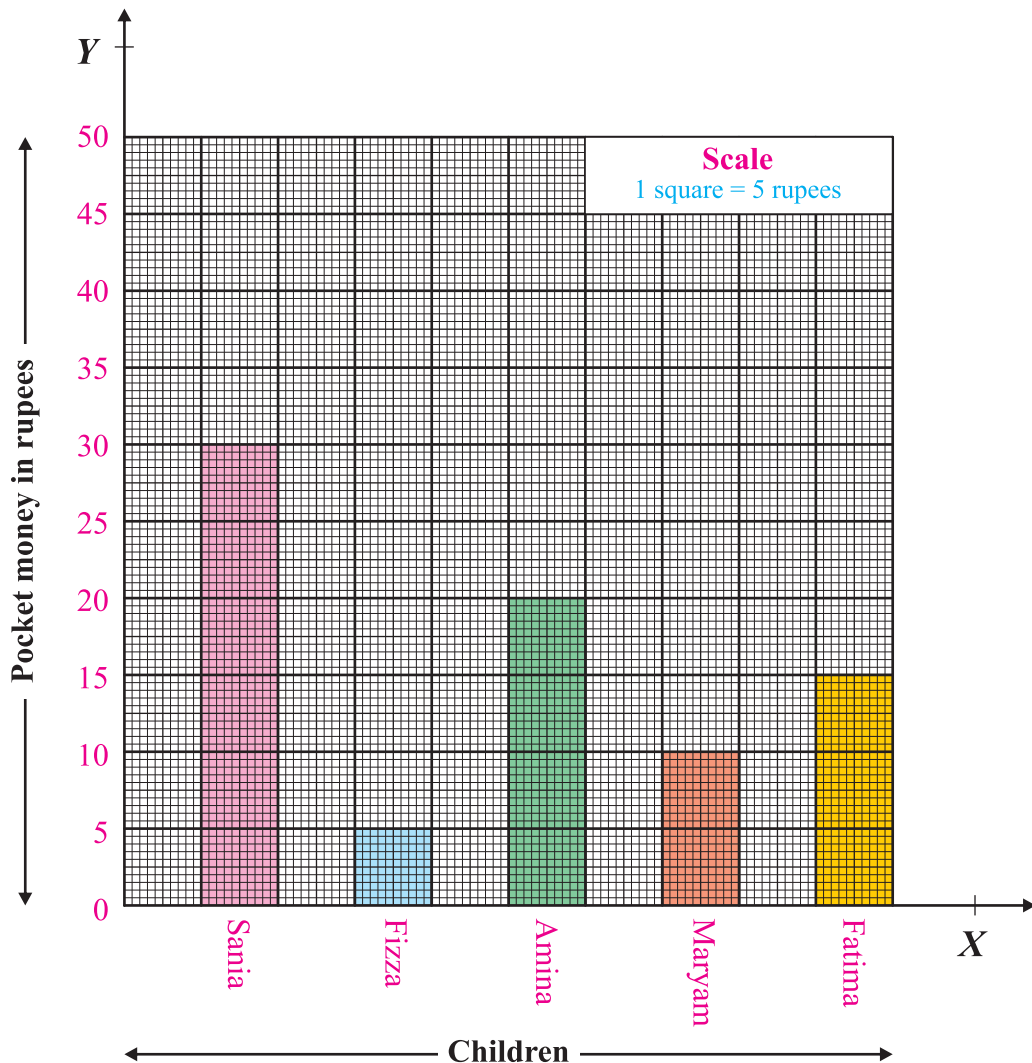
Answer the following questions:

   i.   What information we get from the graph?
   ii. Who is getting the maximum pocket money?
   iii. Who is getting the minimum pocket money?
   iv. What is the difference   between the pocket money of Sania and Fizza?

v.   What is the difference between the pocket money of Fizza and Fatima?

vi.   What is the difference between the pocket money of Sania and Fatima?

vii. What is the difference between the pocket money of Fizza and Maryam?

viii. What is the difference between the pocket money of Fizza and Amina?

ix.   How much rupees is Sania's pocket money?

x.   How much rupees is Fizza's pocket money?

2.   The number of boys in different classes in a school are represented in the following simple horizontal bar graph. Look at the graph carefully and answer the questions given under the graph.

Scale
1 square = 10 students
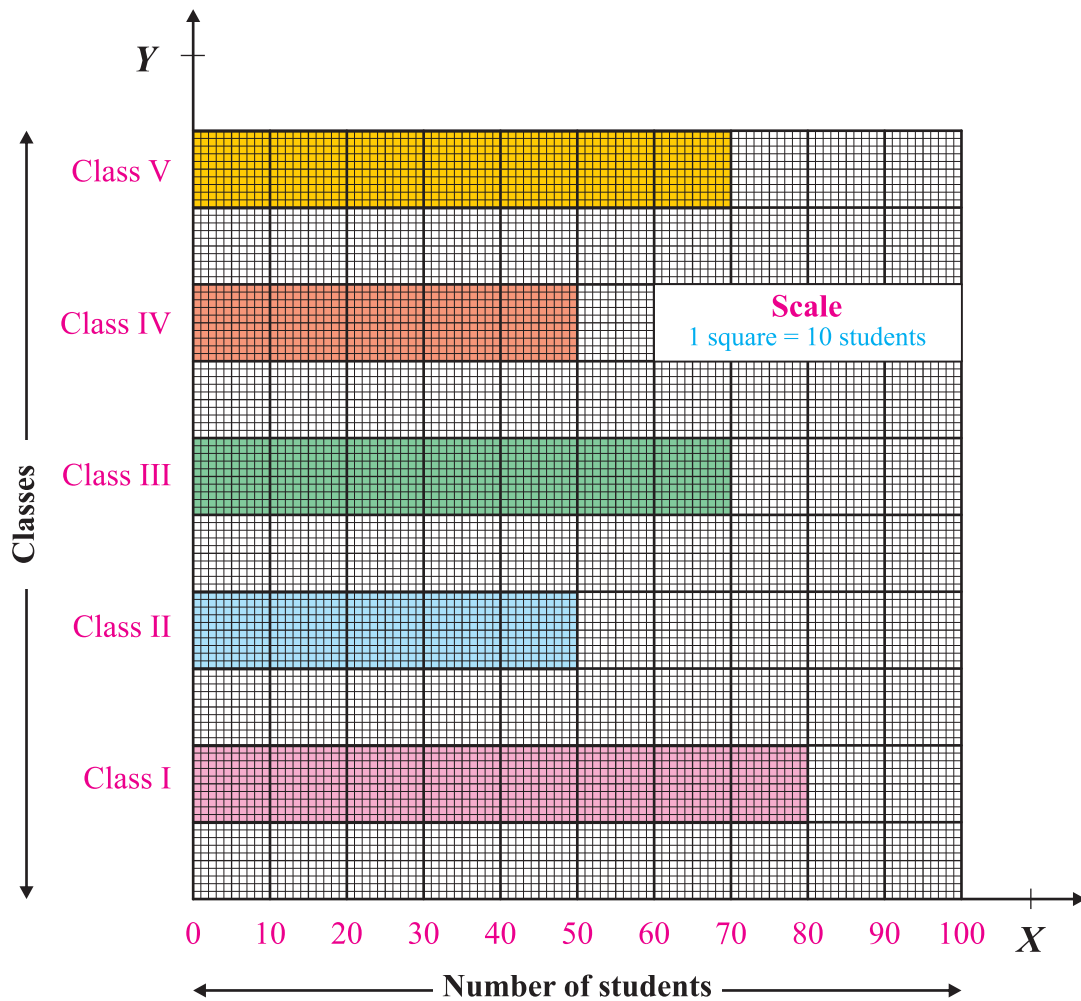
i.   How many students are in class I?

ii.   How many students are in class II?

iii.   How many students are in class III?

iv.   How many students are in class IV?

v.   How many students are in class V?

vi.   In which class the number of students are maximum?

vii.   In which class the number of students are minimum?

viii.   How many students are more in class I than class V.

ix.   In which class the number of students is more either in class I or class IV?

x.   What is the difference between the number of students of class II and class V?

Review Exercise 9

1.   Four possible options have been given. Encircle the correct one.

i.   A quantity representing the given quantities is:

(a)   a data   (b)   a quantity

(c)   a graph   (d)   an average

ii.   The formula $\dfrac{\text{Sum of quantities}}{\text{Number of quantities}}$ is of:

(a)   a graph   (b)   a data

(c)   an information   (d)   an average

iii. The average of marks 50, 10, 30, 20, 40 is:

(a)   50   (b)   150

(c)   30   (d)   40

iv.   Number of quantities × average is equal to:

(a)   sum of quantities   (b)   difference of quantities

(c)   product of quantities   (d)   division of quantities

2.   Define average.

3.   Find the average of 100, 500, 300, 200 and 400.

4.   Income of a worker is given below:

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Income (Rs.)	200	350	400	300	250	300

Find his average of daily income.

Summary

- Average is a quantity which represents the given quantities or numbers.

- $\text{Average} = \dfrac{\text{Sum of quantities}}{\text{Number of quantities}}$

- Sum of quantities = Average × Number of quantities

- $\text{Number of quantities} = \dfrac{\text{Sum of quantities}}{\text{Average}}$

- The information represented in the form of bars is called a bar graph.

- The width of the bar is uniform throughout the graph.