DATA HANDLING

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7

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7.0   Introduction

Ravi is reading the sports section of a newspaper. There are two tables on the sports page of the newspaper.

Top 5 Batsmen in World Cup 2011

Name of the Batsman	Runs scored
T Dilshan (Sri Lanka)	500
Sachin Tendulkar (India)	482
K. Sangakkara (Sri Lanka)	465
Jonadhan Trott (England)	422
U Tharanga (Sri Lanka)	395

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Table - 1

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Top 5 Bowlers in World Cup 2011

Name of the Bowler	Wickets Taken
Shahid Affridi (Pakistan)	21
Zahir Khan (India)	21
TG Southee (New Zealand)	18
Robin Peterson (South Africa)	15
M. Muralitharan (Sri Lanka)	15

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Table - 2

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What do the two tables tell us?

Table 1 tells us the names of batsmen who scored the most runs in the World Cup, 2011 as well as the number of runs they scored. This information can help in taking decisions or in drawing conclusions. For e.g. it can help the organisers of the World Cup in deciding whom to award the prize for the best batsman.

Table-2 tells us the names of bowlers who took the most wickets in the World Cup, 2011 as well as the number of wickets they took. This information can also help in taking decisions or in drawing conclusions. For e.g. it can help the organisers of the World Cup in deciding whom to award the prize for the best bowler.

Information which is in the form of numbers or words and helps in taking decisions or drawing conclusions is called data. The names of batsmen and the runs they scored as well as the names of bowlers and the number of wickets they took is data. Tables and graphs are the ways in which can be data is presented.

The numerical entries in the data are called 'Observations'.

Try This

Look at your school information board. Do you find any data tables there? Find out who uses this data.

7.1   Organising data

Details of seven students of class VIII in a school are collected under the Javahar Bala Arogya Raksha Scheme.

Krishna noted the heights of the following students in his notebook as

Amala-125cm, Lekhya-133cm, Thabasum-121cm, Sudha-140cm, Vanaja-117cm, Lenin-129cm and Rajesh-132cm.

Another student Kumar wrote the same data in the form of a table and arranged the heights in ascending order.

Name of the Student	Height (in cms)
Vanaja	117
Thabassum	121
Amala	125
Lenin	129
Rajesh	132
Lekhya	133
Sudha	140

Now, let us answer these questions.

(i) Who is the tallest amongst the students?

(ii) Who is the shortest amongst the students?

(iii) Whose height is between that of Amala and Rajesh?

Did you use the data written by Krishna? or by Kumar? to answer the question. You must have used Kumar's data as it is organised and thus easier to read and understand.

Do This

In a unit test Amar secured 20, 18, 23, 21, 24 and 22 marks in Telugu, Hindi, English, Mathematics, Science and Social Science respectively. Peter got 23, 21, 20, 19, 24 and 17 marks in the above subjects respectively. Interpret the data in an organized manner.

Classroom Project

Use the weighing machine to find the weights of all your classmates. Organise this data in the form a table. Make sure to arrange the weights in either ascending or descending order. Then answer the following questions:

a.   Who is the lightest student in your class?

b.   How many students weigh more than 25 kg?

c.   How many students weigh between 20 and 30 kg?

7.2 Representative Values

In a hostel

- Average consumption of rice per child per day is 150 g.

- Average age of children is 13 years.

- Average height of children is 135 cm.

On studying this data, can we say that every child consumes exactly 150 gms of rice per day? Can we say that the age of each child in the class is 13 years? Can we say that the height of each child in class is 135 cm? Obviously not, we know that some children may take more than 150 gms of rice some may take less and some may take exactly 150 gms. A similar situation will hold for children's weight and height.

At the same time, 150 gms gives us an idea of the amount of rice consumed by each child in the hostel. It is a representative value of the amount of rice consumed by each child. Similarly, 13 years gives us an idea of the age of each child in the hostel. It is a representative value of the age of each child. The same holds for the height. All the above examples are of a particular representative value called arithmetic mean. In the section ahead, we shall learn about 'arithmetic mean' and also two other types of representative values called 'median' and 'mode'.

7.3.1 Arithmetic Mean

The physical education teacher in a school instructed his students to practice regularly Rajender had his practice sessions for a week as follows.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Minutes	20	35	40	30	25	45	15

Can we compute the time spent by Rajender for practice in terms of time spent per day? Let us observe.

What is the total time Rajender spent during the week on practice?

Total time = 20 + 35 + 40 + 30 + 25 + 45 + 15 = 210 minutes

Now to find the time spent on practice, per day, we divide the total time spent by the number of days.

i.e. $\dfrac{20 + 35 + 40 + 30 + 20 + 45 + 15}{7} = \dfrac{210}{7} = 30$ minutes

This is the average time spent on practice per day or the average practice session per day.

Example 1 : Earnings (in rupees) of a vegetable vendor in a week are ₹ 200, ₹150, ₹180, ₹300, ₹160, ₹170 and ₹170. Find his average earning, per day.

Solution : Total earnings (in rupees) $= 200+150+180+300+160+170+170$

$\qquad\qquad\qquad\qquad\qquad\quad = ₹1330$

Number of days $\qquad\qquad\quad = 7$

Average earning or mean earning $= \dfrac{1330}{7} = ₹\ 190$

The average of a data is also called Arithmetic Mean or Mean.

Average or Mean or Arithmetic Mean (A.M) $= \dfrac{\textbf{Sum of all observations}}{\textbf{Number of observations}}$

Try This

1. The ages (in years) of players are in a team of 16, 16, 16, 14, 17, 18. Then find the following:

   (i)   Age of the youngest and the oldest player.

   (ii)   Mean age of the players.

   What is the average number of glasses of water that you drink per day? in a week. How did you find the average?

7.3.2 Where does the mean lie?

The marks obtained by Anil, Amar, Anthony and Inder in Telugu, Hindi and English are given below.

	Telugu	Hindi	English
Anil	15	8	10
Amar	10	10	12
Antony	11	6	11
Inder	12	12	13

Now let us calculate the average marks obtained by the students in each subject.

Telugu	Hindi	English
$AM = \dfrac{15+10+11+12}{4}$	$AM = \dfrac{8+10+6+12}{4}$	$AM = \ldots\ldots\ldots$
$= \dfrac{48}{4}$	$= \dfrac{36}{4}$	$= \ldots\ldots\ldots$
$= 12$	$= \ldots\ldots..$	$= \ldots\ldots\ldots$
Highest marks = 15	Highest marks = …….	Highest marks = …….
Least marks = 10	Least marks = …….	Least marks = …….
Mean = 12	Mean = …….	Mean = …….

Does the mean lie between the minimum and maximum value in each case?

You will find this to be true.

The arithmetic mean always lies between the highest and lowest observations of the data.

7.3.3   A property of mean

Example 2 :   In a family, ages (in years) of members; Krishna, Radhika, Niharika and Nikhil are 44, 39, 17 and 12. (i) Find the arithmetic mean of their ages. (ii) What were their ages 5 years before? Find their mean age. (iii) Can you see a relationship between the change in mean and the number of years.

Solution :   Present ages of family members are   = 44, 39, 17, 12 years

Number of family members   = 4

Therefore, Arithmetic Mean of their ages $= \dfrac{44+39+17+12}{4} = \dfrac{112}{4} = 28$ years

Ages of family members, 5 years ago $= 44-5, 39-5, 17-5, 12-5$

$= 39, 34, 12, 7$

$\therefore$ mean of their ages 5 years ago $= \dfrac{39+34+12+7}{4} = \dfrac{92}{4} = 23$ years

Thus, on reducing the age of each family member by 5 years, we find that the mean age of the family also decreases by 5 years from the present mean age.

Now calculate the mean age of the family, 3 years from now. What do you think will be the mean age of the family 10 years from now?

You will find that when all the values of data set are increased or decreased by a certain number, the mean also increases or decreases by the same number.

Try This

1. A data of 10 observations has a minimum value 15 and maximum value 25. What is the mean of the data?

   (i) 12   (ii) 15   (iii) 21   (iv) 27

2. Observations of a data are 23, 45, 33, 21, 48, 30, 34, 36 and 35. Without actual calculation choose the mean of the data.

   (i) 20   (ii) 35   (iii) 48   (iv) 50

Exercise - 1

1. Maximum day time temperatures of Hyderabad in a week (from 26th February to 4th March, 2011) are recorded as 26 ºC, 27 ºC, 30 ºC, 30 ºC, 32 ºC, 33 ºC and 32 ºC.

    (i)   What is the maximum temperature of the week?

    (ii)   What is the average temperatures of the week?

2. Rice consumed in a school under the mid-day meal program for 5 consecutive days is 15.750 kg, 14.850 kg, 16.500 kg, 14.700 kg, and 17.700 kg. Find the average rice consumption for the 5 days.

3. In a village three different crops are cultivated in four successive years. The profit (in rupees) on the crops, per acre is shown in the table below-

Crop \ year	2005	2006	2007	2008
Ground nuts	7000	8000	7500	7500
Jawar	6000	1000	8000	1000
Millets	9000	5000	3000	4000

    (i)   Calculate the mean profit for each crop over the 4 years.

    (ii)   Based on your answers, which crop should be cultivated in the next year?

4. The number of passengers who travelled in APSRTC bus from Adilabad to Nirmal in 4 trips in a day are 39, 30, 45 and 54. What is the occupancy ratio (average number of passengers travelling per trip) of the bus for the day?

5. The following table shows the marks scored by Anju, Neelesh and Lekhya in four unit tests of English.

Name of the Student	Unit Test I	Unit Test II	Unit Test III	Unit Test IV
Anju	Absent	19	23	21
Neelesh	0	20	22	24
Lekhya	20	24	24	24

(i) Find the average marks obtained by Lekhya.

(ii) Find the average marks secured by Anju. Will you divide the total marks by 3 or 4? Why?

(iii) Neelesh has given all four tests. Find the average marks secured by him. Will you divide the total marks by 3 or 4? Why?

(iv) Who performed best in the English?

6. Three friends went to a hotel and had breakfast to their taste, paying ₹16, ₹ 17 and ₹ 21 respectively (i) Find their mean expenditure.(ii) If they have spent 3 times the amount that they have already spent, what would their mean expenditure be? (ii) If the hotel manager offers 50% discount, what would their mean expenditure be? (iii) Do you notice any relationship between the change in expenditure and the change in mean expenditure.

7. Find the mean of the first ten natural numbers.

8. Find the mean of the first five prime numbers.

9. In a set of four integers, the average of the two smallest integers is 102, the average of the three smallest integers is 103, the average of all four is 104. Which is the greatest of these integers?

10. Write at least two questions to find the mean, giving suitable data.

Project Work

Find out the number of family members in the houses on your street. Calculate the average family size of your street.

7.4 Mode

The second type of representative value that we will learn about is mode.

Let us read the example given below-

Example 3 : A shop keeper wants to find out which cooking oil he should stock in more number. For this, he maintains a record of cooking oil sale for the week in the form of the table given below.

Day	Packets of oil sold
Mon	GGGSSSSPP
Tue	GGGSSSSSPP
Wed	GGSSSSSSP
Thu	GGGSSSP
Fri	GGGSSPP
Sat	GSSSSSSSS
Sun	GGGSSSP

G = Ground nut oil packet, S = Sunflower oil packet, and P= Palmolien oil packet.

In such a situation will calculating the mean number of oil packets sold help the shopkeeper to take a decision?

Solution : The shopkeeper first calculates the averrage number of packets that he can order.

$$\text{Average number of packets} = \frac{18+30+9}{3} = \frac{57}{3} = 19.$$

Should the shopkeeper stock 19 packets for each type of oil? The shopkeeper looked at his sales figures again. He finds sunflower oil to be the most frequently demanded oil and palmolien oil to be the least demanded oil. If he was to order 19 packets of each he would fall short of groundnut oil and palmolien oil would be in surplus. The shopkeeper decides to stock more packets of sunflower oil and lesser number of packets of palmolien oil. Thus, the number of packets of sunflower oil i.e. 30 is the representative value for the shopkeeper's data as it tells him the most frequently purchased oil.

The most frequently occurring value for a set of observations is called the mode. The longest bar in a bar graph tells you the mode, as can be seen in the bar graph given in the next page.
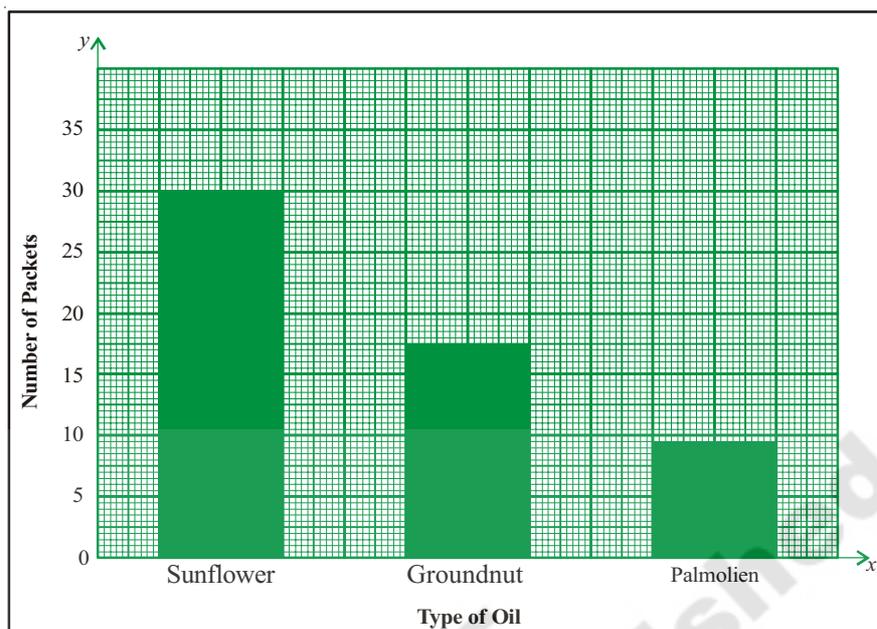
Example 4 : Find the mode of the given set of numbers- 2,3,5,3,4,7,3,2,1,7,3

Solution : Arranging the numbers with same value together, we get 1,2,2,3,3,3,3,4,5,7,7

3 occurs more frequently than the other observations. Thus, Mode = 3

Example 5 : Find the mode of the data 3, 5, 9, 6, 5, 9, 2, 9, 3, 5.

Solution : Arranging the numbers with the same value together we get 2, 3, 3, 5, 5, 5, 6, 9, 9, 9.

Here both 5 and 9 occurs more and equal number of times i.e., 3 times.

Thus, the given data contains two modes, i.e., 5 and 9

This kind of data is called **Bimodal Data**.

Note : If each observation in a data set is repeated an equal number of times then the data set has no mode.

Try This

1. Find the modes of the following data.

(i) 5, 6, 3, 5, 4, 9, 5, 6, 4, 9, 5

(ii) 25, 14, 18, 15, 17, 16, 19, 13, 12, 24

(iii) 10, 15, 20, 15, 20, 10, 15, 20, 10

Example 6 : Following are the marks obtained by 50 students in a unit test, wich is administered for 10 marks. Find the mode of the data.

Marks obtained	No of students
00	2
1	1
2	2
3	1
4	-
5	4
6	10
7	15
8	9
9	5
10	1
Total	50

Solution: In the data marks are observations. From the data table it is clear that 7 marks are obtained by many students.

Mode of the data is 7

Note: The observation 7 that repeats fifteen times is the mode and number of times i.e.15 should not be confused as the mode.

Example 7 : In which of the following situations, is the mode an appropriate representative value?

(a)   A shopkeeper selling shirts, needs to decide which size of shirts to order more.

(b)   For purchasing rice for a party of 20 people.

(c)   For finding the height of the door in your house.

Solution : (a) Let us look at the first situation. Supposing the shopkeeper is selling 4 sizes of shirts and his sale for the month of February is-

Shirt Size	Number
M	15
L	18
XL	40
XXL	22
Total	92

The average number of shirts sold by the shopkeeper is $\dfrac{12+18+40+22}{4} = 23$ shirts.

In such a situation does it make sense for the shopkeeper to order 23 shirts of each size? The shopkeeper looks at his data again. He finds that the most frequently purchased size is XL, If he orders 23 shirts of each size, he will fall short of size XL shirts. He thus finds it more sensible to order more shirts of this size and lesser of the rest.

Thus, the shopkeeper uses mode or the most frequently occurring value to take his decision.

(b) Neither we know how many take maximum and how much nor how many take minimum and how much. If we purchase 20 times of maximum, it would be waste, or if we purchase 20 times of munimum, it is not sufficient. So mode cann't be suggested here.

(c) If there are 5 members in the house, and whose heights are 134cm, 125cm, 100cm, 125cm and 144cm, as mode of the data is 125cm, we may suggest the height if the door must be 125cm. But it is difficult for the person of height 144cm. Even if we take mean of their heights, it is difficult for tall persons. So neither the mode nor the mean can be used here.

Try This

1. One situation where mean would be an appropriate representative value.

2. One situation where mode would be an appropriate representative value.

Exercise - 2

1. Long jumps by 7 students of a team are 98cm, 125cm, 140cm, 155cm, 174cm, 140cm and 155cm. Find the mode of the data.

2. Ages of players in a cricket team are 25, 26, 25, 27, 28, 30, 31, 27, 33, 27, 29.
   (i) Find the mean and mode of the data.(ii) Find the minimum number of players to be added to the above team so that mode of the data changes and what must be their ages.

3. Find the mode of the following data. 12, 24, 36, 46, 25, 38, 72, 36, 25, 38, 12, 24, 46, 25, 12, 24, 46, 25, 72, 12, 24, 36,25, 38 and 36.

4. Decide whether mean or mode is a better representative value in the following situations.

   (i)   A shop keeper, who sells tooth paste tubes of different sizes, wants to decide which size to is be ordered more.

(ii) An invigilator wants to bring sufficient number of additional papers to the examination hall.

(iii) Preparation of the number of laddus for a marriage.

(iv) For finding the favorite cricketer in a class.

7.5   Median

We have looked at situations where mean and mode are representative values of the data. Now let us look at another situation. The following are the salaries (in rupees) earned by the manager and the workers in a production unit.

Manager	-	₹ 40,000
Worker 1	-	₹ 3,300
Worker 2	-	₹ 5,000
Worker 3	-	₹ 4,000
Worker 4	-	₹ 4,200
Worker 5	-	₹ 3,500
Worker 6	-	₹ 4,500
Worker 7	-	₹ 4,200
Worker 8	-	₹ 4,300
Worker 9	-	₹ 3,500
Worker 10	-	₹ 3,500

Will the mean salary or the mode of salaries be a representative value for this data?

Let us calculate the mean salary in the production unit.

$$\text{Mean salary} = \frac{\text{Total salary}}{\text{Number of employees}}$$

$$= \frac{3300+5000+4000+4200+3500+4500+4200+4300+3500+3500+40000}{11}$$

$$= ₹.7272.72$$

Is this salary a representative of the salaries of either the manager or the workers? No it is not. It is much lesser than the manager's salary and more than the salary of all the workers.

Now let us consider the mode. 3500 is the most frequently occurring value in the data. However, it occurs only thrice thus, cannot be a representative of the data.

Now, let us use another way of calculating the representative value.

Let us arrange the numbers in ascending order-

3300, 3500, 3500, 3500, 4000, 4200, 4200, 4300, 4500, 5000, 40000

The middle value of this data is 4200 as it divides employees into 2 equal groups – 5 are earning more than 4200 and 5 are earning less. This value is called **Median** and as you can see it provides a representative picture for all.

In the above example, the number of observations is 11 i.e. an odd number, thus the median divides the data into 2 equal groups.

Now what if the number of observations were even?

Let us the take the example of the production unit again. What if a new worker earning ₹ 4000 joined the production unit?

Arranging the number in ascending order we get-

3300, 3500, 3500, 3500, 4000, 4000, 4200, 4200, 4300, 4500, 5000, 40000

Here both 4000 and 4200 lie in the middle of the data. Here the median will be calculated by finding the average of these two values. Thus, the median salary $= \dfrac{4000 + 4200}{2} = ₹.4100$.

Example 8 : The monthly incomes of 7 graduates is ₹ 8000, ₹ 9000, ₹ 8200, ₹ 7900, ₹ 8500, ₹ 8600 and ₹ 60000. Find the median income.

Solution : Arranging the incomes in ascending order we get : 7900, 8000, 8200, 8500, 8600, 9000, 60000

Number of observations   = 7

Middle term, i.e., 4th term in the data   = 8500

Thus, the median income   = ₹ 8500

Example 9 : Find the median of 49, 48, 15, 20, 28, 17, 14 and 110.

Solution : Ascending order of observations   = 14, 15, 17, 20, 28, 48, 49, 110

Number of observations   = 8

Middle terms, i.e. the 4th and 5th values are 20 and 28.

$$\text{Median} = \text{average of } 4^{\text{th}} \text{ and } 5^{\text{th}} \text{ values} = \frac{20+28}{2} = 24$$

Thus, median of the given data   is 24

Exercise - 3

1.   Say true or false and why?

   (i)   The difference between the largest and smallest observations in a data set is called the mean.

   (ii) In a bar graph, the bar which has greater length indicates mode.

   (iii) Value of every observation in the data set is taken into account when median is calculated.

   (iv) The median of a set of numbers is always one of the numbers

2.   The monthly income (in rupees) of 7 households in a village are 1200, 1500, 1400, 1000, 1000, 1600, 10000. (i) Find the median income of the house holds. (ii) If one more household with monthly income of ₹1500 is added, what will the median income be?

3.   Observations of a data are16, 72, 0, 55, 65, 55, 10, and 41. Chaitanya calculated the mode and median without taking the zero into consideration. Did Chaitanya do the right thing?

4.   How many distinct sets of three positive integers have a mean of 6, a median of 7, and no mode?

5.   Four integers are added to a group of integers 3, 4, 5, 5 and 8 and the mean, median, and mode of the data increases by 1 each. What is the greatest integer in the new group of integers?

Play the Game

Take a dice numbered 1, 2, 3, 4, 5 and 6 on its faces. Make a group of three students. Ask each student to roll the dice and record the number, turn by turn. Repeat the process for 10 rounds. Now each student will have 10 numbers each. Find the mean, median and mode of data of each student.

7.6   Presentation of data

We have already learnt how to present data in bar graphs and pictographs in class 6. Pictographs represent data using pictures of objects. However, presenting data by a pictograph is often time consuming and difficult. Bar graphs help in presenting data with much more ease.

7.6.1 Bar Graph

In this section we will learn a little more about bar graphs. We know that bar graphs are made up of bars of uniform width which can be drawn horizontally or vertically with equal spacing between them. The length of each bar tells us the frequency of the particular item. We also know that the length of the bar graph is as per scale.

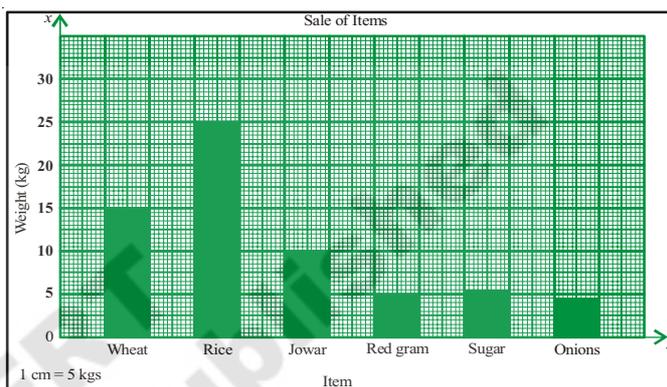**Example 10 :** The bar graph shows the one day sales of various items in a shop.

(i)   What are taken on x-axis and y axis?

(ii) What is the scale selected on the y-axis?

(iii) Which of these provisions has most sale? How much?

(iv) Is the sale of onions more than red gram?

(v)   What is the ratio between the sale of jowar and the sale of red gram?
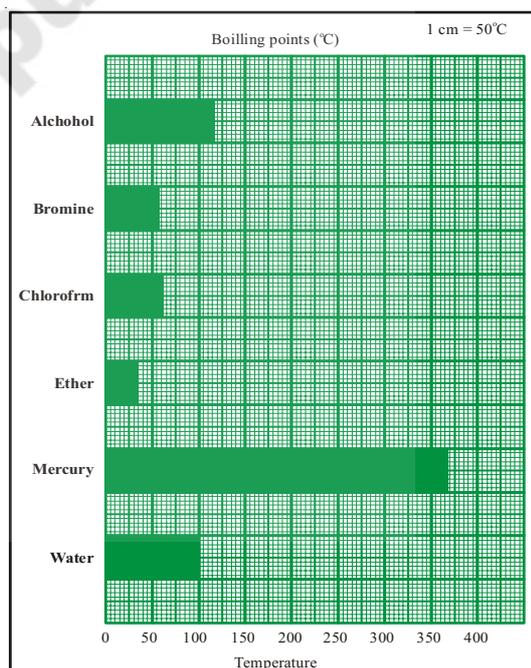

Example 11 : Observe another bar graph.

(i)   What information does the graph give us?

(ii) What are taken on *x*-axis and y-axis?

(iii) Which of these liquids has highest boiling point?

(iv) Which of these liquids has the lowest boiling point?

(v)   What is the approximate ratio between the boiling point of mercury and the boiling point of ether?

7.6.2 Double Bar Graph

Now let us learn about another type of bar graph

Example 12 : Study the following graph presenting the total enrolment of boys and girls in ZPP High School and answer the following questions.

Enrollment in ZPP High School
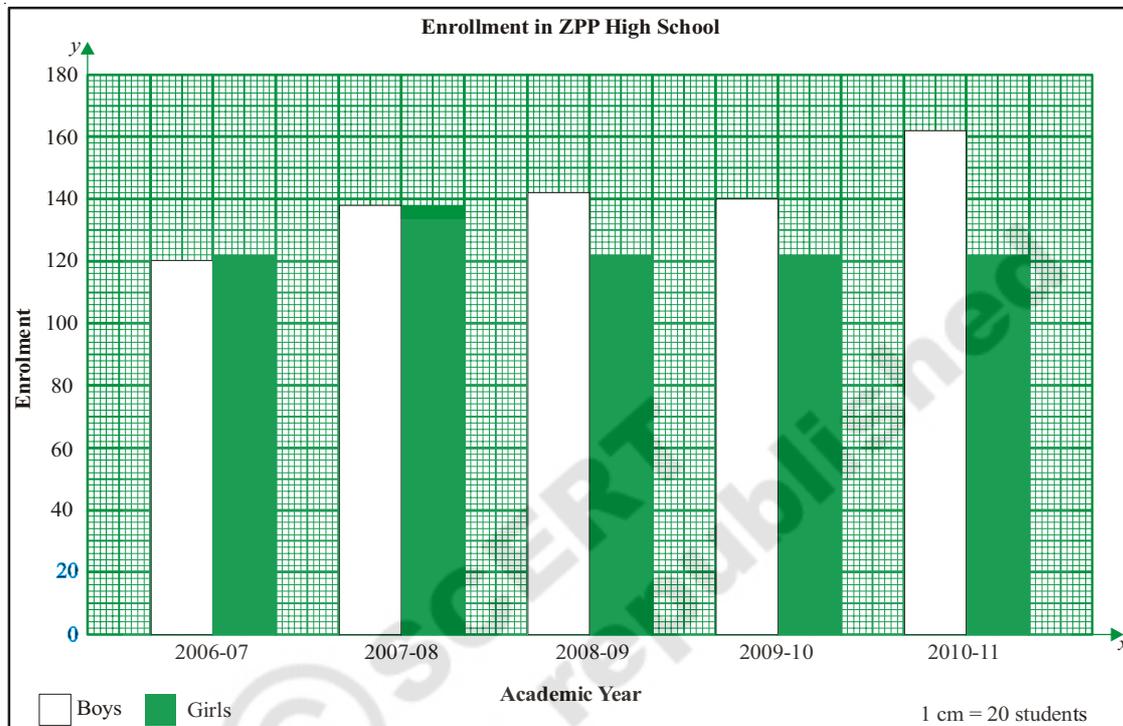
Did you notice that there are two bars for each year? What does the first bar tell you? What does the second bar tell you? This kind of bar graph is called **Double bar graph**. It presents two observations side by side.

(i) In which year is the enrolment of girls more than the boys?

(ii) In which year is the enrolment of boys and girls the same?

(iii) In which year is the enrolment of girls minimum?

(iv) What is the total enrolment in the year 2007-08?

Example 13 : The following are the marks in Maths and Science of five students in class VII.

Present this data in the form of a double bar graph.

Name of Student	Maths	Science
Saravan	70	75
Raman	35	30
Mani	65	75
Renuka	90	100
Girija	22	35
Sharmila	50	50

Solution : Steps in drawing a double bar graph.

1. Draw *x*-axis (horizontal line) and *y*-axis (vertical line) on the graph paper and mark their intersection as O.

2. Take names of students on x-axis.

3. Take Maths and Science marks on *y*-axis,

4. Take an appropriate scale on *y*-axis so that maximum marks of both the subjects fit on the graph sheet. Here the maximum value to be plotted on *y*- axis is 100, so the scale 1 cm = 10 marks, is appropriate.

5. Find the length of each bar by dividing the value by 10 (Scale is 1 cm = 10 marks).

6. Draw bars representing 'Maths marks ' and 'Science marks' side by side of every student.
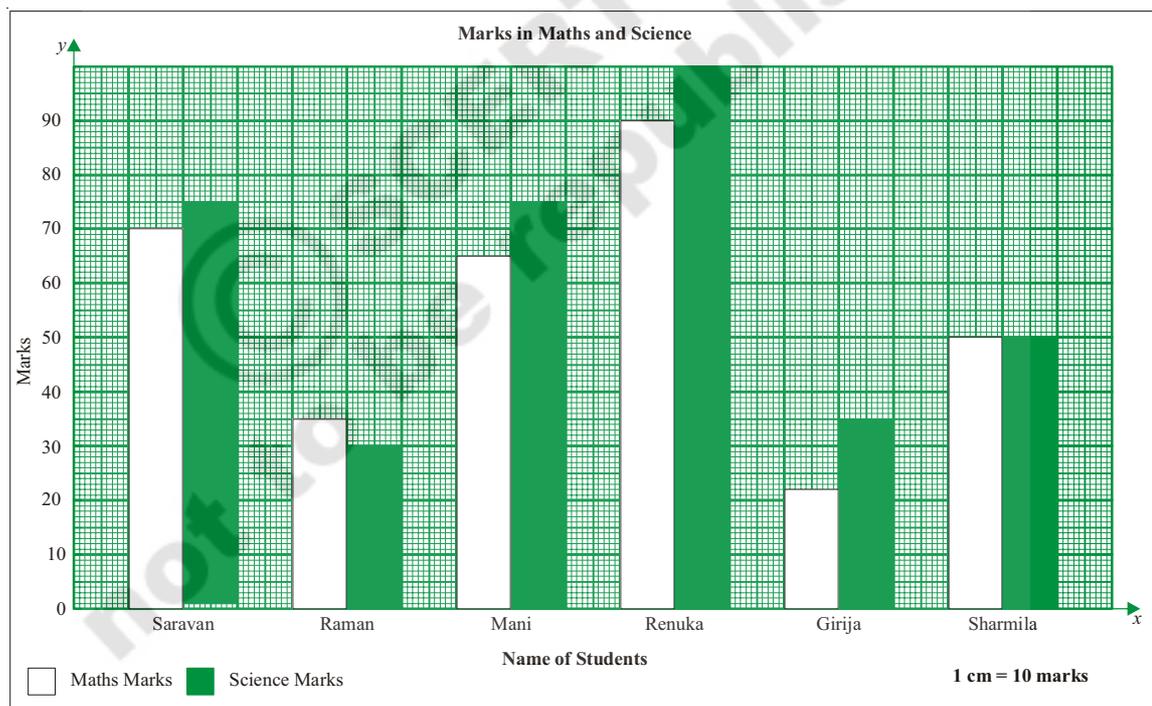
7.6.3 Pie Charts

Another way in which data can be presented is through pie charts.

The monthly budget of a family is given in the table on the left. This data has been presented in a pie chart on the right. The higher the share of expenditure of perticular item of the total income, the more the area occupied by the item in the pie chart.

Budget head	Amount (₹)
Food	1500
Education	750
Others	2250
Savings	4500
Total income	9000
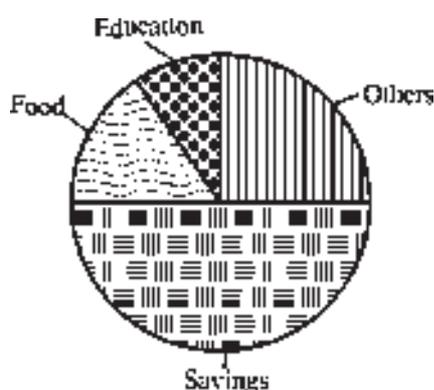
Looking at the pie chart answer the following questions.

(i) What is the shape of the pie chart?

(ii) What is the name of each shape used to present different items in the pie chart?

(iii) Say true or false (a) The largest part of the income is saved.

(b) Least amount of money is spent on education.

7.6.4   Drawing a pie chart

Now, let us learn about how data is presented on a pie chart.

The pie chart represents each item as a portion of the circle, as how much part of the total incomeis is shared by the particular item.

We know that the total angle at the centre of a circle is 360º. We can assume that it represents the total of all observations i.e. ₹ 9000.

Each item of expenditure is a part of the total income thus, the angle of the sector or the area of the sector will depend on the ratio between the item of expenditure and total income.

Thus, the angle of each sector $= \dfrac{\text{Amount of Expenditure}}{\text{Total Income}} \times 360$

We make a table to find the angle of the sectors. The table is shown in the next page

Steps of construction

1.   Draw a circle with any convenient radius and mark it's centre 'O'.

2.   Mark a point A, somewhere on the circumference and join OA.

3.   Construct angle of the sector for food = 60º. Draw ∠AOB = 60º.

4. Construct angle of the sector for education = 30º. Draw ∠BOC = 30º.

5. Construct angle of the sector for other = 90º. Draw ∠COD = 90º.

6. Now ∠DOA = $180°$ represents the angle sector for savings.

Budget head	Amount of expenditure	Ratio between expenditure and total income	Angle of sector or area of the sector
Food	1500	$\dfrac{1500}{9000}=\dfrac{1}{6}$	$\dfrac{1}{6}\times360°=60°$
Education	750	$\dfrac{750}{9000}=\dfrac{1}{12}$	$\dfrac{1}{12}\times360°=30°$
Others	2250	$\dfrac{2250}{9000}=\dfrac{1}{4}$	$\dfrac{1}{4}\times360°=90°$
Savings	4500	$\dfrac{4500}{9000}=\dfrac{1}{2}$	$\dfrac{1}{2}\times360°=180°$

Note: Check whether the sum of all the angles of the sectors equal to 360 º ?
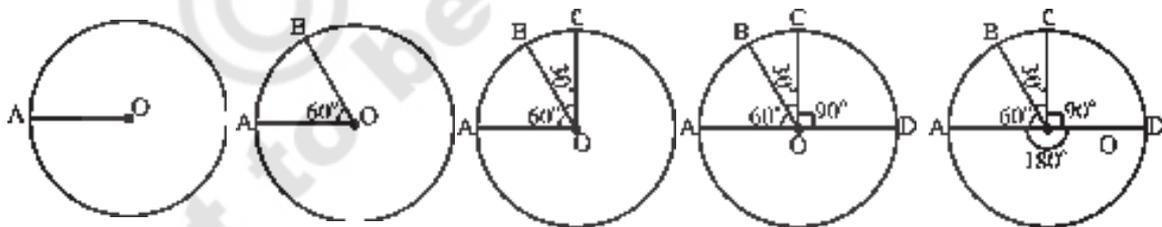
Exercise - 4

1. Draw a bar graph for the following data.

Population of India in successive census years-

Year	1941	1951	1961	1971	1981	1991	2001
Population (in millions) (approx)	320	360	440	550	680	850	1000

Source : Data from census of India 1991 and 2001.

2. Draw a pie chart for the following data.

Item of expenditure	Food	Health	Clothing	Education	Savings
Amount spent in rupees	3750	1875	1875	1200	7500

3. Draw a double bar graph for the following data.

Birth and Death rates of different states in 1999.

| State	Birth Rate (Per 1000)	Death Rate (Per 1000)
Andhra Pradesh	22	8
Karnataka	22	8
Tamil Nadu	19	8
Kerala	18	6
Maharashtra	21	8
Orissa	24	11

Source : The table is taken from vittal statistics SRS 1999.

4. Draw a pie chart for the following data.

Time spent by a child during a day-

Time spent for	Sleep	School	Play	Others
Time spent	8 hrs	6 hrs	2 hrs	8 hrs

5. The adjoining pie chart gives the expenditure on various items during a month for a family. (The numbers written around the pie chart tell us the angles made by each sector at the centre.)
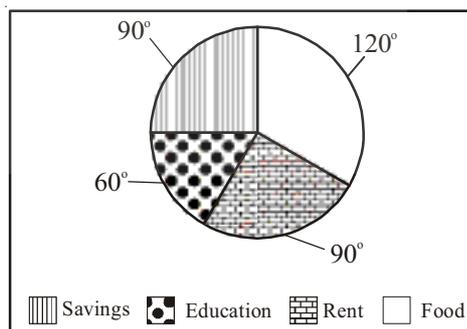
Answer the following-

(i) On which item is the expenditure minimum?

(ii) On which item is the expenditure maximum?

(iii) If the monthly income of the family is ₹ 9000, what is the expenditure on rent?

(iv) If the expenditure on food is ₹ 3000, what is the expenditure on education of children?

Project Work

1. Gather information of the number of different kinds of houses in your locality (ward / colony / village). Then find mode.

2. Collect the item-wise expenditure of your family in a month and represent it as a pie chart.

3. Collect different data presented in the form of bar graphs and pie charts in magazines, newspapers etc. and present them on your school bulletin board.

Looking back

- Mean, mode and median are representative values for a data set.

- Arithmetic mean or mean is equal to sum of all the observations of a data set divided by the number of observations. It lies between the lowest and highest values of the data.

- An observation of data that occurs most frequently is called the mode of the data. A data set may have one or more modes and sometimes none.

- Median is simply the middle observation, when all observations are arranged in ascending or descending order. (In case of even number of observations meadian is the average of middle two observations.)

- A pie chart is a circular chart /graph divided into sectors, and is used to present data.

- The central angle of each sector (and consequently its area) in a pie chart, is proportional to the quantity that it represents.

Dr.C.R.Rao (India)
1920 AD

A well known Statistician, famous for his "Theory of Estimation" (1945).

He worked on Cramer-Rao Inequality and Fisher-Rao theorm.