11 Data Representation

By studying this lesson you will be able to

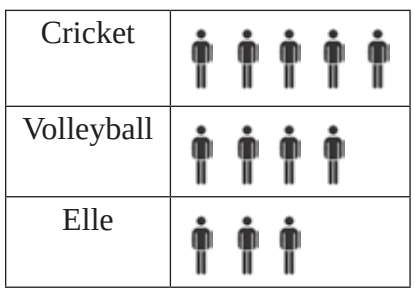
- draw pie charts based on the given data
- extract information from a pie chart

11.1 Representing data in pie charts

The information gathered from the grade 10 students of a certain school regarding the sport they like the most, of the three sports, namely cricket, volleyball and elle is given below.

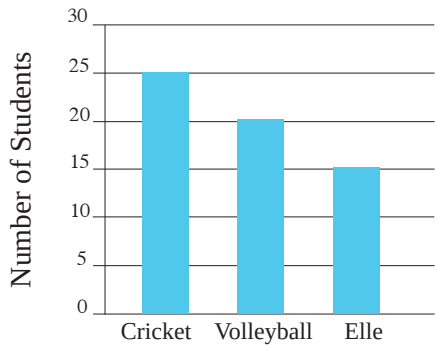
Sport	Number of students
Cricket	25
Volleyball	20
Elle	15

The above information can be represented in a picture graph and a column graph as follows.



Scale: 5 students are represented by 

Picture graph



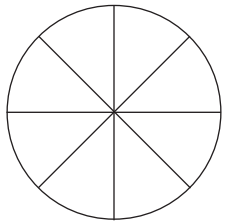
Column graph

The height of each column in the column graph denotes the number of students who like the relevant sport. In the picture graph this is denoted by the figures.

The pie chart is another method of representing data. Pie charts are also called pie graphs.

In a pie chart, the area of the whole circle represents the total number of data. The different frequencies are represented by suitable sectors.

Let us now consider how these sectors are found.



As an example, let us consider the above circle which has been divided into 8 equal sectors.

Since the circle has been divided into 8 equal sectors, the area of each sector is equal to $\frac{1}{8}$ of the area of the circle.

Also, the angle around the centre of this circle is divided into eight equal parts by the sectors.

Therefore, the angle at the centre of each sector is $\frac{1}{8}$ of the angle around the centre.

The angle around the center is 360°. Therefore the angle at the centre of each sector is $\frac{1}{8}$ of 360°.

That is, the angle at the centre of a sector which is $\frac{1}{8}$ of the circle $= \frac{1}{8} \times 360^\circ$

$= \underline{\underline{45^\circ}}$

Similarly, the angle at the centre of the sector which is $\frac{3}{8}$ of the circle $= \frac{3}{8} \times 360^\circ$

$= \underline{\underline{135^\circ}}$

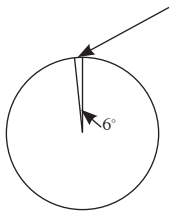
Now let us draw a suitable pie chart to represent the data in the above table.

First, let us draw a circle of suitable radius (about 3 cm.)

Let us represent the 60 students by the total area of the circle, which corresponds to the angle of 360^o around the centre of the circle.

Then the angle at the centre of the sector which denotes one student. $= 360° \times \frac{1}{60}$

$= \underline{\underline{6^o}}$

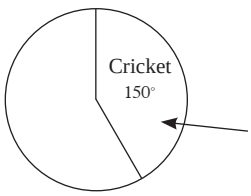


Accordingly, the angle at the centre of the sector which denotes the 25 students who like cricket the most $= 360^o \times \frac{25}{60}$

$= 6^o \times 25$

$= \underline{\underline{150^o}}$

Now let us represent this within the circle as follows

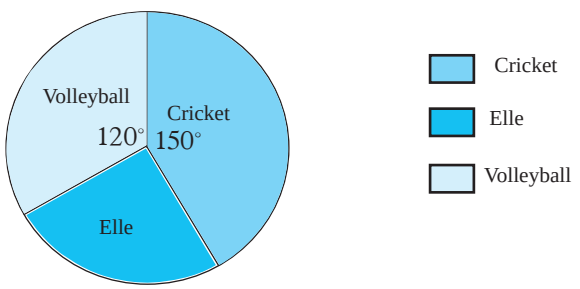


The sector which denotes the students who like cricket the most

Similarly, the angle at the centre of the sector which denotes the 20 students who like volleyball the most $= 360^o \times \frac{20}{60}$

$= 120^o$

The remaining sector of the circle represents the students who like elle. The corresponding angle at the centre can be found using $360° \times \frac{15}{60}$. However this is not necessary, since this angle is equal to the angle obtained by subtracting the above two angles from 360^o. All the above facts can be shown in a pie chart as follows.



Usually the angle at the centre is not denoted in a pie chart. Instead, the value represented by each sector is given as a percentage.

The comparison of data is facilitated by the sectors being shaded in different colours or covered with different patterns. Since all the data is represented by one circle comparisons such as 'more than' or 'less than' can easily be made.

Example 1

The information on the type of lunch packet preferred by 600 people who participated in a 'Shramadana' is given below.

Type of lunch packet	Number of people
Fish	250
Egg	150
Chicken	75
Vegetable	125
Total	600

Let us represent the above information in a pie chart.

The angle at the centre of the sector denoting the 250 people who prefer fish $= 360^{o} \times \frac{250}{600}$

$= \underline{\underline{150^{o}}}$

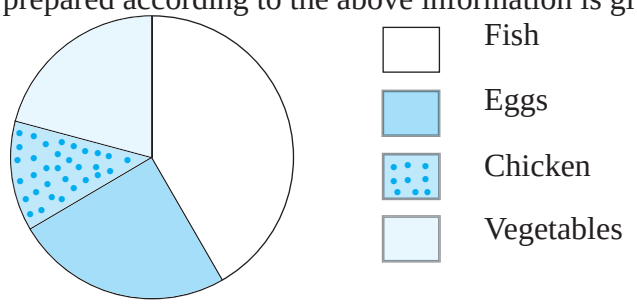
The angle at the centre of the sector denoting the 150 people who prefer eggs $= 360^{o} \times \frac{150}{600}$

$= \underline{\underline{90^{o}}}$

The angle at the centre of the sector denoting the 75 people who prefer chicken $= 360^{o} \times \frac{75}{600}$

$= \underline{\underline{45^{o}}}$

It is not neccessary to calculate the angle at the centre of the sector denoting those who prefer vegetables since the remaining portion of the circle denotes this.
The pie chart prepared according to the above information is given below.



Exercise 11.1

1. There are 40 children in a certain class. Each of these children has selected either dancing, music or art as their aesthetic subject. 20 of these children are studying art while 15 are studying music. The rest are studying dancing. Represent the above information in a pie chart.

2. The following table provides information on the subject streams followed by the students in the advanced level classes of a certain school.

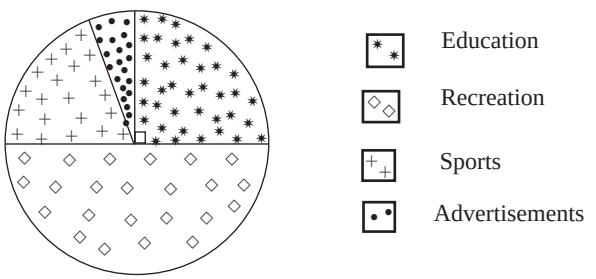
Subject Stream	Number of students
Arts	45
Science	20
Commerce	25
Technology	30

Draw a pie chart to represent the above information.

3. The number of newspapers that were sold at a newspaper stall on a certain day of the week was 540. The number of Sinhalese papers sold was 210 while the number of Tamil papers sold was 150. The rest of the papers that were sold were English papers. Represent this information in a pie chart.

11.2 Extracting information from a pie chart

Example 1



The above pie chart illustrates how a certain TV channel which telecasts programmes 18 hours a day, has divided its telecasting time between its programmes.

Let us answer the following questions by extracting the required information from the pie chart.

(i) For which type of programme has the most amount of time been allocated?

(ii) For which type of programme has the least amount of time been allocated?

(iii) (*a*) What is the magnitude of the angle at the centre of the sector which denotes the time allocated for educational programmes?

(*b*) Write the time allocated for educational programmes as a fraction of the total telecasting time.

(*c*) How much time has been allocated for educational programmes?

(*d*) Represent in the simplest form, the ratio of the time allocated for educational programmes to the time allocated for recreational programmes.

(iv) (*a*) If the time allocated for sports is 3 hours find the angle at the centre of that sector allocated for sports.

(*b*) Find the time allocated for advertisements.

(i) The largest sector of the pie chart represents the time allocated for recreational programmes.

Therefore, the most amount of time has been allocated for recreational programmes.

(ii) The smallest sector of the pie chart represents the time allocated for advertisements.

Therefore, the least amount of time has been allocated for advertisements.

(iii) *a*) 90°

b) Angle at the centre of the sector which denotes the time allocated for educational programmes $\Big\} = 90^\circ$

Angle at the centre representing the total telecasting time $= 360^\circ$

$\therefore$ The time allocated for educational programmes as a fraction of the total telecasting time $= \dfrac{90}{360}$

$= \underline{\underline{\dfrac{1}{4}}}$

(*c*) Time allocated for educational programmes $= 18 \times \dfrac{90}{360}$ hours

$= \underline{\underline{4\dfrac{1}{2}}}$ hours

(*d*) The angle at the centre of the sector which denotes the time allocated for educational programmes $\Big\} = 90^\circ$

The angle at the centre of the sector which denotes the time allocated for recreational programmes $\Big\} = 180^\circ$

$\therefore$ The ratio of the time allocated for educational programmes to the time allocated for recreational programmes $\Big\} = 90^\circ : 180^\circ$

$= \underline{\underline{1 : 2}}$

(iv) (*a*) Time allocated for sports as a fraction of the total time $= \frac{3}{18} = \frac{1}{6}$

The angle of the the sector which denotes sports $= 360^\circ \times \frac{1}{6}$

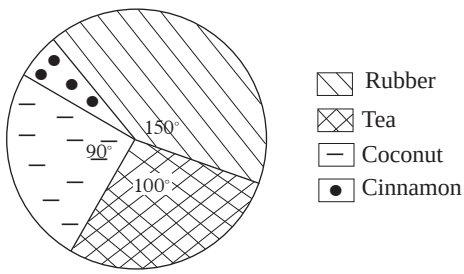
$= \underline{\underline{60^\circ}}$

(*b*) Angle at the centre of the sector which denotes advertisements $\Big\} = 360^\circ - 180^\circ - (90^\circ + 60^\circ) = 30^\circ$

Time allocated for advertisements $= \frac{30}{60} \times 3 = \underline{\underline{1\frac{1}{2} \text{ hours}}}$

Example 2

The following pie chart illustrates the information on the types of crops cultivated on a certain plot of land comprising of 720 hectare.



Answer the following questions using the pie chart.

(i) Which crop has been cultivated in the greatest extent of land?

(ii) Which crop has been cultivated in the smallest extent of land?

(iii) What is the extent of land on which tea has been cultivated?

(iv) What is the extent of land on which cinnamon has been cultivated?

Answers

(i) Rubber

(ii) Cinnamon

(iii) The angle at the centre of the sector denoting the extent of land on which tea has been cultivated $\Big\} = 100^\circ$

$\therefore$ The extent of land on which tea has been cultivated $= \frac{100}{360} \times 720$ hectare

$= \underline{\underline{200 \text{ hectare}}}$

(iv) The angle at the centre of the sector denoting the extent of land on which cinnamon has been cultivated $\Big\} = 360^\circ - (100^\circ + 150^\circ + 90^\circ)$

$= 360^\circ - 340^\circ$

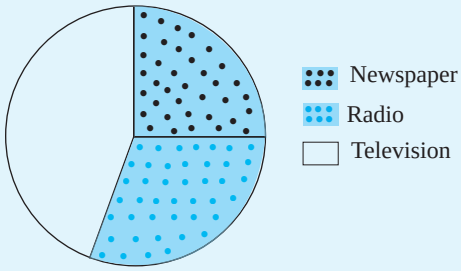
$= 20^\circ$

$\therefore$ The extent of land on which cinnamon has been cultivated $= \frac{20}{360} \times 720$ hectare

$= \underline{\underline{40 \text{ hectare}}}$

Exercise 11.2

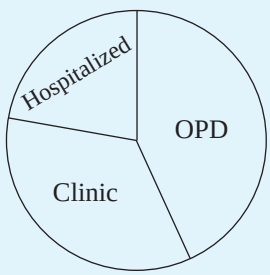
1. The pie chart drawn with the information gathered from 40 grade 10 students of a certain school regarding the type of mass media they most prefer is given below.



Answer the following questions using the pie chart.

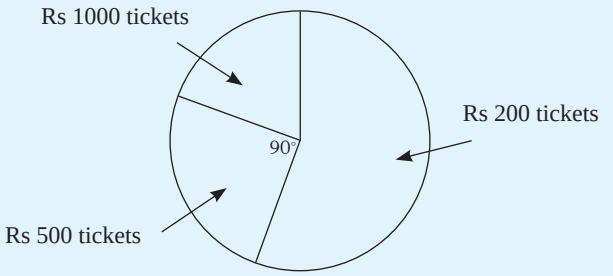
(i) Which type of mass media is preferred by the greatest number of children?
(ii) Which type of mass media is preferred by the least number of children?
(iii) If the angle at the centre of the sector which denotes the children who prefer television is 162^{o}, find the number of children who prefer television.
(iv) If the angle at the centre of the sector which denotes the children who prefer newspapers is 90^{o}; find the number of children who prefer newspapers.

2. The following pie chart illustrates the information on the number of patients who received treatment from the different units of a hospital on a certain day. The total number of patients who received treatment at the hospital on that day was 600.



(i) From which unit did the most number of patients receive treatment on that day?
(ii) If the angle at the centre of the sector denoting this unit (the unit in (i)) is 150^{o}, how many patients received treatment from that particular unit on that day?
(iii) If the number of patients who received treatment while being hospitalized is 130, find the angle at the centre of the sector which denotes these patients.

3. The tickets printed for a drama were valued at Rs 1000, Rs 500 and Rs 200. The following pie chart illustrates the number of tickets of each type that was sold.



(i) Of what value were the tickets that were sold the most?

(ii) What fraction of the total number of tickets sold is the number of Rs 500 tickets sold?

(iii) The number of Rs 1000 tickets that was sold was 140. If the angle at the centre of the sector that denotes the number of Rs 1000 tickets that was sold is 70^{o}, find the number of Rs 200 tickets that was sold.

(iv) What was the total income that was received by selling the tickets?

Miscellaneous Exercise

1. A certain central school has classes from grade 1 to the advanced level. There are 600 students in grades 1 to 5 and 500 students in grades 6 to 11. The number of students in the advanced level classes is 340. Represent this information in a pie-chart.

2. The information gathered from the employees of a certain factory with the aim of providing transport is given below.

Mode of transport	Number of employees
Walking	110
Cycling	100
By bus	690

Represent this information in a pie chart.

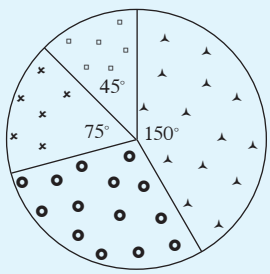
3. The sum of the water, electricity and telephone bills of a certain household for the month of January was Rs 2700. The electricity bill was Rs 1440 and the water bill was Rs 750. Represent the above information in a pie chart.

4. A certain welfare society decided to select one of the following three cities, Polonnaruwa, Anuradhapura, Kandy as the destination of their annual trip. $\frac{1}{4}$ of the members expressed their preference for Polonnaruwa. while 36 members preferred Kandy and the remaining 54 preferred Anuradhapura.

(i) How many members did the welfare society have?

(ii) Represent the above data in a pie chart.

5. The following pie chart illustrates the number of votes received by four parties at an election. The party which received the most number of votes received a total of 9300 votes.



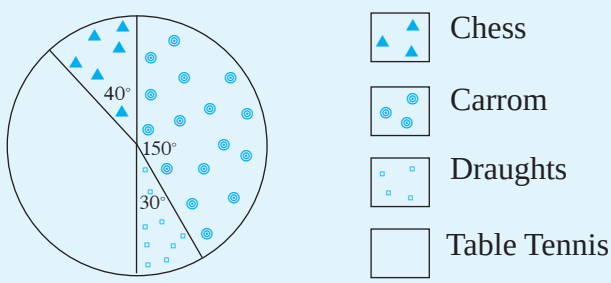
(i) How many votes in total did all four parties receive?

(ii) How many votes in total did the party in third position receive?

(iii) Express the number of votes that the party in fourth position received as a fraction of the total number of votes.

(iv) Using the pie chart, write down the number of votes that the party in second position received as a percentage of the total number of votes.

6. The pie chart given below illustrates the information gathered from the members of a sports club regarding the indoor sport they like the most.



The number of members who like chess the most is 8.

According to the pie chart,

(i) which indoor game is liked the most by the greatest number of members?

(ii) how many members like carrom the most?

(iii) how many members like table tennis the most?