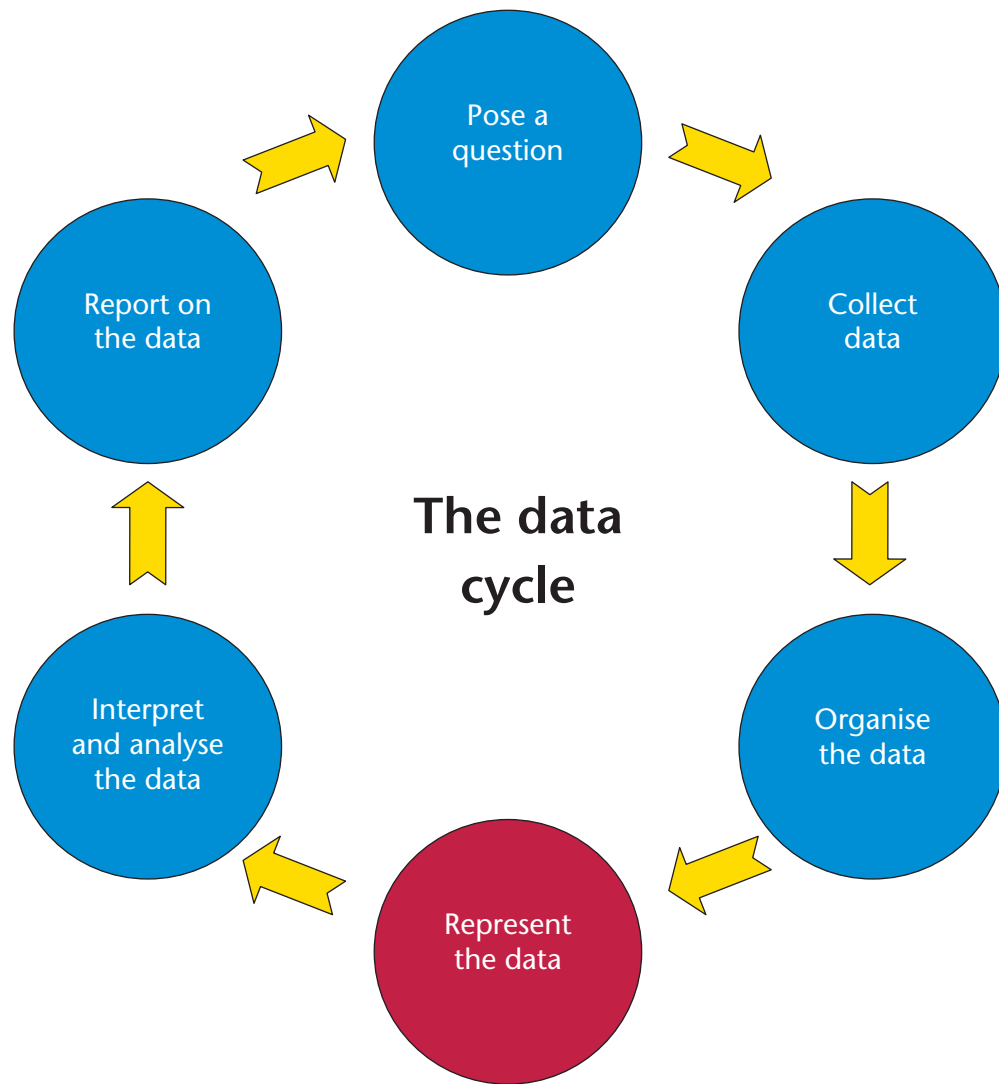


CHAPTER 14

Represent data

When we have collected and organised our data, we often represent it as a graph. This helps us to see the data and patterns in the data more easily. In this chapter, you will revise bar graphs, double bar graphs and pie charts, which you have learnt about in previous grades. You will learn about a new type of graph called a histogram, and how this differs from a bar graph. You will also learn how to draw your own pie charts by estimating fractions of a whole circle.

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14 Represent data

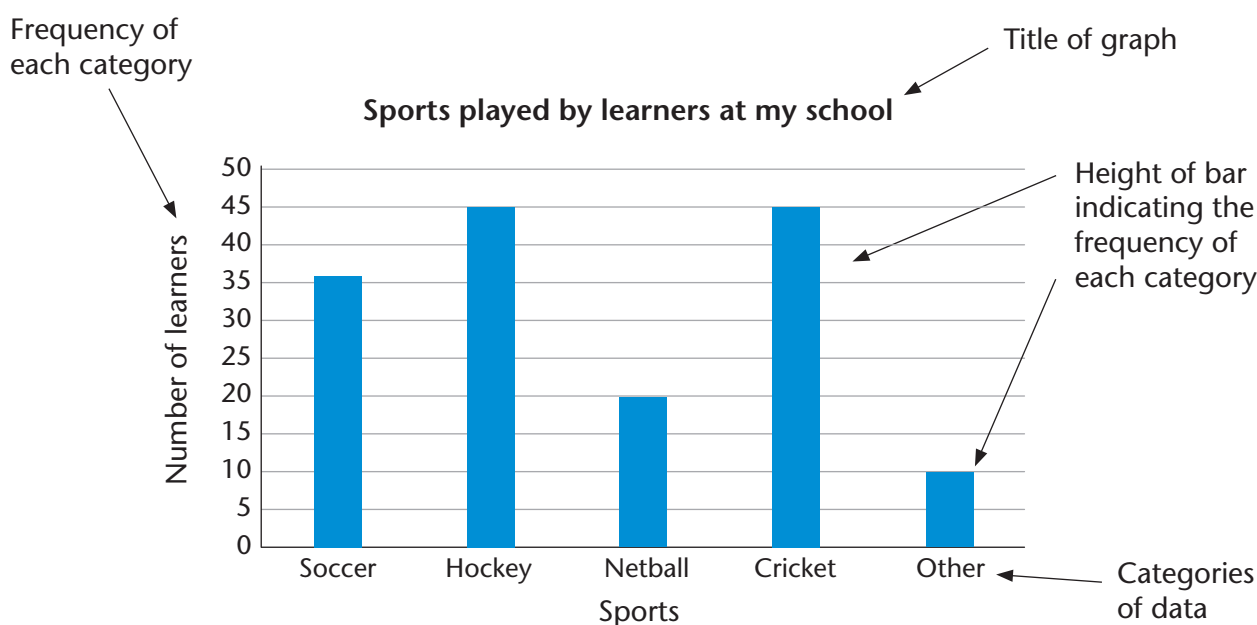
Now that we have collected and organised a set of data, we want to show the results in a useful way.

Remember when you drew dot plots in the previous chapter, you could see which categories or measurements occurred many times and which occurred only a few times. There are a few different graphs that show the important things about the data in such a way that you can see them easily. You need to be able to draw these graphs.

14.1 Bar graphs and double bar graphs

DRAWING A BAR GRAPH

A **bar graph** shows categories (or classes) of data along the horizontal axis, and the frequency of each category along the vertical axis. (Sometimes the axes are swapped around.) Here is an example of a bar graph.



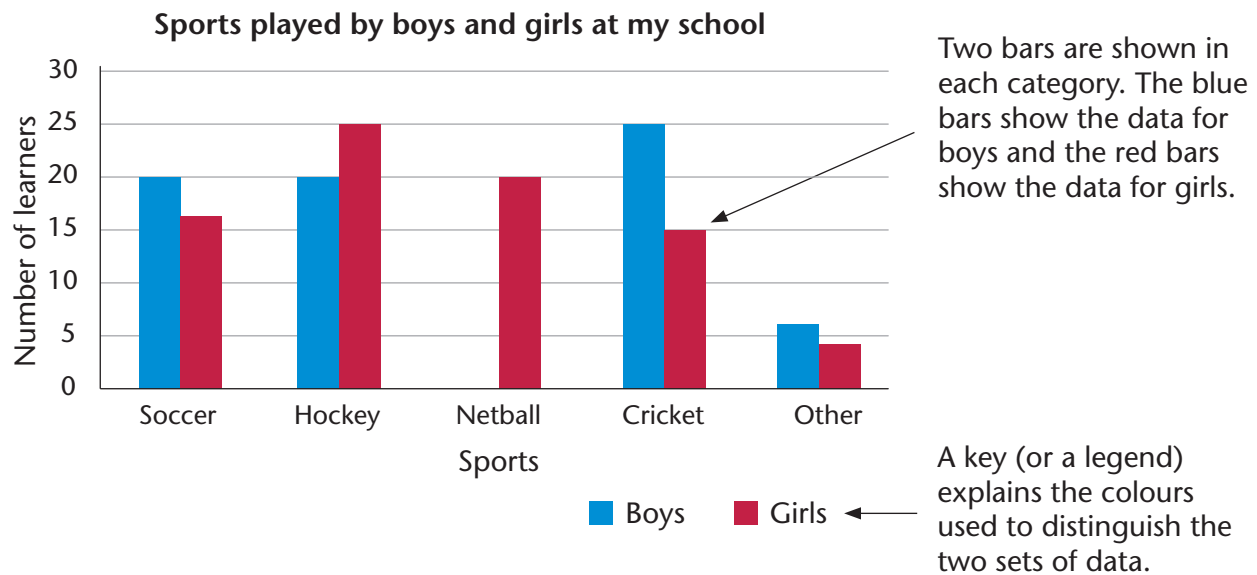
Go back to section 13.2 of chapter 13, where you drew a dot plot and made a tally table of Thandeka's data about languages spoken in her class. Use the data to draw a bar graph on the set of axes on the next page. Draw the bars to the correct height by looking at the numbers on the vertical axis.

Home languages of the Grade 7 class

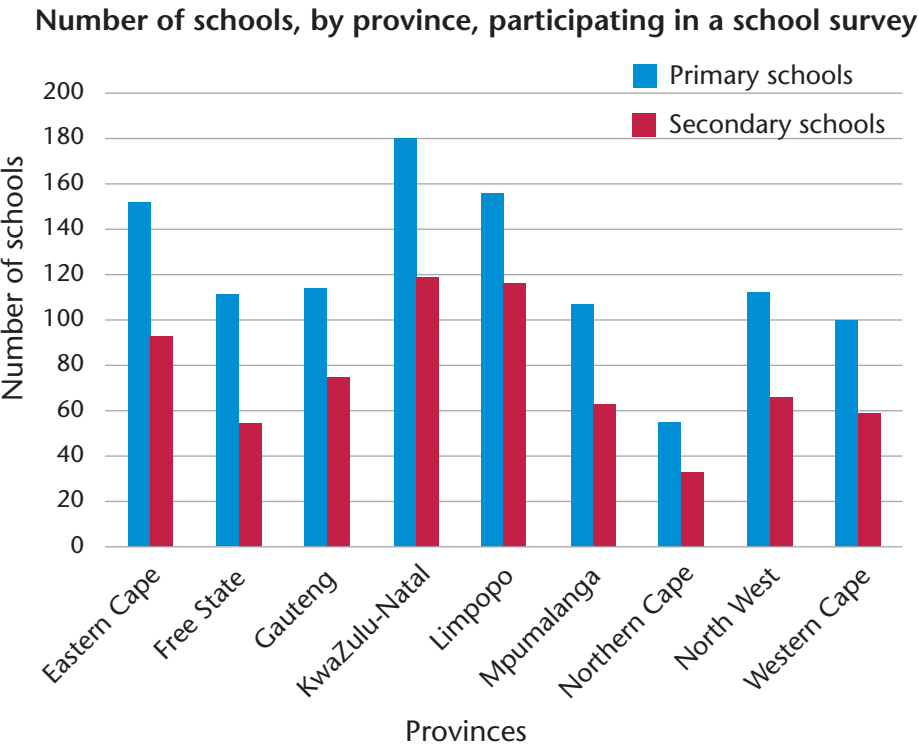


USING DOUBLE BAR GRAPHS

A **double bar graph** shows two sets of data for each category (or class). For example, the double bar graph below shows data collected from girls for each category, and data collected from boys for each category.



1. Look at the data below and answer the questions that follow.



- (a) Did more primary schools or more secondary schools participate in the survey?
-
- (b) Which province had fewer than 50 secondary schools participating in the survey?
-
- (c) Which provinces had more than 150 of its primary schools participating in the survey?
-

2. Draw a double bar graph to show the following data. Use the grid on the next page.

Facilities available at schools in Province A and Province B

Facility	Percentage of schools in Province A	Percentage of schools in Province B
Electricity	73	50
Running water	68	45
Computers	60	20
Internet	30	10



14.2 Histograms

A SITUATION WHERE DATA HAS TO BE ORGANISED

- Mr Makae wants to buy an orange farm. Three farms are available, each with an orchard of orange trees, and the three farms cost about the same. There are 40 orange trees on each farm. The total mass of oranges (in kg) harvested from each tree on each farm over the last 3 years is given below. Which farm should he buy?

Farm A:

426	628	467	413	862	585	652	600	734	611
741	605	536	643	833	438	613	704	623	719
719	701	501	768	642	444	751	579	695	726
616	619	441	703	902	947	785	952	725	721

Farm B:

822	736	773	674	884	463	644	433	688	487
884	530	448	410	982	638	492	638	725	621
743	661	744	530	560	745	455	943	760	734
888	457	621	969	507	500	542	831	576	801

Farm C:

438	530	743	947	450	777	859	748	473	724
750	852	428	464	725	554	758	997	467	743
722	438	779	690	785	543	752	898	474	483
460	772	544	756	491	576	482	744	701	803

2. How can the data about the orange trees on the three farms be organised so that the farmer has a clear picture of the difference between the orchards on the three farms? For now just write down how you think the data may be organised. You will organise the data later when you do the questions that follow.

.....

.....

3. Complete these tally and frequency tables for the data about the masses of oranges harvested on the three orange farms.

Masses of oranges harvested from different trees on Farm A

Mass of oranges harvested from each tree. These are called class intervals .	Number of trees that produced masses in the interval	Total
400 kg or more but less than 500 kg	HHH	
500 kg or more but less than 600 kg	IIII	
600 kg or more but less than 700 kg	HHH HHH II	
700 kg or more but less than 800 kg	HHH HHH III	

Masses of orange harvested from different trees on Farm B

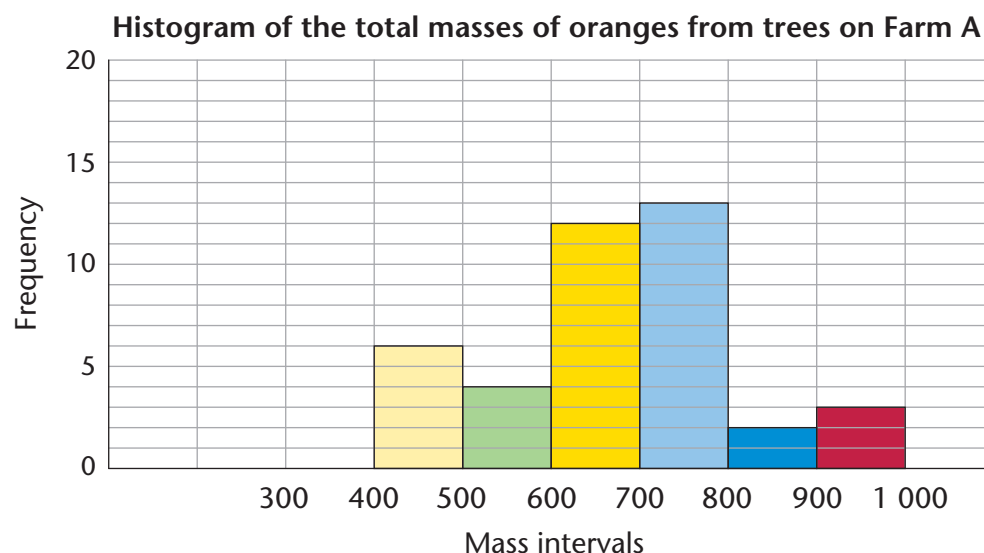
Class interval	Number of trees that produced masses in the interval	Total
400 kg or more but less than 500 kg	HHH III	8
500 kg or more but less than 600 kg	HHH II	7
600 kg or more but less than 700 kg	HHH III	
700 kg or more but less than 800 kg	HHH III	
800 kg or more but less than 900 kg		
900 kg or more but less than 1 000 kg		

Masses of oranges harvested from different trees on Farm C

Class interval	Number of trees that produced masses in the interval	Total
400 kg or more but less than 500 kg		
700 kg or more but less than 800 kg		

On the next page, you will learn how to draw graphs of the data for the three farms.

The data for Farm A is represented on this graph.



This type of graph is called a **histogram**.

(The columns in a histogram are normally not coloured differently, or even coloured at all. In this histogram the columns are coloured only because some questions are asked about them in question 4 below.)

The numbers 400 on the left and 500 on the right of the light yellow column indicate that masses of 400 kg or more but less than 500 kg are counted in that interval.

The height of each column represents the number of masses (the frequency) that fall in that interval.

4. (a) A total of 536 kg of oranges was harvested from one of the trees on Farm A over a period of the 3 years. In which column on the above histogram is this tree represented? Explain your answer.

.....

.....

.....

- (b) Which masses are represented in the red column?

.....

.....

(c) Which class interval is represented by the light blue column on the above histogram?

.....

.....

(d) How many masses are represented by the green column?

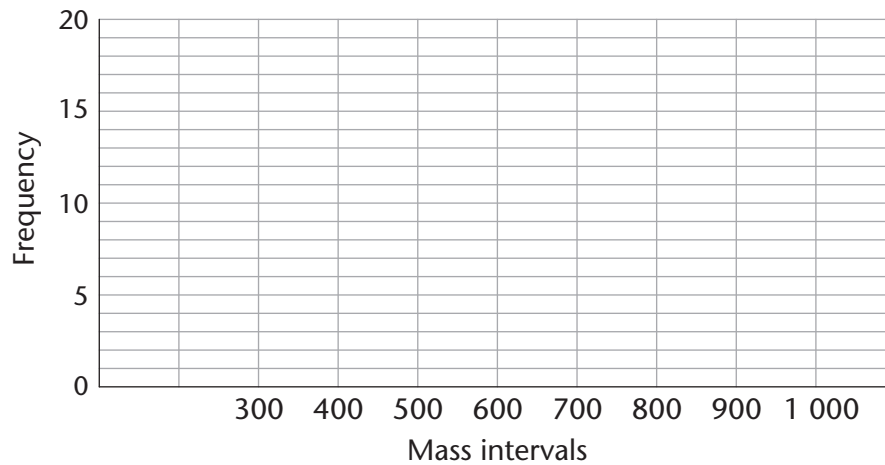
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(e) Which column represents the highest frequency?

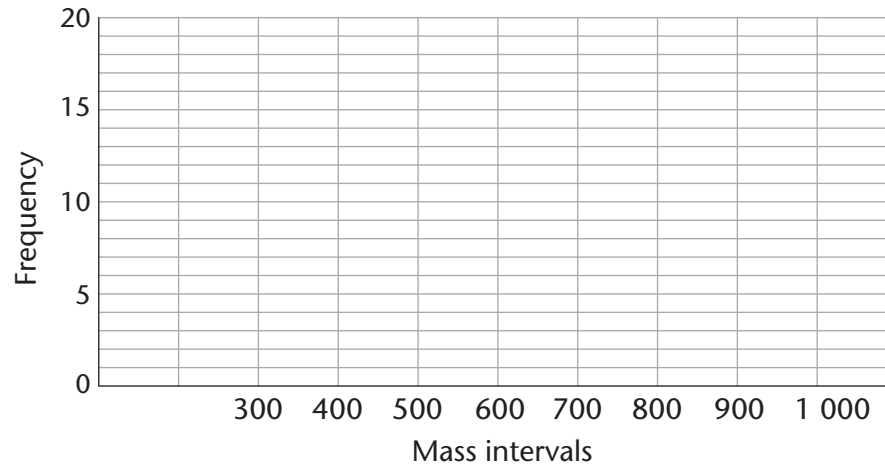
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5. Complete the histograms below.

Histogram of the total masses of oranges from trees on Farm B



Histogram of the total masses of oranges from trees on Farm C



The different class intervals are **consecutive** and cannot have values that overlap. For example, we can group heights into class intervals of 10 cm, as shown below:

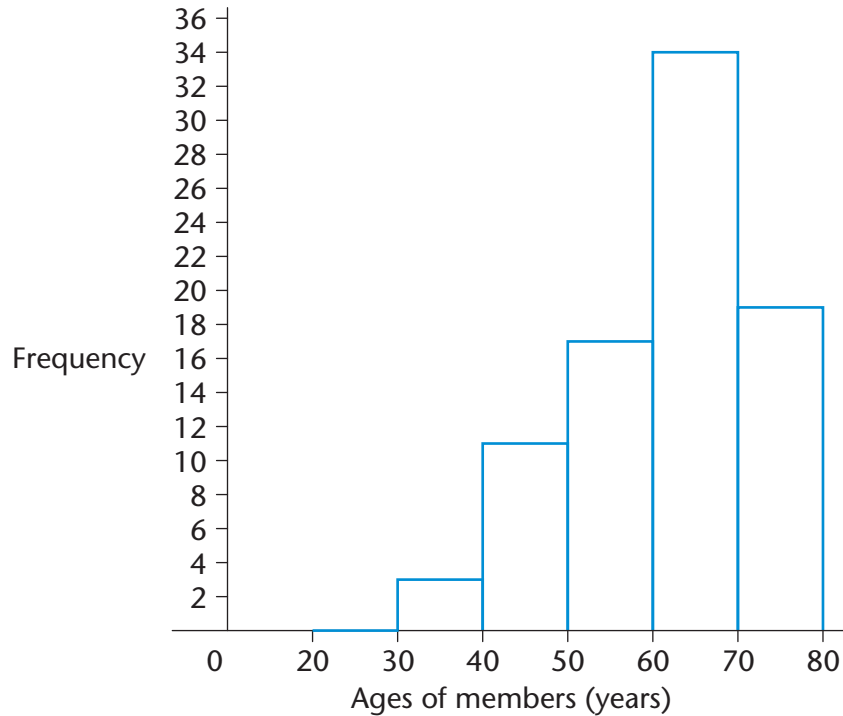
Height (m)	Heights that fall in the class interval	Frequency
1,20–1,30	1,20; 1,25; 1,29	3
1,30–1,40	1,30; 1,31; 1,35; 1,39	4
1,40–1,50	1,40; 1,46; 1,48; 1,48; 1,49	5
1,50–1,60	1,53; 1,53; 1,57; 1,58; 1,59; 1,59	6

We follow the convention that the top value (also called the **upper boundary**) of each class interval is not included in the interval.

So the height of 1,20 m falls into the 1,20–1,30 m interval, but the height 1,30 m falls into the 1,30–1,40 m interval.

INTERPRETING A HISTOGRAM

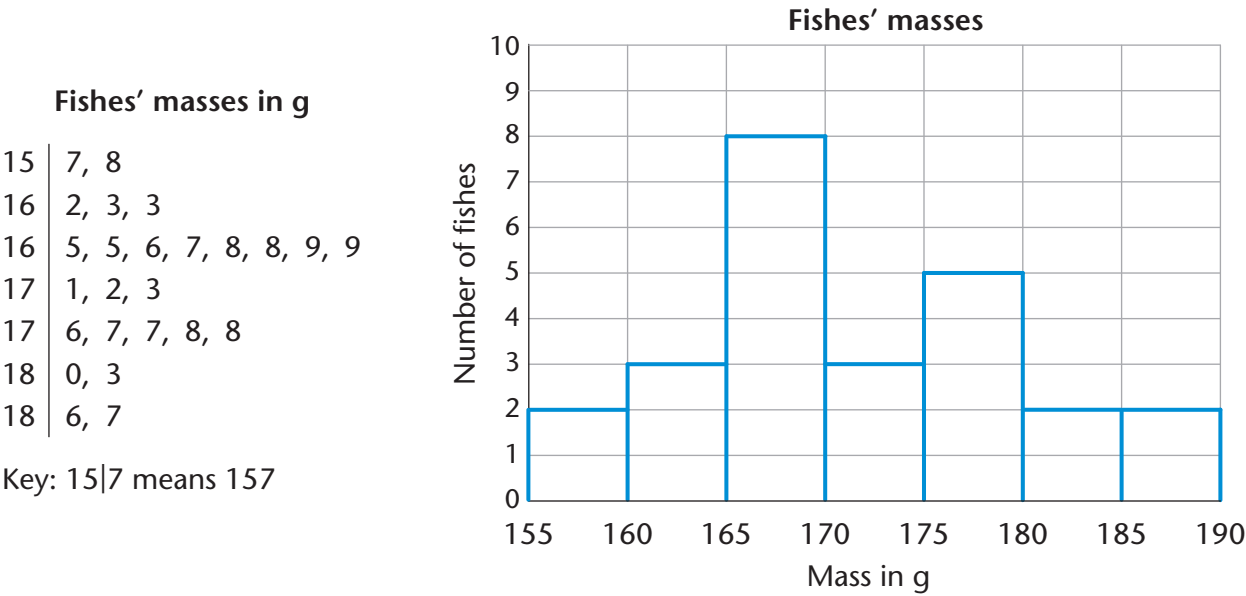
Study the histogram showing the numbers of members, in different age groups, of a sports club. Then answer the questions that follow.



- Complete a frequency table for the information.

- How many of the members are in their fifties?
- How many members does the club have?
.....
- When you drew a bar graph, it did not matter what order the bars were in. Does the order of the columns on the histogram matter? Explain.
.....
.....

Notice that you cannot see the individual data values in a histogram – they have been “lost”. For example, below you can see a stem-and-leaf display and a histogram of the same data set:



A histogram usually has many more data values than a stem-and-leaf display – too many to show in a stem-and-leaf display. It would, for example, be difficult to put the 84 values for the members of the sports club onto a stem-and-leaf display.

DRAWING MORE HISTOGRAMS

- The table shows how long it takes learners from a Grade 7 class at Western Primary to travel to school each day. In question (d) you will represent the data in the table with a histogram.

Time (minutes)	Frequency
0–10	7
10–20	18
20–30	11
30–40	3

- How many learners were asked about their travelling hours?

- Look at the grid provided in question (d). What do you have to consider in order to help you decide on a scale division for the vertical axis?

- What scale will you use on the horizontal axis? Explain your answer.

(d) Draw a histogram of the data.



2. The table shows how much money different vendors earn selling their goods every week.

(a) How many vendors were asked about their earnings?

.....

(b) Look at the grid below. Decide on a scale for the vertical axis of a histogram and indicate it on the axis.

(c) Decide on a scale for the horizontal axis and indicate it on the axis.

(d) Complete the histogram showing the data.

Money (R)	Frequency
0–100	6
100–200	9
200–300	11
300–400	7
400–500	5



3. In a Natural Sciences class, learners planted beans and measured the heights of the bean plants after two months. Here is the data they collected (in cm):

34 65 72 42 37 29 78 43 79 91 43 45 28 42 79
 34 92 87 40 43 43 78 82 47 85 43 32 86 76

(a) Complete this frequency table:

Height of bean plants (cm)	Tally	Frequency
20–30		
30–40		
40–50		
50–60		
60–70		
70–80		
80–90		
90–100		
Total		

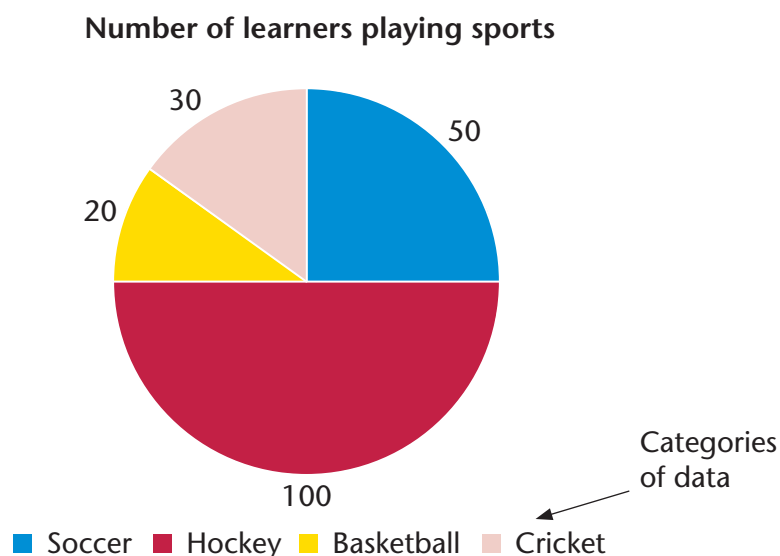
(b) Draw a histogram of this data.



14.3 Pie charts

A **pie chart** consists of a circle divided into slices (**sectors**), where the slices show how the different categories of data make up the whole set of data. Bigger categories of data have bigger slices of the circle.

Look at the example of a pie chart below.



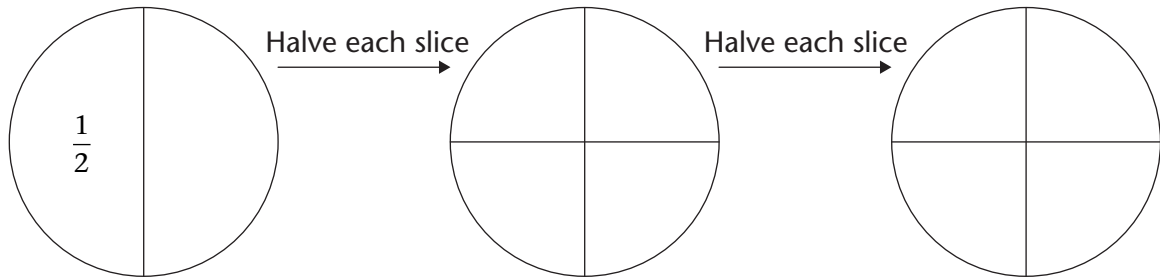
The pie chart shows the following:

- A total of 200 learners were asked about the sports they played:
 $20 + 30 + 50 + 100 = 200$
- The key shows the four categories of data:
 - soccer
 - hockey
 - basketball
 - cricket.
- 100 of the 200 learners play hockey. This is the largest category, and gets the biggest slice (half of the whole).
- 20 of the 200 learners play basketball. This is the smallest category, and gets the smallest slice (one tenth of the whole).

You will learn how to draw accurate pie charts in later grades. In this grade, you will estimate the portions of a pie chart that each category of data requires.

ESTIMATING SIZES OF SLICES IN A PIE CHART

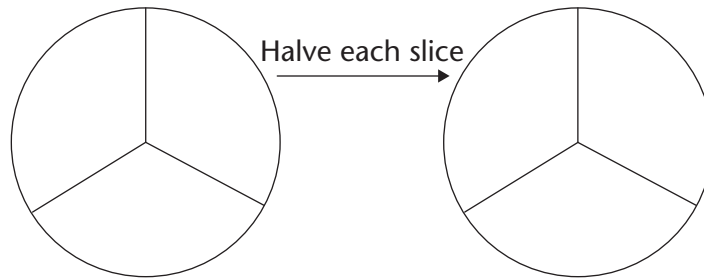
1. (a) Write down the fraction of a whole that each slice in the following diagrams shows.



$$\frac{1}{2} = \dots\dots\dots\%$$

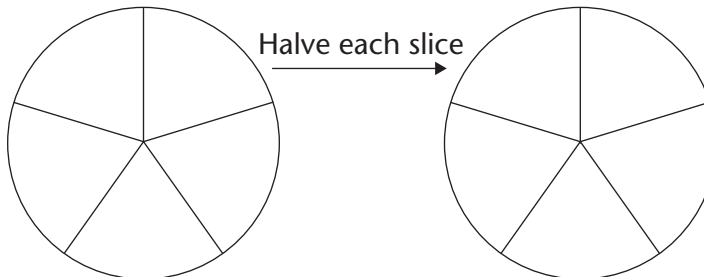
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- (b) Below each diagram in question 1(a), write down what percentage each fraction is equal to.

You can use the diagrams above to estimate the sizes of slices when drawing your own pie charts.

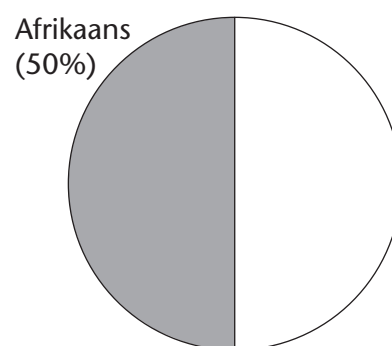
2. Use the data in each of the following tables to complete the pie charts. You must:

- label the major sector
- divide the other sector into the parts that represent the other languages
- label each sector.

(a)

Province: Western Cape

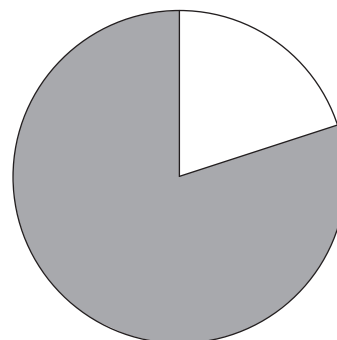
Major languages	Frequency (in %)
Afrikaans	50%
English	20%
isiXhosa	25%
Other	5%



(b)

Province: KwaZulu-Natal

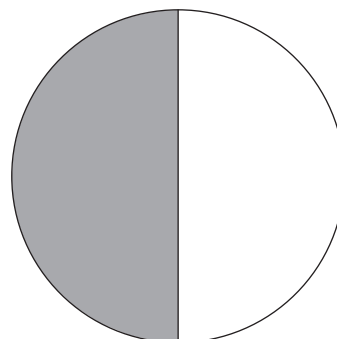
Major languages	Frequency (in %)
English	15%
isiZulu	80%
Other	5%



(c)

Province: Limpopo

Major languages	Frequency (in %)
Sepedi	50%
Tshivenda	15%
Xitsonga	20%
Other	15%



REPRESENTING DATA AS FRACTIONS AND PERCENTAGES IN PIE CHARTS

To represent data in a pie chart, you need to know how to convert (change) the frequencies of the different categories into a fraction or percentage of the total.

1. The learners in Class A were asked how many languages they could speak. The table shows the data that was collected.

- (a) Complete the 'Fraction' column by determining what fraction of the whole each category is.

- (b) Complete the 'Percentage' column by converting the fraction to a percentage.

Remember, to convert a common fraction to a percentage you have to multiply by 100%.

Number of languages spoken by learners in Class A

Languages	Frequency	Fraction	Percentage
One language	10	$\frac{10}{40} = \frac{1}{4}$	25%
Two languages	20		
Three languages	6		
Four languages	2		
More than four languages	2		
Total	40	$\frac{40}{40}$	100%

- (c) Draw a pie chart of the data in your completed table. Use a circular object to draw the circle. Then estimate the sizes of the various slices of the pie chart.

2. The learners in Class B were asked how many languages they could speak. The table shows the data that was collected.
- (a) Complete the 'Fraction' column by determining what fraction of the whole each category is.
- (b) Complete the 'Percentage' column by converting the fraction to a percentage.

Number of languages spoken by learners in Class B

Languages	Frequency	Fraction	Percentage
One language	12	$\frac{12}{60} = \frac{1}{5}$	20%
Two languages	30		
Three languages	12		
Four languages	3		
More than four languages	3		
Total	60	$\frac{60}{60}$	100%

- (c) Draw a pie chart to represent the data in your completed table.