Chapter 2

THE ESSENTIALS OF MAPS

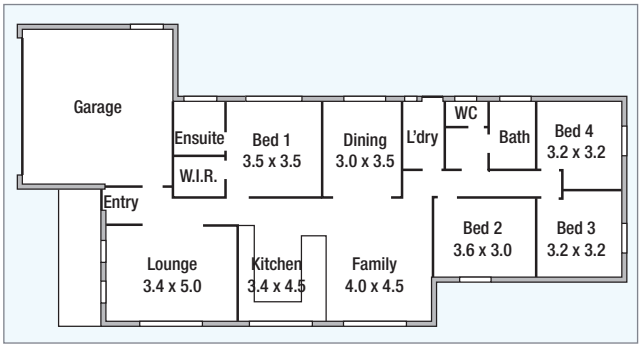
TOPIC 2.1 Maps and plans

A builder would never begin work on a new home without knowing what had to be built and how to build it. Most of this important information is found in the house **plan**, an accurate drawing of the house, as if looking down through the roof from above.

Now do this

Look carefully at Figure 2.1 and then answer the following questions in your workbook:

1. How many rooms are there in the house?
2. Are the lounge and dining rooms separate rooms?
3. Does this house have a family room?
4. Which room has an ensuite bathroom?
5. How big is the lounge room?
6. Which bedroom is closest to the front door?
7. What do you think of this house plan? Is it your ideal house? What would you want in your ideal house? Use a mind map to brainstorm all your ideas.
8. Draw a house plan which incorporates all your ideas to show to a builder.



2.1 Plan of a house

Types of maps

In just the same way that house plans are very important to a builder, very few bushwalkers would go on a long walk without a map. Bushwalkers need a map to help them reach their destination. They need to be able to read the map to recognise the things around them and find their way so they don't get lost.

Many maps show both the **physical** (or natural) **features** of an area (those things made by nature) and the **human** (or cultural) **features** of an area (those things made by people).

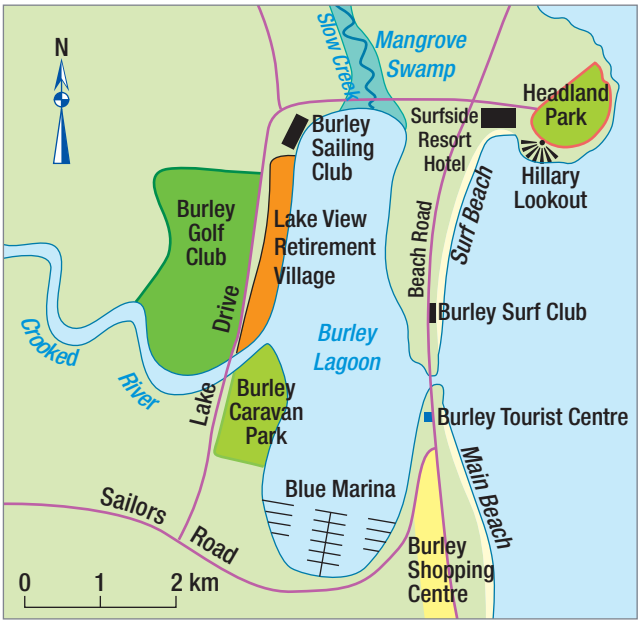
We use maps every day. Two very common maps are the **street directory** and the **road map**. There are also many other types of maps. Each map will be used by different people for a different purpose. Each type of map will tell us something new about the world in which we live.

Maps are usually quite accurate at the time when they are first drawn, but may soon become out of date. Human features can change quite rapidly. Towns and cities expand, and forests grow or are cut down, but the main physical features usually change quite slowly.

Now do this

1. Below are a list of maps and a list of people. Write the list of maps in your workbook and then next to each map write the person who would be most likely to use it.

street directory	tourist
air navigation chart	ship's captain
atlas map of countries	gold prospector
sightseeing map	interstate truck driver
geology map	geography student
road map of Australia	taxi driver
state forests map	airline pilot
sea navigation chart	environmentalist



2.2 Burley tourist map

2 Write down which of these different types of maps you have used.

3 Make a list of the type of map in your atlas that might be used to:
   - **a** travel across Australia
   - **b** find where Australia's rainforests are located
   - **c** find the warmest part of Australia in January
   - **d** see where Australia's dairying areas are located
   - **e** find where Australia's gold mines are located

4 Why might a 20-year-old road map of your local area not be accurate today? Write the reasons in your workbook.

Drawing a map

Now do this

How well can you draw a map? Try this easy exercise:

1 Imagine you are talking with your friends about the quickest way to get to your home from school. Draw a clear map showing the quickest way home.

2 Neatly print the names of the streets and roads you use and those you pass. Add a dotted line to show the route used.

3 Now add a heading at the top of the map and draw a border around the edge.

4 Do you know where north is? If so, add an arrow pointing towards north.

5 Check with your friends to see how accurate they think your map is. Can any improvements be made?

What's in a map?

Congratulations. You have just drawn a map. A **map** is a drawing or plan that shows an area on a flat piece of paper. Most maps show us what is on the ground. They give us a 'bird's-eye view' which means they are drawn as if looking down from above. A map doesn't show the area and everything in it at its true size. Instead, it gives us an idea of what is there and where these features are in relation to each other.

Some maps—such as maps of the Solar System or geological maps—show us what is above or below the Earth's surface. Some maps show a small part of the Earth's surface in great detail, while others show the whole world in little detail. Some only show one feature, such as country boundaries, while others show many physical and human features.

Now do this

1 Use your own words to write a definition of a map.

2 Use your atlas to find examples of maps that show:
   - **a** many different features
   - **b** one kind of feature
   - **c** the whole world
   - **d** part of the world in great detail

Every good map should have:

- a **map title** or heading which tells us what the map shows
- a **border** to define and limit the area
- a **key** to show the symbols used
- a **scale** to show distance and the size of the area covered by the map
- a **north point** or arrow to show direction.

The rest of Chapter 2 explains how each of these is used on a map, and what each of them can tell us.

Now do this

Find a map of your school and answer the following questions.

1 How useful do you think the map is? Does it tell you everything you need to know to find your way around?

2 Would the map be suitable for use by a visitor to the school? Why?

3 Name any features that aren't already labelled. Locate all the toilets. Name all rooms, corridors, and areas of the grounds. What does the map look like now?

4 You have been asked by your student council to draw a new map of the school. Working in a small group, brainstorm ways your group believes it could draw a new map to improve the old map.

5 Now draw the map—making sure all members of the group contribute. Show your map to other students to see what they think. Add any suggestions that they make.

6 How would your new map help new students?

TOPIC 2.2 Map symbols

Imagine the difficulty you would have if, in drawing a map of your street, you tried to accurately show and name every building, fence and path.

Cartographers—people who make maps—would have similar problems if they tried to show and label everything on a map. So they use **map symbols**—a system of signs, marks and coloured lines or shading—to show the location of features such as mountains, rivers, railway lines and built-up areas. Symbols allow features to be shown without cluttering the map with words. Many are drawn to look like the features they show.

Symbols include:

- point symbols to pinpoint a feature such as a mountain or building
- line symbols for railways, roads and rivers
- area symbols for lakes, swamps and forests.

Now do this

1 What is a cartographer?

2 Why do cartographers use map symbols? What would a map look like without map symbols?

3 You have been asked to add furniture to each room on the house plan that you drew in Topic 2.1, 'Maps and plans'. What items would you add to your house plan? If you drew and named each item of furniture in the house, what would happen to the house plan?

4 Design a symbol for each item of furniture or search for a word-processing symbol font. (If working in Microsoft Word, go to **Format**, select **Font** and choose **Symbol** or **Windings** from the list of fonts.) Make a list of your symbols.

Extension CW Material

Colour and line

Colour is an important element of many map symbols. Blue is used to show water and green is used to show parks and different types of vegetation. Landforms such as mountains and cliffs are shown in brown. Red, pink and yellow are used to show urban areas and human features.

The relative importance of features is often shown by the thickness of lines or the size of the printed words on the map.

Now do this

Refer to Figure 2.3, the Wilbury town map.

1 Name and describe two point symbols and two line symbols used on this map. What do they show? Why do you think they are used?

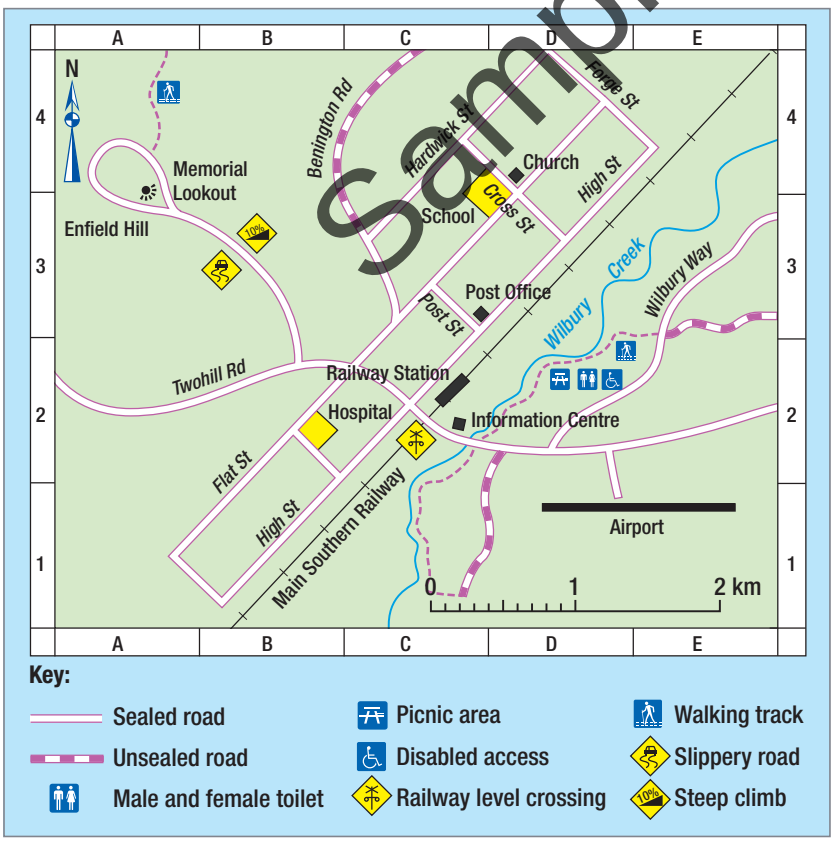
2 Name one area symbol. What does it show?

3 Give one example of colour used to show a feature.

4 What do the map symbols tell you about the area along Wilbury Creek, the railway crossing, and the road to Enfield Hill?

5 What symbols could be used to replace the words for information centre, church, post office, hospital and airport?

6 If these symbols were used on the map, what impact would they have?



2.3 Wilbury town map

The map key

The meaning of the symbols and colours used on the map is explained in the **key**, which is also known as the **legend**. The key is a list of all the symbols on the map and what they stand for. The key 'unlocks' the map—it allows us to understand what the map is showing.

Symbols showing similar features are usually grouped together in the key. Often, a number of symbols related to one feature, such as roads and railways, are shown along the same line.

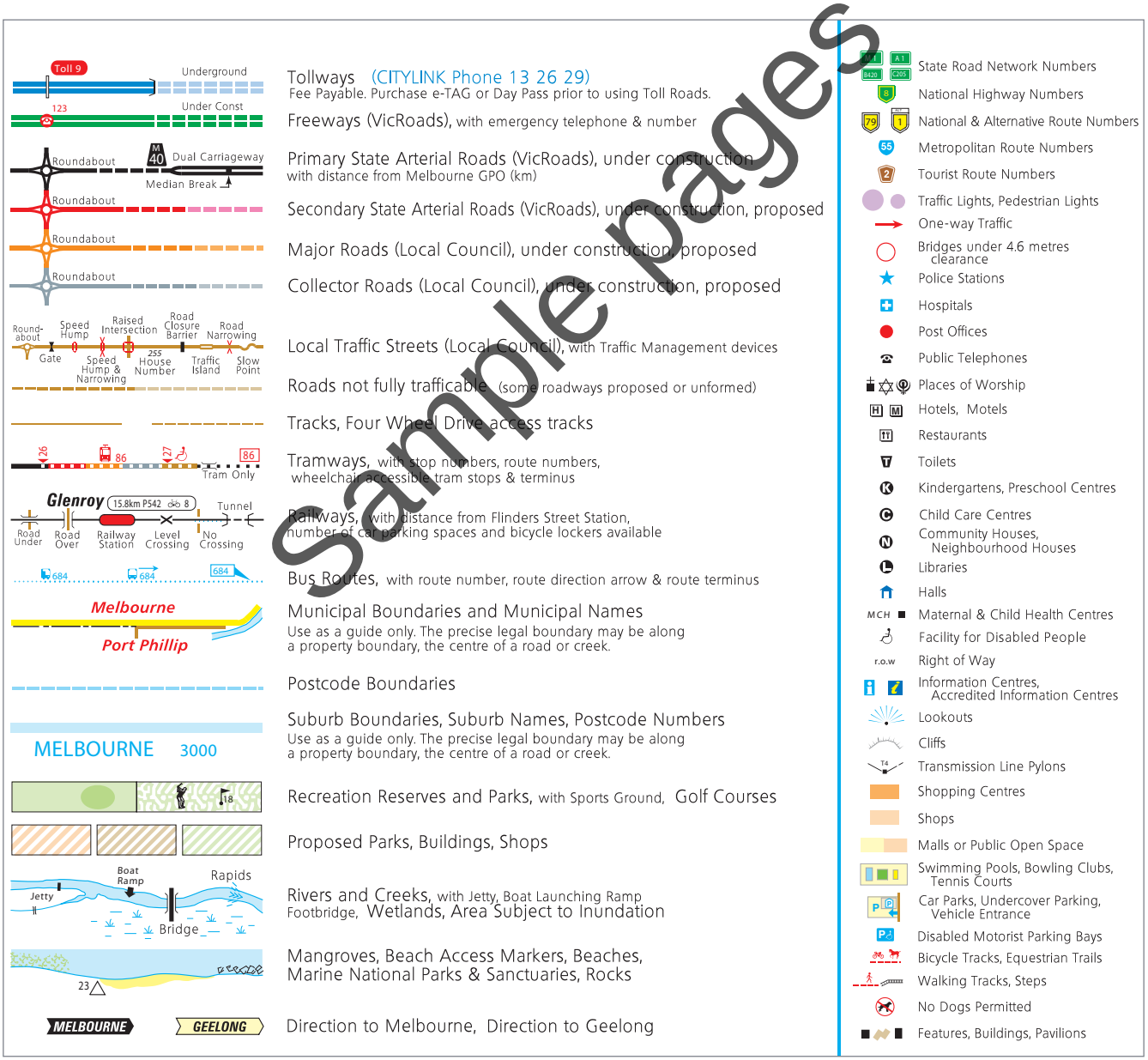
Now do this

Refer to Figure 2.4, the key to map symbols used in the *Melway Greater Melbourne Street Directory 2007* map of Melbourne inner suburbs.

1. Draw and name four point symbols. Why do you think they are used?
2. Draw and name a line symbol, to show how it is used to show a number of related features.
3. Draw and name two area symbols. What do they show?
4. Give two examples of the use of colour to show different line, point and area features.

Now refer to Figure 2.6, the *Melway Greater Melbourne Street Directory 2007* map of Melbourne inner suburbs.

5. Find the Eastern Freeway. What do map symbols tell you about this freeway?
6. Make a list of all the features shown by map symbols in Yarra Bend Park in the north-eastern quarter of the map. What do they tell you about this area?
7. Give examples of two point, line, area and colour symbols used in the south-eastern quarter of the map. How do they help you read the map?
8. How difficult do you think it would be to read this map without map symbols? Give reasons for your answer.
9. What is a map key? What does it help you do? Describe what it would be like to use a street directory without a map key.



2.4 Key to map symbols used in the *Melway Greater Melbourne Street Directory 2007* map of Melbourne inner suburbs (Figure 2.6)

TOPIC 2.3 Finding places

We can waste a lot of time trying to find a place unless a map has a quick and easy system to help us.

Now do this

1 Draw up a table in your book like the one below:

Street and suburb	Time taken (seconds)
York St, Richmond	
Rutland St, Clifton Hill	
Hotham St, Collingwood	
Oak St, Hawthorn	
Marine Pde, Abbotsford	

2 Now find the streets listed in this table on the street directory map on the opposite page. Time and write down how long it takes you to find each street.

Grids and map references

Most maps use a system of numbers or letters—or both—around the borders to help us find places. Some maps have a system of equally spaced horizontal and vertical lines that link the borders of the map. These lines create a grid pattern across the map, which provides even more help to find places. Some maps have the letters and numbers but don't have the lines, so we have to imagine the grid pattern.

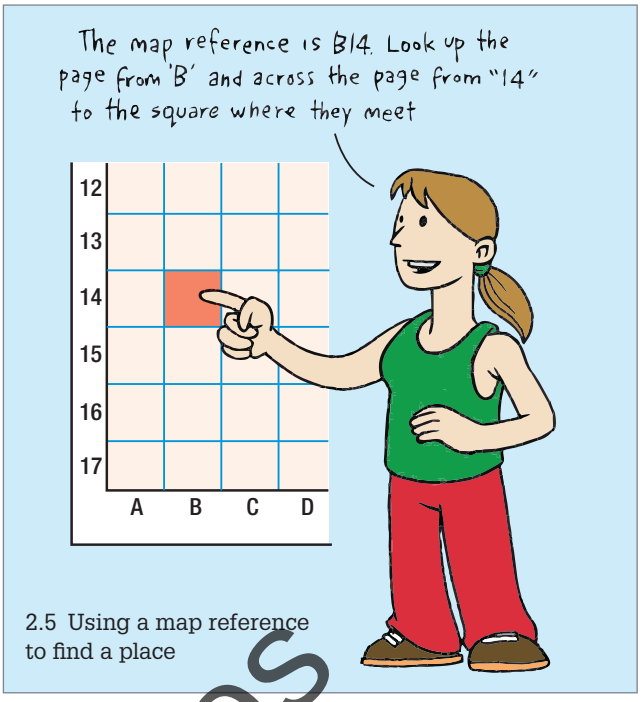
The street directory map you have just used has letters from the alphabet across the top and bottom and numbers along the sides. This is called an **alphanumeric** grid system.

The index of the street directory uses the alphanumeric grid system. It lists a two-figure **map reference** to help us find each place. To use the map reference, find the letter and its grid from top to bottom of the map. Then find the number and its grid across the map.

The square where the vertical and horizontal grids overlap is the map reference, the area where the place or street is located.

Now do this

1 How long will it take you to find the streets listed in the table on the street directory map, using the map reference for each street? Draw up this table in your book, and then write in how long it takes you to find these streets on the map. How much time did you save compared with last time?



2.5 Using a map reference to find a place

Street and suburb	Map reference	Time taken
Myrtle St, Clifton Hill	E2	
Tweedie Pl, Richmond	F8	
Otter St, Collingwood	C4	
Bond St, Abbotsford	G7	
Grattan St, Hawthorn	K9	

2 Now answer the following questions using the street directory map. The map references are clues to the answers. The street directory key (Figure 2.4) you used in the last topic may help you with some of your answers.

- **a** What sport can you play in area H6?
- **b** Name the school in area D5.
- **c** Name the park at E4.
- **d** Name the shopping centre at H8.
- **e** What is the route number of Hoddle Street (D8)?
- **f** Name the sporting ground at B9–10.
- **g** Name the streets at either end of Gordon Street (E2).
- **h** What types of transport can be used in C11?
- **i** Make a list of all the features shown by map symbols in area D7.
- **j** What happens to the road network in area D3 and E3?

2.6 *Melway Greater Melbourne Street Directory 2007* map of Melbourne inner suburbs (opposite)

Scale 1:20 000

0 200 400 600 800 1000 metres

0 1 kilometre

Extension CW Material

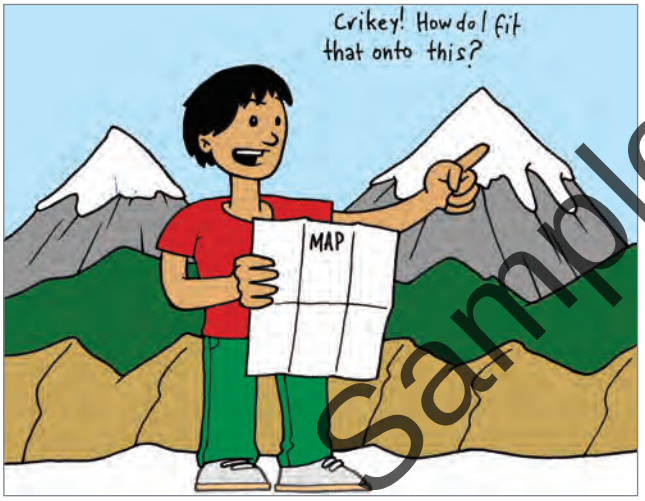
TOPIC 2.4 Scale

Most of us have owned or admired models of cars, people or buildings. They look like the real thing but have been scaled down so that the model is small enough to fit on a shelf or desk.

Finding a way to make things much smaller than they are in real life is important in drawing maps. The actual size of things in real life means that they have to be reduced in size, or scaled down, to fit on the sheet of paper.

Scale tells us the extent to which distance on the ground has been reduced to fit on the map. Scale is the relationship between the distance from one point to another on the map and the distance between the same two points on the ground.

Scale is the ratio of map distance to actual distance—for example, 1 centimetre on the map represents 1 kilometre (100 000 centimetres) on the ground. Scale determines how much of the Earth's surface will be shown and in how much detail.



2.7 The reason for scale

Knowing the scale allows us to calculate the distances between places, the size of features such as lakes and forests, and the density, or number per square kilometre, of things such as houses.

All maps should show scale in at least one of three ways: in words; in numbers, as a representative fraction or ratio; or as a line scale.

Now do this

1 What are models? Why are they used?
2 Use your own words to define scale.
3 Why is scale used when drawing a map?
4 What are the three ways of showing scale on a map?

Scale in words

An example of a scale in words is '1 centimetre to 1 kilometre'. This means 1 centimetre on the map represents or shows 1 kilometre on the ground. Other examples of scales in words are '1 centimetre to 10 metres' and '1 centimetre to 200 metres'.

Note that you should never say '1 centimetre *equals* 1 kilometre'. This is impossible!

Now do this

1 If the scale of a map was '1 centimetre to 1 kilometre', how far on the ground would the following distance on the map represent?
a 2 cm **b** 4.5 cm **c** 10 cm
2 If the scale of the map was '1 centimetre to 250 metres', how far on the ground would the following distance on the map represent?
a 2.5 cm **b** 8 cm **c** 10 cm

Scale in numbers

Using numbers, scale can be shown as a **representative fraction**, or RF (for example, $\frac{1}{1000}$), or as a **ratio** (for example, 1:1000).

If a map has a scale of 1:1000, then one unit of measurement (e.g. 1 centimetre) on the map shows 1000 of the same units (in this case, 1000 centimetres, which is 10 metres) on the ground.

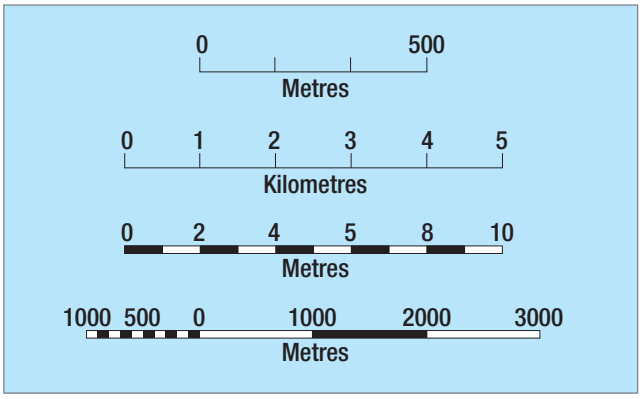
Many people think that representative fractions and ratios are just too difficult to understand, but the secret lies in being able to convert them back into words.

Now do this

1 A scale of 1:10 000 means that:
a 1 millimetre on the map represents ..... on the ground.
b 1 centimetre on the map represents ..... on the ground.
2 A scale of 1:1000 means that:
a 2 centimetres on the map represents ..... on the ground.
b 10 centimetres on the map represents ..... on the ground.
3 A scale of 1:50 000 means that:
a 15 millimetres on the map represents ..... on the ground.
b 1 centimetre on the map represents ..... on the ground.
4 If the middle map extract in Figure 2.10, at a scale of 1:20 000 000, shows Bass Strait to be approximately 1 centimetre wide, what is the approximate distance across Bass Strait?

Scale as a line

A numbered line known as a **line scale** or **linear scale** is the simplest method to understand and use.



2.8 Line scales

Now do this

1. Draw a 5-centimetre line scale to show a scale of 1 cm to 20 km.
2. Draw a 5-centimetre line scale to show a scale of 1:10 000.
3. Using your atlas, turn to the maps of Australia and the Australian states. How is scale shown on these maps? What are some of the most common scales used?

Large-scale and small-scale maps

Maps can be described as large-scale or small-scale. This is a little confusing because:

- large-scale maps show a small area with a great amount of detail
- small-scale maps show a large area with a small amount of detail.

	Scale	Distance on the ground shown by 1 cm on the map
↑ Larger-scale	1:10 000	100 m
	1:25 000	250 m
	1:50 000	500 m
	1:100 000	1 km
↓ Smaller-scale	1:250 000	2.5 km
	1:1 000 000	10 km
	1:5 000 000	50 km

2.9 Small and large scales used for Australian maps

Scale, more than anything else, determines which map we use for different activities. A small-scale map with a scale of 1:5 000 000 would be useful for planning a long trip across Australia, but a larger-scale map with a scale of 1:25 000 or even 1:10 000 would be ideal when going for a walk.

Now do this

1. Study Figure 2.10:
   - **a** Which map shows the largest area?
   - **b** Which map shows the greatest detail? Give your reasons.
   - **c** What is shown on the large-scale map that is not shown on the smallest-scale map?
2. Using Table 2.9 as a guide, what would be the best scale for a map that you were to use on a walk within 3 kilometres of your home? Why?
3. Look at the maps in your atlas and make a list of the advantages of small-scale maps and those of large-scale maps.

The scale of this map extract is 1:2 500 000.
It shows 15 625 square kilometres of the Earth's surface.

The scale of this map extract is 1:20 000 000.
It shows 1 000 000 square kilometres of the Earth's surface.

The scale of this map extract is 1:90 000 000.
It shows 20 250 000 square kilometres of the Earth's surface.

2.10 Different scales show different detail.

TOPIC 2.5 Distance

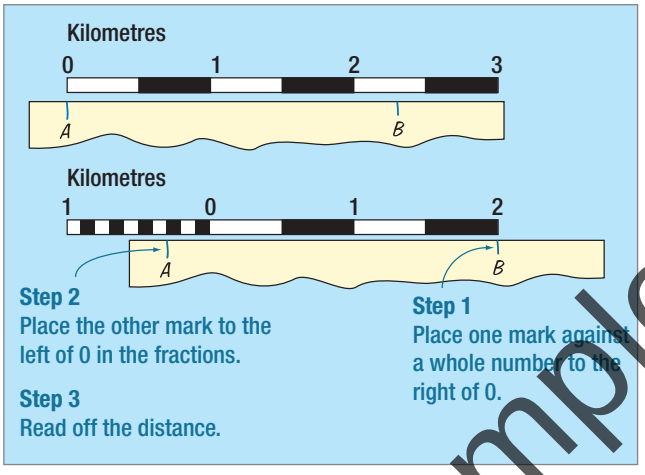
Maps tell us not only where we are, but also how far we are from other places. Road maps usually have the distances between places clearly printed on them. However, many maps don't, and we must use the scale of these maps to work out distance.

Line scales and distance

The most useful scale for measuring distance is the line scale or linear scale.

There are two main types of line scales:

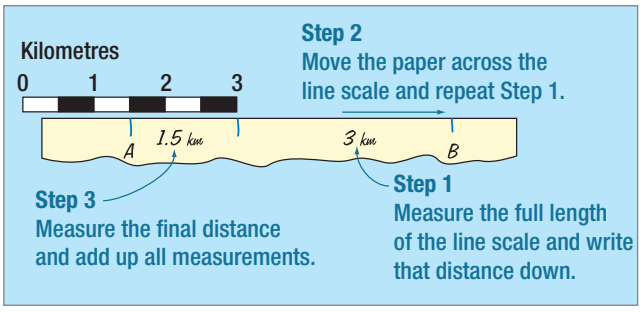
- those that start at 0 and are divided into kilometres
- those that show an additional 1 kilometre to the left of 0, which is divided into tenths or smaller divisions.



2.11 Using line scales to measure fractions of a kilometre

This second type is more useful for measuring fractions of a kilometre. Figure 2.11 shows you how to use a line scale of this type. Always place one mark against a whole number and the other mark in the divided line to the left of 0.

Sometimes the distance to be measured is longer than the line scale. If so, follow the steps in Figure 2.12 to measure the distance.



2.12 Measuring distance when the line scale is too short

Measuring straight-line distances

There are several ways to measure distance in a straight line. You can use a ruler but it's easy to be confused by the divisions on the ruler. It is more accurate to use a sheet of paper or a pair of dividers as shown in Figure 2.13.

With a sheet of paper

Use a sheet of paper with a straight edge and follow the instructions in Figure 2.13 a.

With dividers

Follow the instructions in Figure 2.13 b, then transfer the dividers to the line scale.

With a piece of string or cotton

Stretch the string between two points. Mark off the distance by pinching the string with your fingers and then, keeping your fingers in exactly the same place on the string, measure this distance on the line scale.

Now do this

Use Figure 2.3 on page 16 to complete these activities.

1. Using a sheet of paper with a straight edge, measure the straight-line distance along Flat Street from Twohill Road to Cross Street. How did you use the line scale to measure this distance?
2. Measure the following straight-line distances:
   - **a** from Memorial Lookout to the hospital
   - **b** from the church to the post office
   - **c** from the information centre to the post office
   - **d** the length of the Main Southern Railway line shown on the map
3. Use dividers to measure:
   - **a** the length of Cross Street
   - **b** the length of Flat Street, making a note of how you used the line scale to measure this distance

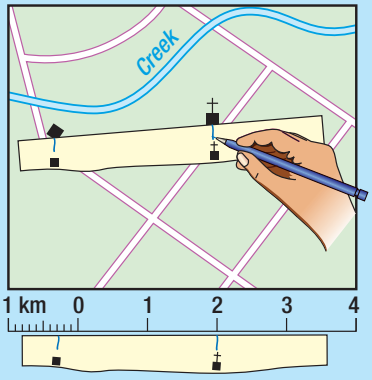
Measuring distances around curves

With a sheet of paper

Use a sheet of paper with a straight edge, and a pencil to pivot or turn the paper to closely follow the bend. Hold the paper firmly on the map when you lift your pencil. See Figure 2.13 c for more assistance.

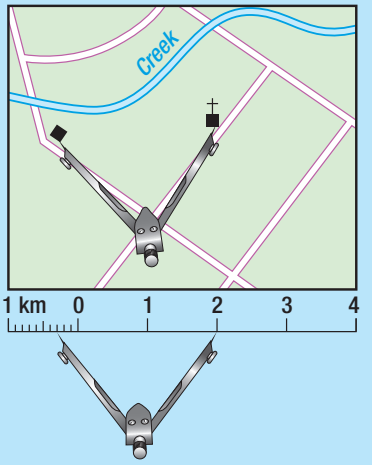
a Measuring straight-line distance using paper

Place a sheet of paper between the two points. Mark the two points, then measure the distance along the line scale.



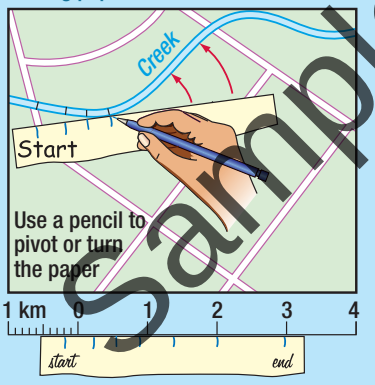
b Measuring straight-line distance using dividers

Open out the dividers to the distance between the two points. Then measure that distance on the line scale.



c Measuring around a bend using paper

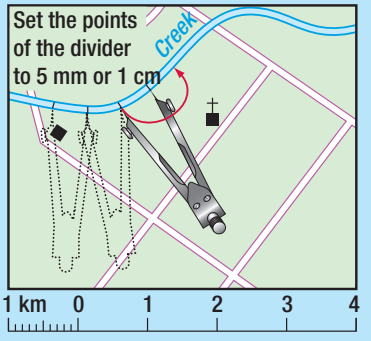
Mark the starting point. Keeping the paper firmly on the map, move your pencil to pivot the paper at each bend or curve to reach the end point. Then measure that distance on the line scale.



d Measuring around a bend using dividers

From the starting point, walk the dividers around the curve, counting the number of steps to the end point. If the distance is not an exact number of steps, open the dividers up for the final step.

Five 5 mm steps, plus one last 7 mm step, measured on the line scale = 3.2 km.



2.13 Using scale to measure distance

With dividers

Set the dividers to 5 millimetres or 1 centimetre because it helps to walk the dividers in small steps around the curve. Figure 2.13 d provides more assistance.

If there are straight sections and sections of differing lengths, divide the distance up into sections, measure them individually, then add up all the sections to give the total distance.

With a piece of string

Lay out the string from start to finish along the curve to be measured. Mark off the distance by pinching the string with your fingers, and then, keeping your fingers in exactly the same place on the string, measure this distance on the line scale.

Now do this

Use Figure 2.3 on page 16 to complete these activities.

1. Using a sheet of paper with a straight edge, measure the distance by road from the corner of Post and High Streets to the corner of Cross and Hardwick Streets. Write down the steps you used on the map and on the line scale.
2. Measure the distance by road from:
   - **a** the hospital to the post office
   - **b** the information centre to the post office
   - **c** the railway level crossing to the church, along High Street
3. Using a sheet of paper with a straight edge, measure the length of Hardwick Street on the map. Make a list of all the steps you used.
4. Using dividers, measure the distance along Twohill Road from Wilbury Way to the intersection with the road to Memorial Lookout. Write down the steps that you used.
5. Use a sheet of paper, dividers and a piece of string to measure the length of Wilbury Way on the map by three different methods. What length did you get with each method? Which method do you prefer? Give reasons for your preference.
6. Using your preferred method, measure the length of Twohill Road across the map.
7. Which do you think would be the best method by which to measure the length of Wilbury Creek across the map? Give reasons for your choice.