

KEY SKILL 1

Maps

In order to navigate from one place to another, people normally use maps. Maps can help us navigate across town, a state or even the world. Maps must always be accurate or else they can be very misleading.

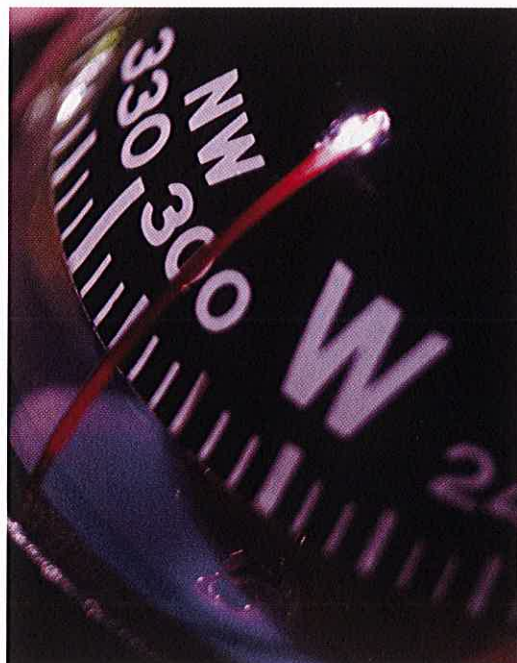
Locating position

Being able to understand the distance is one thing, but being able to specify the direction in which we are going is another. The four main compass directions are north, east, south and west. It can easily be remembered as 'Never Eat Soggy Weetbix' (NESW). We can also specify more directions, for example, the direction halfway between north and east is called north-east.

Locating with grids

Atlases, street directories and maps generally use a square grid so that locations can be found easily. Usually the grid is labelled with letters from west to east and with numbers from north to south.

Each square on the grid can be recognised by specifying a letter and a number. We always use the letter first and then the number, for example, A2. Once you combine the letter and the number, that combination is called a grid reference.

**WORKED EXAMPLE**

What symbol is in a A2 and b C5?

	A	B	C	D
1			#	
2	%			
3		!]
4				
5	=		+	

THINK

a A2 means?

Move to the square.

b C5 means?

Move to the square.

WRITE

Across to column A, down to row 2.

The symbol is %.

Across to column C, down to row 5.

The symbol is +.

QUESTIONS

- 1 Find the words located in the following grid references.

a B6 = _____

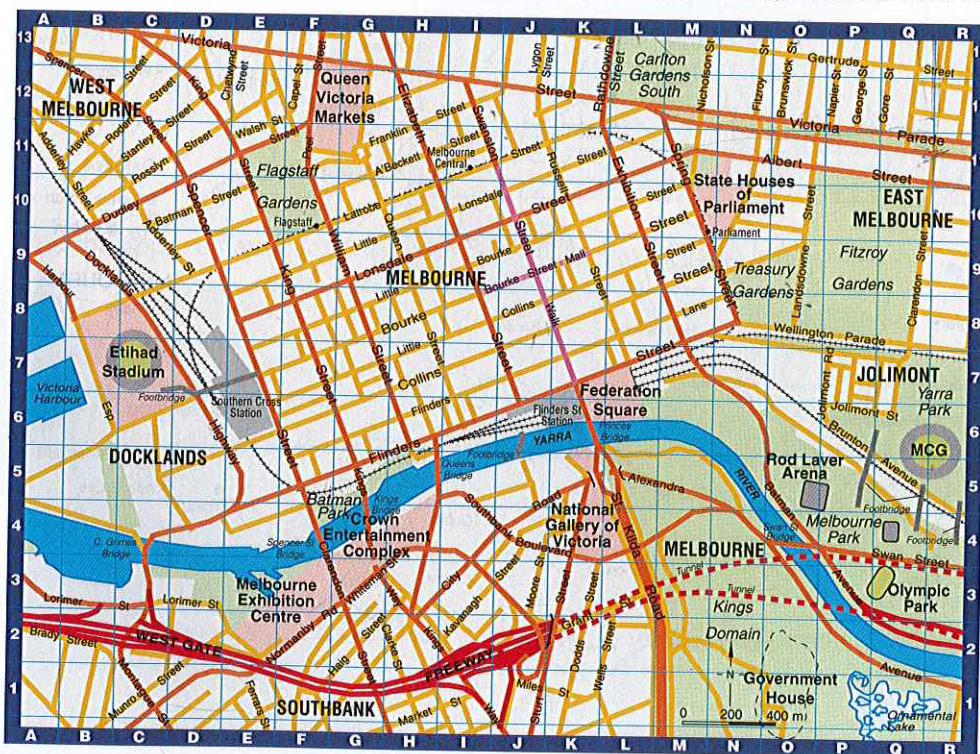
b D2 = _____

c E1 = _____

d A1 = _____

	A	B	C	D	E	F	G
1	Cake		Water		Bird		
2				Duck		Milk	Pears
3	Apple		Biscuit		Horse		
4		Cat					Rhino
5	Tea			Cow		Dog	
6		Pig					

- 2 A map of the Melbourne CBD is shown below. Find the following destinations and give grid references.



- a Carlton Gardens South
- b Treasury Gardens
- c Batman Park
- d Melbourne Cricket Ground
- e Queen Victoria Markets
- f Melbourne Exhibition Centre
- g Corner of Collins St and Swanston St
- h Corner Victoria Parade/Rathdowne St

City of Melbourne

INVESTIGATION 1

Scales

Reading a scale map correctly is extremely important. Without accuracy in map reading and navigation, the world would be very different. What would have happened if Captain Cook had arrived in Australia but then couldn't use his maps to get back to England?

To accurately represent distance on a map we must understand the scale. The scale of a map shows, for example, how many kilometres or metres on the ground is represented by one centimetre on the map. A map must be drawn to scale in order to be accurate, and the scale should be shown so that the reader can work out the actual distances. There are three possible ways of showing a scale.

- Words or figures: 1 cm = 10 km. 1 cm represents 10 km.
- Ratio: 1 : 100 000. This means every centimetre measured represents 100 000 cm or 1000 m or 1 km.
- Scale bar: a graphical representation of scale. In the map below, each interval on the scale bar equals 25 km.

QUESTIONS

1 Using the scale on the map below, find the approximate distance between the following locations.



a Melbourne to Torquay = 4 cm = $4 \times 25 = 100$ km b Geelong to Colac = 3.75 cm = $3.75 \times 25 = 93.75$ km

c Colac to Warrnambool =

= = km

d Warrnambool to Port Fairy =

= = km

e Port Fairy to the Port Campbell =

= = km

f Apollo Bay to Portland =

= = km

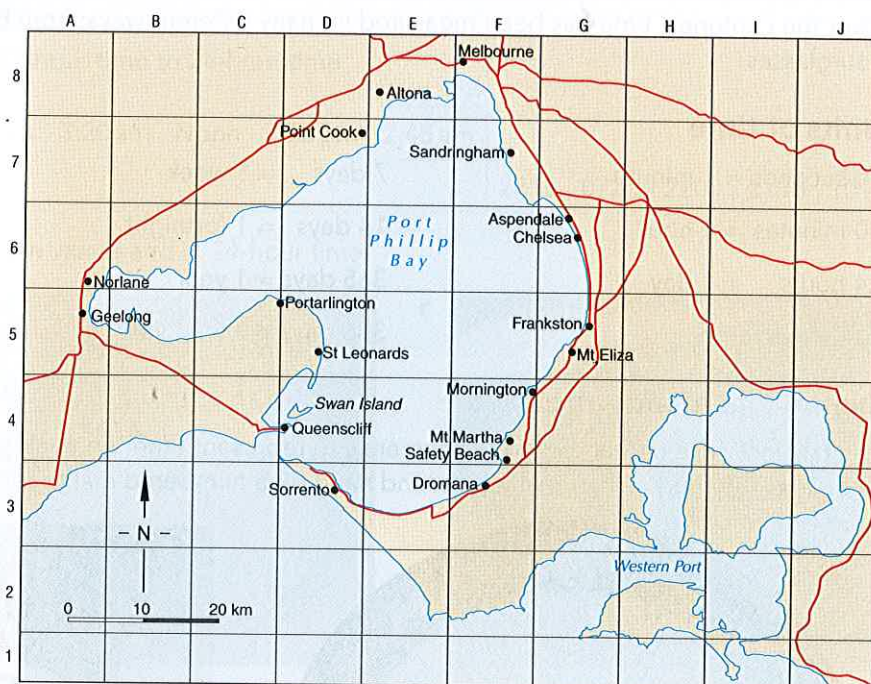
2 What is the map reference for the following locations?

a Chelsea

b Mt Martha

c St Leonards

d Altona



3 Find the approximate distance across Port Phillip Bay at its widest position.

4 Estimate the amount of distance travelled around the bay starting at Sorrento and finishing at Queenscliff.

5 What distance would you travel if you sailed from Frankston to Portarlington?

6 If you travelled clockwise around the bay from Aspendale, what is the next major suburb listed on the map?

KEY SKILL 2

Time

Over the centuries, time has been measured in many different ways: from burning candles to sundials to sand hourglasses.

Units of time

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day

7 days = 1 week

14 days = 1 fortnight

365 days = 1 year

366 days = 1 leap year

10 years = 1 decade

100 years = 1 century

1000 years = 1 millennium

Digital and analogue clocks

Digital clocks use digital displays of numerals to represent time. An analogue clock uses the position of an hour, a minute and, occasionally, a second hand on a numbered dial to represent time.



am and pm

We can use am or pm to describe the time of day. *Ante meridian* (am) means 'before noon' and *post meridian* (pm) means 'after noon'. Noon is 12 o'clock (midday). For example; from midnight until noon, times are referred to as am; for example, 8 o'clock in the morning is 8 am. From noon until midnight, times are referred to as pm; for example, 8 o'clock in the evening is 8 pm.

24-hour time

Many digital clocks or phones can display time in 24-hour time format. The hour numbers are in base 24 instead of base 12, but the minutes are still base 60.

QUESTIONS

- 1 Complete the conversions of 12-hour time to 24-hour time.

12-hour time	Midnight	1 am	3:20 am	Noon	7:25 pm	2:45 am						
24-hour time							2315	0720	2200	2130	1015	

- 2 Write down the following times in words and in 24-hour time.

a



b



c



- 3 Find the length of time between the following.

a 10 am and 5:15 pm =

b 1:30 am and 10:45 am =

c 9:30 pm Friday to 11:00 pm Sunday =

- 4 Find the length of time between the following in terms of minutes.

a 10 am and 5:15 pm =

b 1:30 am and 10:45 am =

c 9:30 pm Friday to 11:00 pm Sunday =

- 5 Complete the following statements with the correct unit of time.

a 2 hours = minutes

b 300 seconds = minutes

c 3 days = hours

d 5 decades = years

e 98 days = weeks

f 2.5 years = months

g 1095 days = years

h 28 days = fortnights

INVESTIGATION 2

Units of time

When you have to find times in certain units, you must convert all of the time units to the unit that has been specified. Once you have converted all the times to the units that you require, simply add the values in correct place values.

QUESTIONS

- 1 The departure and arrival times of a flight from Melbourne to Sydney are shown.

Depart	Melbourne	1125
Arrive	Sydney	1330

- a How many hours and minutes was this flight?

.....

- b Convert the travel time to minutes.

.....

.....

- c Convert the travel time to seconds.

.....

.....

- 2 The time displayed is the time you arrive at the train station. If the next train departs at 1015, how many minutes and seconds until the train departs?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



3 A school camp runs from 4 December at 0600 and arrives back at school on 16 December at 2100.

a How many hours were the students away on camp?

b How many minutes were the students away on camp?

4 The calendar we use is the Gregorian calendar. Investigate the history of the Gregorian calendar and the origins of the names of the months.

5 It is estimated that a person sleeps for 218 150 hours over their lifetime. Is this a reasonable estimate? Support your answer with mathematics.

6 The average moderately active person takes about 7500 steps a day. How far will they walk in their lifetime? Support your answer with mathematics.

KEY SKILL 3

Timetables

When travelling by planes, trains or buses, we need to check a timetable to see the times and possibly the days of a particular service. Timetables normally indicate the departure times and the arrival times, including various stopovers.

A simple way to find out how long a trip takes is to find the difference between the arrival and departure times. You do this by using the skill of subtraction. For example, a train leaves Footscray at 7:20 pm and arrives in Geelong at 8:15 pm. The difference in time is nearly one hour, in fact, 5 minutes short of an hour, so the solution is 55 minutes.



WORKED EXAMPLE

Nobi lives in Kyneton and needs to be in Melbourne for breakfast at 9:30 am. She estimates that it will take her about 30 minutes to reach the café once she arrives in Melbourne.

Castlemaine	Kyneton	Woodend	St Albans	Melbourne
6:28 am	6:50 am	6:59 am	7:41 am	8:06 am
7:07 am	7:30 am	7:38 am	8:17 am	8:40 am
8:10 am	8:31 am	8:40 am	—	9:29 am

a What train should Nobi catch from Kyneton?

b How long is the train trip?

THINK

a What time does he need to arrive in Melbourne?

What is the latest train to get to Melbourne by 9:00 am?

When does the 8.40 am train leave Kyneton?

b The train leaves Kyneton at 7.30 am and arrives in Melbourne at 8.40 am.

WRITE

9:30 am – 30 min = 9:00 am

8:40 am is the latest train to arrive in Melbourne before 9:00 am.

7.30 am

The time taken is 1 hour and 10 minutes.

QUESTIONS

1 The following table shows a selection of flights from Melbourne to Sydney.

Flight	MQ801	MQ803	MQ807	MQ809	MQ811	MQ817	MQ821	MQ825	MQ829	MQ831	MQ833	MQ837	MQ841
Arrives	0720	0735	0805	0820	0835	0905	0935	1005	1035	1105	1135	1235	1335
Departs	0600	0615	0645	0700	0715	0745	0815	0845	0915	0945	1015	1115	1215

a How many flights shown leave Melbourne for Sydney?

.....

.....

b Are the flights all the same duration throughout the day?

.....

.....

c Which flights would you catch to arrive in Sydney by noon but leaving later than the start of a school day?

.....

.....

d What is the earliest flight that leaves Melbourne?

.....

2 Shown below is the ferry timetable from Darling Harbor to Circular Quay.

From	am	am	am	am	am	am	am	pm	pm	pm	pm
Darling Harbour (Aquarium)	7.19	8.13	9.08	9.55	10.47	11.10	11.40	12.10	12.40	1.10	1.40
Pymont Bay	7.22	8.15	9.10	10.00	10.52	11.15	11.45	12.15	12.45	1.15	1.45
Balmain East	7.30	8.22	9.17	10.07	11.00	11.22	11.52	12.22	12.52	1.22	1.52
Balmain	7.38	...	...	...	...	...	...	...	...	...	...
McMahons Point	7.48	8.29	9.24	10.14	11.07	11.29	11.59	12.29	12.59	1.29	1.59
Milsons Point/Luna Park	7.51	8.31	9.26	10.16	11.09	11.31	12.01	12.31	1.01	1.31	2.01
Circular Quay	7.57	8.36	9.31	10.21	11.14	11.36	12.06	12.36	1.06	1.36	2.06

a Find the earliest time that a ship leaves Darling Harbour.

b Find the time differences between the following locations on the first ferry.

i Darling Harbour to Milsons Point

ii Balmain to Circular Quay

c Are the time differences the same throughout the day?

d How many minutes difference is there between the first ferry and the fifth ferry?

e How many minutes difference is there between the second ferry and the seventh ferry?

f What does the symbol '...' in the Balmain row indicate?

INVESTIGATION 3

Using timetables

QUESTIONS

- 1 Below is an example of the ferry timetable from Circular Quay to Darling Harbour in Sydney. As you can see there are many stop-offs along the way.



From	am	am	am	am	am	am	am	am	pm	pm	pm
Departing Circular Quay	6:45	7.50	8:45	9:30	10:15	10:45	11:15	11:45	12:15	12:45	1:15
Milsons Point/Luna Park	6.52	7.56	8.51	9.36	10.21	10.51	11.21	11.51	12.21	12.51	1.21
McMahons Point	6.55	7.58	8.53	9.38	10.23	10.53	11.23	11.53	12.23	12.52	1.23
Balmain	7.05	....	....	....	10.33	....	....	....	....	....	....
Balmain East	7.10	8.05	9:00	9:45	10.38	11:00	11:30	12:00	12:30	1:00	1:30
Darling Harbour (Sydney Aquarium)	7.19	8.13	9.08	9.55	10.47	11.10	11.40	12.10	12.40	1.10	1.40

- a Find the earliest time that the ferry leaves Circular Quay.

- b Find the time differences between the following locations on the last ferry.

- i Milsons Point and Balmain East ii Circular Quay and Darling Harbour.

- c Are the time differences the same throughout the day?

- 2 The following timetable has flights from Cairns to Melbourne.

Departs	Arrives	Flight	Stops	Aircraft
12:40	16:00	MQ648	Non-stop	73G
17:15	20:35	MQ650	Non-stop	73G
20:15	23:35	MQ652	Non-stop	73G
20:35	23:55	MQ653	Non-stop	73G

a What is the duration of the flight?

b What time is the latest arrival at Melbourne?

c If you needed to arrive in Melbourne by 11:30 pm, which flight would you take?

3 The timetable below shows the estimated travel times for a train that stops at all stations between Melbourne and Sydney. Estimate the travel times in minutes of the following trips.

Southern Cross (Melbourne) dep.		8:30
Benalla		10:22
Wangaratta		10:47
Albury		11:47
Culcairn	a	12:19
Henty	a	12:30
The Rock	a	12:51
Wagga Wagga		13:09
Junee		13:52
Cootamundra		14:37
Harden	a	15:13
Yass Junction		16:01
Gunning	a	16:33
Goulburn		17:09
Moss Vale		17:59
Campbelltown	d	19:07
Strathfield	d	19:41
Central (Sydney) arr.		19:55

a Southern Cross to Wangaratta

b Southern Cross to Sydney (Central)

c Wagga Wagga to Sydney (Central)

d Moss Vale to Sydney (Central)

e Harden to Strathfield

f The Rock to Sydney (Central)

PROJECT 1

Puffing Billy

Puffing Billy is a steam train that runs on its original mountain track from Belgrave to Gembrook. It was opened in 1900. A landslide in 1953 closed the track. It was partially re-opened in 1962, and finally completed in 1998.

Puffing Billy timetable: Belgrave to Gembrook and Gembrook to Belgrave

Destination	Time	24-hour time	Destination	Time	24-hour time
Belgrave	11:30 am		Gembrook	2:40 pm	
Menzies Creek	12:03 pm		Cockatoo	3:06 pm	
Emerald	12:18 pm		Lakeside arrive	3:23 pm	
Lakeside arrive	12:33 pm		Lakeside depart	3:45 pm	
Lakeside depart	12:45 pm		Emerald	4:00 pm	
Cockatoo	1:02 pm		Menzies Creek	4:12 pm	
Gembrook	1:30 pm		Belgrave	4:57 pm	

QUESTIONS

- Convert all the times to 24-hour time in the table above.

- What is the total time taken on the journey from Belgrave to Gembrook?

- How does this compare with the return journey from Gembrook to Belgrave? Is there a difference? If so, by how much?

- How long are the stops at Lakeside in both directions?

- How long would you have at Gembrook if you caught the train there and needed to catch the train back?

- 6 Using the photo at right, answer the following questions.
- How many carriages are in the photo?
 - If there were 15 people per carriage, how many people are there in total in the photo?



- 7 The Puffing Billy Great Train Race is a fun run held annually. Runners race *Puffing Billy* from Belgrave to Emerald Lake, which is a distance of 13.2 km.

- If the train travels at 14 km/h, approximately how long does the train take to complete the race?

- The fastest male completed the race in 41 minutes. Work out his average speed in kilometres per minute. (Hint: $\text{Speed} = \frac{\text{distance}}{\text{time}}$.)

- The fastest female completed the race in 49 minutes. Work out her average speed for the distance.

Extension

Research another famous train and find the following facts.

- What is the distance of the line?
- What is the cost of travel on the train?
- Approximately how long does the trip take?
- What is the train's average speed for the journey?
- When did the rail line begin?

KEY SKILL 4

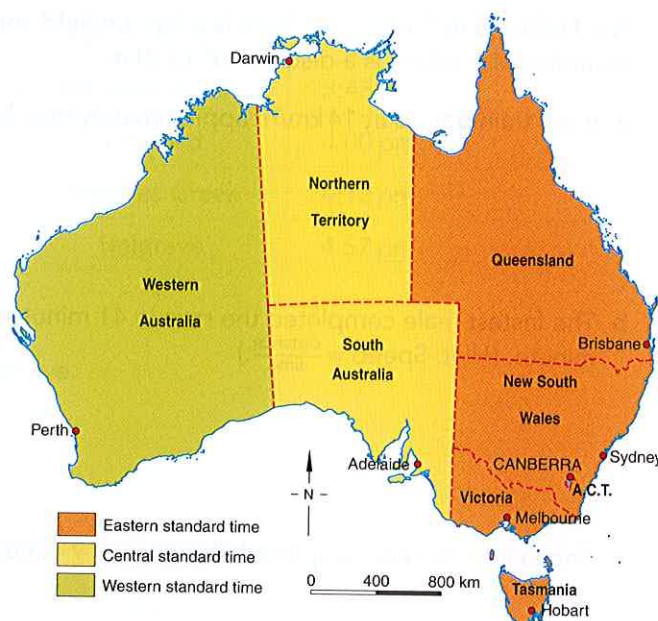
Time zones

Many people in Australia aspire to travel overseas. Some travel to experience other cultures and climates, and some for life-changing experiences. When travelling overseas, you need to be aware of time differences. If you travel in certain directions, you will either lose time or gain time. For example, if you departed Melbourne at midnight 18 April for Bangkok, you would land in Bangkok around 7 am on 18 April (7 hours). However, the flight takes approximately 11 hours — you lost 4 hours due to the time difference. This will be the same for the return flight, except you will add 4 hours to your flight.

Earth is divided into 24 one-hour time zones, and for convenience the boundaries between zones often bend around country or state borders.

Australian time zones

Australian time zones are shown on the map at right. The eastern states are on eastern standard time (EST). South Australia and Northern Territory are on central standard time (CST) and are half an hour behind EST. Western Australia is on western standard time and is 2 hours behind EST. For example, if it is noon in Melbourne, it will be 11:30 am in Adelaide and 10 am in Perth.



Australian time zones

WORKED EXAMPLE

The time in Perth is 2 pm. What are the times in a Adelaide and b Melbourne?

THINK

- a What is the time difference between Perth and Adelaide?

Add 1.5 h.

- b What is the time difference between Perth and Melbourne?

Add 2 h.

WRITE

1.5 h in front

$$2 \text{ pm} + 1.5 \text{ h} = 3:30 \text{ pm}$$

2 h in front

$$2 \text{ pm} + 2 \text{ h} = 4:00 \text{ pm}$$

QUESTIONS

- 1 Complete the table of time differences within Australia.

Western standard time	Central standard time	Eastern standard time
7:00 am		
	5:30 pm	
		1:15 am
	2300	

- 2 Complete the table if it is 8 pm EST in Victoria.

State	New South Wales	Northern Territory	Queensland	South Australia	Tasmania	Western Australia
Time						

- 3 The Indian Pacific is a train line that connects Sydney and Perth. An example of the timetable is shown below.

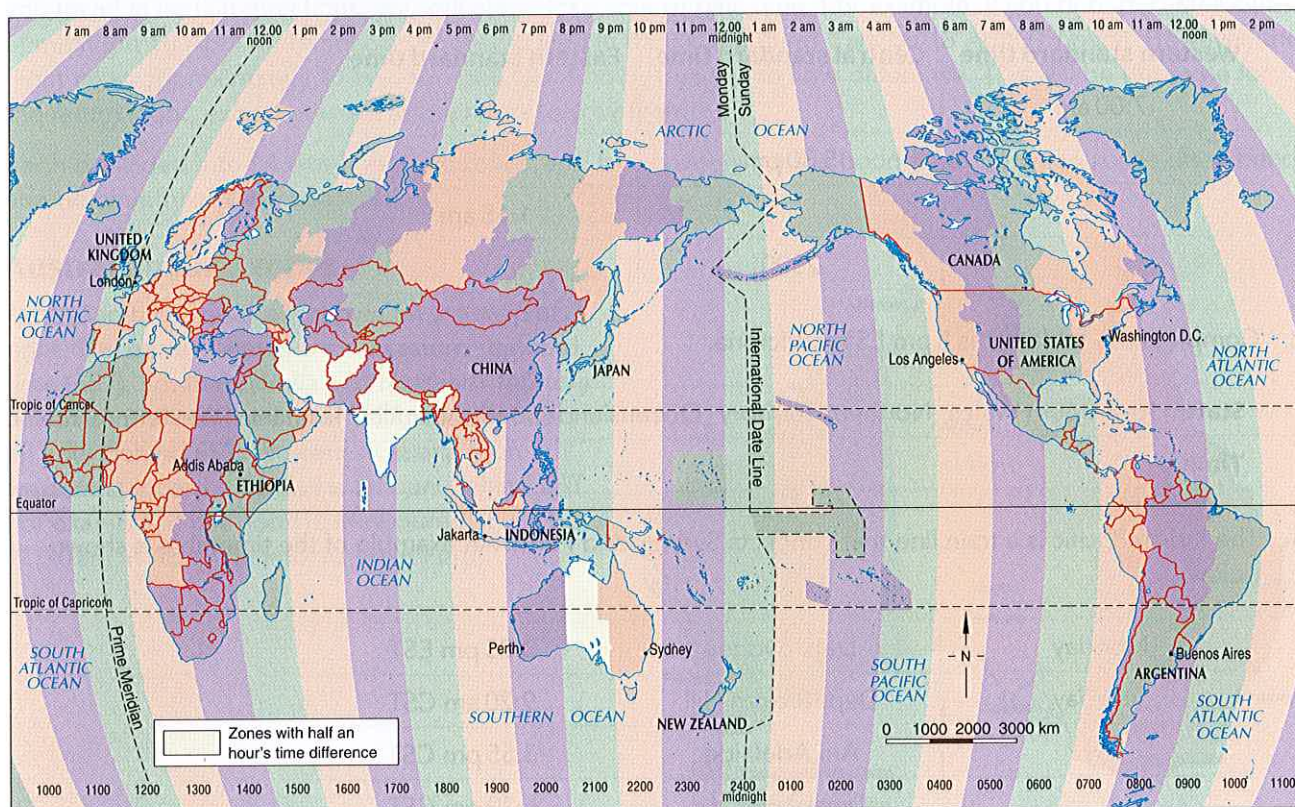
Monday	Dep. Sydney	3:00 pm EST
Tuesday	Dep. Broken Hill	9:20 am CST
	Arr. Adelaide	3:55 pm CST
	Dep. Adelaide	6:30 pm CST
Wednesday	Dep. Kalgoorlie	10:30 pm WST
Thursday	Arr. Perth	9:00 am WST

- a If James phoned his friend Oprah in Perth just as the train was leaving Sydney, what time was it in Perth when he rang?
- b How many hours does it take for the train to travel from Sydney to Perth? (You must also count the time in waiting.) Convert the total time to minutes.
- c The train travels 4352 km from Sydney to Perth. Calculate the average speed of the trip.
(Hint: $\text{Speed} = \frac{\text{distance}}{\text{time}}$.) Give the average speed in both km/h and km/min rounded to 1 decimal place.
- 4 a If Kerrie wants to phone her son in Perth on Friday at 9 pm Perth time, what time does she need to phone from Melbourne?
- b The following week Kerrie was in Sydney. At what time would she need to ring if she wanted to contact her son at the same time as last week?

INVESTIGATION 4

World time zones

By international agreement it was decided that time would be measured from Greenwich, near London. This became known as Greenwich Mean Time (GMT).



World time zones

The International Date Line passes through the Pacific Ocean between Australia and the United States of America. The calendar dates on either side of the line differ by one day. For example, when it is 11:59 pm on Monday in the time zone to the west of the international date line, it will be 11:59 pm on Sunday in the time zone to the east of the international date line.

QUESTIONS

- 1 John lives in Melbourne and phones his sister in London at 7 pm on New Year's Day in Australia. London is 11 hours behind Australian eastern summer time. What is the day and time in London at the time of the call?
- 2 Jayden flies from Melbourne to Auckland (New Zealand), leaving at 0930 EST. New Zealand is 2 hours ahead of EST. If the flight takes 2 hours and 55 minutes, what is the time in Auckland when he arrives?
- 3 Eastern standard time in Australia is 10 hours ahead of GMT. Complete the table at the top of the facing page to show what the times are in each place when it is 0900 EST on Monday. (Hint: Subtract 10 h from EST to get GMT.)

Place	Time compared with GMT	Time when it is 0900 EST on Monday in Melbourne
Athens	GMT + 0200	0100 Monday
Beijing	GMT + 0800	
Delhi	GMT + 0530	
Fiji	GMT + 1200	
Hawaii	GMT - 1000	
Jakarta	GMT + 0700	
New York	GMT - 0500	1800 Sunday
Singapore	GMT + 0800	
Mexico City	GMT - 0600	

- 4 A businesswoman wanted to set up a conference call with people from Jakarta, New York and Perth at 2 pm in Melbourne on Saturday. What time will be the local time for the other people in the meeting?
- 5 Life in the Arctic Circle is affected by extremes in the duration of daylight. Investigate when these extremes occur and the effects they have on living there.



Midnight sun in Alaska

KEY SKILL 5

Travelling by road

TAKE A LOOK BACK AT BOOK 1, PP. 2, 3, 16

Fuel consumption is a major concern when purchasing a car or when travelling in a car. Increasing petrol costs directly affect our bank balance! People are now looking at fuel-efficient cars such as hybrids, which use a combination of fuel and electricity.



To work out fuel consumption, we simply follow this easy formula. It is the number of litres used per 100 kilometres.

$$\text{Fuel consumption} = \frac{\text{number of litres consumed}}{\text{hundreds of kilometers travelled}}$$

WORKED EXAMPLE

Car A uses 50.5 L to travel 425 km and Car B uses 86.6 L to travel 615 km. Which car is more fuel efficient?

THINK

$$\text{Fuel consumption} = \frac{\text{number of litres consumed}}{\text{hundreds of kilometres travelled}}$$

Lowest fuel consumption is best.

WRITE

$$\text{Car A: } \frac{50.5}{4.25} = 11.88 \text{ L/100 km}$$

$$\text{Car B: } \frac{86.6}{6.15} = 14.08 \text{ L/100 km}$$

Car A uses less petrol to travel 100 km.

QUESTIONS

- 1 What is the fuel consumption of a truck that travels 1123 km using 649 litres?

- 2 The size of a car's engine can affect the fuel consumption of the vehicle. (Round answers to 2 decimal places.)

Car	Litres	Hundreds of kilometres	Economy
4-cylinder manual	8.98	1.76	$\frac{8.98}{1.76} = 5.10$
4-cylinder automatic	15.69	2.53	
6-cylinder manual	34.87	3.71	
6-cylinder automatic	21.58	1.98	
8-cylinder manual	12.90	0.97	
8-cylinder automatic	38.86	2.54	

- 3 Which size car engine has the lowest rate of fuel consumption?

- 4 The route from Sydney to Melbourne is about 1000 km. Based on the results of your answers to Question 2, how much extra fuel would you expect to use if you drove an 8-cylinder automatic instead of a 6-cylinder automatic?

- 5 Driving from your house to a holiday house 415 km away, you use 36 litres of petrol. When you tow your family caravan, you use 54 litres. By how much does towing a caravan affect the fuel economy of the car?

INVESTIGATION 5

Cost of road travel

The formula for calculating the number of litres used is:

$$\text{litres used} = \text{fuel consumption (L/100 km)} \times \frac{\text{distance travelled (km)}}{100}$$

A 6-cylinder automatic gets 10.9 L/100 km. The number of litres used when travelling the 32 km to Barwon Heads from Geelong is:

$$10.9 \times \frac{32}{100} = 3.488 \text{ L}$$

To work out the cost of petrol for this short trip, you must multiply the cost of petrol per litre by the number of litres used.

Petrol prices

Type	Cost per litre
Unleaded	\$1.60
Diesel	\$1.75
Autogas	\$0.75

Cost = litres used \times cost of petrol

$$= 3.488 \times 1.60$$

$$= \$5.58$$

For the return trip, double that amount. Therefore, the cost of the trip to Barwon Heads is \$11.16.

QUESTIONS

- 1 If Steve drove from Greensborough to the city (30 kilometres) in a 4-cylinder automatic, work out:
- a the amount of unleaded petrol used (in litres)

- b the cost of the trip.

(Hint: Use the table for fuel consumption on page 21.)

- 2 BJ drove from Torquay to Melbourne (90 kilometres) in an 8-cylinder automatic.

- a How many litres of unleaded petrol did the car consume for the trip?

- b What was the cost of the petrol consumed in driving from Torquay to Melbourne?

- c If BJ returned to Melbourne the same day, work out the total cost of the trip (i.e. Torquay to Melbourne and back again).

- 3 Fill in the table below in terms of litres used for the following trips to 2 decimal places. Show your working out.

Trip	Distance (km)	4-cylinder manual	6-cylinder manual	8-cylinder manual
Melbourne to Sydney	1037	$= \left(\frac{5.1}{100}\right) \times 1037$ $= 52.8 \text{ L}$	$= \left(\frac{9.4}{100}\right) \times 1037$ $= 97.48 \text{ L}$	
Melbourne to Adelaide	921			
Melbourne to Rockhampton	1964			
Melbourne to Karumba	2909			

- 4 Assuming an unleaded-petrol price of \$1.60 per litre, calculate the fuel costs for the above trips.

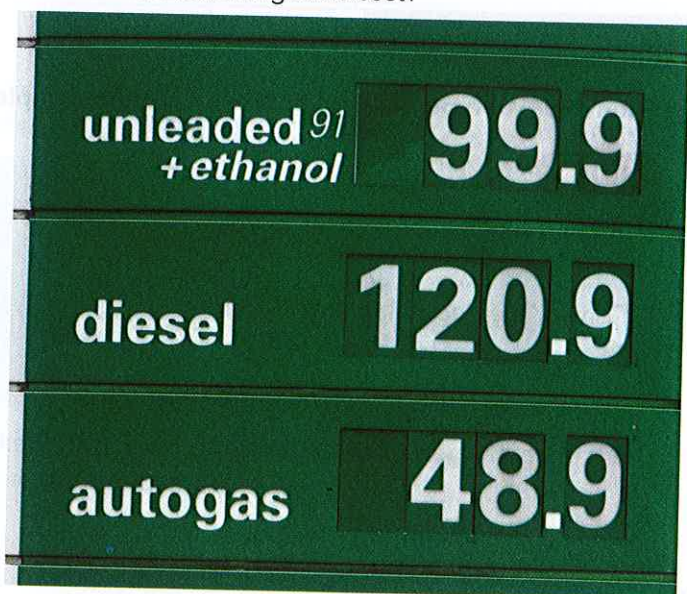
Trip	4-cylinder manual	6-cylinder manual	8-cylinder manual
Melbourne to Sydney	$= 52.8 \text{ L} \times \$1.60/\text{L}$ $= \$84.48$	$= 97.48 \text{ L} \times \$1.60/\text{L}$ $= \$155.97$	
Melbourne to Adelaide			
Melbourne to Rockhampton			
Melbourne to Karumba			

- 5 Referring to the figure below, how much would each fill of the following fuels cost?

a 35 L of premium unleaded

b 40 L of autogas

c 29 L of unleaded diesel



KEY SKILL 6

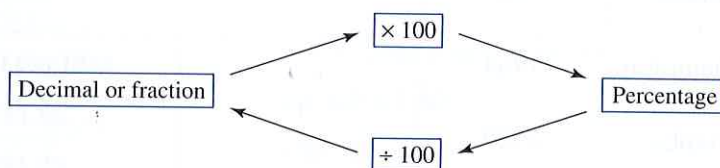
Percentages

TAKE A LOOK BACK AT BOOK 1, PP. 8, 9, 10

In the real world, it is sometimes useful to write fractions with a denominator of 100, relating them to decimals. These fractions are called percentages, and the symbol for percent is %. An easy way to think of percentages is as a number of cents out of a dollar. Percentages express amounts as parts of 100. For example, 35% means '35 parts out of 100 parts' or $\frac{35}{100}$. The line in a fraction is a division symbol. Therefore, $\frac{35}{100} = 35 \div 100 = 0.35$.

Conversions chart

To convert a fraction or decimal to a percentage, we multiply by 100. To convert a percentage into a decimal or fraction, we divide by 100.



The following table shows the conversions of the basic fractions into percentages.

Half	$\frac{1}{2} = 0.5 = 50\%$	Quarters	$\frac{1}{4} = 0.25 = 25\%$
Thirds	$\frac{1}{3} = 0.3 = 33.33\%$		$\frac{2}{4} = 0.50 = 50\%$
	$\frac{2}{3} = 0.6 = 66.67\%$		$\frac{3}{4} = 0.75 = 75\%$
	$\frac{3}{3} = 1 = 100\%$		$\frac{4}{4} = 1 = 100\%$

Percentages always must be equal to 100%. Therefore, if 40% of your trip is spent travelling, the rest of your trip is spent doing other things, which will be 60% of the time. This is called 'complementary percentages'.

WORKED EXAMPLE

a Convert $\frac{3}{5}$ to a percentage.

b Find the complementary percentage.

THINK

a Convert the fraction to a decimal.

Convert the decimal to a percentage.

b Complementary percentage = $100\% - \text{percentage}$

WRITE

$$\frac{3}{5} = 3 \div 5 = 0.6$$

$$0.6 \times 100 = 60\%$$

$$100\% - 60\% = 40\%$$

QUESTIONS

- 1 Brooke spent 23% of her holiday reading.

a Write down this percentage as a decimal.

.....

b What is the complementary percentage?

.....

- 2 Jono drove for 450 km of the entire 600-km trip. Kade drove the rest of the trip.

a What percentage did Jono drive?

.....

b What percentage did Kade drive?

.....

- 3 Complete the table below by using the conversions chart.

Decimal	Percentage	Decimal	Percentage
0.45	45%	0.62	
0.95	95%	0.20	
1.20		0.13	
0.65		0.10	10%
0.40		1	100%

- 4 If a trip from Geelong to Torquay is 32 km and there is a stretch of 20 km without traffic lights, work out the percentage of the distance without traffic lights.

.....

- 5 Peter and Jen drove from Cairns to Port Douglas. The journey was 55 km and Jen drove 40 km of the trip.

a Find the percentage (rounded to 1 decimal place) driven by both people.

.....

b They were passed by 10 vehicles (4 cars, 3 trucks, 2 utes and 1 motorcycle). What percentage of the 10 vehicles was each different type of vehicle that passed their car?

.....

INVESTIGATION 6

Budgets

QUESTIONS

Monique's budget for her 14-day holiday is:

transportation: \$2300
accommodation: \$1200
food: \$700
activities: \$840
incidentals: \$140.

Work out the total amount of money she is prepared to spend.

Work out the percentage of money allocated for accommodation in her budget.

Work out the average amount of money spent on food, activities and incidentals each day.

Adi was planning a trip to the Gold Coast. She had \$2000 to spend on transport. Her options were: flying for \$900, driving her car for \$350, bus for \$250 or renting a car and driving for \$750.

Work out how much money is left over after each option.

Work out the percentage of transport for each option.

- i Flying
- ii Driving her car
- iii Bus
- iv Renting a car and driving

Shard and Gail had \$10 000 to spend on a trip to Bali.

Work out the amount of money spent in each area of their holiday.

- i Accommodation (25%)
- ii Flights (25%)
- ii Entertainment (20%)

How much money was left over? What percentage was left over?



When spending money overseas, your Australian money is converted into the local currency. The exchange rates between currencies continually change as they respond to market forces.

- 4 Why is there a buy rate and a sell rate?

BEST AND FAST		WE BUY (ACQUISTO)	WE SELL (VENDITA)
USA		12953	11132
JAPAN		14453	12328
UNITED KINGDOM		07250	06233
SWITZERLAND		16430	14532
CANADA		15444	13620
AUSTRALIA		17331	15312

- 5 To convert money you multiply the amount of money by the exchange rate.

- a Using the rates shown above, how many Euros does A\$1000 buy?

- b Now convert the Euros back to Australian dollars.

- c What do you notice?

- 6 Use the Oz Forex weblink in your eBookPLUS to investigate the exchange rate between the Australian dollar and the US dollar over the last 5 years. If you had \$2000 Australian dollars:

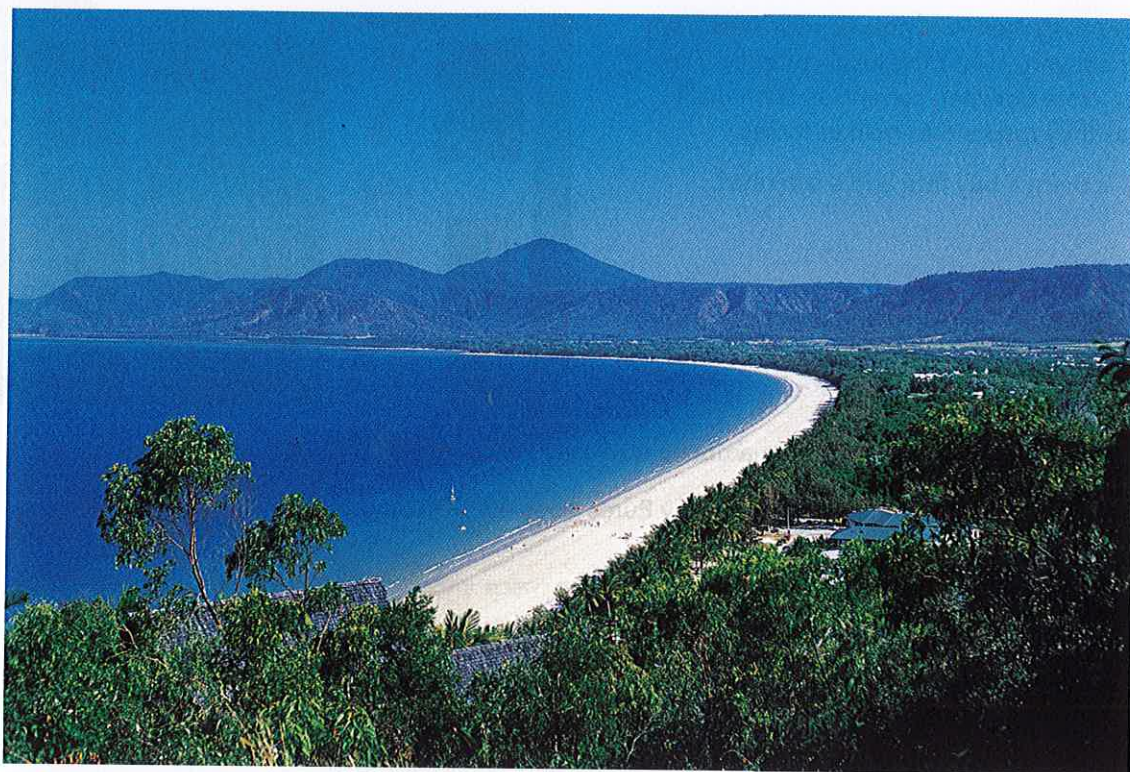
- a when was the best time to have exchanged your money? How many US\$ would you have received?

- b when was the worst time to have exchanged your money? How many US\$ would you have received?

- c what was the difference between the best and worst exchange rates?

PROJECT 2

Port Douglas



You will have to create a budget that does not go over \$3500 for all travel costs and you must show where the money went. In order to do this, you will need to research what everything costs. Your trip will be for 2 weeks.

To help you organise, break your budget down into the following areas:

- *transportation* — getting there and back again and while at Port Douglas
- *food* — what type of food and a daily allowance
- *accommodation* — you can select from three different types of accommodation
- *activities* — what you are going to do and what attractions you may see.

Organisation and creativity

You will learn to balance your wants and needs according to your means. For example, sometimes you can afford a day in a luxury spa if you plan to spend the next two days on the beach with your own homemade sandwiches.

Transportation

Use the Hertz Car Rental, Flight Centre and Queensland Tourism weblinks in your eBookPLUS to find out the costs associated with your trip. Find out what choices exist and how much each costs. You will need to record the destination, price of petrol and car insurance if you are renting a car. You must be able to explain your daily expenses for transportation.

Food

You will need to create a realistic budget for your daily food allowance and your lodging. You must be able to explain and validate your daily expenses for food. There are three ways you can eat:

- high roller — eats out for all meals at exclusive restaurants. \$250 per day.
- middle class — eats out for all meals but at affordable restaurants and cafés. \$80 per day.
- backpacker — prepares all meals, food bought from supermarket. \$40 per day.

Accommodation

You will need to explore accommodation prices at your destination. Your options are:

- camping — at a caravan park only (not in your car)
- backpackers — low range
- hotel/motel — middle range
- five-star hotel — high class.

Activities

You need to find out what there is to do, and what it all might cost. Do your best to find exciting activities. Remember, not everything has to be expensive — walking along the beach is free. You must be able to explain your daily expenses for activities.

Outcome

You must be able to coordinate and display the results of the budget, either using Excel or by hand, with the responsibility of showing how you spent the money. You can do this in a format of diary entries or a group of data.

Check to make sure you have included money in your budget for incidentals (suntan lotion, water, snacks) and prices that may have gone up slightly.

Analysis

Did you spend all of the money? Where did it go and how was it spent? Work out what percentage of your money went to each section (travel, accommodation, food and activities). An example of the percentage cost is:

$$\frac{\text{cost of all your travel expenses}}{\text{total cost of the holiday}} \times 100$$