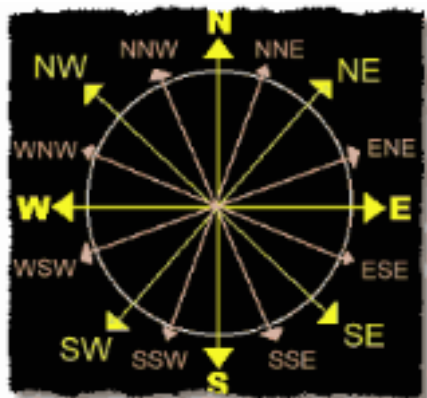


Goals

Goals for this fortnight:

- compare the time taken to travel a specific distance with various modes of transport
- use scales to find distances, such as on maps; for example, road maps, street maps, bushwalking maps, online maps and cadastral maps
- identify the appropriate units for different activities, such as walking, running, swimming and flying
- calculate speed, distance or time using the formula $speed = \frac{distance}{time}$
- interpret distance-versus-time graphs
- calculate and interpret average speed; for example, a 4-hour trip covering 250 km



Theoretical Components

STEP 1

Resources:

PDF file: Week 13 and 14 Notes and Exercises

This Fortnight:

We will be learning:

- Distance, speed and time
- Compass directions
- Street directories and other scale maps
 - Positions
 - Symbols
 - Direction
 - Distances
- Mud maps and touring maps

Practical Components

STEP 2

Read through Week 13 and 14 Notes and Exercises for instructions on what to do.

There are 8 Exercises in this booklet. Read any worked examples before you begin.

Remember to regularly check Google Classroom for messages.

Portfolio Task

STEP 3

Complete the task at the end of the brief and submit your weekly work. 😊

Other

Remember to check Google Classroom or hawkermaths.com for each week's learning brief



ESSENTIAL MATHEMATICS 2

WEEK 13 AND 14 – MAPS

How are we ever going to use this?

- Planning holidays
- Travelling in unfamiliar locations
- Finding an alternate route to avoid traffic problems

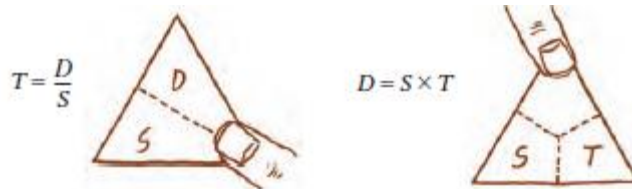
DISTANCE, SPEED AND TIME

When you need to solve problems involving *distance* (D), *speed* (S) and *time* (T), you'll find this road sign will help you remember how to do the calculations. Always put the letters D , S , T in the road sign in alphabetical order.



To calculate speed, cover S with a finger. This leaves $\frac{D}{T}$. This means $S = \frac{D}{T}$.

In the same way, these formulas can be found.



Example:

Alex is hiking at 5 km/h. How far will he hike in 3 hours?

Solution:

Check the units first. The speed is in km/h and the time is in hours. The units are correct.

The question gives the information $S = 5$ and $T = 3$. It asks for the value of D . To work out the formula, cover D on the road sign. S and T are together, so the formula is:

$$D = S \times T$$

$$D = 5 \times 3$$

$$D = 15 \text{ km}$$

Alex will hike 15 km.

Example:

Erin is paddling her canoe at an average speed of 8 km/h. How long will it take her to paddle 20 km?

Solution:

First check the units. The speed is in km/h and the distance is in kilometres. The time will be in hours. In the question, $S = 8$, $D = 20$ and the value of T is required. Cover the T in the road sign and you can see.

The formula is $T = \frac{D}{S}$

$$T = \frac{20}{8} \quad T = 2.5 \text{ hours or } 2 \text{ hours } 30 \text{ minutes}$$

Exercise 1

1.

a. Use the formula $D = S \times T$ to find the value of D when $S = 50$ and $T = 2$.

b. In the formula $S = \frac{D}{T}$, what is the value of S when $D = 48$ and $T = 3$?

2. Chantal walks at a pace of 5 km/h. How far can she walk in:

a. 6 hours?

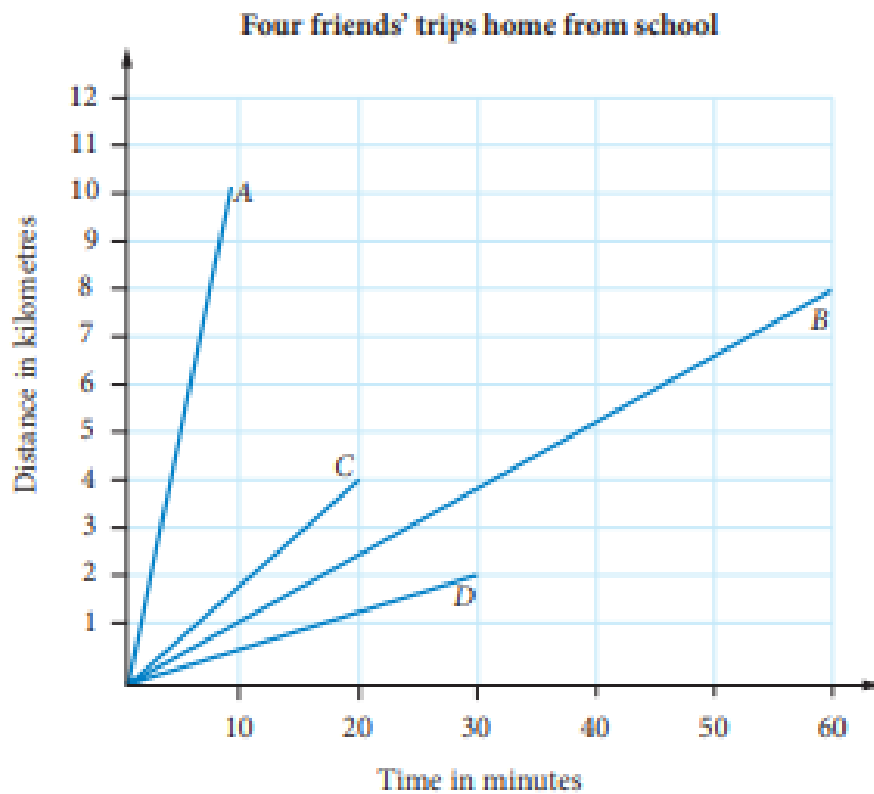
b. $\frac{1}{2}$ hour?

3. Calculate the speed of these trips in km/h.
 - a. Santo walks 12 km in 3 hours.
 - b. Rina rides her bike for 4 hours and she travels 64 km.
 - c. Chris drives his truck 200 km in 5 hours.
4. Kristina flies her light plane 650 km from Brisbane to Rockhampton at an average speed of 200 km/h. How long does the flight take?
5. At 11:45 am Thurza put her canoe in the river at Fitzroy Bridge. She paddled her canoe at 2 km/h up Moores Creek to Juds Park, which is a distance of 5.6 km. At what time did she arrive at Juds Park?

6. The graph shows Luke, Peta, Shelby and Wayne's trip home from school each afternoon. Use the clues to determine which person matches with the graphs A, B, C and D. Use the table below the graph to record your answer.

Clues:

- Shelby walks home at a speed of 4 km/h.
- Wayne rides home at an average speed of 12 km/h.
- Peta travels on the slow bus. With all the stops, the bus only averages 8 km/h.
- Luke drives home at an average speed of 60km/h.



| Graph | Who it is | How far their home is from school |
|-------|-----------|-----------------------------------|
| A | | |
| B | | |
| C | | |
| D | | |

COMPASS DIRECTIONS

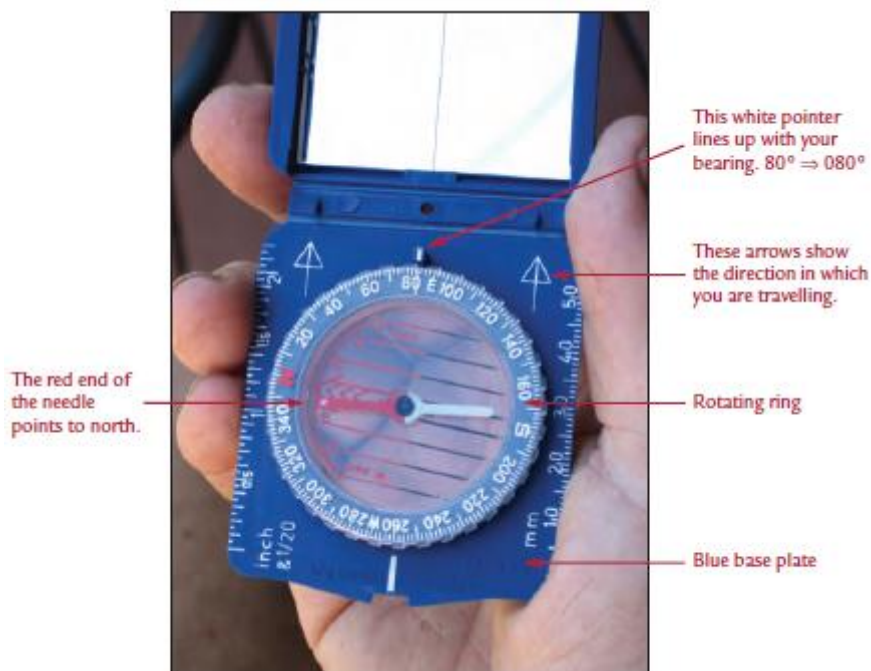
The four major directions of a compass are north (N), south (S), east (E) and west (W). North is usually at the top. Four other major points on a compass lie exactly halfway between these directions.



- North-east (NE) is halfway between north and east.
- South-east (SE) is halfway between south and east.
- South-west (SW) is halfway between south and west.
- North-west (NW) is halfway between north and west.

Including compass directions on a map can make the map easier to follow. Magnetic compass directions give more accurate directions.

There is a wide range of commercially available compasses and they have several features in common: a needle that points to north and an indication of other directions. This photograph shows a modern compass.



Measuring a direction

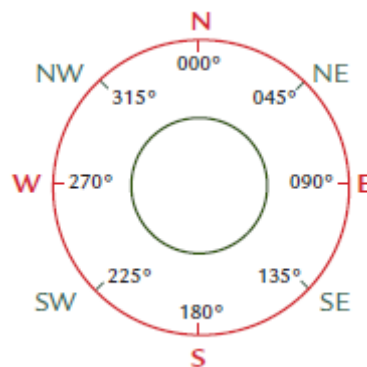
Follow these simple steps to find the direction in which you are travelling.

Step 1: Hold the compass in front of you with the arrows on the base plate pointing to the direction in which you are travelling. You must have the arrows pointing straight in front of you. If you don't, the direction will be wrong.

Step 2: Move the rotating ring until the red arrow on the base plate is directly under the red end of the needle.

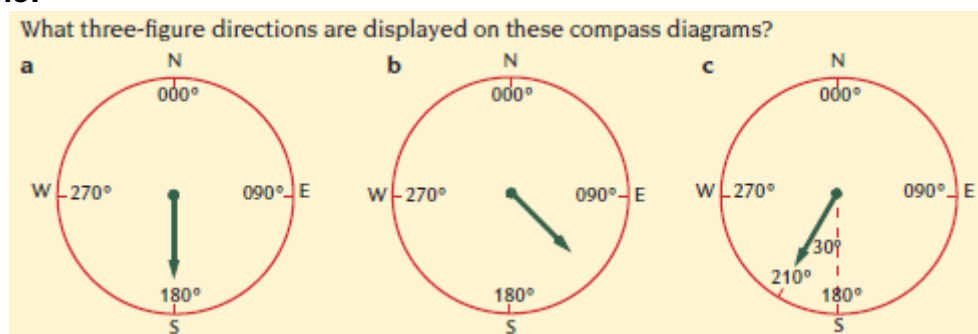
Step 3: Look at the white pointer at the top of the compass. This will be lined up with the bearing of the direction in which you are travelling. In the photograph, the person holding the compass is walking on a bearing of 080°.

Modern compasses have numbers from 0° to 360° around the outside. These numbers are used to specify direction. North is zero degrees and the degrees go around the compass in a clockwise direction.



To avoid any confusion or misunderstanding three digits are always used for direction. Although the direction east is at 90°, in navigation it is referred to as the direction 090°. This diagram shows some directions and their bearings.

Example:



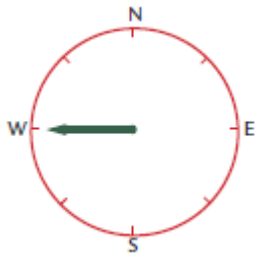
Solution:

- a** Direction is south or 180°. **b** South-east is 135°. **c** Direction is 210°.

Exercise 2

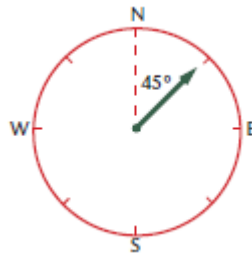
1. Write the directions shown in these diagrams in two different ways (major bearings and as three-figure bearings).

a.

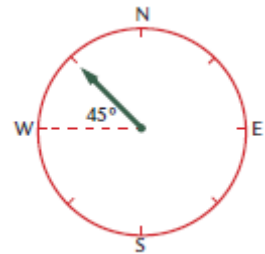


West
270°

b.

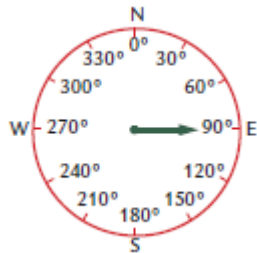


c.

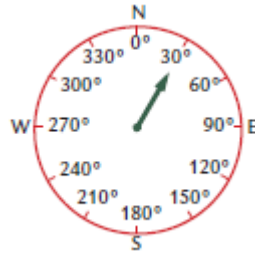


2. Write these directions as three-figure bearings.

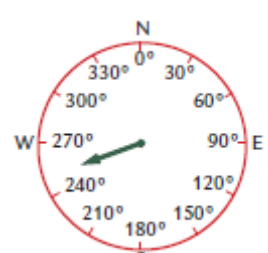
a.



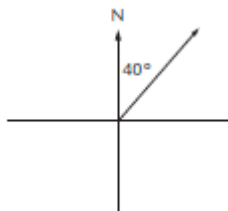
b.



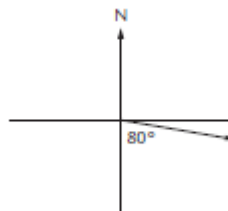
c.



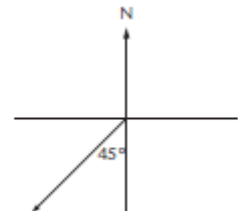
d.



e.

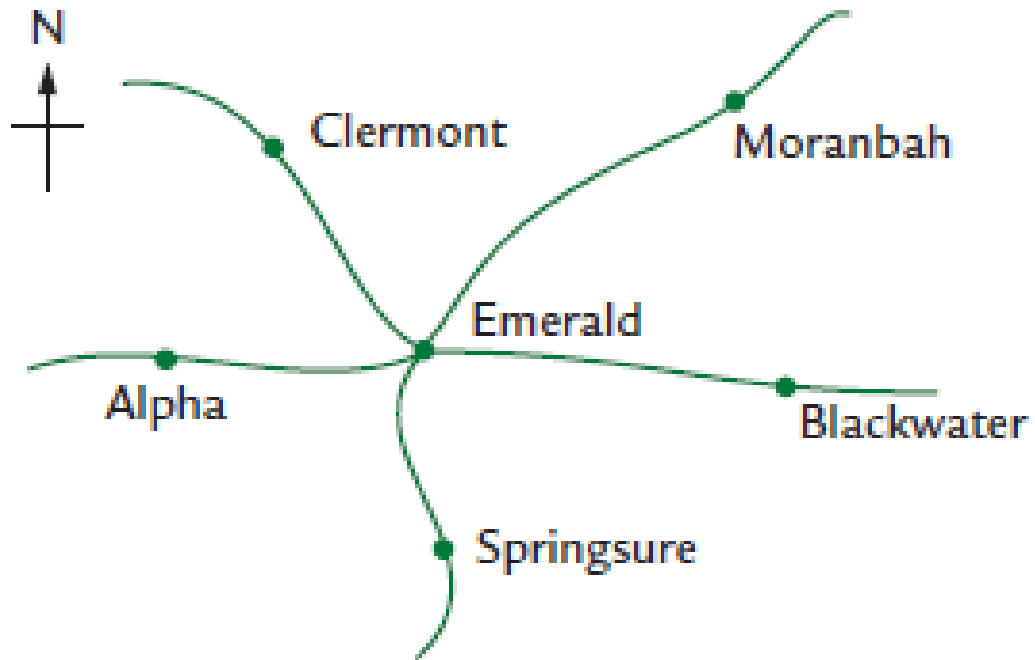


f.



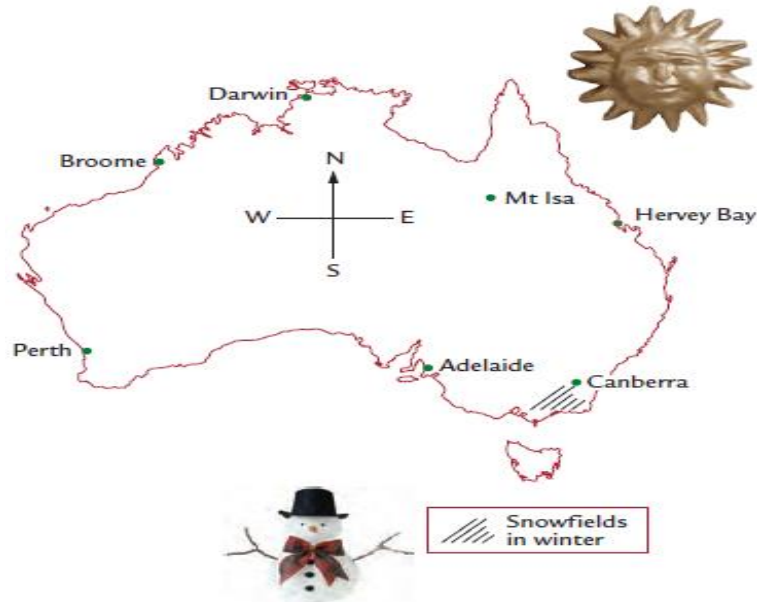
3. The arrow on a wind vane always points to the direction the wind is coming from. When a weather forecast predicts a 'southerly wind', it means a wind that comes from the south.

A westerly wind is bringing smoke from a bushfire to Emerald.



- a. Near which town on this map could the bushfire be?
- b. If the wind keeps blowing in the same direction, which other town will have smoke blown into it?

4. Winds from over the ocean carry moisture and are likely to bring rain. Winds from overland are likely to be dry. The temperature of the land over which a wind has blown will determine whether the wind will be warm or cold. In winter, winds from over the snowfields will be cold while summer winds from over the centre of Australia are likely to be dry and hot.



Are the following winds likely to be hot or cold and bring rain or dry weather?

- | | |
|--|---|
| a. A westerly wind in Mt Isa in February | b. A westerly wind in Perth |
| hot and dry | |
| c. A north-easterly wind in Hervey Bay in June | d. A southerly wind in Canberra in winter |
| e. A north-westerly wind in Broome in May | f. A southerly wind in Darwin in December |
| g. A south-westerly wind in Adelaide in winter | |

STREET DIRECTORIES

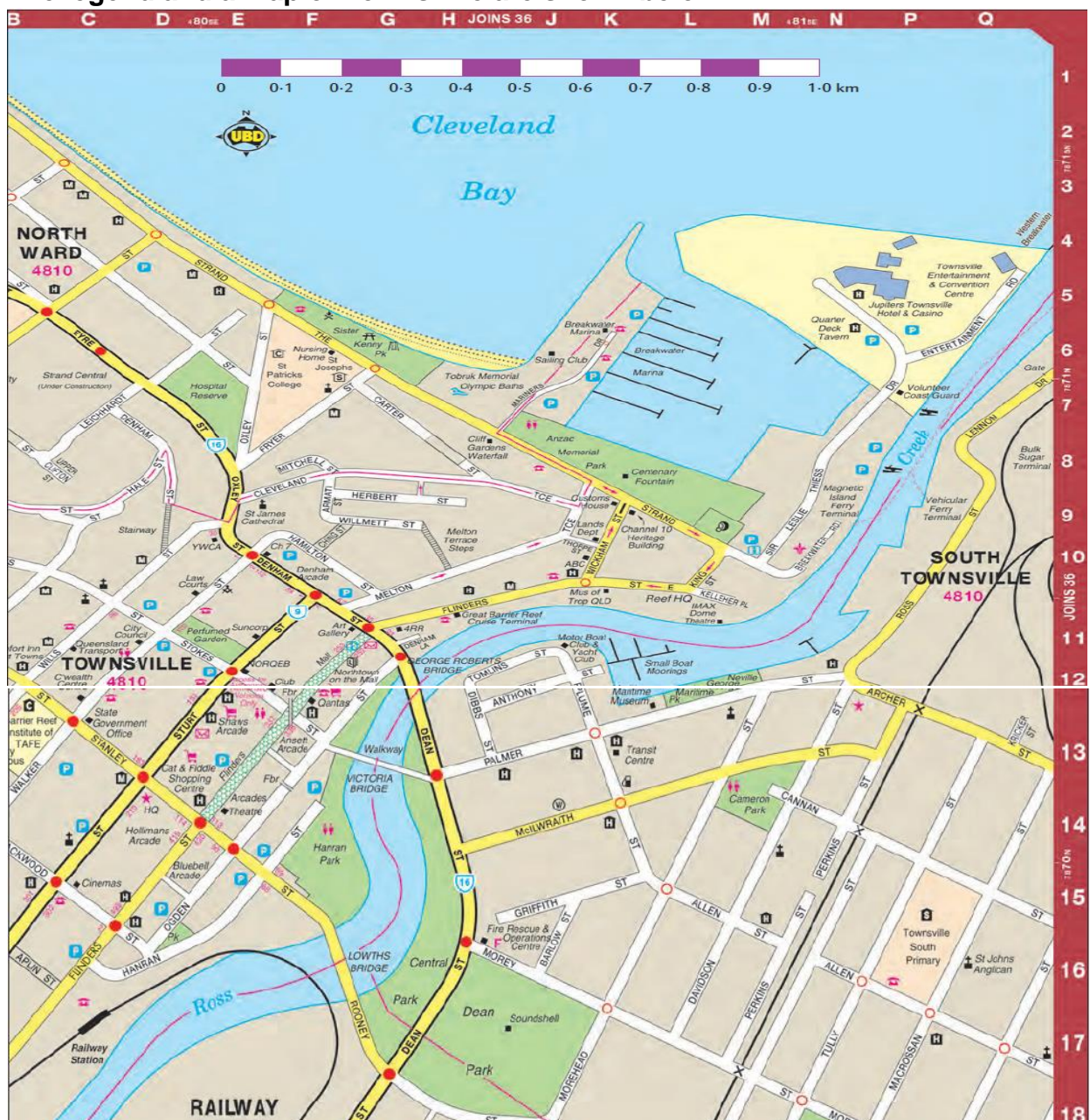
Locating positions on a street map

Street maps use letters and numbers to locate positions. Letters are across the top and numbers are down the side.

Symbols used in a street directory

A lot of local information is provided in street directories. Roundabouts, traffic lights, railways stations, train lines, one-way streets, street numbers, police stations and post offices are just a few of the features included on the maps. To assist map users, the meaning of abbreviations and symbols used in the street directory can be found in the legend.

The legend and a map of Townsville are shown below.

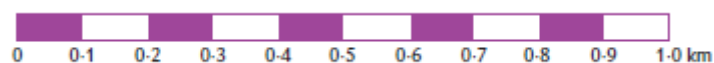


Map Symbols

| | | | |
|------------------|--|--|---------------------------------|
| |Highway or Main Traffic Route | | Accommodation |
| |Alternative Traffic Route | | Ambulance Station |
| |Trafficable Road | | Barbecue |
| |Un-trafficable Road | | Boat Ramp |
| |Traffic Light and Red Light Camera | | Bowling Club/Green |
| |Roundabout and Level Crossing | | Bush Fire Brigade |
| |Road and Railway Bridges | | Camping Area |
| |One-way Traffic Route | | Caravan Park |
| |National and State Route Numbers | | Car Park |
| |Railway Line with Station | | College – Private |
| TOOWOOMBA |Suburb Name | | College – State |
| 4580 |Postcode Number | | Court House |
| |Suburb Boundary | | Fire Station |
| Winton |Local Government Name | | Golf Course |
| |Local Government Boundary | | Guides |
| |Ferry Route | | Hall |
| |Walking Track, Equestrian Trail, Cycleway | | Hospital |
| |Park, Reserve, Golf Course, etc | | Hotel |
| |School or Hospital | | Information Centre |
| |Caravan Park, Cemetery, Shops, etc | | Information Centre (accredited) |
| |Mall, Plaza | | Library |
| | | | Lighthouse |
| | | | Lookout – 360° view |
| | | | Lookout – 180° view |
| | | | Masonic Centre |
| | | | Monument |
| | | | Motel |
| | | | Picnic Area |
| | | | Place of Interest |
| | | | Place of Worship |
| | | | Pol. & Comm. Youth Club |
| | | | Police Station |
| | | | Post Office / Express Post |
| | | | School – Private |
| | | | School – State |
| | | | Scouts |
| | | | Service Station |
| | | | Shopping Centre |
| | | | State Emerg. Service |
| | | | Swimming Pool |
| | | | Telephone |
| | | | Toilets |

Distances on a street map


Maps in a street directory can have different scales. The Townsville map has a scale where 10 cm represents 1 km, or 1 cm represents 100 m. This scale can be shown as:




Exercise 3

1. Use the legend to find the meaning of these symbols.

a. 

b. 

c. 

d. 

Use the Townsville map (p.12) to answer the following questions in this set.

2. What features are at the following locations on the Townsville map?

a. K6

b. E12

3. Give the grid references for these places.

a. The roundabout where Fryer Street and The Strand meet.

b. Townsville South Primary School.

4. How many sets of traffic lights are shown on Sturt Street?

5. What is the significance of the red line going up the middle of Ross Creek?

6. In what suburb is the vehicular ferry terminal at P9?

Exercise 4

Use the Townsville map (p.12) to answer the following questions in this set.

1. Bill drives his car along Oxley Street from E8 to the intersection of Oxley Street and The Strand (E5). In which compass direction is he driving?

2. Julie is driving north-west along The Strand at J8. Where might she be going?

3. A fishing charter boat is travelling along Ross Creek from the small boat moorings at K12 towards the Western Breakwater at Q4. In what direction is the boat travelling?

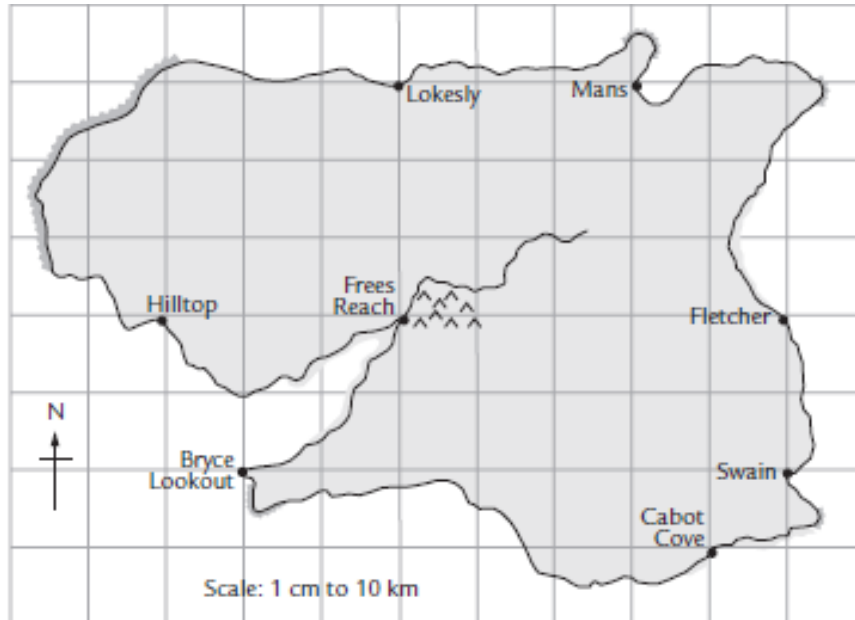
4. In what direction, as the crow flies, is it from St James Cathedral (E9) to the following locations?
 - a. St Patricks College (E6)
 - b. Arcades Theatre (E14)
 - c. George Roberts Bridge (H12)
 - d. Perfumed Garden (E11)

5. Sanjay is riding his bike along The Strand from the Channel 10 Heritage Building to the Cliff Gardens Waterfall. In what direction is he riding?

6. Katrina works at Customs House (K9). She is going to meet a friend for lunch. Katrina walks south-east along *The Strand* and turns left into the first street on the left. She walks to the Y-intersection and follows the left section of the Y. She is meeting her friend at a hotel on the left. What is the name of the hotel?

Exercise 6

This map shows a large island with towns on its shore. A scale of 1 cm represents 10 km has been used.



- Use the scale to determine the true distance between:
 - Hilltop and Swain
 - Lokesly and Mans
 - Frees Reach and Mans
 - Bryce Lookout and Fletcher
- Tim left Cabot Cove and drove north-east for 14 km. He then drove 20 km due north to reach his girlfriend's house. Where does his girlfriend live?
- When Jason went hot-air ballooning, his balloon became caught in a windstorm. The balloon blew 42 km south-west from Lokesly, then changed direction and blew 30 km east, then 45 km south-east, where he was able to land. Near which town did he land?

MUD MAPS

A rough, free-hand drawing that shows approximately where places are is called a **mud map**.

A mud map is a sketch or drawing of where places are. You should put in places of interest, relevant landmarks and approximate distances.

Example:

Jane lives in Felicity Road, Gympie. This is the mud map she drew to help friends find her house.

Jane wrote these instructions.

- Turn off the Bruce Highway at the lights at Monkland Street and River Terrace.
- Follow the road for 1.6 km across the Kidd Bridge until Gympie South State School is on the right and Gympie Race Course is on the left.
- Turn right into Glastonbury Road and drive 5.6 km until you get to Jimbour Road on the right.
- Turn right into Jimbour Road and go 2.6 km until you get to Felicity Road on the left.
- Turn left into Felicity Road. My house is at the end on the left-hand side.

Exercise 7

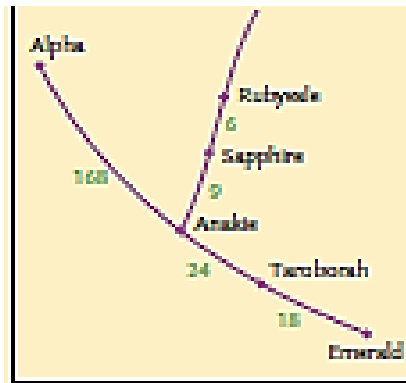
Draw a Mud Map of your travel route from home to Hawker College. Make sure you include approximate distances and the names of all relevant roads/streets/items of interest that would help someone with the directions if they did not know the way (as per the example).

TOURING MAPS

Touring maps show the distance between places, but like the mud map are not necessarily drawn to scale. Australia is a vast, open country and distances between neighbouring towns can be huge. Distances between locations can be calculated from the information shown on touring maps.

Example:

Josephine is in Emerald and plans to travel from Emerald to Rubyvale to go sapphire prospecting. How far is it by road?

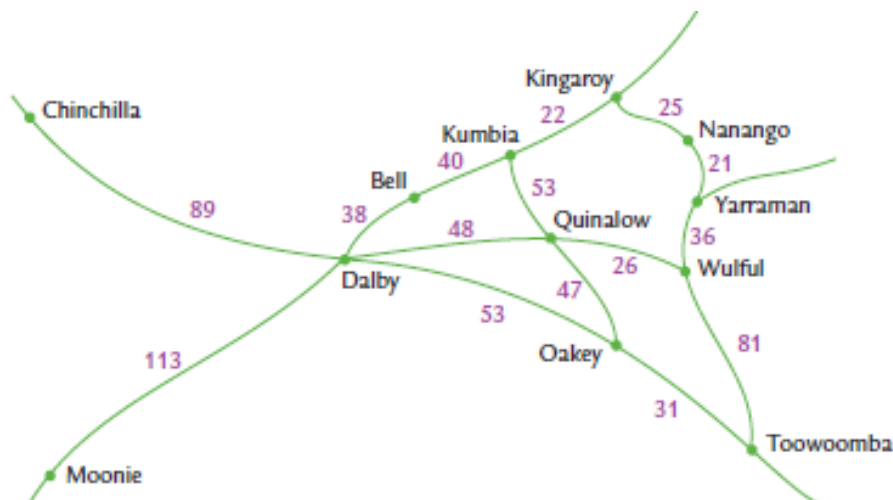


Solution:

Josephine must travel through Taroborah, Anakie and Sapphire.
To work out the distance, add all the distances between the towns.
Distance = $18 + 24 + 9 + 6$ km
= 57 km
It is 57 km from Emerald to Rubyvale.

Exercise 8

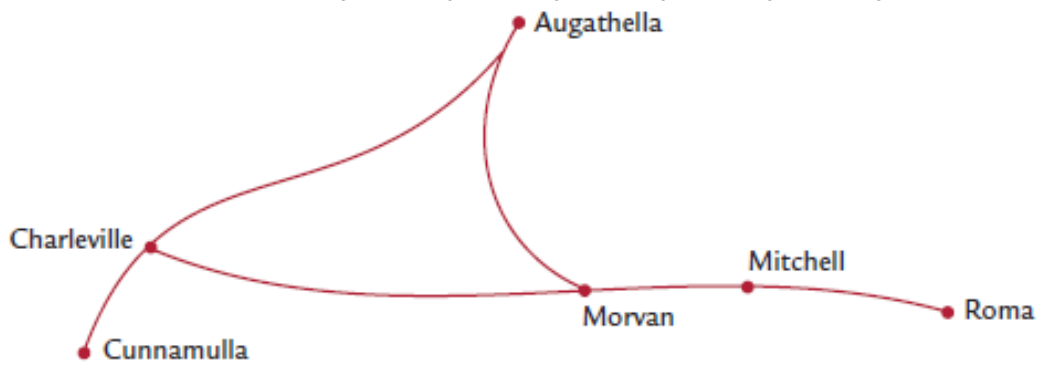
Use this touring map to answer questions 1 to 7. All distances are in kilometres.



1. How far is it from Kingaroy to Wulful?
2. Calculate the distance from Oakley to Kumbia.
3. How much further is it to travel from Dalby to Wulful via Toowoomba than via Quinalow?
4. Keith takes 2 hours to ride his bike from Kumbia to Dalby. Use the formula $speed = \frac{distance\ travelled}{time\ taken}$ to calculate his average speed.
5. How long will it take to travel from Chinchilla to Dalby at an average speed of 71 km/h?
6. Before Lois left Kingaroy to travel to Toowoomba she set her car's trip meter to zero. Between which two places was she when the trip meter showed she had travelled 68 km?
7. When Anna left Moonie her car's odometer showed 062 453. What was the reading when she arrived at Chinchilla?

8. The table below shows some of the distances between Augathella, Charleville, Cunnamulla, Mitchell, Morvan and Roma. The mud map shows the relative positions of the towns.

| | Augathella | Charleville | Cunnamulla | Mitchell | Morvan | Roma |
|-------------|------------|-------------|------------|----------|--------|------|
| Augathella | 0 | 85 | | | 93 | |
| Charleville | 85 | 0 | 197 | | 90 | 268 |
| Cunnamulla | | 197 | 0 | | | |
| Mitchell | | | | 0 | | 87 |
| Morvan | 93 | 90 | | | 0 | 178 |
| Roma | | 268 | | 87 | 178 | 0 |



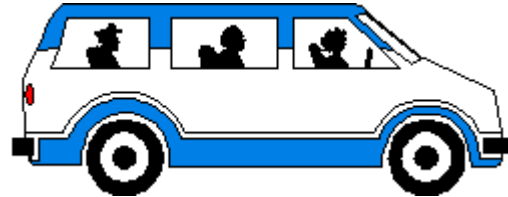
- Use the distances in the table to write the distances between locations on the mud map.
- Complete the missing values in the table.

Week 13/14 Portfolio Task

A group of 10 students are on a field trip to Tidbinbilla when their bus breaks down 50 kilometres away from Hawker College.

A teacher takes 5 of them back to school in her car, travelling at an average speed of 50 kilometres per hour.

The other 5 students start walking towards school at a steady 5 kilometres per hour.



The teacher drops the 5 at school, then immediately turns around and comes back for the others, again travelling at a steady speed of 50 kilometres per hour.

How far have the students walked by the time the car reaches them?

MARKING RUBRIC

| CRITERIA | EXPECTATIONS | POSS | MULT | GIVEN | TOTAL |
|-------------------------------------|---|--------------|------|-------|------------|
| | | | | | |
| Practical | Student completes practical work, including exercises of the brief to an acceptable standard set by the teacher. | 2 | 3 | | /6 |
| Portfolio Task | Student completes the portfolio task of the week to an acceptable standard set by the teacher. | 2 | 2 | | /4 |
| | | | | | |
| Reasoning and Communications | Student responses are accurate and appropriate in presentation of mathematical ideas, with clear and logical working out shown. | 4 | - | | /4 |
| Concepts and Techniques | Student submitted work selects and applies appropriate mathematical modelling and problem solving techniques to solve practical problems, and demonstrates proficiency in the use of mathematical facts, techniques and formulae | 4 | - | | /4 |
| | Submission Guidelines | | | | |
| Timeliness | Student submits the exercises and portfolio tasks by the set deadline. See scoring guidelines for specific details. | 2 | - | | /2 |
| | | FINAL | | | /20 |

Student Reflection: 😊

How did you go with this week's work?

What was interesting?

What did you find easy?

What do you need to work on?