

VCE VM Numeracy Unit 2

Chapter 6 — Numeracy in context

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Theory

What personal numeracy is. Personal numeracy is the mathematics of your own life: the numbers that reach you through a newspaper, a phone app, a timetable, a map, a bill or an event plan, and the decisions you make with them. In the study design (Unit 2, Outcome 1), it means understanding, using and making sense of numbers and maths information that comes in many forms — on paper, on screens, on signs — so that you can get your own jobs done, in situations that are familiar or routine, and in some that are less familiar.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-08.

Where you meet it. The study design gives examples of everyday situations (Unit 2, Outcome 1). Here are the same kinds of situations in this book's words:

- getting around — driving, staying safe on the road, trips to school or work, holidays and family visits
- planning your time — making a timetable for your day, and changing the plan when something changes
- maps, location diagrams and GPS — on paper and on a phone
- giving and following directions — for a tour, a visit or an excursion
- numbers about your own life, in print and on screens — a chart in the local paper, a weekly report from an app on your phone
- planning family and community events — head counts, food, drinks, costs and the programme for the day

None of this is new mathematics. It is the maths of earlier chapters of this book — the problem-solving cycle (§1A), maps and compass directions (§2B), giving and following directions (§2C), tables and graphs (§3B), mean and range (§3C), planning and scheduling (§5C), and timetables and planners (§5D) — pointed at your own week. Every task in this section runs through the four-stage problem-solving cycle.

The problem-solving cycle, at home. Personal jobs never arrive with “use subtraction” written on them, so you run each one through the cycle from §1A: identify the mathematics, act on it, evaluate and reflect, then communicate your answer. Here is the cycle on a very small job.

Stage	Working
1 Identify the mathematics	Your train home leaves at 18:15 and the trip takes 40 minutes. “What time do I get home?” is a time-addition job.
2 Act on and use mathematics	Count on 40 min from 18:15: you get home at 18:55.
3 Evaluate and reflect	Check back: 40 min before 18:55 is 18:15 — the train you caught ✓.
4 Communicate and report	“I get home at 18:55 — that is, 6:55 pm.”

From here on, every example and question in this section is worked through these same four stages. In the scaffolded examples the stages are labelled for you.

Refresher: time and the 24-hour clock. A **duration** is the gap between two times. Add or subtract the minutes first, and carry 60 minutes over into 1 hour when you need to. In **24-hour time** the afternoon and evening keep counting past 12, so 3:45 pm is written 15:45. Remember 1 h = 60 min, so 2 h = 120 min.

Change	Result
09:40 plus 35 min	10:15
14:05 minus 50 min	13:15
3:45 pm in 24-hour time	15:45

Timetables. A **timetable** is a table of times: one row per service, with the time it leaves and the time it arrives. Read across a row to follow one service; read down a column to compare services. The Bus 12 timetable in Example 1

below is the pattern: every service takes the same 25 minutes, so the arrivals column is the departures column plus 25 minutes — the 07:05 service arrives at 07:30. A timetable is also what you reorganise your day around: miss a service, and the next row down is your new plan (Q8).

Personal data in print and digital media. The local paper and the apps on your phone both hand you numbers already drawn: bar charts, line graphs, and claims such as “average” or “target”. Read the axis label and the unit first — litres, hours, dollars — then read the bars or points against it. A chart makes three questions easy: what one day (one bar) shows, what the **mean** of the whole set is, and how spread out the set is, which the **range** answers. This book sticks to the mean and the range (§3C) for every data set in this section.

Refresher: mean and range. The **mean** is the total shared out equally; the **range** is the biggest value minus the smallest. For the data 4, 6, 5, 7, 3: the total is 25, the mean is $25 \div 5 = 5$, and the range is $7 - 3 = 4$.

Travel: driving, road safety and holidays. Travel questions join three numbers — distance, speed and time — and knowing any two of them gives you the third. Road safety lives in the same maths: a long drive is not only driving time, because sensible drivers stop for rest breaks, and every break adds to the time you arrive (Q10).

Refresher: distance, speed and time. Distance = speed $\times$ time, and time = distance $\div$ speed. Keep the units matching: a speed in km/h wants a time in hours, so change minutes to hours first — 30 min = 0.5 h, 45 min = 0.75 h and 90 min = 1.5 h.

Job	Working	Result
Distance at 60 km/h for 2 h	60×2	120 km
Time for 150 km at 50 km/h	$150 \div 50$	3 h
30 min written in hours	$30 \div 60$	0.5 h

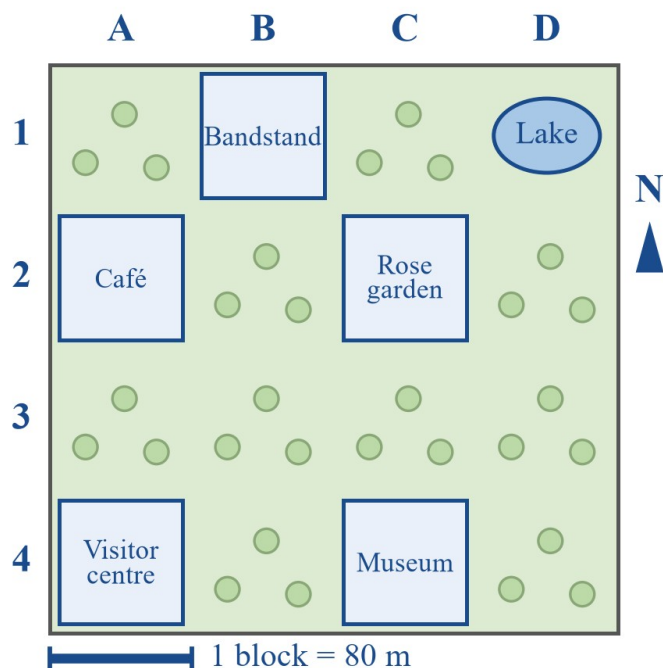
Maps, location diagrams and GPS. A printed map gives you distances through its **scale**: measure the route in centimetres, then multiply by the kilometres each centimetre stands for (Q11). A **location diagram** — a hall plan, a seating plan, a map of a garden — gives you places instead of distances: what is north of what, what is in front of what, what stands beside the door. A phone GPS gives you both at once: the distance left to your destination and the speed you are making, which together say when you will arrive (Q12). Whatever the format, check the north arrow first (§2B).

Refresher: metric lengths. 1 km = 1 000 m, so kilometres to metres multiply by 1 000: 2.4 km = 2 400 m. Metres to kilometres divide by 1 000.

Giving and following directions. Directions here use the six compass points of §2B — **north (N)**, **south (S)**, **east (E)**, **west (W)**, **northeast (NE)** and **southeast (SE)** — plus everyday words such as *in front of* and *beside* (§2A). On a grid map, name a square by its column letter and row number, and count a walk in blocks along the paths, never across them. The Riverside Gardens map below is the grid this section uses: columns A to D run west to east, rows 1 to 4 run north to south, and one block along a path is 80 m of walking. Two reads from it: the museum is 2 blocks east of the visitor centre, and the lake is northeast of the rose garden — 1 block east and 1 block north, equal parts each.

Units 3 & 4 preview. In Units 3 and 4, maps use finer compass points (such as SSW) and numbered directions (such as N15°W) — that level is beyond this book and is not assessed in this book’s tests. This book only ever asks for the six points above.

Riverside Gardens, Cockatoo Springs



Made-up data: Riverside Gardens and its landmarks are made up for this section.

Planning family and community events. An event is a bundle of small maths jobs: enough food and drinks for every guest (multiply by the head count), enough packs or trays when things come in whole packs (round up — a part pack still has to be bought), a fair share of a bill (divide by the number of people sharing), and a programme for the day in which each item starts when the one before it finishes (§5C).

Refresher: capacity. 1 L = 1 000 mL. Litres to millilitres multiply by 1 000; millilitres to litres divide by 1 000: 3 750 mL = 3.75 L. And four 250 mL cups make 1 000 mL, which is 1 L — a handy lot for drinks planning.

Refresher: sharing money and whole packs. Sharing a bill equally is one division: \$27.60 shared between 4 people is $\$27.60 \div 4 = \$6.90$ each. Whole packs need rounding up: 23 sausages in packs of 6 needs 4 packs, because 3 packs hold only 18 and 18 is not enough.

Tools, and rounding. A calculator, a phone app or a spreadsheet will do any calculation in this section (§1E, §1F), and online maps and planners will do some of the reading for you — but nothing in this book needs one to answer it, and every method is shown here with pencil and paper. Carry full accuracy through your working and round only at the end, and only where the question asks: money to the nearest cent, times to the minute — and say so when you do it.

About the data in this section. The timetables, charts, maps, bills and app screens here are **made up** (not real): pretend towns, pretend people and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real business, person or place.

Worked examples

Examples 1 and 2 are **scaffolded** — the working is laid out for you, stage by stage, with teaching comments beside it. Examples 3 and 4 are **unscaffolded** — clean solutions, in the style your own working should aim for.

Example 1 — scaffolded

Owen travels from Possum Gully to Cockatoo Springs for work on Bus 12, and walks 5 minutes from the bus stop to his workplace.

Bus 12 leaves Possum Gully	Bus 12 arrives Cockatoo Springs
07:05	07:30
07:25	07:50
07:45	08:10
08:05	08:30
08:30	08:55
09:00	09:25
15:10	15:35
15:40	16:05

Made-up data: Bus 12, Possum Gully and Cockatoo Springs are made up for this section.

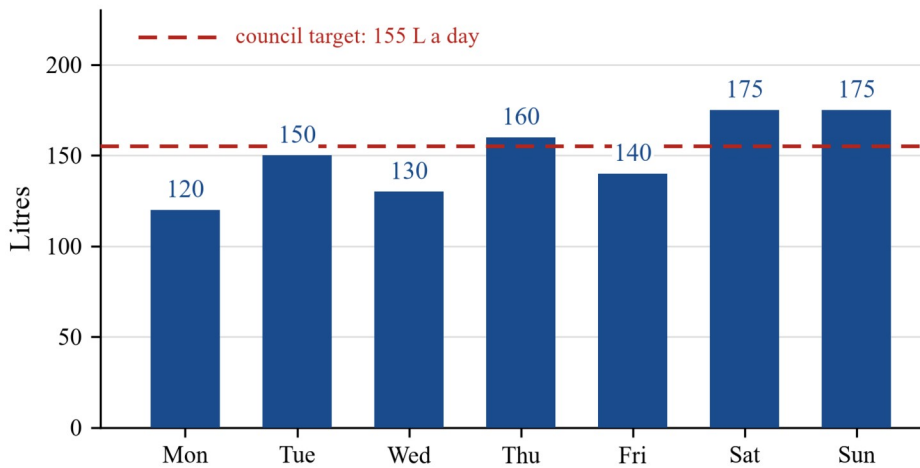
- (a) How long does the 07:05 service take? (b) Owen starts work at 09:00. What is the latest time he can arrive at Cockatoo Springs? (c) Which is the latest bus Owen can catch?

Working	Comment
Stage 1 — Identify: the timetable lists a departure and an arrival for every service; “how long” asks for the gap between them.	Read the question for what it wants before touching a number.
Stage 2 — Act: (a) $07:30 - 07:05 = 25$ min.	Read across the first row: leaves 07:05, arrives 07:30.
Stage 3 — Evaluate: 25 min is a sensible ride between two neighbouring towns — not 25 seconds, not 25 hours.	A quick sanity check on the unit saves silly answers.
Stage 1 — Identify: (b) the 5-min walk sits between the bus and the 09:00 start, so the latest arrival is 5 min before 09:00.	Work backwards from the fixed time.
Stage 2 — Act: $09:00 - 5 \text{ min} = 08:55$.	Count back 5 minutes from 09:00.
Stage 2 — Act: (c) read down the arrivals column for the last arrival at or before 08:55: the 08:30 bus arrives at 08:55. The bus after it, 09:00, arrives 09:25 — too late.	The arrivals column answers “which service”.
Stage 3 — Evaluate: 08:55 plus the 5-min walk is 09:00 exactly, so Owen walks in as work starts ✓.	Check forwards what you found backwards.
Stage 4 — Report: the ride takes 25 min; Owen must arrive by 08:55; the latest bus he can catch is the 08:30.	Report every part the question asked for.

Example 2 — scaffolded

The chart below is from *The Possum Gully Post*. It shows the litres of water used each day of one week at 12 Hakea Street. The council’s target is a mean of 155 L a day or less.

The Possum Gully Post
Water used at 12 Hakea Street this week



Made-up data: the newspaper, the address and every litre in the chart are made up.

- (a) How many litres were used on Wednesday? (b) Find the mean number of litres a day for the week. (c) Find the range of the data, and say whether the week's mean meets the council target.

Working

Comment

Stage 1 — Identify: the bars are litres per day, and the dashed line is the target the mean gets compared with.

Read the axis label and the unit first — litres here.

Stage 2 — Act: (a) the Wednesday bar reaches 130, so Wednesday used 130 L.

Read the value printed on top of the bar.

Stage 2 — Act: (b) total:

Add all seven days.

$$120 + 150 + 130 + 160 + 140 + 175 + 175 = 1050 \text{ L.}$$

$$\text{Mean: } 1050 \div 7 = 150 \text{ L a day.}$$

The mean is the total shared out over the 7 days.

Stage 2 — Act: (c) biggest 175 L, smallest 120 L, so range = $175 - 120 = 55 \text{ L}$.

Range = biggest – smallest.

Stage 3 — Evaluate: the mean, 150 L, is under the target of 155 L, so the target is met ✓. The range of 55 L says the days were not all alike — the weekend days used the most.

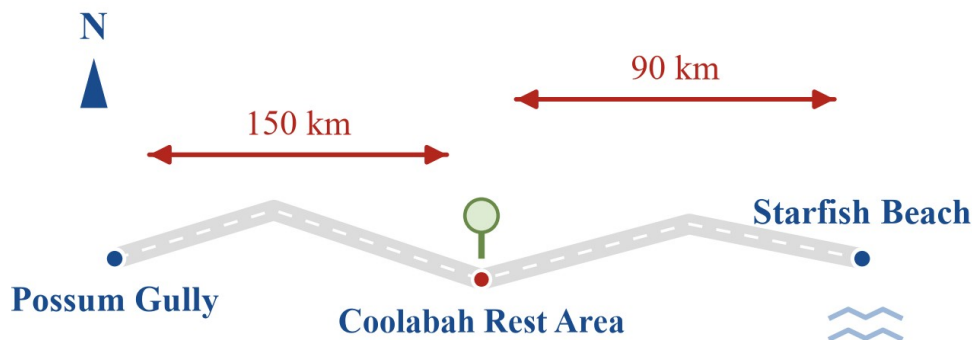
Evaluate against the target the question named.

Stage 4 — Report: Wednesday 130 L; mean 150 L a day; range 55 L; the week meets the council target.

Report every part the question asked for.

Example 3 — unscaffolded

Amira's family drives from Possum Gully to Starfish Beach for the holidays, stopping at Coolabah Rest Area on the way (see the map below). They leave at 09:15, drive at a mean speed of 80 km/h, and stop 30 minutes at the rest area for lunch. (a) How far is the whole drive? (b) How much driving time is that? (c) What time do they arrive at Starfish Beach?



the road home to the beach: one highway, one rest area

Made-up data: the towns, the rest area and the distances are made up for this section.

Solution

- (a) The two legs add: $150 + 90 = 240$ km. (b) Time = distance $\div$ speed: $240 \div 80 = 3$ h of driving. (c) Leaving at 09:15 and adding 3 h of driving gives 12:15; adding the 30-min lunch stop gives 12:45.

$\therefore$ the drive is 240 km and 3 h of driving, and the family arrives at 12:45.

Example 4 — unscaffolded

Dev's family hosts a reunion at Possum Gully Community Hall: 25 guests, with 3 sausages per person on the BBQ. The food bill comes to \$231.25, shared equally between the guests. Lunch is served at 12:30, and the sausages take 40 minutes to cook. (a) How many sausages does Dev cook? (b) How much is each guest's share of the food bill? (c) What is the latest time Dev can start cooking the sausages?

Solution

- (a) $25 \times 3 = 75$ sausages. (b) $\$231.25 \div 25 = \$9.25$ per guest. (c) Count back 40 minutes from 12:30: 11:50.

$\therefore$ Dev cooks 75 sausages, each guest's share is \$9.25, and cooking starts by 11:50 at the latest.

Practice questions

Do every question with the table, chart or map in front of you, and the north arrow checked first where there is one. In the scaffolded block the parts lead you through the steps. In the unscaffolded block, plan the steps yourself and show your working — your teacher may prompt you at any stage, and that is part of how this unit works.

Scaffolded

Q1. Use the Bus 12 timetable below (also printed in Example 1).

Bus 12 leaves Possum Gully	Bus 12 arrives Cockatoo Springs
07:05	07:30
07:25	07:50
07:45	08:10
08:05	08:30
08:30	08:55
09:00	09:25
15:10	15:35
15:40	16:05

Made-up data: Bus 12, Possum Gully and Cockatoo Springs are made up for this section.

- (a) What time does the 07:45 service arrive at Cockatoo Springs?
- (b) What time does the 15:10 service arrive?
- (c) How long does the 08:05 service take?

Q2. (a) Write 3:45 pm in 24-hour time.

- (b) Write 07:20 in 12-hour time.
- (c) A school assembly runs from 08:40 to 11:05. How long is it, in hours and minutes?

Q3. Mia times her walk to school for one week.

Day	Mon	Tue	Wed	Thu	Fri
Minutes walked	18	22	15	25	20

Made-up data: Mia and her walking times are made up for this section.

A poster at school encourages at least 20 minutes of walking a day. (a) Find the mean of Mia's walking times.

- (b) Find the range of Mia's walking times.
- (c) On which days did Mia meet the poster's 20 minutes?

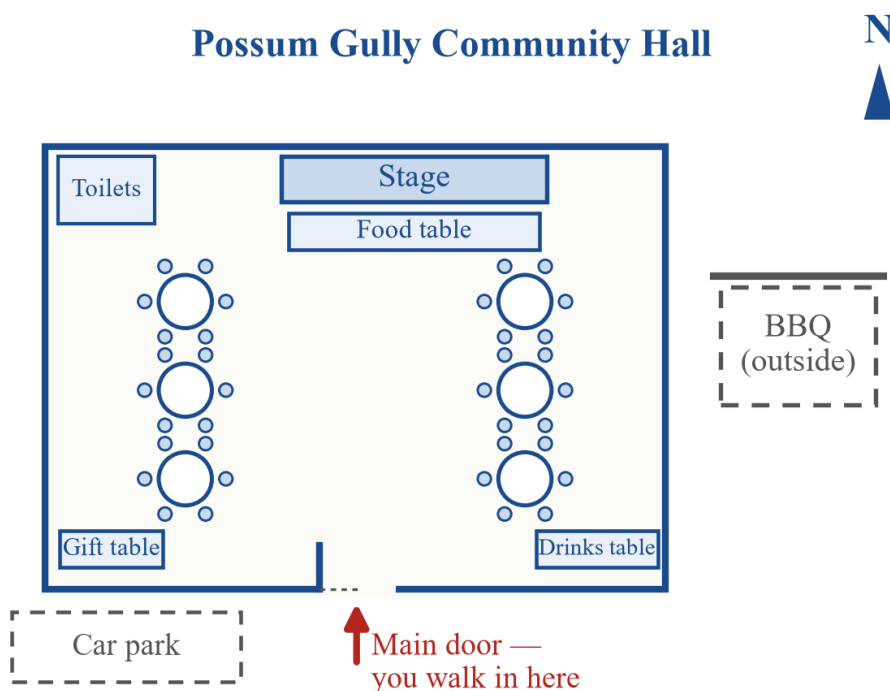
Q4. A coach travels at a mean speed of 80 km/h. (a) How far does it go in 2 h?

- (b) How far does it go in 30 min?
- (c) How long does the coach take to travel 200 km? Give your answer in hours and minutes.

Q5. Use the Riverside Gardens map in the theory, where one block along a path is 80 m. (a) You start at the visitor centre and walk 2 blocks east. Where are you? You then walk 2 blocks north. Where are you now?

- (b) From the rose garden, which compass direction is the lake?
- (c) How many blocks of walking is it from the visitor centre to the rose garden, and how many metres is that?

Q6. Use the hall plan below. You walk in through the main door.



Made-up data: the hall and its plan are made up for this section.

- Which compass direction is the stage from the main door?
- The gift table and the drinks table stand on which sides of the door? Give a compass direction for each.
- Describe where the food table is, compared with the stage.

Unscaffolded

Q7. Priya gets to work by walking 10 minutes to the station, catching an 18-minute train, then walking 5 minutes from the station to her workplace. (a) How long is Priya's whole trip to work?

- Priya must be at work by 08:30. What is the latest time she can leave home?
- One morning Priya leaves home at 08:05. What time does she arrive at work?

Q8. Use the Bus 12 timetable in Example 1. Ted reaches the Possum Gully stop just as the 07:45 bus pulls away. (a) What time would that bus have arrived at Cockatoo Springs?

- What is the next service, and what time does it arrive?
- How many minutes later than the 07:45 bus does Ted arrive?

Q9. The Possum Gully Post reports the litres of water used per day at a sports ground over five days.

Day	Mon	Tue	Wed	Thu	Fri
Litres reported	46	52	49	55	48

Made-up data: the newspaper and every litre in the table are made up.

The article claims the mean is 50 L a day. (a) Show that the total for the five days is 250 L.

- Hence show that the article's claim of a 50 L mean is correct.
- Find the range of the data.

Q10. A family drives 330 km at a mean speed of 60 km/h, taking a 15-minute rest break after every 2 h of driving. They leave at 08:00. (a) How much driving time is the trip, in hours and minutes?

(b) How many rest breaks do they take, and how long is the whole trip including the breaks?

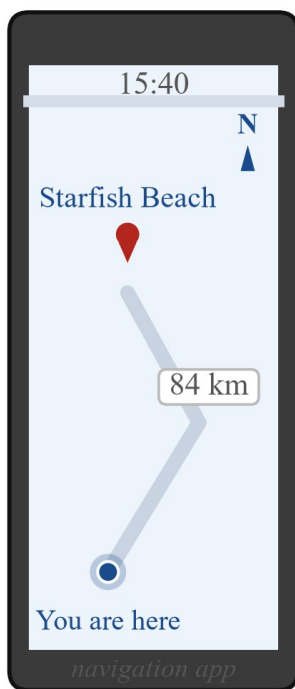
(c) What time do they arrive?

Q11. On a printed map with scale 1 cm = 25 km, the road from Wandoo Wells to the lighthouse measures 4 cm. Rowan drives it at a mean speed of 80 km/h, leaving at 13:20. (a) How many kilometres is the drive?

(b) How long does the drive take, in hours and minutes?

(c) What time does Rowan arrive?

Q12. The GPS screen below shows a drive to Starfish Beach: 84 km left to the destination, a mean speed of 70 km/h, and the clock at 15:40.



Made-up data: the phone screen, the place and the distances on it are made up.

(a) How many hours of driving are left?

(b) Write that time in hours and minutes.

(c) If the mean speed holds, what time does the driver arrive?

Q13. Use the Riverside Gardens map in the theory for a school excursion, where one block along a path is 80 m. (a) The group walks from the bandstand to the lake. Give the compass direction and the number of blocks.

(b) How many metres is that walk?

(c) Later the group walks from the museum to the lake, calling at the rose garden on the way. Give the directions of the two legs, and the whole walk in blocks and in metres.

Q14. Morning tea at the hall: 38 guests, 4 cupcakes each, and cupcakes bake in trays of 12. Each guest will also drink 250 mL of juice. (a) How many cupcakes are needed?

(b) How many trays must be baked?

(c) How much juice is needed, in millilitres and in litres?

Q15. A birthday lunch bill comes to \$310.50, shared equally. (a) There are 18 people at the table. What is each person's share?

(b) Two people leave before the bill comes, so 16 people share it. What is each share now, to the nearest cent?

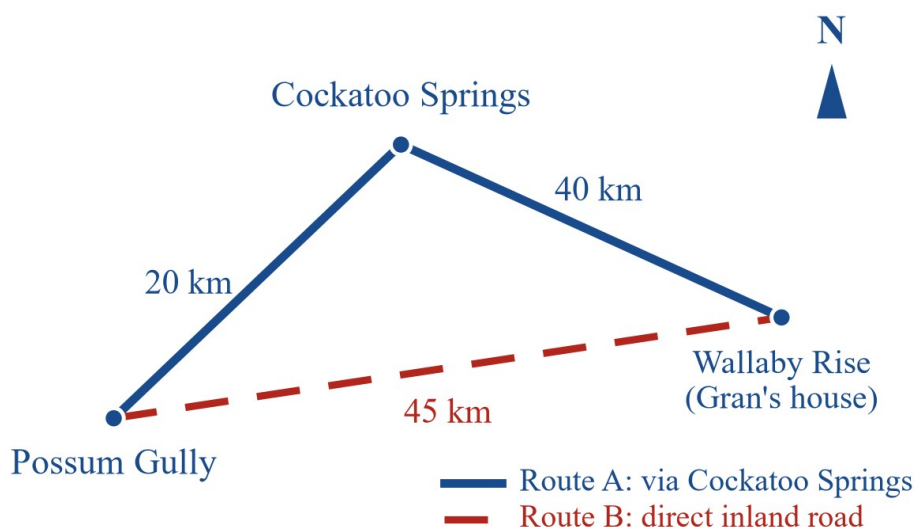
(c) Explain in one sentence why each share grew.

Q16. The programme for the family reunion at the hall: setup runs from 09:00 to 10:15; the welcome speech starts at 11:15 and runs 15 minutes; the games run 40 minutes, starting as the welcome ends; morning tea then takes 20 minutes to prepare; lunch is at 12:30. (a) How many minutes of setup is that?

(b) What time do the games finish?

(c) Morning tea preparation starts as soon as the games finish. Is tea ready by the 12:30 lunch?

Q17. Gran's house is at Wallaby Rise. The sketch below shows two routes from Possum Gully: route A via Cockatoo Springs (20 km then 40 km, driven at a mean 60 km/h), and route B, the direct inland road (45 km, driven at a mean 90 km/h).



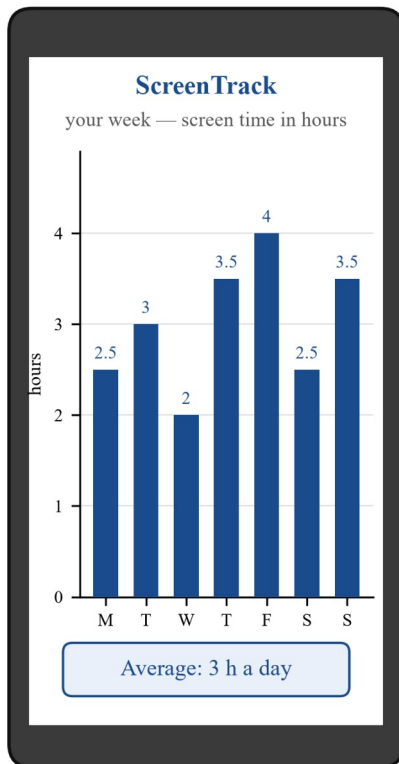
Made-up data: the towns, the routes and the distances are made up.

(a) How long does route A take?

(b) How long does route B take, in minutes?

(c) How much time does route B save?

Q18. The screen below is a weekly report from ScreenTrack, a made-up screen-time app.



Made-up data: the app, the week and every hour on the screen are made up.

- (a) Find the mean of the seven days.
 - (b) Find the range of the seven days.
 - (c) The app claims “Average: 3 h a day”. Is the claim correct?
-

Answers

Q1. (a) 08:10. (b) 15:35. (c) 25 min.

Q2. (a) 15:45. (b) 7:20 am. (c) 2 h 25 min.

Q3. (a) 20 min. (b) 10 min. (c) Tuesday, Thursday and Friday.

Q4. (a) 160 km. (b) 40 km. (c) 2 h 30 min.

Q5. (a) The museum, then the rose garden. (b) Northeast. (c) 4 blocks, 320 m.

Q6. (a) North. (b) Gift table west, drinks table east. (c) In front of the stage (south of it).

Q7. (a) 33 min. (b) 07:57. (c) 08:38.

Q8. (a) 08:10. (b) The 08:05 service, arriving 08:30. (c) 20 min later.

Q9. (a) 250 L. (b) 50 L a day — the claim is correct. (c) 9 L.

Q10. (a) 5 h 30 min. (b) 2 breaks; 6 h in all. (c) 14:00.

Q11. (a) 100 km. (b) 1 h 15 min. (c) 14:35.

Q12. (a) 1.2 h. (b) 1 h 12 min. (c) 16:52.

Q13. (a) East, 2 blocks. (b) 160 m. (c) 2 blocks north, then northeast (1 block east and 1 block north); 4 blocks, 320 m.

Q14. (a) 152 cupcakes. (b) 13 trays. (c) 9 500 mL, which is 9.5 L.

Q15. (a) \$17.25. (b) \$19.41, to the nearest cent. (c) The same bill shared between fewer people gives a bigger share each.

Q16. (a) 75 min. (b) 12:10. (c) Yes — tea is ready at 12:30, exactly lunch time.

Q17. (a) 1 h. (b) 30 min. (c) 30 min.

Q18. (a) 3 h. (b) 2 h. (c) Yes — the mean of the seven days is exactly 3 h.

Fully-worked solutions

Q1. (a) Read across the 07:45 row: it arrives at 08:10. (b) Read across the 15:10 row: it arrives at 15:35. (c) The 08:05 service arrives at 08:30, and 08:05 to 08:30 is 25 min — the same as every service on this route.

∴ (a) 08:10 (b) 15:35 (c) 25 min.

Q2. (a) Add 12 hours to an afternoon time: 3:45 pm is 15:45. (b) 07:20 is before midday, so it is 7:20 am. (c) From 08:40 to 11:05 is 145 min, and 145 min is 2 h 25 min.

∴ (a) 15:45 (b) 7:20 am (c) 2 h 25 min.

Q3. (a) Total: $18 + 22 + 15 + 25 + 20 = 100$ min, so the mean is $100 \div 5 = 20$ min. (b) Biggest 25 min, smallest 15 min: range = $25 - 15 = 10$ min. (c) The days at or over 20 min are Tuesday (22), Thursday (25) and Friday (20).

∴ (a) 20 min (b) 10 min (c) Tuesday, Thursday and Friday.

Q4. (a) $80 \times 2 = 160$ km. (b) $30 \text{ min} = 0.5 \text{ h}$, so $80 \times 0.5 = 40$ km. (c) $200 \div 80 = 2.5 \text{ h}$, and 0.5 h is 30 min, so 2 h 30 min.

∴ (a) 160 km (b) 40 km (c) 2 h 30 min.

Q5. (a) From the visitor centre (A4), 2 blocks east along row 4 lands on the museum (C4); 2 blocks north from the museum lands on the rose garden (C2). (b) From the rose garden (C2) the lake (D1) is 1 block east and 1 block north — equal parts — so northeast. (c) Visitor centre (A4) to rose garden (C2) is 2 blocks east and 2 blocks north, 4 blocks in all, and $4 \times 80 = 320$ m.

∴ (a) the museum, then the rose garden (b) northeast (c) 4 blocks, 320 m.

Q6. (a) North is up on the plan, and the stage is at the far end from the door, so the stage is north of the main door. (b) With north up, west is left and east is right: the gift table is west of the door and the drinks table is east of it. (c) The food table stands between the door and the stage — in front of the stage, which is south of it.

∴ (a) north (b) gift table west, drinks table east (c) in front of (south of) the stage.

Q7. (a) $10 + 18 + 5 = 33$ min. (b) Count back 33 min from 08:30: 07:57. (c) Count on 33 min from 08:05: 08:38.

∴ (a) 33 min (b) 07:57 (c) 08:38.

Q8. (a) The 07:45 row arrives at 08:10. (b) The next row down is the 08:05 service, arriving 08:30. (c) 08:10 to 08:30 is 20 min.

∴ (a) 08:10 (b) the 08:05 service, arriving 08:30 (c) 20 min later.

Q9. (a) Add the five days one at a time:

$$46 + 52 = 98$$

$$98 + 49 = 147$$

$$147 + 55 = 202$$

$$202 + 48 = 250$$

The total for the five days is 250 L. (b) The mean is the total shared over 5 days: $250 \div 5 = 50$ L a day, so the article's claim is correct. (c) Biggest 55 L, smallest 46 L: range = $55 - 46 = 9$ L.

∴ (a) total 250 L (b) mean 50 L, claim correct (c) 9 L.

Q10. (a) $330 \div 60 = 5.5$ h, which is 5 h 30 min of driving. (b) A break after every full 2 h of driving gives 2 breaks on a 5 h 30 min drive (none at the very end, because they arrive). Driving is 330 min and the breaks are $2 \times 15 = 30$ min, so the whole trip is $330 + 30 = 360$ min = 6 h. (c) 08:00 plus 6 h is 14:00.

∴ (a) 5 h 30 min (b) 2 breaks, 6 h in all (c) 14:00.

Q11. (a) $4 \times 25 = 100$ km. (b) $100 \div 80 = 1.25$ h, which is 1 h 15 min. (c) 13:20 plus 1 h 15 min is 14:35.

∴ (a) 100 km (b) 1 h 15 min (c) 14:35.

Q12. (a) Time = distance $\div$ speed: $84 \div 70 = 1.2$ h. (b) 1.2 h is 72 min, which is 1 h 12 min. (c) 15:40 plus 72 min: 1 h on is 16:40, then 12 min more is 16:52.

∴ (a) 1.2 h (b) 1 h 12 min (c) 16:52.

Q13. (a) Bandstand (B1) to lake (D1): same row, 2 columns to the right — east, 2 blocks. (b) $2 \times 80 = 160$ m. (c) Museum (C4) to rose garden (C2): same column, 2 rows up — north, 2 blocks. Rose garden (C2) to lake (D1): 1 block east and 1 block north — northeast, 2 blocks. The whole walk is $2 + 2 = 4$ blocks, and $4 \times 80 = 320$ m.

∴ (a) east, 2 blocks (b) 160 m (c) 2 blocks north then northeast 2 blocks; 4 blocks, 320 m.

Q14. (a) $38 \times 4 = 152$ cupcakes. (b) $152 \div 12 = 12$ trays with 8 cupcakes over, and those 8 still need a tray of their own: 13 trays. (c) $38 \times 250 = 9500$ mL, and $9500 \div 1000 = 9.5$ L.

∴ (a) 152 cupcakes (b) 13 trays (c) 9 500 mL = 9.5 L.

Q15. (a) $\$310.50 \div 18 = \$17.25$. (b) $\$310.50 \div 16 = \$19.40625$, which rounds to $\$19.41$ to the nearest cent. (c) The bill is the same size shared between fewer people, so each share is bigger.

$\therefore$ (a) $\$17.25$ (b) $\$19.41$ (c) the same bill shared between fewer people.

Q16. (a) 09:00 to 10:15 is 1 h 15 min, which is 75 min. (b) The welcome ends at $11:15 + 15 \text{ min} = 11:30$, and the games end at $11:30 + 40 \text{ min} = 12:10$. (c) Tea is ready at $12:10 + 20 \text{ min} = 12:30$ — exactly as lunch is served, so yes, in time with no minutes to spare.

$\therefore$ (a) 75 min (b) 12:10 (c) yes, ready at 12:30 exactly.

Q17. (a) Route A is $20 + 40 = 60$ km at 60 km/h: $60 \div 60 = 1$ h. (b) Route B is $45 \div 90 = 0.5$ h, which is 30 min. (c) Route A takes 60 min and route B takes 30 min, so route B saves $60 - 30 = 30$ min.

$\therefore$ (a) 1 h (b) 30 min (c) 30 min saved.

Q18. (a) Total: $2.5 + 3 + 2 + 3.5 + 4 + 2.5 + 3.5 = 21$ h, so the mean is $21 \div 7 = 3$ h. (b) Biggest 4 h, smallest 2 h: range $= 4 - 2 = 2$ h. (c) The mean of the seven bars is exactly 3 h, so the app's claim is correct.

$\therefore$ (a) 3 h (b) 2 h (c) yes, the claim is correct.

Chapter 6 Numeracy in context — 6B Civic numeracy

Theory

About the data in this section. The wards, towns, elections, surveys, ads, dashboards and news numbers in this section are **made up** (not real): pretend places and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real place, person, election or business.

In the study design (Unit 2, Outcome 1), civic numeracy means understanding, reading and checking the numbers and statistics that governments, the news and the media, and other sources of data put out, so that you can deal with what life asks of you in your local area, your state, the whole country and the world.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-09.

What this section covers. Numbers arrive from civic life every week: election results, unemployment rates, advertising claims, survey results, interest-rate changes, screen-time reports. This section is about staying on top of those numbers — reading them (what does this rate, table or chart actually say?) and checking them (does this claim match the data?). The maths is all toolkit you already own: percentages, fractions, means, ranges and simple chances, pointed at government, political, social, environmental and economic data.

Where civic numbers show up. The same few number shapes keep appearing. A **share** of a group (“the winner took 43.5 % of the vote”). A **rate** per 100 people (“unemployment is 4.8 %”). A **change** on last year (“up 12 400 households”). A **claim** to check (“9 in 10 households have a bin”). A **chance** (“1 in 25 households wins a free tree”). Here are six of the places those numbers reach you:

Where civic numbers show up (made-up examples)

News report “Unemployment in the shire rose to 4.8%.”	Government ad “9 in 10 households now have a recycling bin.”	Community notice “Petition: 380 of 500 people asked for stricter rules.”
Election result “Baxter wins Eastvale Ward with 43.5% of the vote.”	Survey result “Mean screen time for the group was 4 hours a day.”	Bank letter “The official interest rate rose from 3.5% to 4%.”

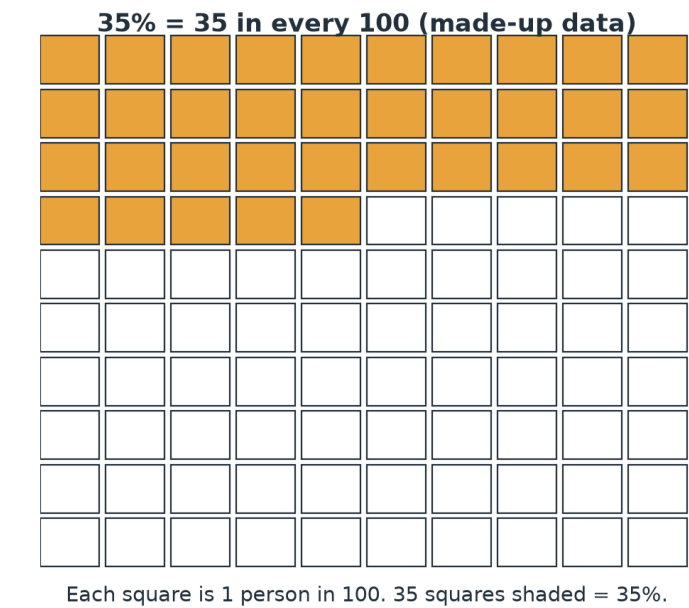
Six cards showing where civic numbers show up: a news report, a government ad, a community notice, an election result, a survey result and a bank letter, each with a made-up example number

Rates, shares and “per 100”. A percentage is a share out of 100, so 100 % is the whole group. Two refreshers carry most of this section:

Refresher — a percentage of an amount. “15% of 1 200” means 15 for every 100: turn the percentage into a decimal and multiply. $15\% = 0.15$, and $0.15 \times 1\,200 = 180$. Same shape every time: a percentage of an amount is the decimal times the amount. So 5 % of 1 200 people is $0.05 \times 1\,200 = 60$ people.

Refresher — fractions, decimals and percentages. One share has three outfits (Section 4B). Fraction to decimal: top $\div$ bottom. Decimal to percentage: $\times 100$. Percentage to fraction: over 100, then simplify. So $\frac{3}{4} = 0.75 = 75\%$, and $42\% = 0.42 = \frac{21}{50}$.

A **share of a vote or a survey** works exactly like a chance: the part you care about over the whole. If 4 200 of 12 000 votes go to one candidate, that share is $4\,200 \div 12\,000 = 0.35 = 35\%$ of the vote — 35 squares in every 100 on the grid below:



A 10 by 10 grid of squares with 35 of the 100 squares shaded, showing that 35% means 35 in every 100

Refresher — “1 in N” talk. Civic claims often say “1 in 5” or “1 in 25” instead of a percentage. That is a fraction waiting to happen: 1 in 5 is $\frac{1}{5}$. The civic versions worth knowing by heart:

Civic talk	As a fraction	As a percentage
1 in 2	$\frac{1}{2}$	50 %
1 in 4	$\frac{1}{4}$	25 %
1 in 5	$\frac{1}{5}$	20 %
1 in 10	$\frac{1}{10}$	10 %
1 in 20	$\frac{1}{20}$	5 %
1 in 25	$\frac{1}{25}$	4 %

Percentage points. When one percentage moves to another, the gap between them is stated in **percentage points**. A recycling rate rising from 52 % to 67 % rose $67 - 52 = 15$ percentage points. Saying “points” keeps the gap clear of the shares themselves: the rate did not rise “by 15%”, it rose from one share to a share 15 points higher.

Election and voting words. **Enrolled** voters are the people on the roll, able to vote. **Turnout** is the share of enrolled voters who actually vote: 480 voting out of 600 enrolled is a turnout of 80 %. A **majority** is more than half — over 50 % — of the votes. With three or more candidates standing, the winner can take the most votes without a majority.

Six economic words. The news cycle repeats six economic numbers, and each one is a share, a rate or a change you can already read. **Inflation** is how fast prices, on the whole, are rising. The **official interest rate** is the rate set by the central bank — when it moves, loan rates and savings rates move with it. The other four sit in the cards below:

Six economic words this section uses

Unemployment rate the share of the workforce without a job but looking for work	Underemployment people with a job who want more hours than they get	Participation rate the share of working-age people who are in the workforce
Gender pay gap the difference between average pay for men and for women	Inflation how fast prices, on the whole, are rising	Official interest rate the rate set by the central bank — it moves loan and savings rates

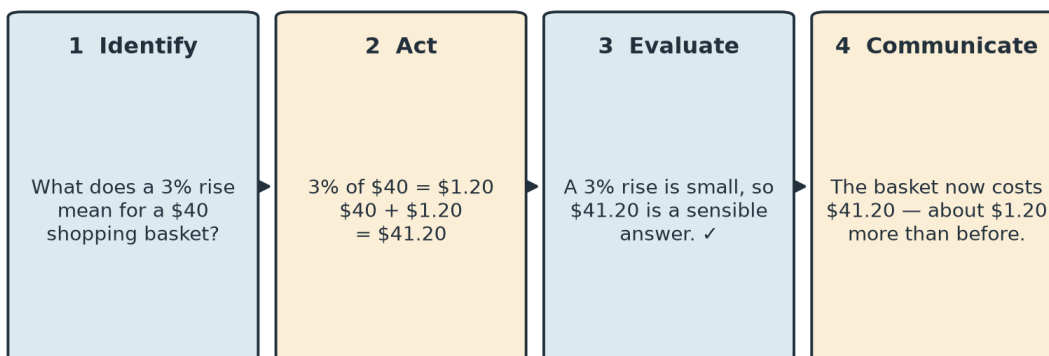
Six cards defining the economic words used in this section: unemployment rate, underemployment, participation rate, gender pay gap, inflation and official interest rate

Social and environmental numbers. Civic data also covers social issues — human rights (the share of residents who can reach a health service), animal welfare (a petition on roaming cats), cultural life (festival attendance up 20 % on last year), and gender (the **gender pay gap**, the difference between average pay for men and for women). And it covers local environmental issues: climate change (rainfall and temperature trends), land degradation (hectares of farmland losing topsoil), and pollution (recycling rates). Same number shapes again: shares, rates, changes and claims.

Checking a claim. An ad or a headline makes a claim; a survey or a data set supplies numbers. The check is usually two steps: put the claim and the data in the same outfit (both as percentages, say), then compare. Run it through the problem solving cycle:

Refresher — the problem solving cycle. Four stages (Section 1A). **Identify** what is asked and what data you have. **Act** — do the maths. **Evaluate** — check the answer is sensible against the situation. **Communicate** — say the answer in a plain sentence.

Checking a claim with the problem solving cycle — prices rise 3% (made-up data)



Four boxes in a row showing the problem solving cycle applied to a 3% price rise on a \$40 shopping basket: identify, act, evaluate, communicate

Refresher — chance words and $P()$. Section 4A's chance words still apply: impossible, unlikely, even chance, likely, certain. Section 4B's $P()$ counts favourable over total when outcomes are equally likely:

$P(\text{win}) = \frac{\text{favourable}}{\text{total}}$. A chance of 15 % sits low on the scale — unlikely. A chance of 76 % sits high — likely.

Refresher — mean and range. From Section 3C: the **mean** is the total $\div$ the count, the levelled-out share of the data; the **range** is the highest – the lowest, the spread. On a line chart, the **trend** is simply the direction the line travels over time — up, down or flat.

Refresher — rounding to a stated place. From Section 1C: look one place to the right of the place you are rounding to; 5 or more, round up; 4 or less, leave it. 6.1714...% to 1 decimal place: the second decimal digit is 7, so the first rounds up to give 6.2%. 892 600 to the nearest thousand: the hundreds digit is 6, so round up to 893 000.

Refresher — reading big numbers. Civic numbers run big, and the space is a thousands separator: 892 600 reads “eight hundred and ninety-two thousand, six hundred”. Keep the space every three digits from the right — in prose, in tables and in maths (as in \$ 4 140) — so a long number stays readable.

Technology. A calculator or a spreadsheet will run these divisions and percentages for you, and news sites hand you the charts already drawn. Using one is fine wherever it helps; this section shows every step by hand first, so you can see what the machine is doing. No question here needs one.

U3/4 preview: in Units 3 and 4 claims like these meet formal statistical testing — here, putting the numbers side by side is the whole job.

Worked examples

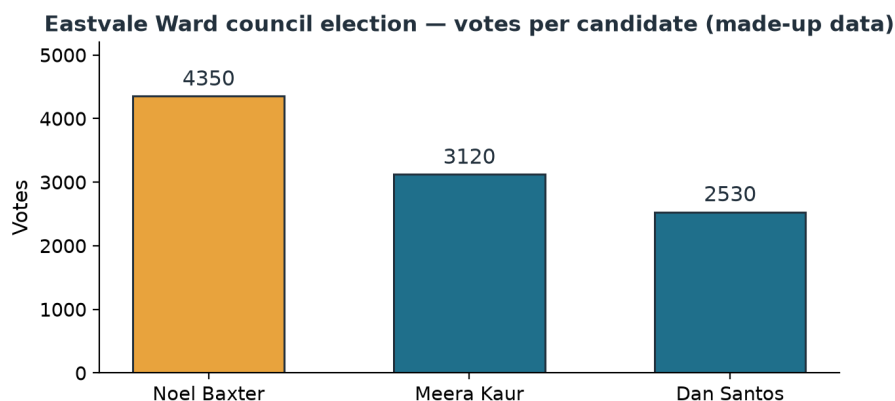
Example 1 — scaffolded

The table shows the count for the Eastvale Ward council election.

Candidate	Votes
Noel Baxter	4 350
Meera Kaur	3 120
Dan Santos	2 530

Made-up data: the ward, the candidates and every number in this table are made up for this section.

- (a) How many votes were cast in total? (b) What share of the vote did the winner take, as a percentage? (c) What was the winning margin, in votes?



Bar chart of the Eastvale Ward council election votes: Noel Baxter 4350, Meera Kaur 3120, Dan Santos 2530, with Baxter’s winning bar highlighted

Working	Comment
(a) $4\,350 + 3\,120 + 2\,530 = 10\,000$ votes	Every vote went to one of the three candidates.
(b) Winner: Noel Baxter, with 4 350 votes. $4\,350 \div 10\,000 = 0.435$	The highest count wins. Share = part $\div$ whole.
$0.435 \times 100 = 43.5$, so 43.5 %	Decimal to percentage is $\times 100$.
(c) $4\,350 - 3\,120 = 1\,230$ votes	Margin = winner – runner-up.
Check: 43.5 % is under 50 %.	Three candidates split the vote, so no majority — sensible.

Noel Baxter wins Eastvale Ward with 43.5 % of the 10 000 votes, a winning margin of 1 230 votes over Meera Kaur.

Example 2 — scaffolded

The shire paper compares two towns. Remember: the **unemployment rate** is the share of the **labour force** (people in work or looking for work) who are without a job but looking.

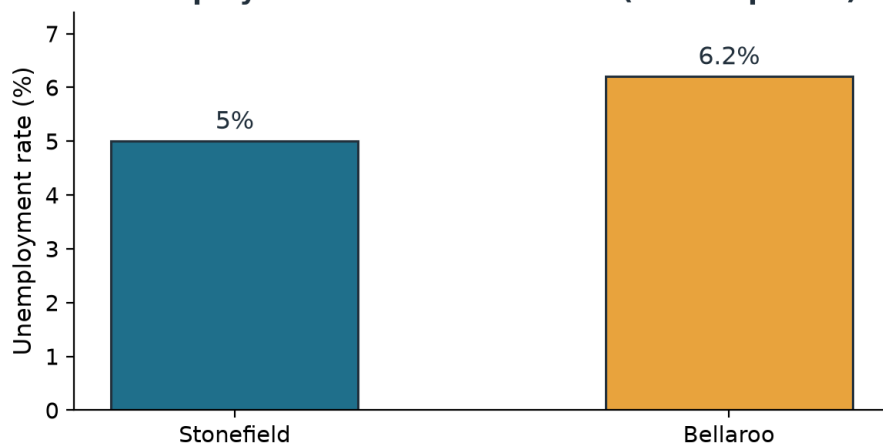
Town	Labour force	Unemployed
Stonefield	2 400	120
Bellaroo	1 750	108

Made-up data: the towns and every number in this table are made up for this section.

- (a) Find Stonefield's unemployment rate, as a percentage. (b) Find Bellaroo's, to 1 decimal place. (c) How many people in Stonefield's labour force are employed? (d) Which town has the higher unemployment rate?

Bellaroo: $108 \div 1\,750 = 6.1714\dots\% = 6.2\%$ (to 1 decimal place)

Unemployment rate in two towns (made-up data)



Bar chart comparing unemployment rates: Stonefield 5% and Bellaroo 6.2%, with the Bellaroo rounding shown

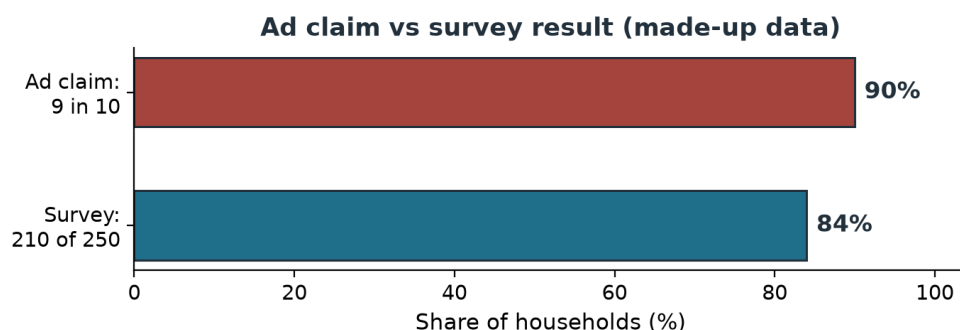
Working	Comment
Rate = unemployed $\div$ labour force, then $\times 100$.	The rate is a share of the labour force, not of the whole town.

Working	Comment
(a) Stonefield: $120 \div 2\,400 = 0.05$ $0.05 \times 100 = 5$, so 5 %	This division finishes exactly. Decimal to percentage is $\times 100$.
(b) Bellaroo: $108 \div 1\,750 = 0.061714\dots$ $0.061714\dots \times 100 = 6.1714\dots\% \approx 6.2\%$ to 1 decimal place	This division does not finish. The second decimal digit is 7, so round the first digit up.
(c) $2\,400 - 120 = 2\,280$ people	Labour force – unemployed = employed.
(d) $6.2\% > 5\%$: Bellaroo’s rate is higher.	Compare rates, not head counts — the towns are different sizes.

Stonefield’s unemployment rate is 5 % and Bellaroo’s is 6.2 % (to 1 decimal place), so Bellaroo’s rate is higher; 2 280 people in Stonefield’s labour force are employed.

Example 3 — unscaffolded

An ad in the *Wattle Range Weekly* says: “9 in 10 households in the shire now have a recycling bin.” A council survey of 250 households finds 210 of them with a bin. Does the survey support the ad’s claim? Show your working.



Two horizontal bars on a 0-to-100 percent scale: the ad claim “9 in 10” at 90% and the survey result “210 of 250” at 84%

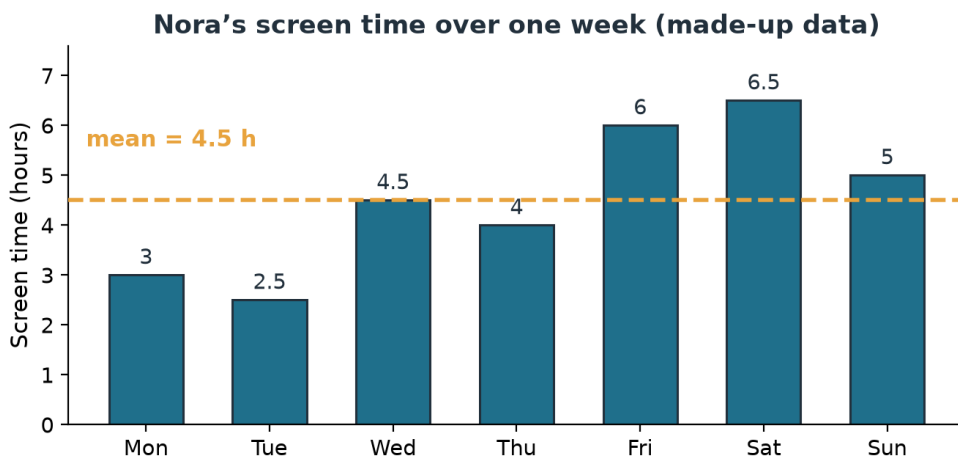
Put both numbers in the same outfit — percentages. The claim: “9 in 10” is $\frac{9}{10} = 0.9 = 90\%$. The survey: 210 of 250 households is $\frac{210}{250} = \frac{21}{25} = 0.84 = 84\%$.

The survey’s 84 % sits 6 percentage points below the claim’s 90 %, so the survey does not back the ad.

$\therefore$ The survey does not support the claim: $84\% < 90\%$.

Example 4 — unscaffolded

Nora’s phone tracks her screen time. One week reads: Mon 3 h, Tue 2.5 h, Wed 4.5 h, Thu 4 h, Fri 6 h, Sat 6.5 h, Sun 5 h. The app’s guideline says: “If your mean goes over 4 h a day, plan some screen-free breaks.” (a) Find Nora’s mean screen time per day. (b) Find the range of her daily screen times. (c) Does the guideline apply to Nora?



Bar chart of Nora's screen time in hours for each day of one week — 3, 2.5, 4.5, 4, 6, 6.5, 5 — with a dashed mean line at 4.5 hours

The mean is the total $\div$ the count. The total is $3 + 2.5 + 4.5 + 4 + 6 + 6.5 + 5 = 31.5$ h over 7 days, so the mean is $31.5 \div 7 = 4.5$ h a day. The range is the highest – the lowest: $6.5 - 2.5 = 4$ h. The guideline's line is 4 h a day, and $4.5 > 4$.

$\therefore$ Mean 4.5 h a day and range 4 h; the mean is over 4 h, so the guideline applies — Nora should plan some screen-free breaks.

Practice questions

Scaffolded

Q1. A petition, a survey and a report each give a share in a different outfit. Write each one in the outfit asked for.

- The petition says “3 in 5 residents back the new library”. Write 3 in 5 as a percentage.
- A survey reports 42 %. Write it as a decimal and as a fraction in simplest form.
- A report gives 0.68. Write it as a percentage and as a fraction in simplest form.

Q2. Stonefield counts 1 200 street trees, and 15 % of them are gum trees.

- How many gum trees are there?
- How many of the trees are not gum trees?
- A storm brings down 30 trees. What percentage of all the street trees is that?

Q3. In Eastvale Ward, 600 people are enrolled to vote and 480 of them vote on election day.

- Write the turnout as a fraction in simplest form.
- Write the turnout as a percentage.
- What percentage of the enrolled voters did not vote?

Q4. A loan ad charges 6 % interest for a year on a \$ 500 loan. The official interest rate is 4 % a year.

- How much interest does the \$ 500 loan cost in one year?
- How much is paid back altogether after one year?
- A savings account pays the official rate of 4 % a year. How much interest does \$ 2500 earn in one year?

Q5. A news report says prices have risen 5 % this year. A loaf of bread costs \$ 3.20 and a bottle of milk \$ 2.20.

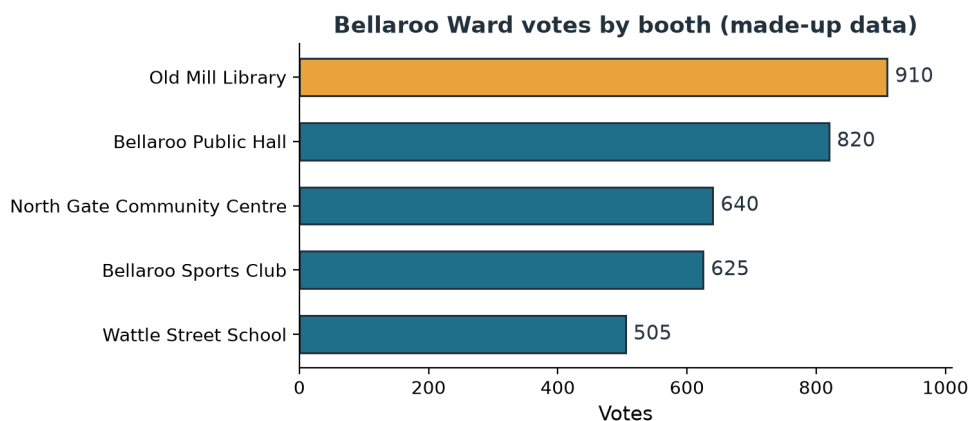
- (a) How much does the loaf rise, to the nearest cent?
- (b) What does the loaf cost now, to the nearest cent?
- (c) What does the milk cost now, to the nearest cent?

Q6. Kip’s app reports his screen time over 5 days: 2, 3, 2.5, 4 and 3.5 hours.

- (a) Find the total hours.
- (b) Find the mean hours per day.
- (c) Find the range of the daily hours.

Un scaffolded

Q7. The bar chart shows the Bellaroo Ward vote counted booth by booth.



Horizontal bar chart of Bellaroo Ward votes by booth: Old Mill Library 910, Bellaroo Public Hall 820, North Gate Community Centre 640, Bellaroo Sports Club 625, Wattle Street School 505

- (a) How many votes were cast in the ward altogether?
- (b) What percentage of the ward’s votes were cast at Old Mill Library?
- (c) Did any one booth record a majority — more than 50 % — of the ward’s votes? Use the numbers to explain.

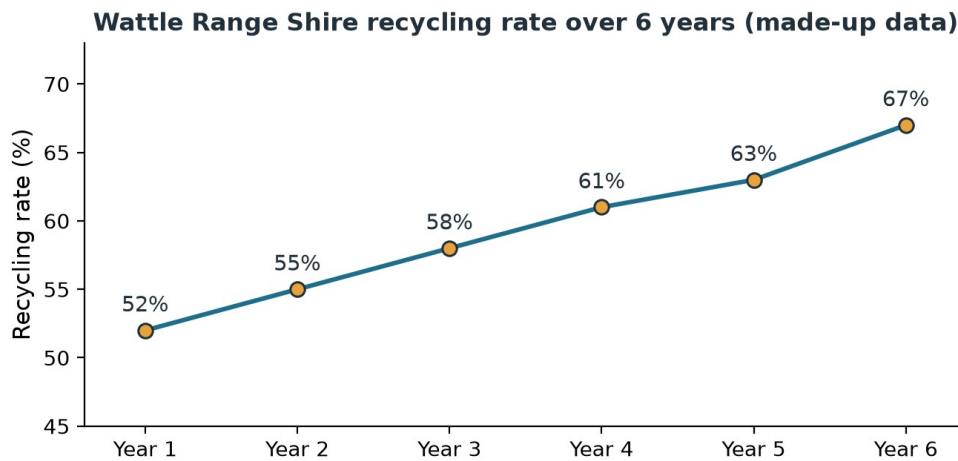
Q8. The table gives employment numbers for Wattle Range Shire.

Group	Count
Working-age population	5 000
Labour force	3 200
Unemployed	160
Underemployed (in work, wanting more hours)	240

Made-up data: the shire and every number in this table are made up for this section.

- (a) Find the unemployment rate: the unemployed as a percentage of the labour force.
- (b) Find the participation rate: the labour force as a percentage of the working-age population.
- (c) Find the underemployment rate: the underemployed as a percentage of the labour force.

Q9. The line chart shows the shire's recycling rate over 6 years.



Line chart of the Wattle Range Shire recycling rate in percent over 6 years: 52, 55, 58, 61, 63, 67

- (a) Read the rate in Year 1.
- (b) How many percentage points did the rate rise from Year 1 to Year 6?
- (c) Find the mean rate over the 6 years, to 1 decimal place.

Q10. A factory's pay report gives mean weekly pay: \$1 250 for men and \$1 100 for women.

- (a) Find the difference in mean weekly pay, in dollars.
- (b) Write the gap as a percentage of the men's mean pay.
- (c) The report's summary says the gap is "less than 1 in 10". Does your answer to (b) support that? Use the numbers to explain.

Q11. Prices rise 3% in a year. A shopping basket that cost \$240 at the start of the year tracks the rise exactly. Wages at the same shop rise 2%, from \$900 a week.

- (a) How much more does the basket cost, to the nearest cent?
- (b) What does the basket cost at the end of the year, to the nearest cent?
- (c) Find the new weekly wage, to the nearest cent. Did wages keep up with prices? Use the numbers to explain.

Q12. The council runs a draw: 20 streets enter, and 3 winning streets each get a nature-strip planting. The draw takes 3 cards at random from the 20. Kip’s street is one of the 20.

Council draw: 3 of the 20 street cards are drawn at random (made-up draw)

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

The highlighted cards show one possible draw — any 3 of the 20 are equally likely.

A grid of 20 numbered cards with 3 of them highlighted, showing a draw in which 3 of the 20 cards are taken at random

- Find the chance that the first card drawn is Kip’s street, as a fraction, a decimal and a percentage.
- Find the chance that Kip’s street is one of the 3 winning streets, as a fraction, a decimal and a percentage.
- Name the chance word from Section 4A that best fits your answer to (b).

Q13. The Save Our Strays group surveys 500 residents about stricter rules for roaming cats; 380 of them back the rules.

- Write the share who back the rules as a fraction in simplest form.
- Write that share as a decimal and as a percentage.
- Name the chance word from Section 4A that best fits a randomly chosen surveyed resident backing the rules.

Q14. Eight teens at the Stonefield Youth Centre log their screen time for one day: 3.5, 4, 2.5, 5, 6, 3, 4.5 and 3.5 hours. A draft report claims “teens at the centre average more than 5 hours a day”.

- Find the mean screen time for the group.
- Find the range of the screen times.
- Does the data support the report’s claim? Use the numbers to explain.

Q15. Abby has \$ 4 000 in a savings account paying the official interest rate of 3.5 % a year.

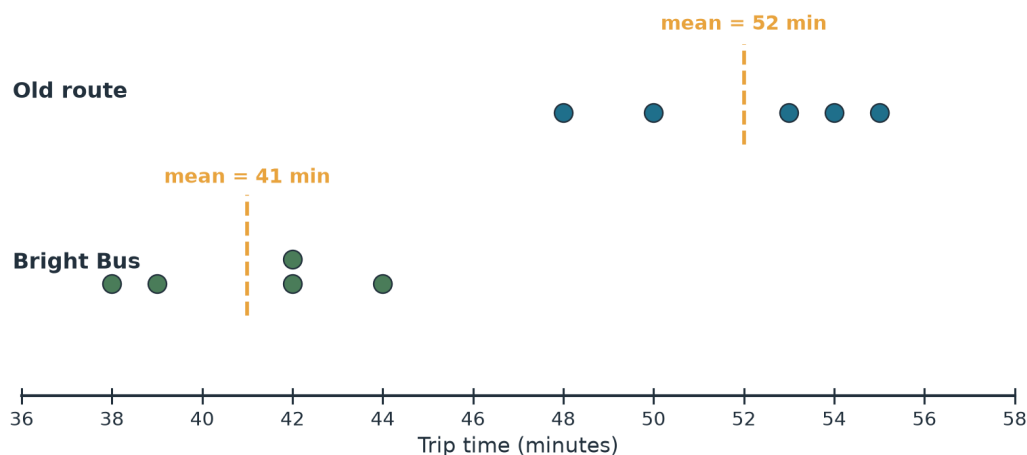
- How much interest does the account earn in one year?
- How much is in the account after one year, if the interest is left in?
- The official rate rises to 4 % a year. How much extra interest would \$ 4 000 earn in a year at 4 % instead of 3.5 %?

Q16. A national news report says 892 600 households now have solar panels, up 12 400 on the year before.

- How many households had solar panels the year before?
- Round 892 600 to the nearest thousand.
- The headline reads “solar households nearing 900 000”. Is that a sensible headline? Use rounding to the nearest hundred thousand to explain.

Q17. A Bright Bus ad claims the new route “saves commuters 15 minutes on average”. One commuter times five trips on the old route: 55, 50, 54, 48 and 53 minutes; then five trips on Bright Bus: 44, 39, 42, 38 and 42 minutes.

One commuter’s trip times — 5 old-route days, 5 Bright Bus days (made-up data)

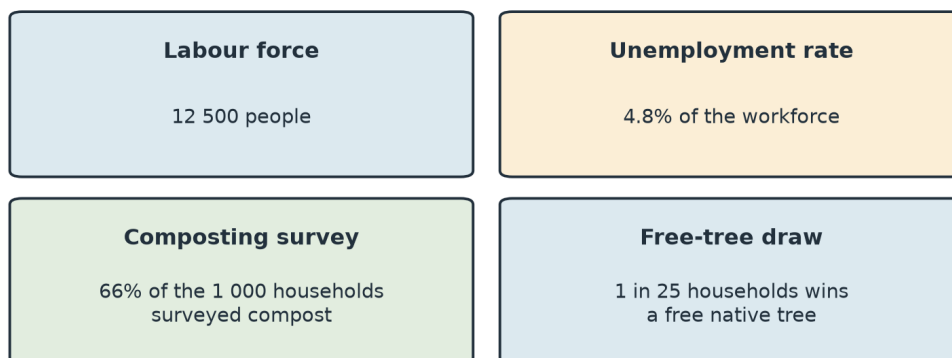


Two dot plots of trip times in minutes: old route values 48, 50, 53, 54, 55 with mean 52, and Bright Bus values 38, 39, 42, 42, 44 with mean 41

- Find the mean trip time on the old route.
- Find the mean trip time on Bright Bus.
- Find the actual mean saving per trip. Does the commuter’s data support the ad’s claim? Use the numbers to explain.

Q18. The community dashboard below is on the shire’s website.

Wattle Range Shire community dashboard (made-up data)



A four-tile community dashboard: labour force 12 500 people, unemployment rate 4.8% of the workforce, composting 66% of the 1 000 households surveyed, and a free-tree draw of 1 in 25 households

- How many people in the shire’s labour force are unemployed?
- How many of the 1 000 surveyed households compost?
- Write the chance that a household wins a free tree in the draw as a percentage, and name the chance word from Section 4A that fits it.

Answers

Q1. (a) 60 %. (b) 0.42, $\frac{21}{50}$. (c) 68 %, $\frac{17}{25}$.

Q2. (a) 180 trees. (b) 1 020 trees. (c) 2.5 %.

Q3. (a) $\frac{4}{5}$. (b) 80 %. (c) 20 %.

Q4. (a) \$ 30. (b) \$ 530. (c) \$ 100.

Q5. (a) \$ 0.16. (b) \$ 3.36. (c) \$ 2.31.

Q6. (a) 15 h. (b) 3 h per day. (c) 2 h.

Q7. (a) 3 500 votes. (b) 26 %. (c) no — the biggest booth share is 26 %, well under 50 %.

Q8. (a) 5 %. (b) 64 %. (c) 7.5 %.

Q9. (a) 52 %. (b) 15 percentage points. (c) 59.3 % (to 1 decimal place).

Q10. (a) \$ 150. (b) 12 %. (c) no — 1 in 10 is 10 %, and 12 % > 10 %.

Q11. (a) \$ 7.20. (b) \$ 247.20. (c) \$ 918.00; no — wages rose 2 % against prices' 3 %.

Q12. (a) $\frac{1}{20} = 0.05 = 5\%$. (b) $\frac{3}{20} = 0.15 = 15\%$. (c) unlikely.

Q13. (a) $\frac{19}{25}$. (b) 0.76, 76 %. (c) likely.

Q14. (a) 4 h per day. (b) 3.5 h. (c) no — the mean is 4 h, under the 5 h claimed.

Q15. (a) \$ 140. (b) \$ 4 140. (c) \$ 20.

Q16. (a) 880 200 households. (b) 893 000. (c) yes — 892 600 rounds to 900 000 to the nearest hundred thousand.

Q17. (a) 52 min. (b) 41 min. (c) 11 min; no — the actual saving is under the 15 min claimed.

Q18. (a) 600 people. (b) 660 households. (c) 4 %; unlikely.

Fully-worked solutions

Q1. (a) 3 in 5 is $\frac{3}{5} = 3 \div 5 = 0.6$, and $0.6 \times 100 = 60\%$. (b) $42\% = 42 \div 100 = 0.42$, and $\frac{42}{100} = \frac{21}{50}$ after dividing top and bottom by 2. (c) $0.68 \times 100 = 68\%$, and $\frac{68}{100} = \frac{17}{25}$ after dividing top and bottom by 4.

Q2. (a) $0.15 \times 1200 = 180$ gum trees. (b) $1200 - 180 = 1020$ trees. (c) $30 \div 1200 = 0.025$, and $0.025 \times 100 = 2.5\%$.

Q3. (a) $\frac{480}{600} = \frac{4}{5}$ after dividing top and bottom by 120. (b) $4 \div 5 = 0.8$, so 80 %. (c) $600 - 480 = 120$ did not vote; $120 \div 600 = 0.2 = 20\%$ (or $100 - 80 = 20$).

Q4. (a) $0.06 \times 500 = \$30$. (b) $500 + 30 = \$530$. (c) $0.04 \times 2500 = \$100$.

Q5. (a) $0.05 \times 3.20 = \$0.16$. (b) $3.20 + 0.16 = \$3.36$. (c) $0.05 \times 2.20 = 0.11$, and $2.20 + 0.11 = \$2.31$.

Q6. (a) $2 + 3 + 2.5 + 4 + 3.5 = 15$ h. (b) $15 \div 5 = 3$ h per day. (c) Highest 4, lowest 2: $4 - 2 = 2$ h.

Q7. (a) $820 + 640 + 910 + 505 + 625 = 3500$ votes. (b) $910 \div 3500 = 0.26 = 26\%$. (c) No. A majority needs more than 50 % of the ward's votes; the biggest booth share is 26 %, so no booth came close to a majority.

Q8. (a) $160 \div 3\,200 = 0.05 = 5\%$. (b) $3\,200 \div 5\,000 = 0.64 = 64\%$. (c) $240 \div 3\,200 = 0.075 = 7.5\%$.

Q9. (a) 52%. (b) $67 - 52 = 15$ percentage points. (c) Total $52 + 55 + 58 + 61 + 63 + 67 = 356$; mean $356 \div 6 = 59.333\ldots \approx 59.3\%$ to 1 decimal place.

Q10. (a) $1\,250 - 1\,100 = \$150$. (b) $150 \div 1\,250 = 0.12 = 12\%$. (c) “1 in 10” is $\frac{1}{10} = 10\%$. The gap is 12%, and $12 > 10$, so the summary’s claim is **not supported** by the report’s own numbers.

Q11. (a) $0.03 \times 240 = \$7.20$. (b) $240 + 7.20 = \$247.20$. (c) $0.02 \times 900 = 18$, and $900 + 18 = \$918.00$. Wages rose 2% while prices rose 3%; $2 < 3$, so wages did **not** keep up with prices.

Q12. (a) 1 favourable card of 20 equally likely cards: $\frac{1}{20} = 1 \div 20 = 0.05 = 5\%$. (b) 3 winning cards of the 20:

$\frac{3}{20} = 3 \div 20 = 0.15 = 15\%$. (c) 15% sits low on the chance scale, so the word is **unlikely**.

Q13. (a) $\frac{380}{500} = \frac{19}{25}$ after dividing top and bottom by 20. (b) $19 \div 25 = 0.76$, and $0.76 \times 100 = 76\%$. (c) 76% sits high on the chance scale, so the word is **likely**.

Q14. (a) Total $3.5 + 4 + 2.5 + 5 + 6 + 3 + 4.5 + 3.5 = 32$ h; mean $32 \div 8 = 4$ h per day. (b) Highest 6, lowest 2.5: $6 - 2.5 = 3.5$ h. (c) The claim says more than 5 h a day; the group’s mean is 4 h, and $4 < 5$, so the data does **not support** the claim.

Q15. (a) $0.035 \times 4\,000 = \$140$. (b) $4\,000 + 140 = \$4\,140$. (c) At 4%: $0.04 \times 4\,000 = 160$; extra interest $160 - 140 = \$20$.

Q16. (a) $892\,600 - 12\,400 = 880\,200$ households. (b) The hundreds digit is 6, so round the thousands up: 893 000. (c) To the nearest hundred thousand, 892 600 rounds to 900 000 (the ten-thousands digit is 9), so “nearing 900 000” is a **sensible** headline.

Q17. (a) Total $55 + 50 + 54 + 48 + 53 = 260$ min; mean $260 \div 5 = 52$ min. (b) Total $44 + 39 + 42 + 38 + 42 = 205$ min; mean $205 \div 5 = 41$ min. (c) Saving $52 - 41 = 11$ min per trip. The ad claims 15 min and $11 < 15$, so the commuter’s data does **not support** the claim — the ad overstates the saving.

Q18. (a) $0.048 \times 12\,500 = 600$ people. (b) $0.66 \times 1\,000 = 660$ households. (c) 1 in 25 is $\frac{1}{25} = 1 \div 25 = 0.04 = 4\%$, which sits low on the chance scale — **unlikely**.

Chapter 6 Numeracy in context — 6C Financial numeracy

Theory

About the data in this section. The prices, budgets, odds boards, pay slips and charts in this section are **made up** (not real data). They are written to look like the money you meet in real life so you can practise on them. Every shop, servo, team, app and employer named here is invented.

In the study design (Unit 2, Outcome 1), financial numeracy means understanding and carrying out deals with money, such as buying and paying, and making well-informed choices about how you use and manage your money.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-09.

What this section covers. Money decisions come up every week of your life. This section builds six money jobs, in the order you will meet them:

- **Comparing prices** — unit prices on the shelf: which pack is the better buy?
- **Costs over time** — petrol and grocery prices across months; the mean and the range sum up the story.
- **Comparing providers** — phone plans and power plans: which one charges less for what you actually use?
- **Budgets** — money in, money out, and what is left; spreadsheets and apps do the adding for you.
- **Gambling chance** — what sporting odds mean, what a win returns, and the chance the odds suggest.
- **Money trends and tax** — house prices, the cost of living and wages; then GST, tax and superannuation on a pay slip.

The six money jobs in this section



The six money jobs in this section

Every money job in this section uses the same three-step habit. **Plan:** pick the maths that fits the job. **Do:** work it out, by hand or with a calculator or app. **Check:** compare the answer with your estimate — does it make sense? For example, 4 packets of pasta at \$2.20 each: estimate $4 \times \$2 = \$8$, then the exact cost is $4 \times \$2.20 = \$8.80$, and the check says yes, \$8.80 is close to the \$8 estimate, so it is sensible.

Money words. These words carry the whole section. Learn them here and every question gets easier.

Word	What it means
income	money coming in (pay, allowances, benefits)
expenses	money going out (rent, food, bills, fun)
budget	a plan for your income and your expenses
surplus	income – expenses when income is bigger: money left over
shortfall	expenses – income when expenses are bigger: money missing
gross pay	your pay before tax is taken out
take-home pay	what actually reaches your bank account after tax
wage	pay per hour or per shift
salary	pay agreed for the year, paid in equal amounts each week or month
utilities	household services you pay for: power, water, phone, internet
stake	the money you put on a bet
return (payout)	the money a winning bet gives back, stake included
decimal odds	what a bet pays per \$1 staked: $\text{return} = \text{stake} \times \text{odds}$
servo	Australian slang for a petrol station

Comparing prices: the unit price. Two packs of the same food can be different sizes and different prices, so the price tag alone does not tell you the better buy. The *unit price* — the cost of one litre, one kilogram, one egg — does.

Refresher — unit price and the best buy. Unit price = total price ÷ number of units. The pack with the **lower** unit price is the better buy, whatever size the pack is. If the size is in grams, change to kilograms first: 1000 g = 1 kg, so divide the grams by 1000 (750 g = 0.75 kg).

Same shelf, two rice packs

Sunfield Rice	Home brand rice
2 kg	750 g
5.60	2.55
per kg: $5.60 \div 2 = 2.80$	per kg: $2.55 \div 0.75 = 3.40$
BETTER BUY — cheaper per kg	

Sunfield works out 0.60 cheaper per kilogram.

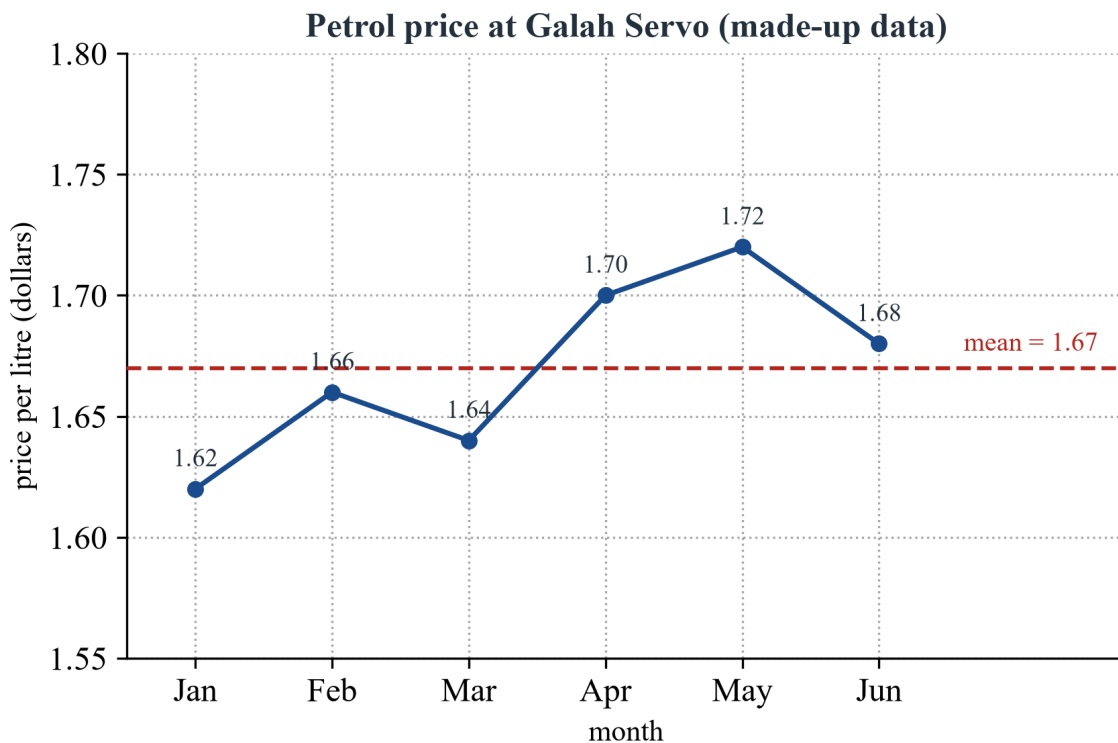
Amounts in Australian dollars.

Two rice packs on the same shelf with their unit prices

Read the shelf tags above. Sunfield Rice: 2 kg for \$5.60, so $\$5.60 \div 2 = \$2.80$ per kg. Home brand rice: 750 g = 0.75 kg for \$2.55, so $\$2.55 \div 0.75 = \$3.40$ per kg. The smaller, cheaper-looking pack is actually dearer per kilogram — Sunfield saves you \$0.60 on every kilogram.

Costs over time: mean and range. Prices move from week to week. A line chart shows the movement; two numbers sum it up.

Refresher — mean and range. Mean = (add all the values) $\div$ (how many values there are). The mean is the typical value. Range = biggest value – smallest value. The range tells you how much the values spread out.



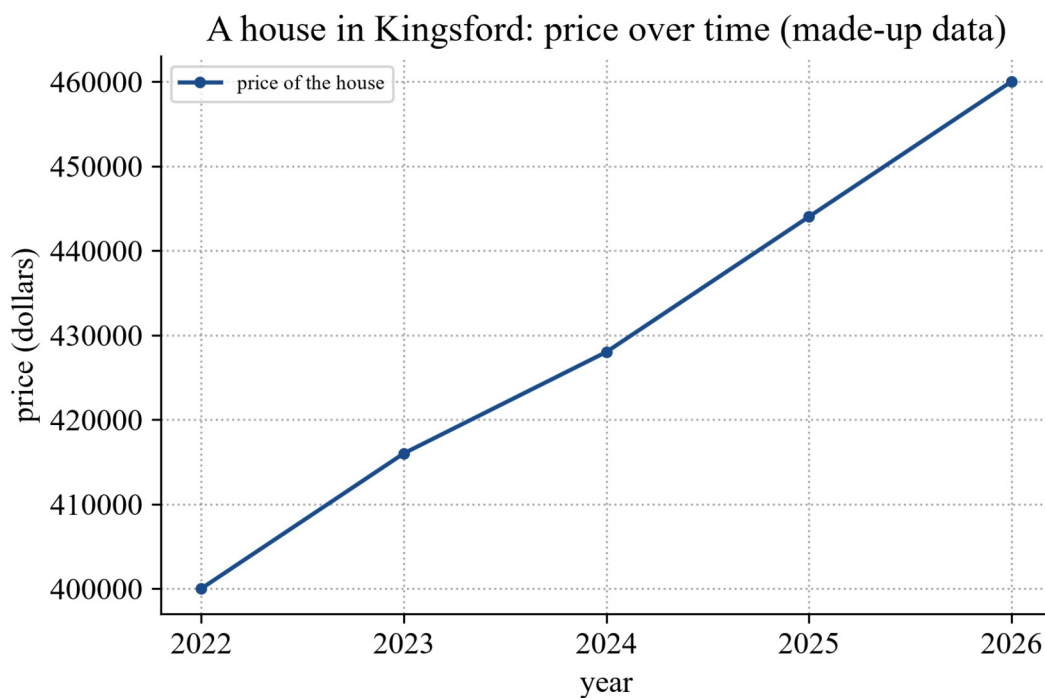
Petrol price at Galah Servo over six months with the mean marked

The chart above shows the petrol price at Galah Servo for six months. Add the six prices: $1.62 + 1.66 + 1.64 + 1.70 + 1.72 + 1.68 = 10.02$. Mean = $\$10.02 \div 6 = \$1.67$ per litre (the dashed line). Range = $\$1.72 - \$1.62 = \$0.10$ per litre. In words: the price **rose** from January to a **peak** in May, then **fell** in June, but stayed inside a small 10-cent range.

Comparing providers. Phone plans and power plans charge you in two kinds of ways: a fixed charge (per month or per day) and a usage charge (per GB of data, per kWh of power). A kilowatt-hour (kWh) is the unit power companies measure your electricity use in. To compare two plans for *your* use, work out the total each plan would charge you, or the cost per unit. For example, \$19 a month for 10 GB works out at $\$19 \div 10 = \$1.90$ per GB, while \$30 a month for 25 GB works out at $\$30 \div 25 = \$1.20$ per GB — the bigger plan is cheaper per GB, but only worth it if you will actually use the data.

Refresher — a percentage of an amount. “Percent” means out of 100, so a percentage of an amount is a multiplication: write the percent as a decimal (divide by 100) and multiply. For example, 10% of \$35 = $0.10 \times \$35 = \$3.50$. Fast 10% trick: move the decimal point one place to the left (\$35 $\rightarrow$ \$3.50).

Refresher — percentage change. Percentage change = (change $\div$ starting amount) $\times$ 100%. The change is new amount – starting amount. For example, a house bought for \$400 000 and now worth \$460 000 has changed by \$60 000, and $\$60\,000 \div \$400\,000 = 0.15$, so $0.15 \times 100\% = 15\%$: the price rose 15%.



A house price rising over four years

Budgets. A budget is a plan for money in and money out. The key line is: $\text{income} - \text{expenses} = \text{surplus}$ (when income wins) or a shortfall (when expenses win). For example, \$500 income with rent \$240, groceries \$110, phone \$20 and transport \$30 gives expenses of \$400, so the surplus is $\$500 - \$400 = \$100$ for the week. A spreadsheet or a budget app keeps that list for you and adds the expense column with one formula, typed with an equals sign in front, like `=SUM(B2:B6)`, which adds cells B2 down to B6. Change one number and the total updates itself — that is the whole point of doing a budget with technology. You can always do the same adding with pen and paper.

Gambling: reading the odds. Sports betting quotes *decimal odds*: the money a winning bet returns for every \$1 you stake, your stake included. Three facts do all the work in this section:

- $\text{return (payout)} = \text{stake} \times \text{odds}$
- $\text{profit} = \text{return} - \text{stake}$ (because the stake comes back inside the return)
- the chance the odds suggest $= 1 \div \text{odds}$, as a decimal ($\times 100$ for a percentage). This is called the **implied chance** — the chance the odds suggest, nothing more.

Sample betting board (decimal odds)

HEAD TO HEAD — Saturday match		
Outcome	Odds	Implied chance
Kurrajong Kangaroos	2.50	40%
Boronia Bears	1.60	62.5%

Implied chance = $1 \div \text{odds}$: Kangaroos $1 \div 2.50 = 0.40 = 40\%$; Bears $1 \div 1.60 = 0.625 = 62.5\%$

The chances add to 102.5% — more than 100%.
The extra is the betting company's slice.

A head-to-head betting board with the implied chances

On the board above, \$10 on the Bears at odds of 1.60 returns $\$10 \times 1.60 = \$16.00$, so the profit is $\$16.00 - \$10.00 = \$6.00$. The odds suggest a chance of $1 \div 1.60 = 0.625 = 62.5\%$ that the Bears win, and $1 \div 2.50 = 0.40 = 40\%$ that the Kangaroos win. Notice the two chances add to 102.5%, more than 100%: the extra over 100% is the betting company's slice, and it is how the company makes its money whichever team wins. Odds are not tips — a 62.5% chance still loses about four times in ten — so the only safe rule is to stake what you can afford to lose, and treat it as the cost of the entertainment, not a way to earn.

Money trends: cost of living, houses, wages. The *Consumer Price Index* (CPI) is a number that tracks how the price of a standard basket of groceries and bills changes; when people say “inflation” or “the cost of living”, this is the movement they mean. If the CPI goes up 3%, a basket that cost \$100 last year costs $\$100 + (3\% \text{ of } \$100) = \$100 + \$3 = \$103$ this year.

What a 3% CPI rise does to one basket of groceries



$$3\% \text{ of } 100 = 3, \text{ so } 100 + 3 = 103$$

Amounts in Australian dollars.

A 100-dollar basket becoming a 103-dollar basket after a 3% CPI rise

Wages move the same way. A 2% pay rise on \$25.00 an hour adds $2\% \text{ of } \$25.00 = \$0.50$, giving \$25.50 an hour. And here is the money judgement behind the numbers: if prices rise 3% while your wage rises 2%, your pay buys less than it did — that is what a cost-of-living squeeze feels like in a household budget. House prices trend too (see the

Kingsford chart above), but a trend is a story about the past, not a promise about next year: prices can fall as easily as rise, and that risk is part of reading any money chart.

Costing a holiday. A trip costs money in several places at once: fares, nights away (nights $\times$ price per night), food and activities. Cost each option fully, add the pieces, then compare the totals with your budget — the option that fits the budget wins. Trip-planner apps and fare-comparison sites are built for exactly this job: the sample screen below quotes two fares for the same trip, and a planner would add the motel and the tour on top. Apps quote estimates, so check the total against your own list before you book.

Skyward Air — trip planner
Return fare, home to Sandy Cove (sample screen)

Depart TUESDAY
per person, return

180

Depart SATURDAY
per person, return

240

Also in Fleur's plan:
Sandy Cove Motel — 95 per night
Beach tour — 45 per person
Fleur's budget for the trip: 550

Amounts in Australian dollars.

A sample trip-planner screen with two fares and the other trip costs

Tax, GST and superannuation. Three money words sit on every pay slip and most receipts. The *Goods and Services Tax* (GST) is a tax of 10% added to the price of most goods and services in Australia: on a bill of \$200 before GST, the GST is 10% of \$200 = \$20, so the total is \$220.

BULOKE BUILD SUPPLIES

Tax invoice (sample)

Labour	150.00
Parts	50.00
Amount before GST	200.00
GST (10%)	20.00
Total	220.00

Amounts in Australian dollars.

A sample tax invoice showing GST at 10%

Tax on wages is taken out before you are paid: your employer withholds it (holds it back) and sends it to the government, so your take-home pay is less than your gross pay. *Superannuation* (“super”) is the opposite direction: extra money your employer pays **on top of** your wage into a super fund for your retirement — it never comes out of your take-home pay. In this section we use a made-up super rate of 10% of gross pay to keep the arithmetic clean (the real rate is set by law and is not exactly 10%).

QUANDONG CAFE

Pay slip (sample) — one week

Gross pay	820.00
Tax withheld	−96.00
Take-home pay	724.00

Superannuation — 10% of gross,	82.00
--------------------------------	-------

paid on top to FutureNest Super

Super is extra money your employer pays on top —
it does not come out of your take-home pay.

Amounts in Australian dollars.

A sample weekly pay slip showing gross pay, tax, take-home pay and super

On the pay slip above: take-home = $\$820.00 - \$96.00 = \$724.00$, and super = $10\% \text{ of } \$820.00 = \$82.00$ paid on top. On a \$600 week the super would be $10\% \text{ of } \$600 = \$60.00$, also on top.

Using technology. Everything in this section can be done with pen, paper and a basic calculator, and every question here can be answered that way. Technology is there to speed up the adding and to keep your lists: a spreadsheet totals a budget column with $\text{=SUM}(\dots)$, a budget app watches your spending, a fare app quotes two flights side by side, and a calculator does 10% in one key press. Use whichever tool you have — the thinking (plan, do, check) is yours either way.

U3/4 preview. In Units 3 and 4 this money work grows to include interest, loans and how the value of things like cars falls over time; none of that is part of Unit 2 and none of it is assessed here.

Worked examples

Example 1 — scaffolded

Annie's car has a 40 L tank and it is empty. Redbank Servo charges \$1.72 per litre and Galah Servo charges \$1.68 per litre.

- What does a full tank cost at Redbank Servo?
- What does a full tank cost at Galah Servo?
- Which servo is cheaper for a full tank, and by how much?

Working	Comment
(a) $40 \times \$1.72 = \$68.80$	cost = litres $\times$ price per litre
(b) $40 \times \$1.68 = \$67.20$	same 40 L at the other servo
(c) $\$68.80 - \$67.20 = \$1.60$	subtract the two totals

Galah Servo is cheaper, and a full tank there saves Annie **\$1.60**.

Example 2 — scaffolded

Juno keeps a weekly budget in a spreadsheet, shown below. Cell B7 holds the formula $\text{=SUM}(B2:B6)$ and cell B9 holds the formula $\text{=B8}-B7$.

Juno's weekly budget (spreadsheet view)

	B7	=SUM(B2:B6)
	A	B
1	Item	Amount (dollars)
2	Rent	250
3	Groceries	95
4	Phone	20
5	Transport	40
6	Fun	35
7	Total expenses	440
8	Income	560
9	Surplus	120

Cell B7 holds =SUM(B2:B6), which shows 440.
Cell B9 holds =B8-B7, which shows 120.

Amounts in Australian dollars.

Juno's weekly budget spreadsheet

- What does the formula in B7 do, and what number does it show?
- What is Juno's surplus for the week?
- Juno decides to spend \$65 on Fun instead of \$35. What is the new total for expenses, and the new surplus?

Working	Comment
(a) =SUM (B2 : B6) adds 250 + 95 + 20 + 40 + 35 = \$440	SUM adds the whole expense column, B2 down to B6
(b) \$560 – \$440 = \$120	surplus = income – expenses
(c) \$440 + \$30 = \$470, then \$560 – \$470 = \$90	Fun rose \$30, so expenses rise \$30 and the surplus falls \$30

The spreadsheet would show those new numbers by itself the moment Juno typed 65 into cell B6 — but pen and paper reach the same answer.

Example 3 — unscaffolded

The betting board in the theory above quotes the Kurrajong Kangaroos at odds of 2.50 against the Boronia Bears. Alma puts an \$8 stake on the Kangaroos. If the Kangaroos win, how much money does Alma get back, how much of that is profit, and what chance of a Kangaroos win do the odds suggest?

Solution.

A winning bet returns the stake times the odds, so Alma's \$8 at odds of 2.50 returns $\$8 \times 2.50 = \$20.00$. The stake comes back inside that return, so the profit is the return minus the stake: $\$20.00 - \$8.00 = \$12.00$. The chance the odds suggest is $1 \div \text{odds}$, so $1 \div 2.50 = 0.40$, which is 40%.

$\therefore$ A win returns **\$20.00**, of which **\$12.00** is profit, and the odds of 2.50 suggest a **40%** chance of a Kangaroos win.

Example 4 — unscaffolded

Fleur is planning 3 nights at Sandy Cove. The trip-planner screen in the theory above quotes a return fare of \$180 if she flies out on Tuesday or \$240 if she flies out on Saturday. The Sandy Cove Motel charges \$95 per night and the beach tour costs \$45 per person. Fleur's budget for the whole trip is \$550. Cost both options and say which departure fits her budget.

Solution.

Both options need the same motel and tour: 3 nights at \$95 is $3 \times \$95 = \$285$, and with the \$45 tour that part is $\$285 + \$45 = \$330$. Adding the Tuesday fare gives $\$180 + \$330 = \$510$ for the trip, while the Saturday fare gives $\$240 + \$330 = \$570$. Comparing each total with the \$550 budget, \$510 fits and \$570 is $\$570 - \$550 = \$20$ over.

$\therefore$ Flying out on **Tuesday** costs \$510 and fits the \$550 budget; the Saturday option costs \$570, which is \$20 over, so Tuesday is the choice.

Practice questions

Scaffolded

Q1. Find the unit price in each case.

- (a) 4 L of milk for \$6.00: the price per litre.
- (b) 3 kg of potatoes for \$5.85: the price per kilogram.
- (c) 6 eggs for \$4.50: the price per egg.

Q2. Mae fills her 35 L tank at Galah Servo, where petrol is \$1.66 per litre.

- (a) What does the full tank cost?
- (b) The next week she buys half a tank, 17.5 L. What does that cost?
- (c) In part (a) Mae pays with a \$100 note. What change does she get?

Q3. Sunfield Pasta sells 500 g packs for \$2.20. A home brand sells 750 g packs for \$2.85.

- (a) Find the Sunfield price per kilogram.
- (b) Find the home brand price per kilogram.
- (c) Which is the better buy, and how much does it save per kilogram?

Q4. Annie's week: her wage is \$480 and she gets a \$40 allowance. Her expenses are rent \$220, groceries \$90, phone \$18, transport \$35 and fun \$45.

- (a) What is her total income for the week?
- (b) What are her total expenses for the week?
- (c) Does the week end in a surplus or a shortfall, and how much?

Q5. Remember that GST is 10% of the price before GST.

- (a) Find the GST on a \$60 job.
- (b) What is the total price of that job, including GST?
- (c) A \$35 delivery also has GST added. Find the GST and the total price.

Q6. A betting board quotes the Buloke Boars at odds of 4.00 against the Casuarina Cats. Mae puts a \$10 stake on the Boars.

- (a) If the Boars win, what does the bet return?
- (b) How much of that return is profit?
- (c) What chance of a Boars win do the odds suggest? Give a decimal and a percentage.

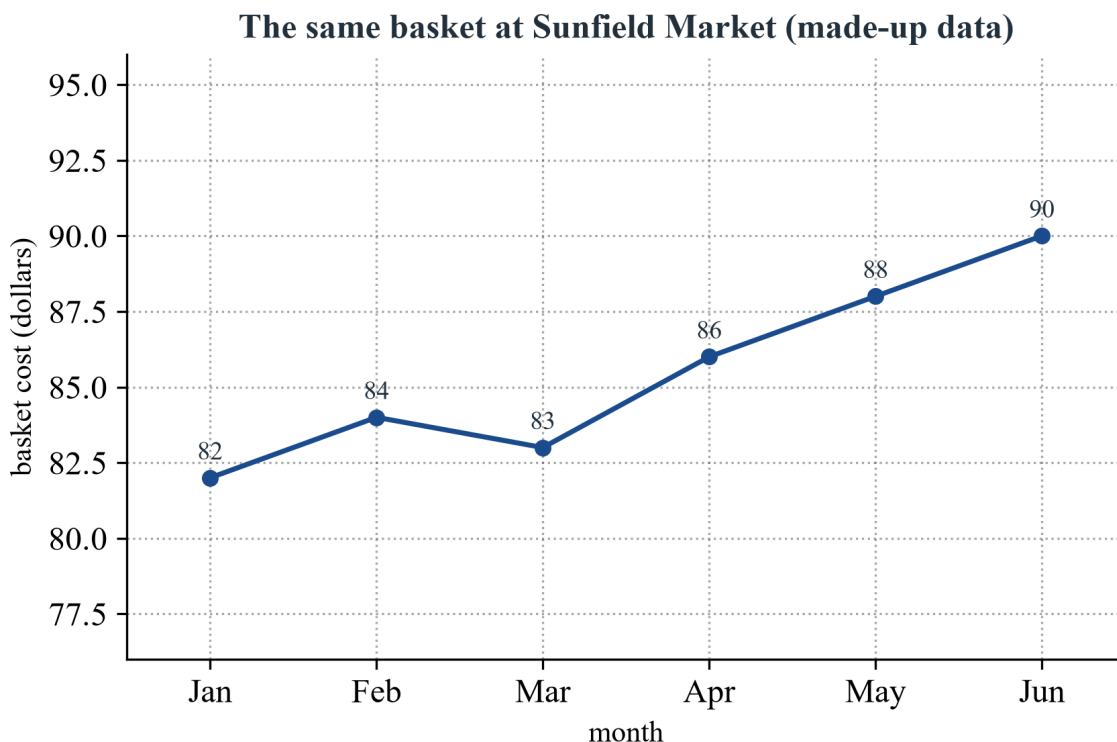
Unscaffolded

Q7. Bellvale Mobile sells two plans: the Small plan at \$25 a month with 20 GB of data, and the Large plan at \$40 a month with 50 GB of data. Tara uses about 45 GB a month. Say which plan covers her use, what that plan costs her over 12 months, and then compare the two plans by their cost per GB to say which plan is cheaper per GB.

Q8. The price of petrol at Galah Servo over five weeks was \$1.64, \$1.68, \$1.72, \$1.70 and \$1.66 per litre. Find the mean price to the nearest cent, find the range, and describe in one sentence how the price moved over the five weeks.

Q9. A house in Kingsford sold for \$480 000 in 2025 and the same house was valued at \$504 000 in 2026. Find the change in dollars, find the percentage change, and then find what the house would be worth if the price fell 5% from the 2026 value.

Q10. The chart below shows what the same shopping basket cost at Sunfield Market each month from January to June.



The same basket at Sunfield Market over six months

Read the chart and say what the basket cost in March, between which two months the biggest rise happened and how big that rise was, and whether the basket cost rose or fell overall from January to June and by how much.

Q11. Annie earns \$28.50 an hour and works 20 hours a week. Find her weekly pay. Her employer then gives her a 2% pay rise: find her new hourly rate, and find her new weekly pay at 20 hours.

Q12. Cyril earns \$3200 a month. His employer pays super at a rate of 10% of his gross pay into FutureNest Super, on top of his wage. Find the super paid for one month, the super paid over 12 months, and the total cost to the employer of one month of Cyril's pay (wage plus super).

Q13. Hal's weekly pay slip from the Sheoak Garden Shop shows gross pay \$760 and tax withheld \$84. Find Hal's take-home pay for the week, his take-home pay over 4 weeks, and the super his employer pays on top for the week at a rate of 10% of gross pay.

Q14. A betting board for Saturday's match quotes the Kurrajong Kangaroos at 1.80, a draw at 3.50 and the Boronia Bears at 4.50.

Say which outcome the odds suggest is most likely and give its chance as a percentage to the nearest whole number. Give the chance of a Bears win as a decimal correct to 2 decimal places and as a percentage to the nearest whole

number. Then add the three chances (Kangaroos $1 \div 1.80$, draw $1 \div 3.50$, Bears $1 \div 4.50$) and give the total as a percentage to the nearest whole number, and say who keeps the extra above 100%.

Q15. Juno is planning 4 nights away. The return fare is \$165 if she flies out Tuesday or \$210 if she flies out Saturday. The motel costs \$90 per night and the museum tour costs \$40 per person. Juno's budget for the trip is \$600. Cost the trip for each departure day and say which one fits the budget, and by how much the other one misses it.

Q16. Mae is comparing two power providers for her flat. Coastlight Power charges a supply charge of \$0.85 per day plus \$0.32 per kWh. Hillview Power charges a supply charge of \$1.05 per day plus \$0.28 per kWh. In one month Mae counts 30 days and her meter shows 250 kWh used. Cost the month with each provider and say which is cheaper this month, and by how much.

Q17. Alma's monthly budget: income \$2200; expenses rent \$950, groceries \$420, phone \$30, power \$140, transport \$180, entertainment \$150, clothes \$120, other \$260. Find her total expenses, say whether the month ends in a surplus or a shortfall and by how much, and then find the new result if she cuts entertainment to \$100 and clothes to \$90.

Q18. The same four items at Sunfield Market cost this last year and this year:

Item	Last year	This year
Rice, 2 kg	\$5.20	\$5.60
Pasta, 500 g	\$2.00	\$2.20
Milk, 2 L	\$3.10	\$3.25
Eggs, 12-pack	\$5.40	\$6.00

Find the total cost of the four items last year and this year, find the percentage change in that total to the nearest whole percent, and then find which single item rose the most in percentage terms (work each item's percentage rise to the nearest whole percent).

Answers

Q1. (a) \$1.50 per litre (b) \$1.95 per kg (c) \$0.75 per egg

Q2. (a) \$58.10 (b) \$29.05 (c) \$41.90

Q3. (a) \$4.40 per kg (b) \$3.80 per kg (c) home brand, saving \$0.60 per kg

Q4. (a) \$520 (b) \$408 (c) surplus of \$112

Q5. (a) \$6.00 (b) \$66.00 (c) GST \$3.50, total \$38.50

Q6. (a) \$40.00 (b) \$30.00 (c) $0.25 = 25\%$

Q7. Large plan; \$480 over 12 months; Large \$0.80 per GB against Small \$1.25 per GB, so Large is cheaper per GB.

Q8. Mean \$1.68 per litre (to the nearest cent); range \$0.08; the price rose for the first three weeks then fell over the last two weeks.

Q9. \$24 000 rise; 5% rise; \$478 800 after a 5% fall.

Q10. \$83 in March; the biggest rise was March to April, up \$3; the basket rose overall, up \$8 from January to June.

Q11. \$570.00 a week; new rate \$29.07 an hour; new weekly pay \$581.40.

Q12. \$320 a month; \$3840 over 12 months; \$3520 total monthly cost.

Q13. \$676 a week; \$2704 over 4 weeks; \$76.00 super for the week.

Q14. Kangaroos, 56% (nearest whole); Bears 0.22 (2 d.p.) = 22% (nearest whole); the three chances add to 106% (nearest whole), and the extra above 100% is the betting company's slice.

Q15. Tuesday \$565 (fits the \$600 budget); Saturday \$610, which misses the budget by \$10.

Q16. Coastlight \$105.50; Hillview \$101.50; Hillview is cheaper this month by \$4.00.

Q17. Total expenses \$2250; a shortfall of \$50; after the cuts, total \$2170 and a surplus of \$30.

Q18. \$15.70 last year, \$17.05 this year; up \$1.35 = 9% (nearest whole); eggs rose most, 11% (pasta 10%, rice 8%, milk 5%).

Fully-worked solutions

Q1. Unit price = total price $\div$ number of units.

(a) $\$6.00 \div 4 \text{ L} = \$1.50$ per litre. **$\$1.50$ per litre**

(b) $\$5.85 \div 3 \text{ kg} = \$1.95 \text{ per kg.}$ **$\$1.95$ per kg**

(c) $\$4.50 \div 6 = \$0.75$ per egg. $\$ \mathbf{\text{half} \{ \$0.75 \} \$}$ per egg

Q2. (a) $35 \text{ L} \times \$1.66 = \$58.10$. $\$ \mathbf{\$58.10}$

(b) Half a tank is $35 \div 2 = 17.5$ L, and $17.5 \times \$1.66 = \$29.05$. $\mathbf{\$29.05}$

(c) $\$100.00 - \$58.10 = \$41.90$ change. $\$41.90$

Q3. (a) $500\text{ g} = 0.5\text{ kg}$, so $\$2.20 \div 0.5 = \$4.40$ per kg. $\mathbf{\$4.40}$ per kg

(b) $750 \text{ g} = 0.75 \text{ kg}$, so $\$2.85 \div 0.75 = \$3.80$ per kg. $\mathbf{\$3.80}$ per kg

(c) The lower unit price is the better buy: the home brand at \$3.80 per kg, saving $\$4.40 - \$3.80 = \$0.60$ per kilogram. **\$0.60 per kg saved**

Q4. (a) $\text{Income} = \$480 + \$40 = \$520$. $\mathbf{\$520}$

(b) $\text{Expenses} = 220 + 90 + 18 + 35 + 45 = \$408$. $\mathbf{\$408}$

(c) Income is bigger, so it is a surplus: $\$520 - \$408 = \$112$. $\mathbf{\$112}$ surplus

Q5. (a) $\text{GST} = 10\% \text{ of } \$60 = 0.10 \times \$60 = \$6.00$. $\mathbf{\$6.00}$

(b) $\text{Total} = \$60 + \$6 = \$66.00$. $\mathbf{\$66.00}$

(c) $\text{GST} = 10\% \text{ of } \$35 = \$3.50$, total = $\$35 + \$3.50 = \$38.50$. $\mathbf{\$3.50}$ and $\mathbf{\$38.50}$

Q6. (a) $\text{Return} = \text{stake} \times \text{odds} = \$10 \times 4.00 = \$40.00$. $\mathbf{\$40.00}$

(b) $\text{Profit} = \text{return} - \text{stake} = \$40.00 - \$10.00 = \$30.00$. $\mathbf{\$30.00}$

(c) Chance the odds suggest = $1 \div 4.00 = 0.25 = 25\%$. $\mathbf{0.25 = 25\%}$

Q7. Tara uses 45 GB a month. The Small plan's 20 GB is not enough, so she needs the **Large** plan (50 GB covers 45 GB). Over 12 months the Large plan costs $12 \times \$40 = \$480$. Per GB: Large = $\$40 \div 50 = \$0.80$ per GB, Small = $\$25 \div 20 = \$1.25$ per GB, so the Large plan is cheaper per GB as well as being the only plan that covers her. $\mathbf{\$480}$; Large $\mathbf{\$0.80}$ /GB vs Small $\mathbf{\$1.25}$ /GB

Q8. Mean: add the five prices, $1.64 + 1.68 + 1.72 + 1.70 + 1.66 = 8.40$, then $8.40 \div 5 = 1.68$, so the mean is \$1.68 per litre to the nearest cent (it lands exactly on the cent). Range: biggest – smallest = $\$1.72 - \$1.64 = \$0.08$. Pattern: the price rose over the first three weeks to a peak of \$1.72, then fell over the last two weeks. $\mathbf{\$1.68}$; range $\mathbf{\$0.08}$

Q9. Change = $\$504\,000 - \$480\,000 = \$24\,000$. Percentage change = $\text{change} \div \text{starting amount} = \$24\,000 \div \$480\,000 = 0.05$, and $0.05 \times 100\% = 5\%$, a 5% rise. A 5% fall from the 2026 value is 5% of $\$504\,000 = \$25\,200$, so the house would be worth $\$504\,000 - \$25\,200 = \$478\,800$. $\mathbf{\$24\,000}$; $\mathbf{5\%}$; $\mathbf{\$478\,800}$

Q10. March: the March point sits at \$83. Biggest rise: month to month the basket went +\$2 (Jan–Feb), –\$1 (Feb–Mar), +\$3 (Mar–Apr), +\$2 (Apr–May), +\$2 (May–Jun), so the biggest rise is March to April at \$3. Overall: January \$82 to June \$90 is a rise of \$8, so the basket cost rose overall. $\mathbf{\$83}$; $\mathbf{+\$3}$ (Mar–Apr); rose $\mathbf{\$8}$ overall

Q11. Weekly pay = $\$28.50 \times 20 = \$570.00$. A 2% rise adds 2% of $\$28.50 = \$0.57$, so the new rate is $\$28.50 + \$0.57 = \$29.07$ an hour. New weekly pay = $\$29.07 \times 20 = \$581.40$. $\mathbf{\$570.00}$; $\mathbf{\$29.07}$; $\mathbf{\$581.40}$

Q12. Super for one month = $10\% \text{ of } \$3200 = 0.10 \times \$3200 = \$320$. Over 12 months that is $12 \times \$320 = \$3840$. The employer's total monthly cost is wage plus super = $\$3200 + \$320 = \$3520$. $\mathbf{\$320}$; $\mathbf{\$3840}$; $\mathbf{\$3520}$

Q13. Take-home = gross – tax = $\$760 - \$84 = \$676$ for the week. Over 4 weeks that is $4 \times \$676 = \$2704$. Super on top = $10\% \text{ of } \$760 = \$76$ for the week. $\mathbf{\$676}$; $\mathbf{\$2704}$; $\mathbf{\$76.00}$

Q14. The chances the odds suggest are Kangaroos $1 \div 1.80 = 0.5555... \approx 56\%$ to the nearest whole number, draw $1 \div 3.50 = 0.2857... \approx 29\%$, Bears $1 \div 4.50 = 0.2222... \approx 22\%$ (0.22 to 2 decimal places). The biggest chance is the Kangaroos at 56%, so the Kangaroos are the most likely outcome. Adding the three exact chances, $0.5555... + 0.2857... + 0.2222... = 1.0634...$, which is 106% to the nearest whole number. The total is above 100%, and the extra above 100% is the betting company's slice — it stays with the company whichever way the match goes. Kangaroos $\mathbf{56\%}$; Bears $\mathbf{0.22 = 22\%}$; total $\mathbf{106\%}$, extra kept by the betting company

Q15. Both options share the motel and tour: 4 nights $\times \$90 = \$360$, plus the \$40 tour, is \$400. Tuesday: $\$165 + \$400 = \$565$. Saturday: $\$210 + \$400 = \$610$. Against the \$600 budget, Tuesday fits (\$565 is under \$600) and Saturday

misses by $\$610 - \$600 = \$10$. Tuesday $\$565$ fits; Saturday $\$610$, $\$10$ over

Q16. Coastlight: supply = $30 \text{ days} \times \$0.85 = \$25.50$; usage = $250 \text{ kWh} \times \$0.32 = \$80.00$; total = $\$25.50 + \$80.00 = \$105.50$. Hillview: supply = $30 \times \$1.05 = \$31.50$; usage = $250 \times \$0.28 = \$70.00$; total = $\$31.50 + \$70.00 = \$101.50$. Hillview is cheaper this month by $\$105.50 - \$101.50 = \$4.00$. (Next month, with different usage, the answer could flip — that is why you cost the month you actually had.) Coastlight $\$105.50$; Hillview $\$101.50$; Hillview cheaper by $\$4.00$

Q17. Total expenses = $950 + 420 + 30 + 140 + 180 + 150 + 120 + 260 = \$2250$. Expenses are bigger than the $\$2200$ income, so the month ends in a shortfall of $\$2250 - \$2200 = \$50$. After the cuts, entertainment $\$100$ and clothes $\$90$ take $\$80$ out of the total: $\$2250 - \$80 = \$2170$, and now income wins: $\$2200 - \$2170 = \$30$ surplus. $\$2250$; shortfall $\$50$; then surplus $\$30$

Q18. Last year total = $5.20 + 2.00 + 3.10 + 5.40 = \$15.70$. This year total = $5.60 + 2.20 + 3.25 + 6.00 = \$17.05$. The change is $\$17.05 - \$15.70 = \$1.35$, and $\$1.35 \div \$15.70 = 0.0859\dots$, so $0.0859\dots \times 100\% \approx 9\%$ to the nearest whole percent. Item by item, to the nearest whole percent: rice $\$0.40 \div \$5.20 \approx 8\%$, pasta $\$0.20 \div \$2.00 = 10\%$, milk $\$0.15 \div \$3.10 \approx 5\%$, eggs $\$0.60 \div \$5.40 \approx 11\%$ — so the eggs rose the most in percentage terms. (The eggs also rose the most in dollars, $+\$0.60$, so the two stories agree here — but they are different questions, and they will not always agree.) $\$15.70$ and $\$17.05$; 9% ; eggs, 11%

Chapter 6 Numeracy in context — 6D Health numeracy

Theory

About the data in this section. The towns, clinics, workplaces, apps, health pages, surveys and product panels in this section are **made up** (not real): pretend places and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real place, person or product — and nothing here is medical advice.

In the study design (Unit 2, Outcome 1), health numeracy means using maths to look after your own health, safety and wellbeing, and also being aware of the same issues as they affect your community or your workplace.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-09.

What this section covers. Health numbers arrive every week: a fitness app's mean steps, a nutrition panel's sugar per serve, a workplace safety board's incident rate, a clinic health page's "1 in 4" chance, a safety data sheet's mixing instructions, a country family's trip to the nearest doctor. This section is about staying on top of those numbers — reading them (what does this goal, rate or chance actually say?) and using them (is the goal met? is the workplace safer than last year? is this mix safe?). The maths is all toolkit you already own: mean, range, percentages, fractions, simple chances and trends, pointed at your own health and safety, your workplace's, and your community's.

Where health numbers show up. The same few number shapes keep appearing. A **goal** to meet ("8 000 steps a day"). A **rate** per 100 people ("7.5 incidents per 100 workers"). A **share** of a group ("16 % of drivers"). A **trend** over time (a rate falling year by year). A **chance** ("about 1 in 4 people"). A **mix** ("dilute 1 part concentrate to 4 parts water"). Here are six of the places those numbers reach you:

Where health numbers show up (made-up examples)

Fitness app "Your mean this week: 7 300 steps a day." — StepWise	Nutrition panel "Sugar: 18 g per 100 g. Serving size: 40 g."	Work safety board "Incident rate this year: 7.5 per 100 workers."
Clinic health page "About 1 in 4 people will break a bone in a fall at home."	Safety data sheet "Dilute 1 part concentrate to 4 parts water."	Country clinic sign "GP travel time: Kadnia 10 min · Hillview 55 min."

Six cards showing where health numbers show up: a fitness app, a nutrition panel, a work safety board, a clinic health page, a safety data sheet and a country clinic sign, each with a made-up example number

Refresher — a percentage of an amount. "12% of the shire's 2 000 residents" means 12 for every 100: turn the percentage into a decimal and multiply. $12\% = 0.12$, and $0.12 \times 2\,000 = 240$ residents. Same shape every time: a percentage of an amount is the decimal times the amount. The other direction is $\text{part} \div \text{whole}$: if 30 of the 250 people in a clinic survey walk to get there, that share is $30 \div 250 = 0.12 = 12\%$.

Refresher — fractions, decimals and percentages. One share has three outfits (Section 4B). Fraction to decimal: top $\div$ bottom. Decimal to percentage: $\times 100$. Percentage to fraction: over 100, then simplify. So $\frac{2}{5} = 0.4 = 40\%$, and

$$55\% = 0.55 = \frac{11}{20}.$$

Refresher — “1 in N” talk. Clinic health pages often say “1 in 4” or “1 in 50” instead of a percentage. That is a fraction waiting to happen: 1 in 4 is $\frac{1}{4}$. The health versions worth knowing by heart:

Health talk	As a fraction	As a percentage
1 in 2	$\frac{1}{2}$	50 %
1 in 4	$\frac{1}{4}$	25 %
1 in 5	$\frac{1}{5}$	20 %
1 in 8	$\frac{1}{8}$	12.5 %
1 in 10	$\frac{1}{10}$	10 %
1 in 50	$\frac{1}{50}$	2 %
2 in 5	$\frac{2}{5}$	40 %

“1 in 5” means 1 person in every 5 — one share, four outfits:

“1 in 5” means 1 person in every 5 (made-up data)



$1 \text{ in } 5 = 1/5 = 0.2 = 20\% \text{ — four outfits, same size.}$

A row of five circles with the first one shaded, showing that “1 in 5” means 1 person in every 5, the same as one-fifth, 0.2 or 20%

Percentage points. When one percentage moves to another, the gap between them is stated in **percentage points**. An incident rate rising from 5 % to 7.5 % rose $7.5 - 5 = 2.5$ percentage points. Saying “points” keeps the gap clear of the shares themselves: the rate did not rise “by 7.5 %”, it rose from one share to a share 2.5 points higher.

Refresher — rates “per 100 workers”. Safety boards report an **incident rate**: reported incidents per 100 workers. Divide, then turn the share into a percentage: 12 incidents across 240 workers is $12 \div 240 = 0.05 = 5\%$, read as “5 incidents per 100 workers”. Rates let workplaces of different sizes be compared fairly — the same reason a share beats a head count.

Six health words. Health pages and safety boards repeat the same few words, and each one is a goal, a rate, a share or a mix you can already read. The cards below define the six words this section keeps using:

Six health words this section uses

Goal the number you aim for — like 8 000 steps a day	Incident rate reported incidents per 100 workers	Likelihood how likely something is to happen — as a fraction, decimal or percentage
Safety data sheet the sheet that comes with a workplace chemical: safe use, storage, first aid	Dilute to thin a strong liquid (the concentrate) with water	Serving size the amount of food or drink a panel's numbers refer to

Six cards defining the health words used in this section: goal, incident rate, likelihood, safety data sheet, dilute and serving size

Mixing by parts. A safety data sheet gives mixing instructions like “dilute 1 part concentrate to 4 parts water”. Count the equal parts: the mix has $1 + 4 = 5$ parts, so the concentrate is $\frac{1}{5} = 20\%$ of the mix and the water is $\frac{4}{5} = 80\%$. With 250 mL of concentrate poured, the water needed is $4 \times 250 = 1\,000$ mL. Getting this right is a safety issue: a mix stronger than the sheet says can burn skin and damage surfaces.

Refresher — millilitres and litres. Mixes and drinks are measured in millilitres (mL) and litres (L): 1 L = 1 000 mL. Litres to mL: $\times 1\,000$ (2 L is 2 000 mL). mL to litres: $\div 1\,000$ (250 mL is 0.25 L, and 1 800 mL is 1.8 L).

Refresher — mean, range and trend. From Section 3C: the **mean** is the total $\div$ the count, the levelled-out share of the data; the **range** is the highest – the lowest, the spread. The mean always sits between the lowest and highest values — a free check. On a line chart, the **trend** is simply the direction the line travels over time — up, down or flat. An app's mean steps, a café's falling drink sales and a cold store's incident rate all read the same way.

Refresher — chance words and P(). Section 4A's chance words still apply: impossible (0 %), unlikely (below 50 %), even chance (50 %), likely (above 50 %), certain (100 %). A chance of 25 % sits low on the scale — unlikely. Chances can also be moved: safety measures — grab mats in the bathroom, a heatwave cooling plan, a tidy storeroom — **lower the likelihood** of harm. Dropping a chance from 25 % to 10 % is the whole point of the fix.

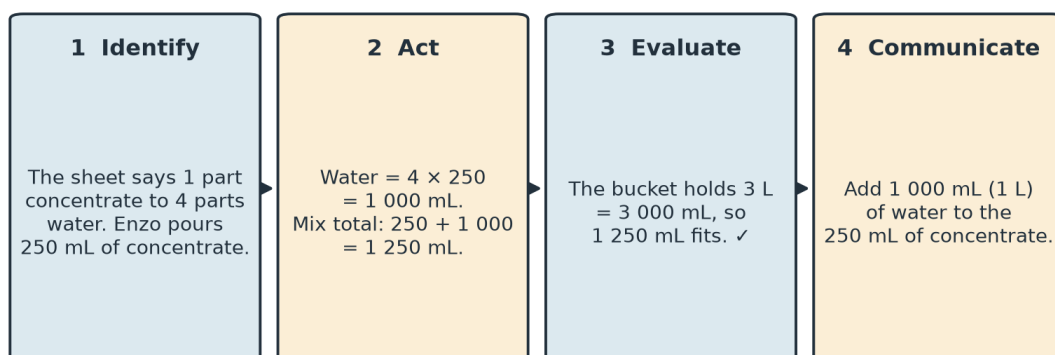
Refresher — rounding to a stated place. From Section 1C: look one place to the right of the place you are rounding to; 5 or more, round up; 4 or less, leave it. A 6-day water log totalling 11.8 L gives a mean of $11.8 \div 6 = 1.9666\dots$ L; to 1 decimal place, the second decimal digit is 6, so round up to 2.0 L. Questions in this section always state the place.

Refresher — reading big numbers. Health data can run big, and the space is a thousands separator: 12 000 reads “twelve thousand”. Keep the space every three digits from the right — in prose, in tables and in maths (as in 36 500 steps) — so a long number stays readable.

Health tasks and the problem solving cycle.

Refresher — the problem solving cycle. Four stages (Section 1A). **Identify** what is asked and what data you have. **Act** — do the maths. **Evaluate** — check the answer is sensible against the situation. **Communicate** — say the answer in a plain sentence. Here is the mixing task from above, run through the cycle:

A mixing task through the problem solving cycle (made-up data)



Four boxes in a row showing the problem solving cycle applied to a dilution task: 250 mL of concentrate mixed 1 part to 4 needs 1 000 mL of water

Technology. A calculator or a spreadsheet will run these divisions and percentages for you, and fitness and health apps compute means, totals and goal checks automatically — that is exactly the arithmetic in this section. Using one is fine wherever it helps; this section shows every step by hand first, so you can see what the machine is doing. No question here needs one.

U3/4 preview: in Units 3 and 4 health numbers like these meet formal risk evaluation and deeper statistics — here, reading the numbers and comparing them is the whole job.

Worked examples

Example 1 — scaffolded

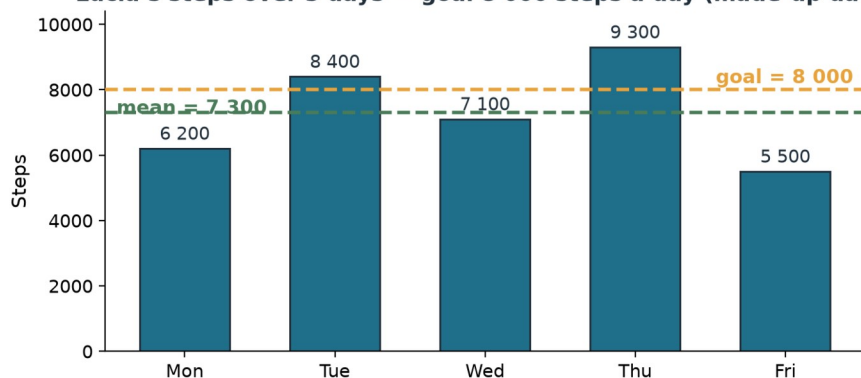
Lucia's StepWise app records her steps for five days. Her goal is 8 000 steps a day.

Day	Steps
Mon	6 200
Tue	8 400
Wed	7 100
Thu	9 300
Fri	5 500

Made-up data: the app, the person and every number in this table are made up for this section.

- (a) How many steps did Lucia walk in total over the five days? (b) Find her mean steps per day. (c) Find the range of her daily steps. (d) On how many days did Lucia reach her goal?

Lucia's steps over 5 days — goal 8 000 steps a day (made-up data)



Bar chart of Lucia's steps for Monday to Friday — 6 200, 8 400, 7 100, 9 300, 5 500 — with a dashed goal line at 8 000 and a dashed mean line at 7 300

Working	Comment
(a) $6\,200 + 8\,400 + 7\,100 + 9\,300 + 5\,500 = 36\,500$ steps	Total = add every value.
(b) $36\,500 \div 5 = 7\,300$ steps a day	Mean = total $\div$ count.
(c) Sorted: 5 500, 6 200, 7 100, 8 400, 9 300 $9\,300 - 5\,500 = 3\,800$ steps	Sorting first puts the highest and lowest in view. Range = highest – lowest.
(d) Tue (8 400) and Thu (9 300): 2 days	A day reaches the goal at 8 000 steps or more.
Check: $5\,500 \leq 7\,300 \leq 9\,300$ ✓	The mean must sit between the lowest and highest days.

Lucia walked 36 500 steps in total, a mean of 7 300 steps a day — below her 8 000 goal — with a range of 3 800 steps; she reached the goal on 2 of the 5 days.

Example 2 — scaffolded

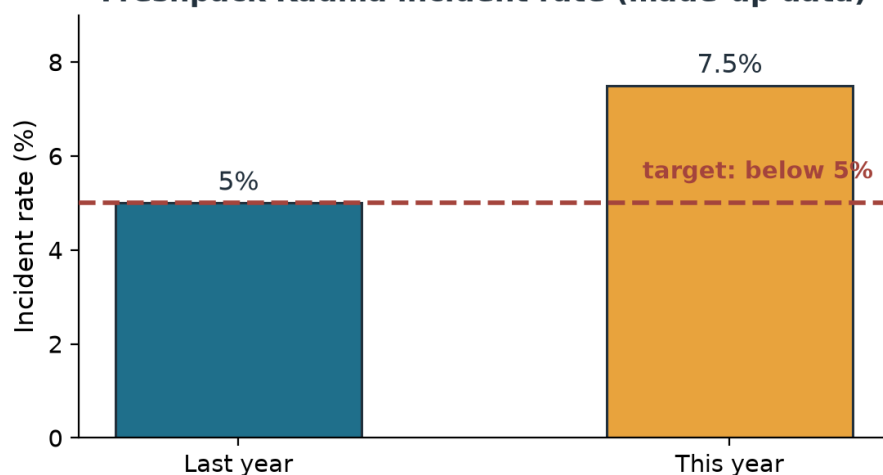
Freshpack Kadnia is a fruit-packing shed. The safety officer, Dario, reads the year’s numbers off the safety board. The **incident rate** is reported incidents per 100 workers, as a percentage. The board’s target is “below 5 %”.

	This year	Last year
Workers	240	240
Reported incidents	18	12

Made-up data: the workplace and every number in this table are made up for this section.

- (a) Find this year’s incident rate, as a percentage. (b) Find last year’s rate, and the change between the two years, in percentage points. (c) Did the shed meet the board’s target this year?

Freshpack Kadnia incident rate (made-up data)



Bar chart comparing Freshpack Kadnia’s incident rate: 5% last year and 7.5% this year, with a dashed target line at 5%

Working	Comment
Rate = incidents $\div$ workers, then $\times 100$.	The rate is a share of the workers.

Working	Comment
(a) This year: $18 \div 240 = 0.075$ $0.075 \times 100 = 7.5$, so 7.5 %	This division finishes exactly. Read as “7.5 incidents per 100 workers”.
(b) Last year: $12 \div 240 = 0.05 = 5\%$ $7.5 - 5 = 2.5$ percentage points	Same shape, last year’s numbers. The rate rose 2.5 percentage points.
(c) $7.5\% > 5\%$: the target is not met. Check: 18 of 240 is a small share — between 5 % and 10 % ✓	The target needs the rate below 5 %. So 7.5 % is a sensible size.

Freshpack’s incident rate rose 2.5 percentage points, from 5 % last year to 7.5 % this year, so the shed did not meet its below-5 % target.

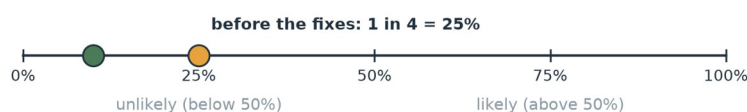
Example 3 — unscaffolded

The Kadnia Community Clinic’s healthy-living page says: “Over a lifetime, about 1 in 4 people will break a bone in a fall at home. Simple fixes — grab mats in the bathroom, brighter hallways, tidy floors — drop the chance to about 1 in 10.”

- Write the “1 in 4” chance as a fraction, a decimal and a percentage.
- Name the chance word from Section 4A that best fits this chance.
- Write “1 in 10” as a percentage. By how many percentage points do the fixes lower the chance?

The clinic’s fall-risk chance on a 0-to-100% scale

with the fixes: 1 in 10 = 10%



Both chances sit in the unlikely zone — the fixes lower the chance by 15 percentage points.

A chance scale from 0% to 100% marked with 25% for the chance before the fixes and 10% with the fixes, both inside the unlikely zone below 50%

“1 in 4” is $\frac{1}{4} = 1 \div 4 = 0.25$, and $0.25 \times 100 = 25\%$. 25 % sits below 50 % on the chance scale, so the word is *unlikely*. “1 in 10” is $\frac{1}{10} = 10\%$, and $25 - 10 = 15$ percentage points — that is how far the fixes lower the chance.

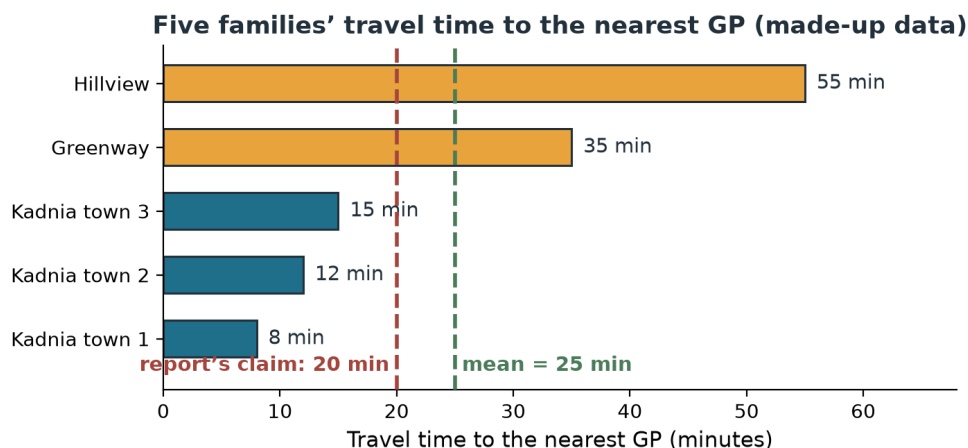
$\therefore \frac{1}{4} = 0.25 = 25\%$, which is unlikely; with the fixes the chance is 10 %, lowered by 15 percentage points.

Example 4 — unscaffolded

Five families across Kadnia Shire time the trip to their nearest GP: 8, 12 and 15 minutes for the three families in Kadnia town, 35 minutes for the family in Greenway, and 55 minutes for the family in Hillview. The shire’s health report claims: “The average family in our shire is within 20 minutes of a GP.”

- Find the mean travel time.
- Find the range of the travel times.

(b) Does the data support the report's claim? Use the numbers to explain.



Horizontal bar chart of five families' travel time to the nearest GP in minutes: Kadnia town families 8, 12 and 15, Greenway 35, Hillview 55, with dashed lines at the mean of 25 minutes and the report's claimed 20 minutes

The mean is the total $\div$ the count: $8 + 12 + 15 + 35 + 55 = 125$ minutes over 5 families, so the mean is $125 \div 5 = 25$ minutes. The range is the highest – the lowest: $55 - 8 = 47$ minutes. The claim's line is 20 minutes, and $25 > 20$ — the country families' longer trips pull the mean up past it.

$\therefore$ Mean 25 minutes, range 47 minutes; $25 > 20$, so the data does not support the claim — on this data the average family is not within 20 minutes of a GP.

Practice questions

Scaffolded

Q1. A school health page, a clinic survey and a workplace poster each give a health number in a different outfit. Write each one in the outfit asked for.

- (a) The school page says “2 in 5 teens walk or ride to school”. Write 2 in 5 as a percentage.
- (b) The clinic survey reports 0.35. Write it as a percentage and as a fraction in simplest form.
- (c) The workplace poster reports 55 %. Write it as a decimal and as a fraction in simplest form.

Q2. A muesli bar's nutrition panel says: sugar 5 g per bar. The Kadnia clinic's guide is no more than 50 g of added sugar a day.

- (a) How much sugar is in 3 bars?
- (b) One bar's sugar is what percentage of the 50 g daily guide?
- (c) Enzo wants no more than 25 g of added sugar from these bars. What is the most whole bars he can eat?

Q3. Brock's StepWise app tracks his active minutes over 4 days: 22, 35, 28 and 41 minutes. His goal is 30 active minutes a day.

- (a) Find the total active minutes.
- (b) Find the mean active minutes per day. Did the mean reach Brock's goal?
- (c) Find the range of the daily active minutes.

Q4. At Greenway Aged Care, 12 of the 80 staff reported a slip at work this year. The home's safety target is “fewer than 10 % of staff reporting a slip”.

- (a) Write the share of staff who reported a slip as a fraction in simplest form.
- (b) Write that share as a percentage.
- (c) Did the home meet its target? Use the numbers to explain.

Q5. Enzo mixes floor cleaner at The Hungry Wombat café. The safety data sheet says: dilute 1 part concentrate to 4 parts water. He uses 500 mL of concentrate and 2 000 mL of water.

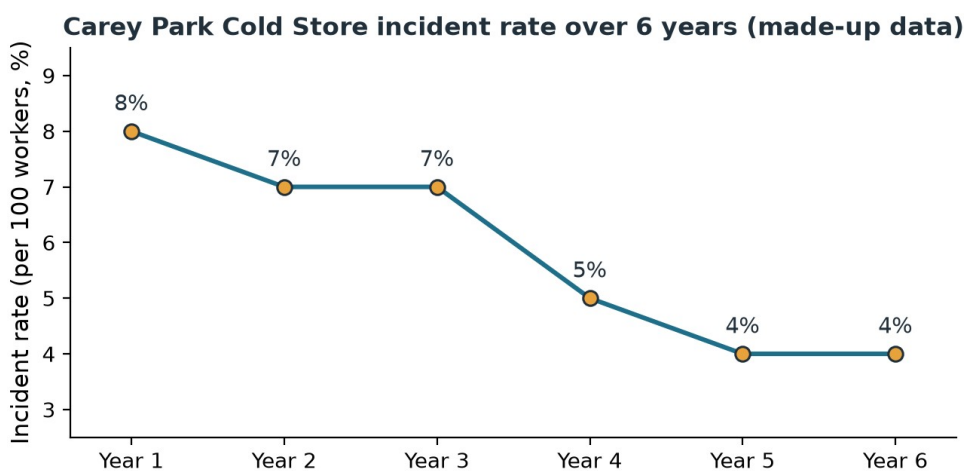
- How much mixed cleaner does he have, in mL and in L?
- What percentage of the mix is concentrate?
- The sheet also says “do not use a mix stronger than 25 %”. Is Enzo’s mix safe to use? Explain.

Q6. Sami keeps a water log. Over 6 days she drinks 1.8, 2.2, 1.5, 2.0, 2.6 and 1.7 litres. Her goal is 2 L a day.

- Find the total water over the 6 days.
- Find the mean water per day, to 1 decimal place.
- On how many days did Sami drink at least 2 L?

Unscaffolded

Q7. The line chart shows the incident rate at the Carey Park Cold Store over 6 years, as incidents per 100 workers.



Line chart of the Carey Park Cold Store incident rate over 6 years: 8%, 7%, 7%, 5%, 4%, 4%

- Read the rate in Year 4.
- In how many years was the rate exactly 4 %?
- Describe the trend, and find the fall in percentage points from Year 1 to Year 6.

Q8. Kadnia Shire’s road-safety group surveys 250 drivers; 40 of them admit checking their phone while stopped at a red light. The campaign’s target is “fewer than 10 % of drivers”.

- Write the share who admitted it as a fraction in simplest form.
- Write that share as a percentage.
- Does the shire meet the campaign’s target? Use the numbers to explain.

Q9. After a healthy-eating push, The Hungry Wombat tracks its sugary-drink sales: 320, 300, 275, 250 and 220 cups sold in Weeks 1 to 5.

- How many cups were sold in Week 5?
- Find the mean cups sold per week.
- Describe the trend, and find the fall in cups from Week 1 to Week 5.

Q10. The clinic’s heatwave page says: “On a hot day, about 1 in 8 households without a cooling plan will need help from the heat. With a cooling plan, the chance drops to about 1 in 50.”

- (a) Write “1 in 8” as a fraction, a decimal and a percentage.
- (b) Name the chance word from Section 4A that best fits “1 in 8”.
- (c) Write “1 in 50” as a percentage. Does the cooling plan raise or lower the chance, and by how many percentage points?

Q11. The table shows the road distance from six towns to Kadnia Base Hospital.

Town	Distance (km)
Greenway	45
Hillview	80
Carey Park	32
North Kadnia	95
East Kadnia	60
Kadnia West	18

Made-up data: the towns, the hospital and every number in this table are made up for this section.

- (a) Find the mean distance to the hospital.
- (b) Find the range of the distances.
- (c) How many of the six towns are within 50 km of the hospital?

Q12. Enzo runs the monthly chemical **audit** — a scheduled count and check — in The Hungry Wombat’s storeroom. The table shows his count beside the maximum each safety data sheet allows. The storeroom’s total limit is 40 containers.

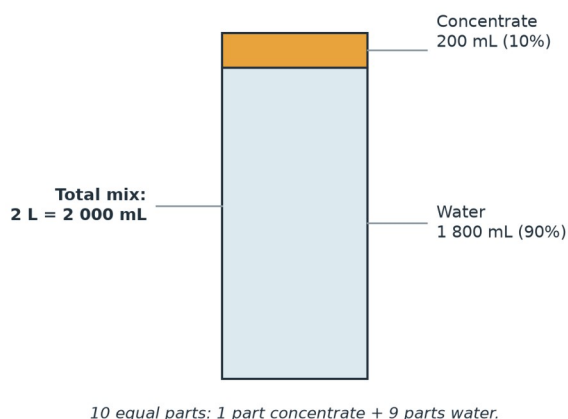
Chemical	Containers in store	Maximum allowed
Bleach	6	10
Dishwashing liquid	12	15
Floor cleaner	8	8
Oven cleaner	5	4
Drain cleaner	2	6

Made-up data: the café, the storeroom and every number in this table are made up for this section.

- (a) Which chemical is over its maximum? By how many containers?
- (b) How many containers are in the storeroom altogether?
- (c) How many more containers could the storeroom hold before reaching its limit of 40?

Q13. The safety data sheet for the café’s food-safe cleaner says: dilute 1 part concentrate to 9 parts water. Enzo needs 2 L of mixed cleaner for the benches.

Mixing 2 L of cleaner — 1 part concentrate to 9 parts water



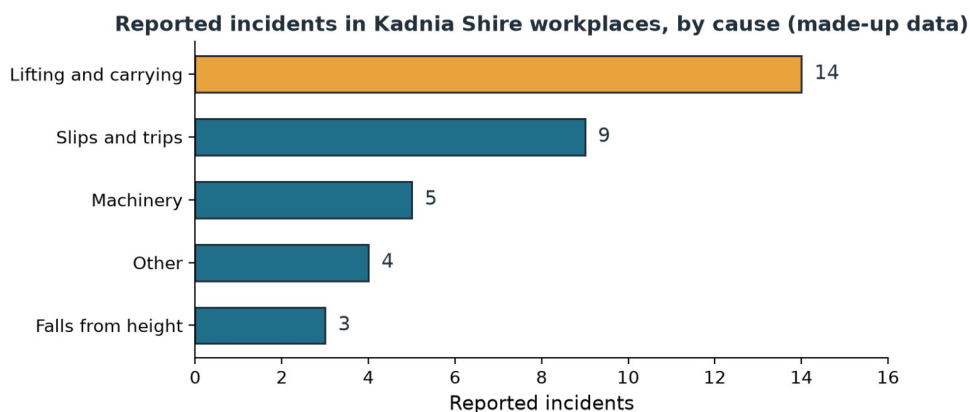
A 2-litre bucket drawn as a rectangle split into ten equal parts: a thin bottom layer of 200 mL of concentrate under 1 800 mL of water

- How many millilitres is 2 L?
- How many mL of concentrate does Enzo need?
- How many mL of water, and what percentage of the mix is concentrate?

Q14. Yara joins a walking program. Her walks, in km — Week 1: 2.1, 2.4, 1.8, 2.2 and 2.0. Week 4: 3.0, 3.2, 2.8, 3.5 and 3.0.

- Find the mean walk in Week 1.
- Find the mean walk in Week 4.
- Find the rise in the mean walk from Week 1 to Week 4. Did the program lift Yara’s typical walk? Use the numbers to explain.

Q15. The bar chart shows the incidents reported across Kadnia Shire workplaces last year, by cause.



Horizontal bar chart of reported incidents by cause: lifting and carrying 14, slips and trips 9, machinery 5, other 4, falls from height 3

- Which cause was the most common?
- How many incidents were reported altogether?
- What percentage of all the incidents came from the most common cause?

Q16. A cereal box’s nutrition information panel says: sugar 18 g per 100 g. The serving size is 40 g. The clinic’s guide is no more than 50 g of added sugar a day.

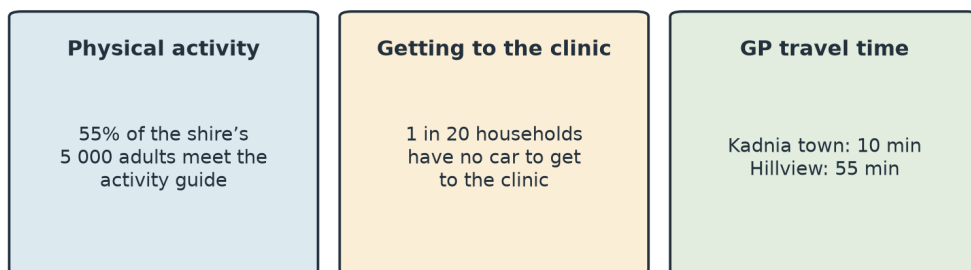
- (a) Find the sugar in one 40 g serving.
- (b) Find the sugar in two servings.
- (c) One serving’s sugar is what percentage of the 50 g daily guide?

Q17. The Kadnia clinic tracks flu-like visits through the season: 12, 18, 25, 20 and 10 visits in Weeks 1 to 5. The clinic’s season summary says “about 1 in 6 shire residents had the flu this season”. Kadnia Shire’s population is 12 000.

- (a) Find the mean visits per week.
- (b) Find the range of the weekly visits.
- (c) How many residents is 1 in 6 of the shire’s 12 000 people?

Q18. The Kadnia Shire health-report dashboard is on the shire’s website.

Kadnia Shire health-report dashboard (made-up data)



A three-tile health-report dashboard: 55% of the shire’s 5 000 adults meet the activity guide; 1 in 20 households have no car to get to the clinic; GP travel time Kadnia town 10 minutes, Hillview 55 minutes

- (a) How many of the 5 000 adults meet the activity guide?
- (b) Write “1 in 20” as a percentage, and name the chance word from Section 4A that fits it.
- (c) How much longer is the Hillview travel time than the Kadnia town time?

Answers

Q1. (a) 40 %. (b) 35 %, $\frac{7}{20}$. (c) 0.55, $\frac{11}{20}$.

Q2. (a) 15 g. (b) 10 %. (c) 5 bars.

Q3. (a) 126 minutes. (b) 31.5 minutes a day; yes, $31.5 > 30$. (c) 19 minutes.

Q4. (a) $\frac{3}{20}$. (b) 15 %. (c) no — $15 \% > 10 \%$.

Q5. (a) 2 500 mL, 2.5 L. (b) 20 %. (c) yes — $20 \% \leq 25 \%$.

Q6. (a) 11.8 L. (b) 2.0 L (to 1 decimal place). (c) 3 days.

Q7. (a) 5 %. (b) 2 years. (c) falling trend; 4 percentage points.

Q8. (a) $\frac{4}{25}$. (b) 16 %. (c) no — $16 \% > 10 \%$.

Q9. (a) 220 cups. (b) 273 cups. (c) falling trend; 100 cups.

Q10. (a) $\frac{1}{8} = 0.125 = 12.5 \%$. (b) unlikely. (c) 2 %; lowered by 10.5 percentage points.

Q11. (a) 55 km. (b) 77 km. (c) 3 towns.

Q12. (a) oven cleaner, by 1 container. (b) 33 containers. (c) 7 containers.

Q13. (a) 2 000 mL. (b) 200 mL. (c) 1 800 mL; 10 %.

Q14. (a) 2.1 km. (b) 3.1 km. (c) 1.0 km; yes — $3.1 > 2.1$.

Q15. (a) lifting and carrying. (b) 35 incidents. (c) 40 %.

Q16. (a) 7.2 g. (b) 14.4 g. (c) 14.4 %.

Q17. (a) 17 visits. (b) 15 visits. (c) 2 000 residents.

Q18. (a) 2 750 adults. (b) 5 %; unlikely. (c) 45 minutes.

Fully-worked solutions

Q1. (a) 2 in 5 is $\frac{2}{5} = 2 \div 5 = 0.4$, and $0.4 \times 100 = 40 \%$. (b) $0.35 \times 100 = 35 \%$, and $\frac{35}{100} = \frac{7}{20}$ after dividing top and bottom by 5. (c) $55 \div 100 = 0.55$, and $\frac{55}{100} = \frac{11}{20}$ after dividing top and bottom by 5.

Q2. (a) $3 \times 5 = 15$ g. (b) $5 \div 50 = 0.1$, and $0.1 \times 100 = 10 \%$. (c) $25 \div 5 = 5$ whole bars — 5 bars is exactly 25 g, so 5 fits the cap.

Q3. (a) $22 + 35 + 28 + 41 = 126$ minutes. (b) $126 \div 4 = 31.5$ minutes a day; $31.5 > 30$, so yes, the mean reached the goal. (c) Highest 41, lowest 22: $41 - 22 = 19$ minutes.

Q4. (a) $\frac{12}{80} = \frac{3}{20}$ after dividing top and bottom by 4. (b) $3 \div 20 = 0.15$, and $0.15 \times 100 = 15 \%$. (c) No. The target needs fewer than 10 %, and $15 \% > 10 \%$, so the target was **not met**.

Q5. (a) $500 + 2\,000 = 2\,500$ mL; $2\,500 \div 1\,000 = 2.5$ L. (b) The mix has $1 + 4 = 5$ equal parts, so $500 \div 2\,500 = 0.2 = 20 \%$. (c) Yes — the sheet's cap is 25 % and $20 \% \leq 25 \%$, so the mix is **safe**.

- Q6.** (a) $1.8 + 2.2 + 1.5 + 2.0 + 2.6 + 1.7 = 11.8$ L. (b) $11.8 \div 6 = 1.9666... \approx 2.0$ L to 1 decimal place (the second decimal digit is 6, so round up). (c) At least 2 L: 2.2, 2.0 and 2.6 — 3 days.
- Q7.** (a) Year 4: 5% (5 incidents per 100 workers). (b) Years 5 and 6: 2 years. (c) The rate falls or stays flat every year — a **falling trend**; $8 - 4 = 4$ percentage points.
- Q8.** (a) $\frac{40}{250} = \frac{4}{25}$ after dividing top and bottom by 10. (b) $4 \div 25 = 0.16$, and $0.16 \times 100 = 16\%$. (c) No. The target needs fewer than 10%, and $16\% > 10\%$, so the target is **not met**.
- Q9.** (a) Week 5: 220 cups. (b) Total $320 + 300 + 275 + 250 + 220 = 1365$; mean $1365 \div 5 = 273$ cups. (c) Sales fall every week — a **falling trend**; $320 - 220 = 100$ cups.
- Q10.** (a) $\frac{1}{8} = 1 \div 8 = 0.125$, and $0.125 \times 100 = 12.5\%$. (b) 12.5% sits below 50% on the chance scale — **unlikely**.
(c) 1 in 50 is $\frac{1}{50} = 1 \div 50 = 0.02 = 2\%$; $2\% < 12.5\%$, so the plan **lowers** the chance, by $12.5 - 2 = 10.5$ percentage points.
- Q11.** (a) Total $45 + 80 + 32 + 95 + 60 + 18 = 330$ km; mean $330 \div 6 = 55$ km. (b) Highest 95, lowest 18: $95 - 18 = 77$ km. (c) Within 50 km: Greenway (45), Carey Park (32) and Kadnia West (18) — 3 towns.
- Q12.** (a) Compare each count with its maximum: only oven cleaner is over, by $5 - 4 = 1$ container. (Floor cleaner is $8 = 8$ — at its maximum, not over.) (b) $6 + 12 + 8 + 5 + 2 = 33$ containers. (c) $40 - 33 = 7$ more containers.
- Q13.** (a) $2 \times 1000 = 2000$ mL. (b) The mix has $1 + 9 = 10$ equal parts, so the concentrate is $\frac{1}{10}$: $2000 \div 10 = 200$ mL.
(c) Water is the other 9 parts: $2000 - 200 = 1800$ mL; the concentrate is $\frac{1}{10} = 0.1 = 10\%$ of the mix.
- Q14.** (a) Week 1 total $2.1 + 2.4 + 1.8 + 2.2 + 2.0 = 10.5$ km; mean $10.5 \div 5 = 2.1$ km. (b) Week 4 total $3.0 + 3.2 + 2.8 + 3.5 + 3.0 = 15.5$ km; mean $15.5 \div 5 = 3.1$ km. (c) $3.1 - 2.1 = 1.0$ km; $3.1 > 2.1$, so yes — the program **lifted** Yara's typical walk.
- Q15.** (a) The longest bar: **lifting and carrying** (14 incidents). (b) $14 + 9 + 5 + 4 + 3 = 35$ incidents. (c) $14 \div 35 = 0.4$, and $0.4 \times 100 = 40\%$.
- Q16.** (a) Per 1 g: $18 \div 100 = 0.18$ g; one 40 g serving: $0.18 \times 40 = 7.2$ g. (b) $2 \times 7.2 = 14.4$ g. (c) $7.2 \div 50 = 0.144$, and $0.144 \times 100 = 14.4\%$.
- Q17.** (a) Total $12 + 18 + 25 + 20 + 10 = 85$; mean $85 \div 5 = 17$ visits. (b) Highest 25, lowest 10: $25 - 10 = 15$ visits. (c) 1 in 6 of 12 000 is $12\,000 \div 6 = 2\,000$ residents.
- Q18.** (a) $55\% = 0.55$, and $0.55 \times 5\,000 = 2\,750$ adults. (b) 1 in 20 is $\frac{1}{20} = 1 \div 20 = 0.05 = 5\%$, which sits low on the chance scale — **unlikely**. (c) $55 - 10 = 45$ minutes longer.

Chapter 6 Numeracy in context — 6E Vocational numeracy

Theory

About the data in this section. The workplaces, workers, plans, logs and numbers in this section are **made up** (not real): pretend businesses and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real business, person or place.

In the study design (Unit 2, Outcome 1), vocational numeracy is the maths you need to do the jobs a workplace asks of you: reading the documents and information that work produces; using workplace tools, apps and systems; giving and following directions; and helping with quality checks and with collecting data.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-09.

What this section covers. Every workplace runs on numbers. Hours on a timesheet. Incident counts on a safety report. Temperature readings on a quality log. Distances on a site plan. Kilometres in a delivery log. This section practises six work jobs with numbers: comparing old and new ways of doing a task, reading safety data and its trend, following and giving directions, running quality checks, reading workplace plans and escape diagrams, and recording information. The maths is toolkit you already own — mean, range, percentages, time, metric lengths, compass directions — pointed at work.

Workplace words to know. Six words come up again and again on the job. Each one is explained here and again where it is used.

Six workplace words this section uses

OHS occupational health and safety — the rules and habits that keep workers safe	Hazard anything at work that could hurt someone — a spill, a trailing cord, a forklift	Incident an event at work where someone is hurt or something is damaged
Near miss an event that could have hurt someone but did not — a lucky escape	PPE personal protective equipment — boots, gloves, hi-vis vest, hard hat	Quality assurance (QA) planned checks that products and work meet the required standard

Six cards defining the workplace words this section uses: OHS, hazard, incident, near miss, PPE and quality assurance (QA)

Old ways, new ways. Workplaces have moved from paper to digital: handwritten dockets (a **docket** is a paper slip listing items or times) to scanner apps, paper timesheets to time apps, typed invoices to order software. When a boss asks “is the new tool worth it?”, two things get compared: the **time** the task takes, and the **effort** involved (the walking, the writing, the double-checking). Time is the part you can compute: time the task a few runs each way, find the mean of each set of times, then find the difference between the two means.

Refresher — decimal hours and minutes. A timesheet records time in decimal hours. The part after the dot is a share of 60 minutes, so the quarters are worth knowing by heart: $0.25 \text{ h} = 15 \text{ min}$, $0.5 \text{ h} = 30 \text{ min}$, $0.75 \text{ h} = 45 \text{ min}$. Minutes to hours: divide by 60, so $90 \text{ min} \div 60 = 1.5 \text{ h}$. Hours to minutes: multiply by 60, so $1.5 \text{ h} \times 60 = 90 \text{ min}$.

One hour, split into quarters: decimal hours and minutes

0–15 min	15–30 min	30–45 min	45–60 min
0.25 h = 15 min	0.5 h = 30 min	0.75 h = 45 min	1 h = 60 min

$$1.5 \text{ h} = 90 \text{ min} = 1 \text{ h } 30 \text{ min} \quad 7.25 \text{ h} = 7 \text{ h } 15 \text{ min}$$

One hour split into four equal quarters, labelled $0.25 \text{ h} = 15 \text{ min}$, $0.5 \text{ h} = 30 \text{ min}$, $0.75 \text{ h} = 45 \text{ min}$ and $1 \text{ h} = 60 \text{ min}$, with $1.5 \text{ h} = 90 \text{ min} = 1 \text{ h } 30 \text{ min}$ and $7.25 \text{ h} = 7 \text{ h } 15 \text{ min}$ written below

Refresher — mean and range. From Section 3C: the **mean** is the total $\div$ the count — the levelled-out share of the numbers. The **range** is the highest – the lowest — how spread out they are. A quick model: five jobs take 22, 25, 24, 26 and 23 minutes. Total = 120 min, count = 5, so mean = $120 \div 5 = 24$ min. Range = $26 - 22 = 4$ min.

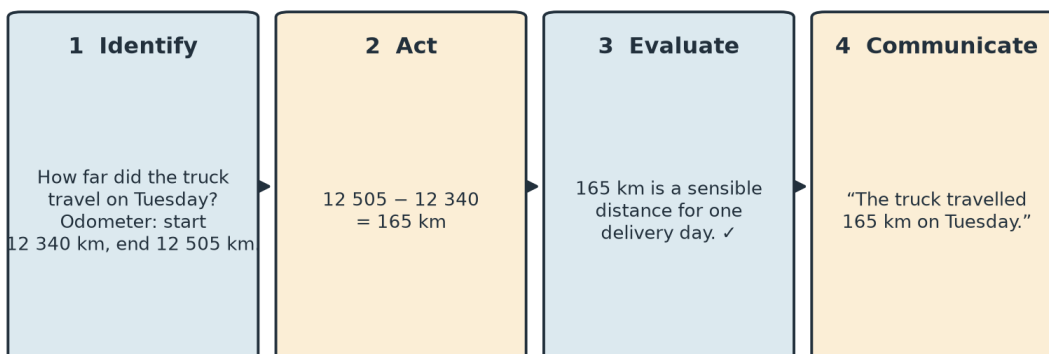
Safety numbers (OHS). OHS data gets counted and written down: **incidents** (how many people were hurt), **near misses** (how many lucky escapes), training done (how many workers out of all workers). A safety report usually shows the count for each month or each quarter, often as a line graph, so the site can see whether things are getting safer or not.

Refresher — percentages. A percentage is a share out of 100. Part $\div$ whole gives a decimal; times 100 turns it into a percentage: 17 on-time trucks out of 20 is $17 \div 20 = 0.85 = 85\%$. A percentage *of* an amount goes the other way: 5 % of 800 items is $0.05 \times 800 = 40$ items.

The **trend** is the overall direction the numbers travel over time — up, down or flat (Section 3D). A falling incident count is good news. A rising one tells the site to go looking for hazards.

Refresher — the problem solving cycle. Four stages (Section 1A). **Identify** — what is being asked, and what numbers do I have? **Act** — do the maths. **Evaluate** — does the answer make sense in the workplace? **Communicate** — report the answer in a plain sentence, with its units. Every task in this section runs through those four stages.

From a recorded number to a report — the problem solving cycle (made-up data)



Four boxes in a row showing the problem solving cycle on a work record: *Identify* (how far did the truck travel? odometer start 12 340 km, end 12 505 km), *Act* ($12\ 505 - 12\ 340 = 165 \text{ km}$), *Evaluate* (165 km is sensible for one delivery day), *Communicate* (the truck travelled 165 km on Tuesday)

Instructions and directions. Work instructions are often about moving: “walk 40 m north to the workshop, turn right through 90° , then walk 25 m to the loading bay”. Two skills matter here: following directions exactly, and giving directions someone else can follow. Good written directions are numbered steps — one step each, with a distance, a direction and a landmark.

Refresher — compass points and turns. On most plans, north is up (Section 2B). The four main points are N, S, E and W; NE is halfway between N and E, and SE is halfway between S and E. Turns use the everyday angles from

Section 2D: a right-angle turn is 90° , a turn back the way you came is 180° , and half a right angle is 45° . Facing north and turning right through 90° leaves you facing east.

Quality assurance (QA) numbers. Quality assurance means planned checks that a product meets its standard. A QA rule states a pass band: “the fridge must stay between 2°C and 5°C ”, or “each pack must weigh between 490 g and 510 g”. The **data requirements** are what must be recorded for every check: the reading, the time, who checked, and pass or fail. Readings outside the band get recorded and reported, not hidden. QA also checks samples: the passes in a sample are reported as a fraction or a percentage of the whole sample.

Refresher — metric lengths. Workplaces measure in metres (m), centimetres (cm) and millimetres (mm): $1\text{ m} = 100\text{ cm}$, $1\text{ m} = 1000\text{ mm}$, and $1\text{ km} = 1000\text{ m}$. Metres to centimetres: multiply by 100, so $1.2\text{ m} = 120\text{ cm} = 1200\text{ mm}$. Centimetres to metres: divide by 100, so $350\text{ cm} = 3.5\text{ m}$.

Refresher — rounding to a stated place. From Section 1C: look one place to the right of the place you are rounding to. If that digit is 5 or more, round up; if it is 4 or less, leave it. 7.86 to 1 decimal place: the next digit is 6, so round up to 7.9. 312 to the nearest 10: the next digit is 2, so leave it at 310. Every question here that needs rounding tells you the place in the question.

Plans and diagrams. Workplaces use two kinds of picture. A **site plan** shows the whole site from above: the buildings, the equipment, the yards and the gates. An **evacuation diagram** shows how to get out in an emergency: the emergency doors, the routes, the hazards to steer around, and the **muster point** — the spot outside where everyone gathers to be counted. Plans are drawn to **scale**: a short length on paper stands for a longer length in real life.

Refresher — simple scale. “Scale: $1\text{ cm} = 2\text{ m}$ ” means every centimetre on the plan is 2 m in real life (map scales, Section 2B). Plan to real: multiply — a wall drawn 5 cm long is $5 \times 2 = 10\text{ m}$ long. Real to plan: divide — a 14 m yard is drawn $14 \div 2 = 7\text{ cm}$ long.

Recording information. Work gets recorded on timesheets, logbooks, dockets, delivery logs and QA sheets. A good record carries the date, the numbers, the units and the name of the person recording. Once numbers are recorded, they can be computed from: the distance a vehicle travelled is the odometer at the end – the odometer at the start. (The **odometer** is the counter in a vehicle that shows how many kilometres it has travelled.) Some recorded numbers are reported as rates — kilometres per hour (km/hr), or litres per 100 km (L/100 km) — the same style of representation Section 1D uses. Write big numbers with a space every three digits, like 41 466, so they stay easy to read.

Technology. Real workplaces run all of this on scanner apps, time apps, spreadsheets, GPS trackers and online ordering systems, and those tools are worth knowing (Section 1F). Nothing in this section needs one: every question here can be done with pen, paper and a simple calculator.

U3/4 preview: In Units 3 and 4, workplace data like this gets analysed formally and risks get weighed with likelihoods — here, reading the numbers, finding the mean and describing the trend is the whole job.

Worked examples

Example 1 — scaffolded

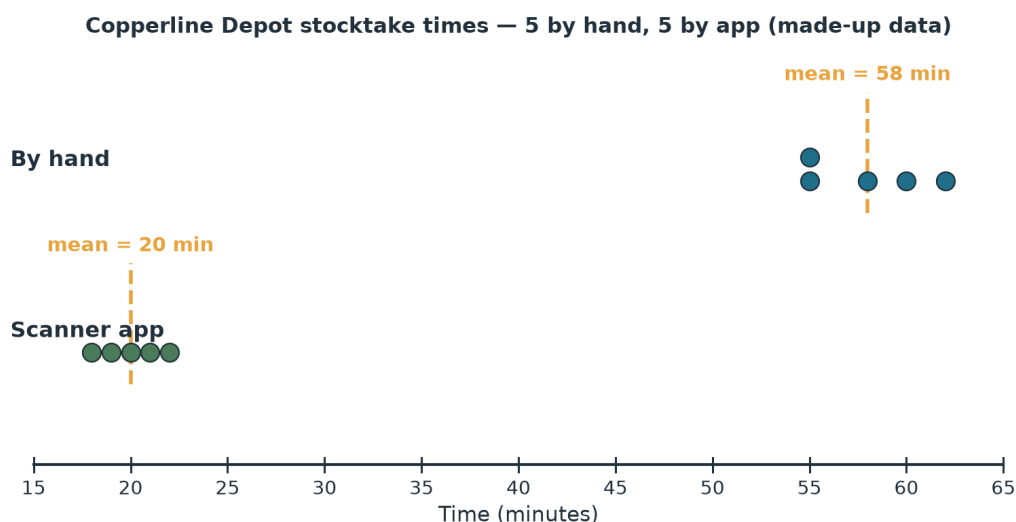
Copperline Depot used to count its stock by hand, writing each count onto paper dockets. A full count of the store is called a **stocktake**. The manager timed five stocktakes by hand, then timed five stocktakes once the new scanner app arrived. The times, in minutes, were:

Way of working	Five stocktake times (min)
By hand (paper dockets)	55, 62, 58, 60, 55
Scanner app	22, 18, 21, 19, 20

Made-up data: the depot and every number in this table are made up for this section.

- Find the mean time for a stocktake by hand.
- Find the mean time for a stocktake with the scanner app.

(c) On average, how many minutes per stocktake does the app save?



Dot plot with two rows of Copperline Depot stocktake times in minutes: by hand 55, 55, 58, 60, 62 with a dashed line at the mean of 58 min, and scanner app 18, 19, 20, 21, 22 with a dashed line at the mean of 20 min

Working

Comment

(a) Total: $55 + 62 + 58 + 60 + 55 = 290$ min

The mean is the total $\div$ the count.

Mean: $290 \div 5 = 58$ min

Five stocktakes by hand were timed.

(b) Total: $22 + 18 + 21 + 19 + 20 = 100$ min

Same method on the app times.

Mean: $100 \div 5 = 20$ min

Five app stocktakes were timed.

(c) $58 - 20 = 38$ min saved

The difference between the two means.

Check: 38 min saved out of about an hour is believable
— the app scans instead of writing.

Evaluate the answer against the job (Section 1C).

A stocktake by hand takes a mean of 58 min and a stocktake with the app takes a mean of 20 min, so the app saves 38 min per stocktake on average. The effort drops too: less writing, and no walking back to the office to double-check a docket.

Example 2 — scaffolded

Ironwood Constructions records every incident on its building sites. One site's safety report shows the incidents for six months:

Month	Mar	Apr	May	Jun	Jul	Aug
Incidents	8	7	5	6	4	3

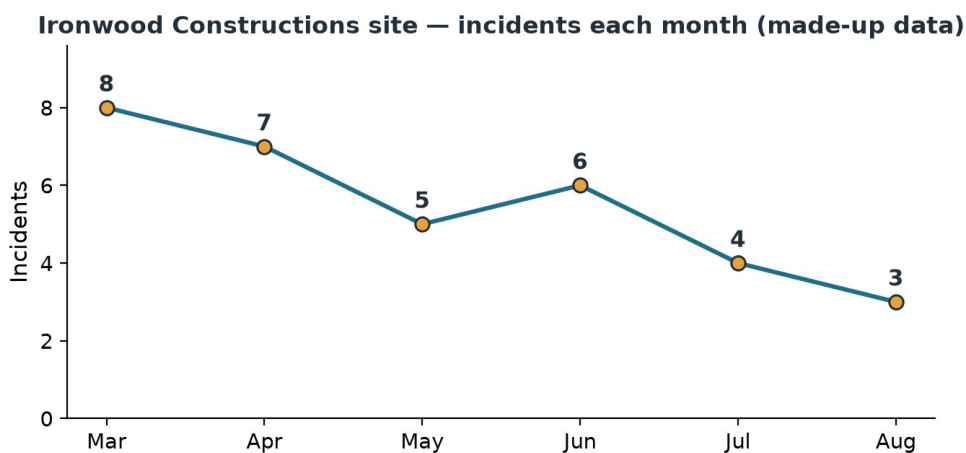
Made-up data: the company and every number in this table are made up for this section.

(a) How many incidents were there in total?

(b) Find the mean number of incidents per month.

(c) Find the range of the monthly counts.

(d) Describe the trend in incidents over the six months.



Line graph of incidents each month at the Ironwood Constructions site: Mar 8, Apr 7, May 5, Jun 6, Jul 4, Aug 3, falling overall

Working	Comment
(a) $8 + 7 + 5 + 6 + 4 + 3 = 33$ incidents	Add all six months for the total.
(b) $33 \div 6 = 5.5$ incidents per month	Mean = total $\div$ count; the count is 6 months.
(c) Highest 8, lowest 3: $8 - 3 = 5$	Range = highest – lowest.
(d) The counts fall from 8 to 3, with one small rise in June: the trend is downwards overall.	The trend is the overall direction (Section 3D).

The site recorded 33 incidents in total, a mean of 5.5 per month and a range of 5. The trend is downwards overall, which is good news for the site — but the June rise is worth a look.

Example 3 — unscaffolded

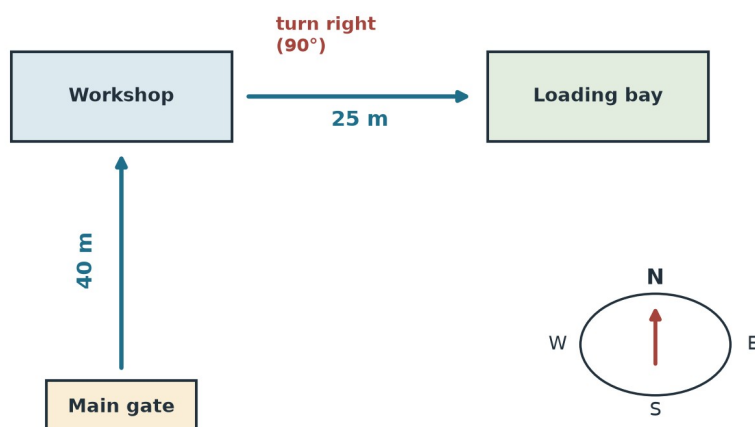
A new delivery driver at Brumby Timber Yard is handed these written instructions:

“From the main gate, walk 40 m north to the workshop door. Turn right through 90° . Walk 25 m to the loading bay.”

- After the right turn, which compass direction is the driver facing?
- How many metres does the driver walk in total?

(c) Complete the sentence for the delivery report: “The loading bay is _____ of the main gate.”

Brumby Timber Yard — the route from the main gate (made-up plan)



Plan of the walking route at Brumby Timber Yard: 40 m north from the main gate to the workshop, a right-angle turn, then 25 m east to the loading bay, with a compass rose showing north up

The driver sets off facing north. A right turn through 90° from north leaves the driver facing **east** (Section 2D). The walk has two straight legs, so the total is $40 + 25 = 65$ m. The route goes north first and then east, so the loading bay sits between north and east of the gate — that is, **north-east** (Section 2B).

$\therefore$ The driver faces east after the turn, walks 65 m in total, and the loading bay is north-east of the main gate.

Example 4 — unscaffolded

The QA rule at Ferngrove Foods is that the smallgoods fridge must stay between 2°C and 5°C . Bree, the QA officer, records eight readings across one shift: 3.1, 4.6, 5.8, 2.4, 4.0, 3.6, 4.9 and 2.6°C .

Made-up data: the company and every reading here are made up for this section.

- Find the mean of the readings, correct to 1 decimal place.
- Find the range of the readings.
- How many readings break the QA rule?

Ferngrove Foods fridge — 8 readings across one shift (made-up data)

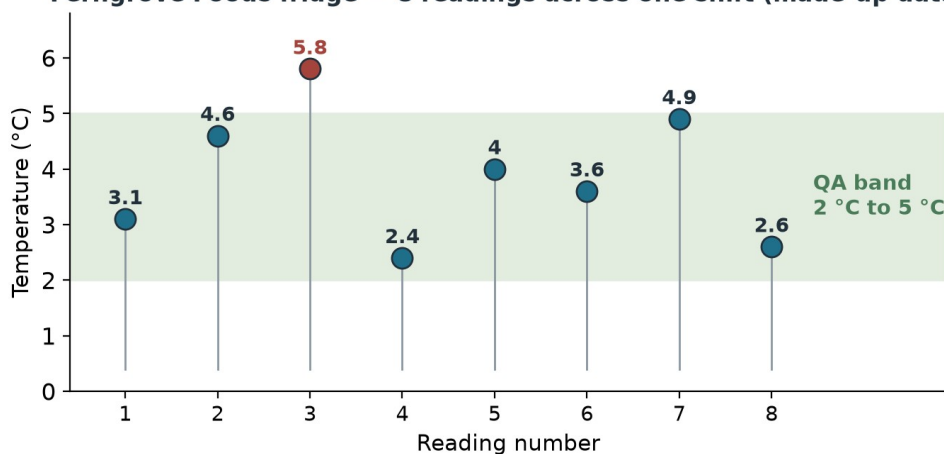


Chart of the eight fridge readings across the shift with the QA band from 2°C to 5°C shaded: the readings sit inside the band except the 5.8°C reading, which sits above it

The mean is the total $\div$ the count. The total is $3.1 + 4.6 + 5.8 + 2.4 + 4.0 + 3.6 + 4.9 + 2.6 = 31.0$ and the count is 8, so the mean is $31.0 \div 8 = 3.875$. Correct to 1 decimal place, the next digit is 7, so round up: 3.9°C . The range is the highest – the lowest: $5.8 - 2.4 = 3.4^\circ\text{C}$. The QA rule wants every reading between 2°C and 5°C . Only 5.8°C sits outside the band (above it), so exactly 1 reading breaks the rule — and by the data requirements, Bree must record it and report it.

$\therefore$ The mean is 3.9°C (to 1 decimal place), the range is 3.4°C , and 1 reading (5.8°C) breaks the QA rule.

Practice questions

Scaffolded

Q1. Taylah's time app records her shifts at Copperline Depot this week, in hours: Mon 7.5, Tue 8, Wed 7.25, Thu 8, Fri 6.75.

Made-up data: Taylah's shifts and every number here are made up for this section.

- (a) Write Wednesday's 7.25 h in hours and minutes.
- (b) Find the total hours for the week.
- (c) Find the mean hours per shift.

Q2. The OHS record for one Ironwood Constructions site shows the incidents for five months, Feb to Jun: 6, 4, 7, 3, 5.

Made-up data: the monthly counts are made up for this section.

- (a) How many incidents were there in total?
- (b) Find the mean number of incidents per month.
- (c) Find the range of the monthly counts.

Q3. Zane starts at the tool shed at Copperline Depot and walks 20 m north to the workbench. He then turns right through 90° and walks 15 m to the sand pile.

- (a) How many metres does Zane walk in total?
- (b) Which compass direction is Zane facing after the turn?
- (c) Which compass direction is the sand pile from the tool shed?

Q4. Bree keeps a tally of rejected jars at Ferngrove Foods through one morning. A tally counts in fives: four upright strokes, then a diagonal slash across them for the fifth.

Ferngrove Foods — rejected jars, tallied by hour (made-up data)	
Hour	Tally
7 am	
9 am	/
11 am	
1 pm	/

Each | is one rejected jar; every fifth jar gets a diagonal slash.

Tally sheet of rejected jars at Ferngrove Foods by hour: 7 am shows four strokes, 9 am shows a group of five and two strokes, 11 am shows three strokes, 1 pm shows a group of five and one stroke

- How many jars were rejected in the 9 am hour?
- How many jars were rejected in total?
- Find the mean number of rejected jars per hour.

Q5. The QA rule at Ferngrove Foods is that each sausage pack must weigh between 490 g and 510 g. A sample of five packs weighs: 496, 508, 512, 491 and 502 g.

Made-up data: the pack weights are made up for this section.

- How many packs in the sample break the QA rule?
- Find the range of the sample weights.
- Find the mean weight of the sample, to the nearest gram.

Q6. A plan of the Brumby Timber Yard workshop is drawn at scale 1 cm = 3 m.

- A wall is drawn 4 cm long on the plan. How long is it in real life?
- The workbench is drawn 2.5 cm long on the plan. How long is it in real life?
- The yard gate is 18 m from the door in real life. How long is it drawn on the plan?

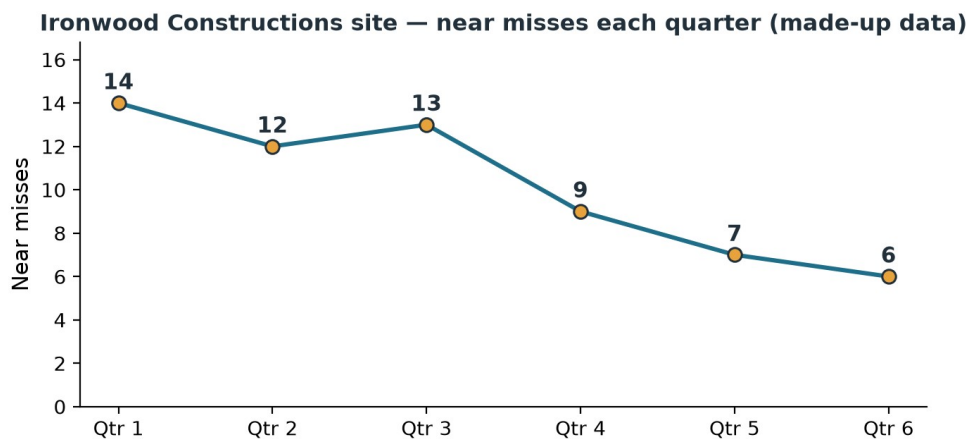
Unscaffolded

Q7. At Copperline Depot, order pickers used to fill orders from a paper list. Five runs with the paper list took, in minutes: 26, 24, 28, 25, 27. Five runs with the new scanner app took, in minutes: 15, 17, 14, 16, 13.

Made-up data: the run times are made up for this section.

- Find the mean time per run with the paper list.
- Find the mean time per run with the scanner app.
- The manager claims the scanner “saves more than 10 minutes a run on average”. Do the numbers support the claim? Explain with the numbers.

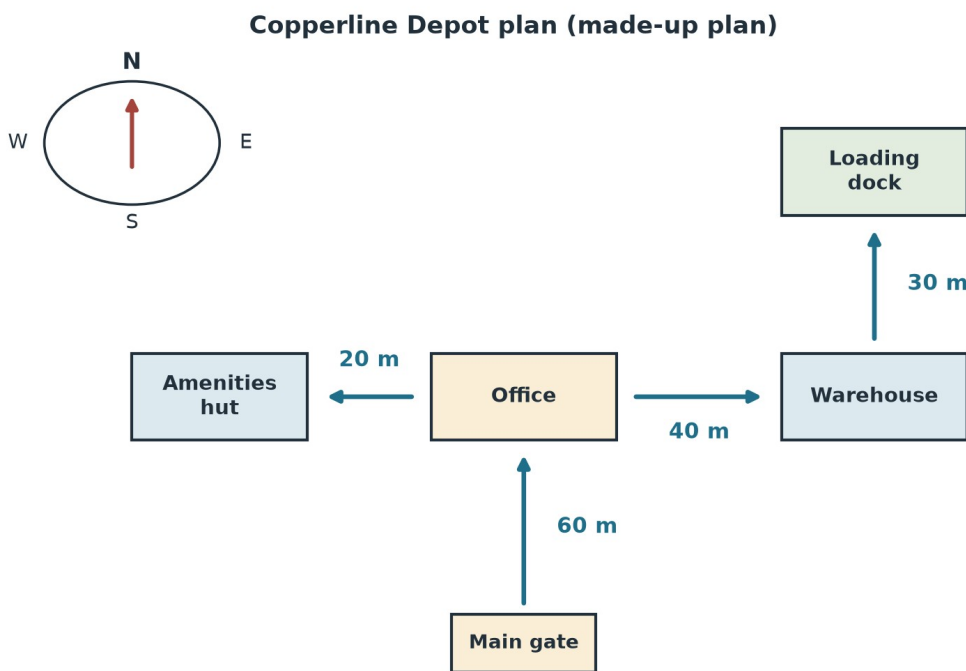
Q8. The line graph shows the near misses recorded each quarter at one Ironwood Constructions site.



Line graph of near misses each quarter at the Ironwood Constructions site: Qtr 1 14, Qtr 2 12, Qtr 3 13, Qtr 4 9, Qtr 5 7, Qtr 6 6, falling overall

- How many near misses were recorded in Qtr 2?
- Describe the trend in near misses across the six quarters.
- Find the mean number of near misses per quarter, to 1 decimal place.

Q9. The plan shows Copperline Depot, with the walking distances marked.



Plan of Copperline Depot with a compass rose: 60 m north from the main gate to the office, 40 m east from the office to the warehouse, 30 m north from the warehouse to the loading dock, and 20 m west from the office to the amenities hut

- Which compass direction is the warehouse from the office?
- A driver walks from the main gate to the office, then to the warehouse door, then to the loading dock. How many metres does the driver walk in total?
- Write one sentence of directions from the main gate to the amenities hut.

Q10. The forklift logbook at Brumby Timber Yard read 232 h at its last service. This week Hemi records these hours in the logbook: Mon 4.5, Tue 5, Wed 6, Thu 5.5, Fri 4, Sat 3. The forklift is serviced every 250 h.

Made-up data: the logbook numbers are made up for this section.

- (a) How many hours did the forklift run this week?
- (b) What does the logbook read now?
- (c) Has the forklift passed its 250 h service point? By how many hours?

Q11. A stocktake at Copperline Depot counts the shelves in four aisles: Aisle A 150, Aisle B 120, Aisle C 140, Aisle D 90.

Made-up data: the aisle counts are made up for this section.

- (a) How many shelves were counted in total?
- (b) Find the mean number of shelves per aisle.
- (c) What percentage of all the shelves are in Aisle A?

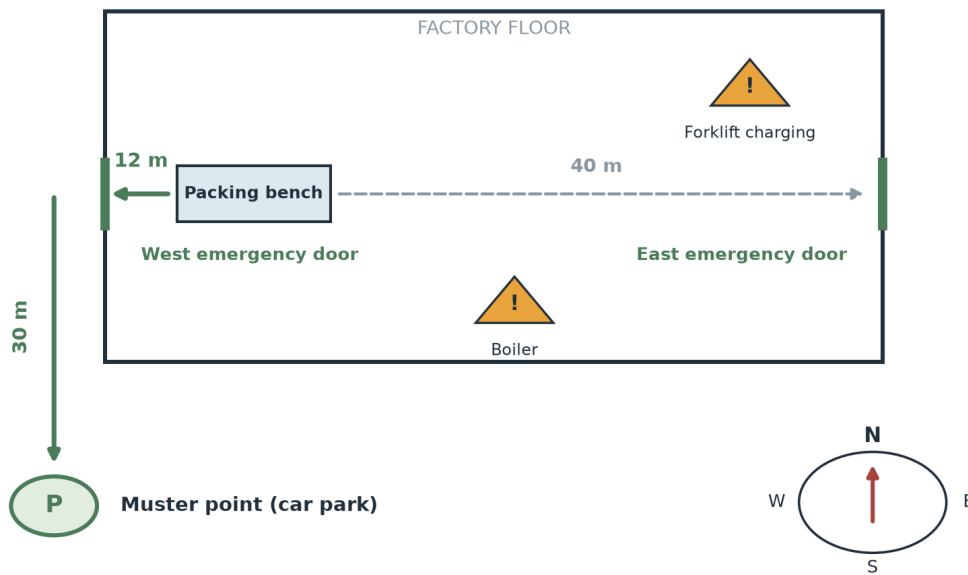
Q12. The QA card at Brumby Timber Yard says each garden-bed plank must be 1.5 m long, and a cut passes if it is within 2 cm of 1.5 m. Raj records five cuts, in centimetres: 148, 151, 152, 149, 153.

Made-up data: the cut lengths are made up for this section.

- (a) Write 1.5 m in centimetres.
- (b) Which cut breaks the QA rule?
- (c) Find the mean length of the five cuts, to the nearest centimetre.

Q13. The evacuation diagram shows the Ferngrove Foods factory floor, its two emergency doors, its hazards and its muster point.

Ferngrove Foods factory — evacuation diagram (made-up plan)



Evacuation diagram of the Ferngrove Foods factory with a compass rose: the packing bench is 12 m from the west emergency door and 40 m from the east emergency door; the muster point in the car park is 30 m south of the west emergency door; hazards marked are the forklift charging point and the boiler

- Which emergency door is nearer to the packing bench? Use the distances to explain.
- Find the total escape distance: packing bench to that door, then to the muster point.
- Which compass direction is the muster point from that door?

Q14. The accounts clerk at Copperline Depot used to type 60 paper invoices a week, at 6 minutes each. The new ordering software produces the same 60 invoices at 2.5 minutes each.

Made-up data: the invoice numbers are made up for this section.

- How many minutes a week did the paper invoices take?
- How many hours a week does the software take?
- How many hours a week are saved?

Q15. Ironwood Constructions employs 240 workers. So far 216 of them have finished the new safety course.

Made-up data: the worker counts are made up for this section.

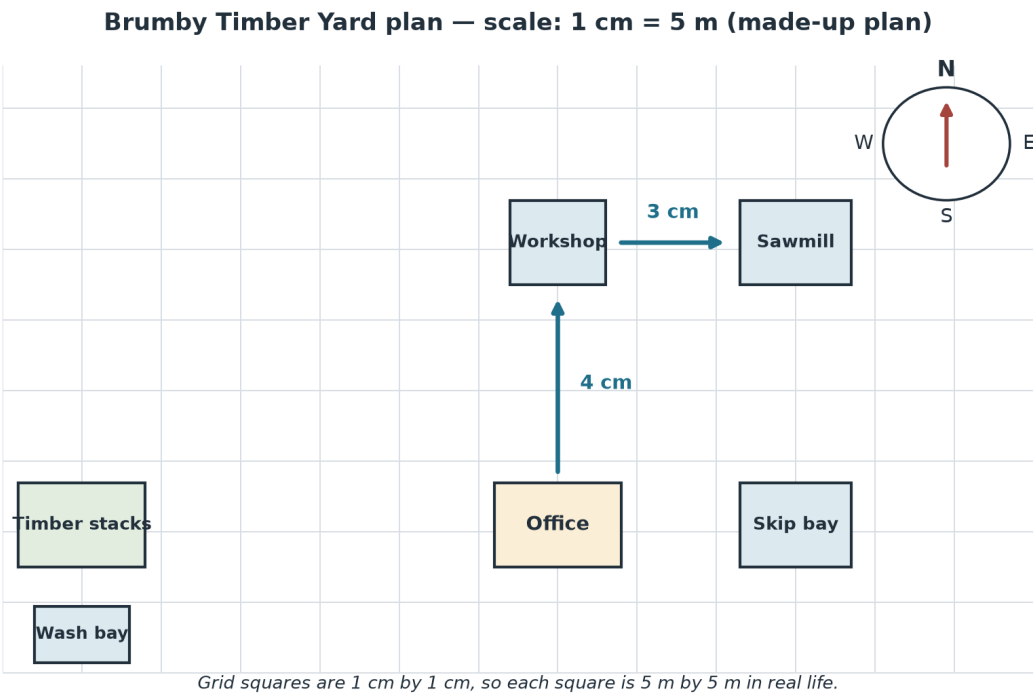
- What percentage of workers have finished the course?
- What percentage have not finished it?
- How many workers have not finished the course?

Q16. A QA officer at Ferngrove Foods checks a sample of 50 jars and 46 pass. The QA rule releases a batch when at least 90 % of the sample passes.

Made-up data: the sample counts are made up for this section.

- Write the pass share as a fraction in simplest form.
- Write the pass share as a percentage.
- Is the batch released? Explain with the numbers.

Q17. The plan shows Brumby Timber Yard, drawn at scale 1 cm = 5 m on a 1 cm grid.



Plan of Brumby Timber Yard on a 1 cm grid at scale 1 cm = 5 m, with a compass rose: the workshop is 4 cm north of the office, the sawmill is 3 cm east of the workshop, the timber stacks are 6 cm west of the office, with a wash bay and a skip bay also marked

- (a) Which compass direction is the workshop from the office?
- (b) Hemi walks from the office to the workshop, then to the sawmill. How many metres does he walk in total?
- (c) An old skip has to be moved to a spot “30 m west of the office”. What is already standing at that spot?

Q18. Zane’s delivery log at Copperline Depot for Tuesday reads:

Record	Value
Odometer at start of day	41 286 km
Odometer at end of day	41 466 km
Fuel added that day	18 L

Made-up data: the log and every number in this table are made up for this section.

- (a) How many kilometres did the truck travel on Tuesday?
- (b) Find the fuel used per 100 km.
- (c) The depot target is 9.5 L/100 km or better. Did Tuesday’s run meet the target? Explain with the numbers.

Answers

Q1. (a) 7 h 15 min (b) 37.5 h (c) 7.5 h per shift

Q2. (a) 25 incidents (b) 5 per month (c) 4

Q3. (a) 35 m (b) east (c) north-east

Q4. (a) 7 jars (b) 20 jars (c) 5 per hour

Q5. (a) 1 pack (512 g) (b) 21 g (c) 502 g (to the nearest gram)

Q6. (a) 12 m (b) 7.5 m (c) 6 cm

Q7. (a) 26 min (b) 15 min (c) yes — the saving is 11 min a run, which is more than 10

Q8. (a) 12 (b) downwards overall (c) 10.2 (to 1 decimal place)

Q9. (a) east (b) 130 m (c) answers may vary — for example: walk 60 m north from the main gate to the office, then turn and walk 20 m west to the amenities hut

Q10. (a) 28 h (b) 260 h (c) yes — 10 h past the service point

Q11. (a) 500 shelves (b) 125 per aisle (c) 30 %

Q12. (a) 150 cm (b) the 153 cm cut (c) 151 cm (to the nearest centimetre)

Q13. (a) the west emergency door — 12 m against 40 m (b) 42 m (c) south

Q14. (a) 360 min (b) 2.5 h (c) 3.5 h a week

Q15. (a) 90 % (b) 10 % (c) 24 workers

Q16. (a) $\frac{23}{25}$ (b) 92 % (c) yes — 92 % is at least 90 %

Q17. (a) north (b) 35 m (c) the timber stacks

Q18. (a) 180 km (b) 10 L/100 km (c) no — 10 L/100 km is above the 9.5 L/100 km target

Fully-worked solutions

Q1. (a) The 0.25 of an hour is $0.25 \times 60 = 15$ min, so 7.25 h = **7 h 15 min**. (b) $\$7.5 + 8 + 7.25 + 8 + 6.75 = \$ 37.5$ h. (c) $\$37.5 = \$ 7.5$ h per shift.

Q2. (a) $\$6 + 4 + 7 + 3 + 5 = \$ 25$ incidents. (b) $\$25 = \$ 5$ per month. (c) Highest 7, lowest 3: $\$7 - 3 = \$ 4$.

Q3. (a) $\$20 + 15 = \$ 35$ m. (b) Facing north, a right turn through 90° leaves Zane facing **east**. (c) The route goes north then east, so the sand pile is **north-east** of the tool shed.

Q4. (a) The 9 am row is one group of five plus two strokes: $\$5 + 2 = \$ 7$ jars. (b) $\$4 + 7 + 3 + 6 = \$ 20$ jars. (c) $\$20 = \$ 5$ per hour.

Q5. (a) The band is 490 g to 510 g. Only 512 g sits outside it, so **1 pack** breaks the rule. (b) $\$512 - 491 = \$ 21$ g. (c) Total $496 + 508 + 512 + 491 + 502 = 2509$ g; mean $2509 \div 5 = 501.8$ g, which rounds to **502 g** to the nearest gram.

Q6. (a) Plan to real: multiply. $\$4 = \$ 12$ m. (b) $\$2.5 = \$ 7.5$ m. (c) Real to plan: divide. $\$18 = \$ 6$ cm.

Q7. (a) Total $26 + 24 + 28 + 25 + 27 = 130$ min; mean $\$130 = \$ 26$ min. (b) Total $15 + 17 + 14 + 16 + 13 = 75$ min; mean $\$75 = \$ 15$ min. (c) Saving per run: $26 - 15 = 11$ min. 11 min is more than 10 min, so **yes, the numbers support the manager's claim**.

Q8. (a) Qtr 2 shows **12** near misses. (b) The counts fall from 14 to 6 with one small rise in Qtr 3, so the trend is **downwards overall**. (c) Total $14 + 12 + 13 + 9 + 7 + 6 = 61$; mean $61 \div 6 = 10.1666\dots$, which rounds to **10.2** to 1 decimal place.

Q9. (a) The warehouse is **east** of the office. (b) $\$60 + 40 + 30 = \$ 130 \text{ m}$. (c) Answers may vary; a model sentence: **walk 60 m north from the main gate to the office, then turn and walk 20 m west to the amenities hut**.

Q10. (a) $\$4.5 + 5 + 6 + 5.5 + 4 + 3 = \$ 28 \text{ h}$. (b) $\$232 + 28 = \$ 260 \text{ h}$. (c) 260 h is past 250 h, so **yes**: $\$260 - 250 = \$ 10 \text{ h}$ past the service point — book the service.

Q11. (a) $\$150 + 120 + 140 + 90 = \$ 500 \text{ shelves}$. (b) $\$500 = \$ 125 \text{ per aisle}$. (c) $\$150 = 0.3 = \$ 30 \%$ of the shelves.

Q12. (a) $\$1.5 = \$ 150 \text{ cm}$. (b) The rule passes cuts within 2 cm of 150 cm, so 148 cm and 152 cm pass (exactly 2 cm out). The **153 cm cut** is 3 cm out and breaks the rule. (c) Total $148 + 151 + 152 + 149 + 153 = 753 \text{ cm}$; mean $753 \div 5 = 150.6 \text{ cm}$, which rounds to **151 cm** to the nearest centimetre.

Q13. (a) The **west emergency door**: 12 m from the bench against 40 m to the east door. (b) $\$12 + 30 = \$ 42 \text{ m}$. (c) The muster point is **south** of the west emergency door.

Q14. (a) $\$60 = \$ 360 \text{ min}$ (which is $360 \div 60 = 6 \text{ h}$). (b) $60 \times 2.5 = 150 \text{ min}$, and $\$150 = \$ 2.5 \text{ h}$. (c) $\$6 - 2.5 = \$ 3.5 \text{ h}$ a week saved.

Q15. (a) $\$216 = 0.9 = \$ 90 \%$. (b) $\$100\% - 90\% = \$ 10 \%$. (c) $\$240 - 216 = \$ 24 \text{ workers}$.

Q16. (a) $\$ = \$ \frac{23}{25}$. (b) $\$46 = 0.92 = \$ 92 \%$. (c) The rule needs at least 90%; 92% is at least 90%, so **yes, the batch is released**.

Q17. (a) The workshop is **north** of the office. (b) Office to workshop: $4 \times 5 = 20 \text{ m}$; workshop to sawmill: $3 \times 5 = 15 \text{ m}$; total $\$20 + 15 = \$ 35 \text{ m}$. (c) 30 m at this scale is $30 \div 5 = 6 \text{ cm}$ on the plan, and 6 cm west of the office is where **the timber stacks** already stand.

Q18. (a) $\$41\,466 - 41\,286 = \$ 180 \text{ km}$. (b) $\$18 = \$ 10 \text{ L per } 100 \text{ km}$. (c) The target is 9.5 L/100 km or better; 10 L/100 km is more fuel than 9.5, so **no, Tuesday's run did not meet the target** (0.5 L/100 km over).

Chapter 6 Numeracy in context — 6F Recreational numeracy

Theory

In the study design (Unit 2, Outcome 1), recreational numeracy is the maths inside the things you do in your free time — for example sport, the arts and social media, and plenty more.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-09.

Free time is full of numbers. Your club counts goals and ladder points, your phone counts minutes and pick-ups, the betting board counts odds, the orienteering map counts metres, and the trip planner counts kilometres and minutes. This section is about picking those numbers up, doing one or two sensible steps with them, and saying what they mean — in sport, on social media, around a games night, and out on the water, the track and the road.

Where the numbers of free time show up



Six cards: game-day stats, screen-time reports, odds and chances, course maps, wind and headings, trip maps and GPS — each with the kind of question its numbers ask.

The maths you already have. Nothing in this section is new maths. You will plan, solve and check (§1A); read grid references and the six compass points (§2B); use the everyday angles 45° , 90° , 180° and 360° (§2D); swap between fractions, decimals and percentages (§3B); find a mean and a range (§3C); talk about chance (§4B); and use speed, distance and time (§5D). The refreshers below put each tool back in your hand at the point where this section needs it.

Refresher — mean and range. The **mean** (average) spreads a total evenly over the values: $\text{mean} = \text{total} \div \text{number of values}$. The **range** is how spread out the values are: $\text{range} = \text{highest} - \text{lowest}$. A team kicks 3, 5 and 4 goals in three games: the total is $3 + 5 + 4 = 12$, so the mean is $12 \div 3 = 4$ goals a game, and the range is $5 - 3 = 2$ goals. Sanity check: a mean always sits between the lowest and the highest value.

Sport and event statistics. A bar chart of goals a round, finishers a week or tickets a day is read straight off the bars: the height of a bar is the number for that round, week or day. From the whole set of bars you can report the **mean** (the typical amount) and the **range** (the spread), and describe the **trend** — whether the numbers are generally rising, falling or steady across the chart. Trends are described in words; you are not asked to predict beyond the chart.

Social media: use, overuse and staying in charge. Wellbeing apps and phone settings produce weekly reports: minutes a day, pick-ups a day, late-night use. The same tools apply — a mean tells you the typical day, a range tells you how much your days vary, and a fraction tells you what part of a day's pick-ups happened after a certain time. Reports like this are useful for noticing overuse: many people find that heavy late-night scrolling costs them sleep, mood and attention the next day, and that setting limits (or a screen-free challenge with a target mean) helps. The numbers here are simple; the point is to read them honestly and decide what to do.

Refresher — chance in three outfits. The **probability** (chance) of an event when every outcome is equally likely is

$$P(\text{event}) = \frac{\text{favourable outcomes}}{\text{total outcomes}}$$

and the same chance can wear three outfits: a fraction, a decimal or a percentage. Three of four teammates own a club hoodie: $P(\text{hoodie}) = \frac{3}{4} = 0.75 = 75\%$. Words like “1 in 5” are fractions too: 1 in 5 is $\frac{1}{5} = 0.2 = 20\%$. A success rate is the same idea: 8 goals from 10 shots on target is $\frac{8}{10} = \frac{4}{5} = 0.8 = 80\%$. The probability of *not* happening is the rest of the whole: $1 - P(\text{event})$, or count the unfavourable outcomes instead.

Gambling: odds, payouts and chances. Betting boards in Australia show **decimal odds**: a number that tells you the payout for every \$1 staked, including your stake back.

- **Payout** = bet $\times$ odds number. At odds of 4.00, a \$10 bet pays $\$10 \times 4.00 = \$40$ if it wins (your \$10 stake is inside that \$40).
- The odds number also hints at the **chance the board suggests**: $1 \div \text{odds}$. At odds of 4.00 that is $1 \div 4 = 0.25 = 25\%$.
- Lower odds mean the board thinks the outcome is *more* likely; higher odds mean less likely (and a bigger payout if it happens).

That is all this book asks: one multiplication for a payout, one division for the suggested chance. Gambling is adults-only (18+) in Australia, and for young people it is something to understand, not to join in on. If gambling ever worries you or someone close to you, free confidential help exists — talk to a trusted adult or look up gambling help services in your state.

Units 3 & 4 preview. In Units 3 and 4 you weigh chances against what can be won or lost to evaluate *risk* in decisions like gambling. That is beyond this book and is not tested here.

Navigation: directions and angles on the move. Orienteering, sailing, bushwalking and bike riding all ask two questions: *which way*, and *how far*. This book uses six compass points only — **north, south, east, west, northeast, southeast** — with north up on every map, and grid references letter-first (C4 means column C, row 4).

Refresher — the four everyday angles. Turns and corners in this book use only these angles:

Turn	Angle
half a right angle (an eighth of a full turn)	45°
a right angle (a quarter turn)	90°
a half turn	180°
a full turn	360°

So a wind from the north meeting a boat sailing east is a 90° (a quarter-turn) difference, and a wind that shifts a half turn (180°) from the north now comes from the south.

Units 3 & 4 preview. In Units 3 and 4, maps and navigation also use finer compass points (like SSW) and numbered directions (like N15°W). That level is beyond this book and is not tested here — this book asks for the six compass points above only.

Refresher — average speed, and minutes to hours. Average speed spreads a distance evenly over the time: $\text{speed} = \text{distance} \div \text{time}$. Driving 120 km in 2 h is $120 \div 2 = 60$ km/h. Times often arrive in minutes, so change them to hours first: 15 min = 0.25 h, 30 min = 0.5 h, 45 min = 0.75 h, 90 min = 1.5 h (divide the minutes by 60). Then $\text{time} = \text{distance} \div \text{speed}$, and $\text{distance} = \text{speed} \times \text{time}$.

Refresher — reading a scale. A map scale turns measured centimetres into real distance: multiply the centimetres by the kilometres each centimetre stands for. At a scale of 1 cm = 10 km, a route measuring 3 cm is $3 \times 10 = 30$ km long. Grid course maps work the same way with squares instead of centimetres: if 1 square along a track = 200 m, then 4 squares of walking is $4 \times 200 = 800$ m. Count squares *along the track you walk*, not diagonally across open ground.

Trip planning with maps and GPS. A trip plan chains the tools above: measure the route on the map, use the scale to get kilometres, use the average speed to get hours, then add stops and count forward on the clock from the departure time. A GPS does the same job mid-trip: “20 km to go at 80 km/h” means $20 \div 80 = 0.25$ h, so 15 minutes, left before you arrive. Clock answers are written in 24-hour time, like 09:50 or 14:20.

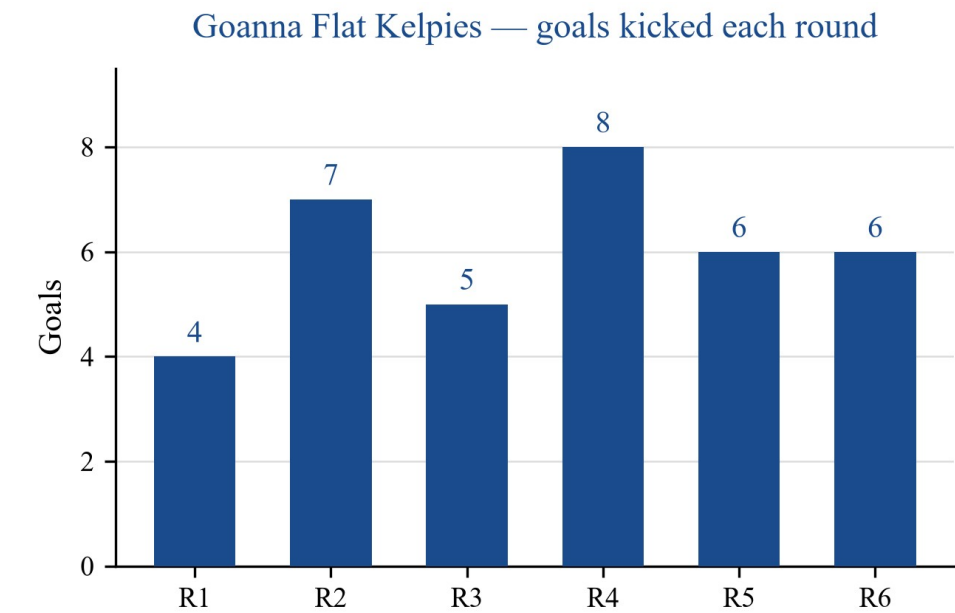
Tools and rounding. Calculators, phones and apps are welcome everywhere in this section — the skill is choosing the right numbers and reading the result sensibly. Where an answer does not come out exactly, this section always tells you the rounding to use (for example, “to one decimal place”), and your answer line should repeat it. Always carry units (goals, minutes, km, km/h, m) so a reader can check your thinking.

About the data in this section. The clubs, teams, events, apps, odds boards and maps here are **made up** (not real): pretend people, pretend places and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about any real club, person, app or place.

Worked examples

Example 1 — scaffolded

The bar chart shows the goals the Goanna Flat Kelpies kicked in each of the first six rounds of the season.



Bar chart of Kelpies goals per round: R1 4, R2 7, R3 5, R4 8, R5 6, R6 6.

Made-up data: the Kelpies’ round-by-round goals are made up for this section.

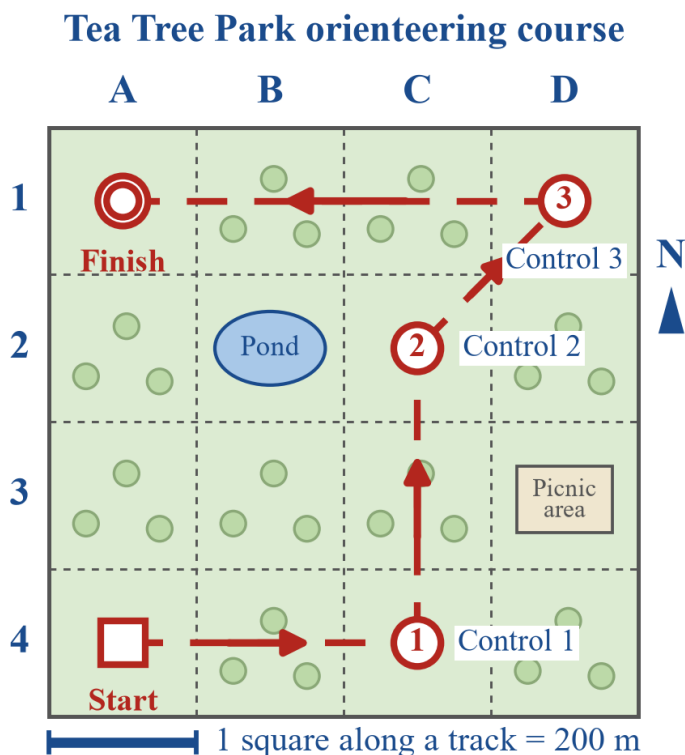
- (a) Read from the chart: how many goals did the Kelpies kick in round 3?
- (b) Find the mean number of goals per round over the six rounds.
- (c) Find the range, and say which round was the highest-scoring.

Working	Comment
Stage 1 — Identify: the six bars give 4, 7, 5, 8, 6, 6 goals. Asked: (a) the round-3 value, (b) the mean of all six, (c) the range and the tallest bar.	Read bars straight down to the axis label. The mean and range need all six values, not just one bar.
Stage 2 — Do: (a) the round-3 bar reaches 5, so 5 goals. (b) $\text{total} = 4 + 7 + 5 + 8 + 6 + 6 = 36$; $\text{mean} = 36 \div 6 = 6$ goals a round. (c) $\text{range} = 8 - 4 = 4$ goals; the tallest bar is round 4, with 8 goals.	$\text{Mean} = \text{total} \div \text{number of values}$. $\text{Range} = \text{highest} - \text{lowest}$.
Stage 3 — Check: the mean 6 sits between the lowest bar (4) and the highest (8) ✓. Backwards: $6 \times 6 = 36$, the total again ✓.	A mean outside the data, or a backwards check that misses, means re-add.
Stage 4 — Report: (a) 5 goals in round 3. (b) a mean of	Answer in words, with the unit (goals).

6 goals a round. (c) a range of 4 goals; round 4 was the highest-scoring round.

Example 2 — scaffolded

Matilda is walking the Tea Tree Park orienteering course. On this map, 1 square along a track = 200 m of walking. The course runs Start (A4) → control 1 (C4) → control 2 (C2) → control 3 (D1); a **control** is a checkpoint she must visit in order.



Tea Tree Park grid map, columns A-D and rows 1-4, with the dashed red course Start to control 1 to control 2 to control 3, and a scale of 1 square = 200 m.

Made-up map: Tea Tree Park and its course are made up for this section.

- Give the direction from the Start to control 1, and the distance in squares and in metres.
- Find the total walking distance from the Start to control 3 (via controls 1 and 2), in squares, in metres and in kilometres.
- At a mean walking speed of 4 km/h, how many minutes does that distance take?

Stage 1 — Identify: 1 square along a track = 200 m; course Start (A4) → 1 (C4) → 2 (C2) → 3 (D1). Asked: (a) direction, squares and metres for Start → 1; (b) the total to control 3; (c) the time at 4 km/h.

Grid references are letter-first. North is up, rows grow southward.

Stage 2 — Do: (a) Start → 1 runs **east**, 2 squares: $2 \times 200 = 400$ m. (b) 1 → 2 runs north, 2 squares; 2 → 3 runs northeast (1 square east plus 1 square north), 2 squares; total $2 + 2 + 2 = 6$ squares, so $6 \times 200 = 1\,200$ m = 1.2 km. (c) time = $1.2 \div 4 = 0.3$ h, and $0.3 \times 60 = 18$ minutes.

Count squares along the tracks walked. A northeast step of 1 east + 1 north costs 2 squares of walking.

Working	Comment
Stage 3 — Check: backwards, $400 \div 200 = 2$ squares ✓. At 4 km/h for 0.3 h: $4 \times 0.3 = 1.2$ km, the distance again ✓.	Minutes to hours: $18 \div 60 = 0.3$ h, the same step in reverse.
Stage 4 — Report: (a) east, 2 squares, 400 m. (b) 6 squares, which is 1 200 m or 1.2 km. (c) about 18 minutes of walking.	Keep metres and kilometres straight: 1 000 m = 1 km.

Example 3 — unscaffolded

Over the season the Goanna Flat Kelpies played 20 games: 12 wins, 5 draws and 3 losses. On Sunday the club's board lists the Kelpies at odds of 3.00 to win, and Alex puts a \$12 bet on them.

- Find the chance that a randomly chosen game from the season was a win, as a fraction in simplest form, a decimal and a percentage.
- Find the chance that a randomly chosen game was *not* a win, as a fraction in simplest form and a percentage.
- If the Kelpies win on Sunday, what payout does Alex collect?

Solution.

- Wins are 12 of the 20 games:

$$P(\text{win}) = \frac{12}{20} = \frac{3}{5} = 0.6 = 60\%$$

- Not a win means a draw or a loss: $5 + 3 = 8$ games.

$$P(\text{not win}) = \frac{8}{20} = \frac{2}{5} = 0.4 = 40\%$$

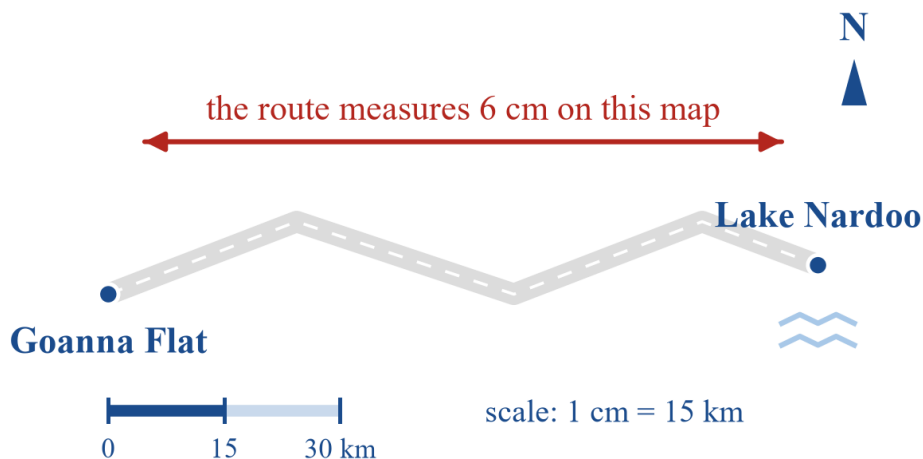
Check: $60\% + 40\% = 100\%$ ✓ — win and not-win cover every game.

- Payout = bet $\times$ odds number: $\$12 \times 3.00 = \$36$ (the stake is included in that payout).

$\therefore$ (a) $\frac{3}{5} = 0.6 = 60\%$ (b) $\frac{2}{5} = 0.4 = 40\%$ (c) a \$36 payout.

Example 4 — unscaffolded

The Kelpies make the away final at Lake Nardoo, and Stella's family drives up for the day. On the road map below the route measures 6 cm, and the scale is 1 cm = 15 km. The family leaves Goanna Flat at 09:50, travels at a mean speed of 60 km/h, and makes one 10-minute stop for morning tea.



Road sketch from Goanna Flat to Lake Nardoo with a double arrow marking that the route measures 6 cm on the map, and a scale bar of 1 cm = 15 km.

Made-up map: the road, towns and scale are made up for this section.

- Find the road distance from Goanna Flat to Lake Nardoo, in kilometres.
- Find the driving time (not counting the stop).
- What time does the family arrive?

Solution.

- Each centimetre stands for 15 km, so the distance is $6 \times 15 = 90$ km.
- Time = distance $\div$ speed = $90 \div 60 = 1.5$ h, which is 1 h 30 min.
- Count forward: $09:50 + 1 \text{ h } 30 \text{ min} = 11:20$; add the 10-minute stop: $11:20 + 10 \text{ min} = 11:30$.

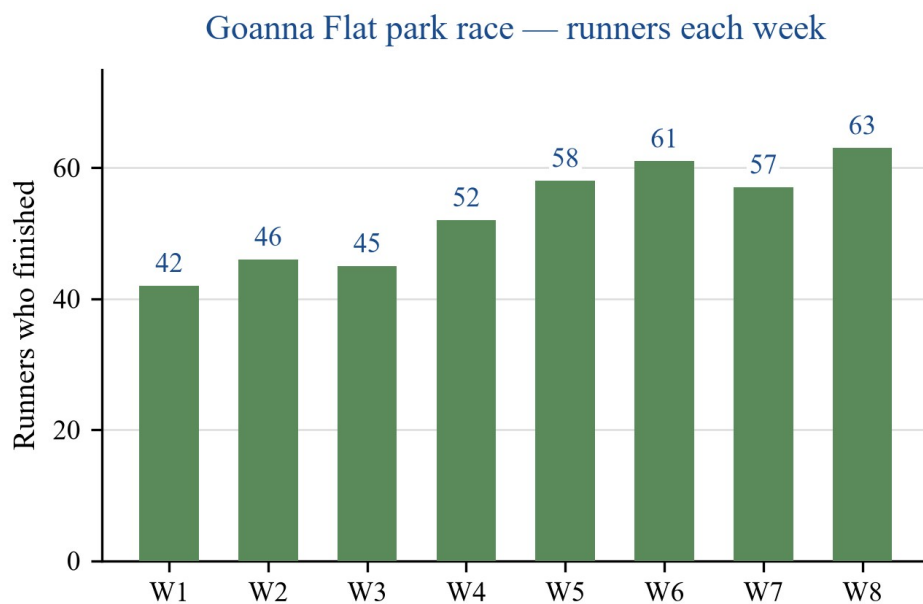
$\therefore$ (a) 90 km (b) 1 h 30 min of driving (c) arrival at 11:30.

Practice questions

Work each question in your workbook, one step per line, with units on every number. The scaffolded questions carry the Plan–Solve–Check stages with them; for the unscaffolded ones, run the stages in your head. Your teacher may prompt you at any stage — the stages are yours to use, not rules to obey.

Scaffolded

Q1. The bar chart shows how many runners finished the weekly Goanna Flat park race in each of its first eight weeks.

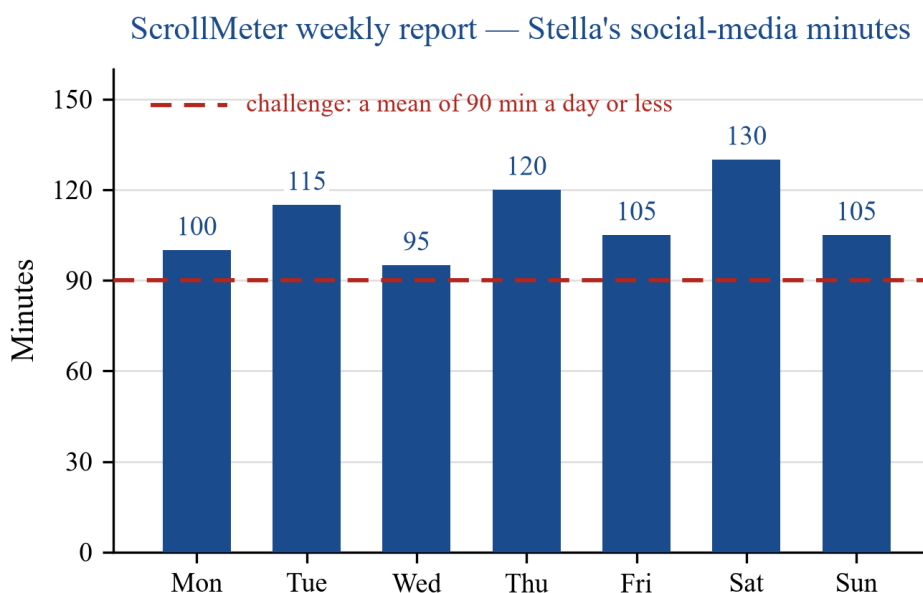


Bar chart of park race finishers per week: W1 42, W2 46, W3 45, W4 52, W5 58, W6 61, W7 57, W8 63.

Made-up data: the weekly finisher counts are made up for this section.

- Read from the chart: how many runners finished in week 5?
- Find the mean number of finishers per week over the eight weeks.
- Find the range, and describe the trend across the eight weeks in words.

Q2. Stella’s wellbeing app, ScrollMeter, produced this report of her social-media minutes for one week.



Bar chart of Stella’s social-media minutes per day: Mon 100, Tue 115, Wed 95, Thu 120, Fri 105, Sat 130, Sun 105, with a dashed line at 90 labelled as the challenge target.

Made-up data: Stella’s ScrollMeter report is made up for this section.

Stella is attempting Screen-Free September, whose challenge is a mean of 90 minutes a day or less.

- Find Stella’s mean social-media minutes per day for this week.
- Find the range of her daily minutes.
- Did Stella meet the challenge? Answer with her mean and the target, and say by how many minutes a day she was over or under.

Q3. Give each chance as a fraction, then as a decimal or percentage as asked.

- A coin toss decides which team kicks off. What is $P(\text{heads})$? Give it as a fraction, a decimal and a percentage.
- A raffle flyer says each ticket has a “1 in 4” chance of a prize. Write that chance as a fraction and as a percentage.
- A bag at the club fete holds 10 tokens, exactly 1 of which wins a prize. One token is drawn at random. Write $P(\text{win})$ as a fraction, a decimal and a percentage.

Q4. The table shows goal shooting for one player from each team in the last round.

Player	Goals	Shots on target
Charlie (Kelpies)	18	24
Harley (Brolgas)	15	25

Made-up data: the shooting figures are made up for this section.

- Write Charlie’s success rate (goals per shot on target) as a percentage.
- Write Harley’s success rate as a percentage.
- Which player converted the better rate? Answer with both percentages.

Q5. Use the Tea Tree Park course map in Example 2, where 1 square along a track = 200 m.

- (a) Give the direction from control 1 to control 2, and the number of squares.
- (b) Find the walking distance from the Start to control 2 (via control 1), in squares and in metres.
- (c) Give the direction from control 2 to control 3.

Q6. Poppy rides the Mulga Road loop, a 24 km circuit, in 1 h 30 min.

- (a) Write her ride time in hours (as a decimal).
- (b) Find her mean speed in km/h.
- (c) At that same mean speed, how long would a 32 km ride take? Give your answer in hours.

Un scaffolded

Q7. Charlie's club app tracked his running distance in five games: 9.5 km, 10.2 km, 8.8 km, 11.0 km and 9.3 km.

- (a) Show that the total distance is 48.8 km, adding one game per line.
- (b) Hence find his mean distance per game, **to one decimal place**.
- (c) Find the range of the five distances.

Q8. Over the same season the Lyrebird Bay Brolgas played 20 games: 11 wins, 5 draws and 4 losses.

- (a) Write the chance that a randomly chosen Brolgas game was a win, as a fraction in simplest form.
- (b) Write that chance as a percentage.
- (c) Write the chance that a randomly chosen game was *not* a win, as a percentage.

Q9. The board below is up in the clubrooms before Saturday's match.

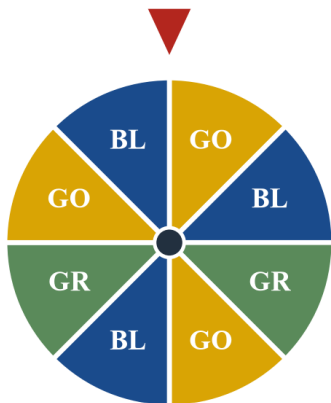
SATURDAY 3:00 PM	
Kelpies vs Brolgas	
<i>Goanna Flat Park · decimal odds</i>	
Kelpies to win	2.50
Draw	4.00
Brolgas to win	5.00
Payout = bet × odds · 18+ · know the odds before you bet	

Dark betting board for Kelpies vs Brolgas: Kelpies to win 2.50, draw 4.00, Brolgas to win 5.00, decimal odds.

Made-up data: the teams, the board and its odds are made up for this section. Gambling is 18+ only.

- (a) Alex bets \$20 on the Kelpies to win. If they win, what payout does the board promise?
- (b) What chance does the board suggest for a Kelpies win? Give it as a decimal and a percentage.
- (c) Do the same for a Brolgas win. Which team does the board suggest is more likely to win?

Q10. The club games-night wheel below has 8 equal sectors: 3 gold, 3 blue and 2 green. A spin lands on one sector at random.



3 gold · 3 blue · 2 green

the club games-night wheel — 8 equal sectors

Spinner wheel with 8 equal sectors: 3 gold, 3 blue, 2 green, with a pointer at the top.

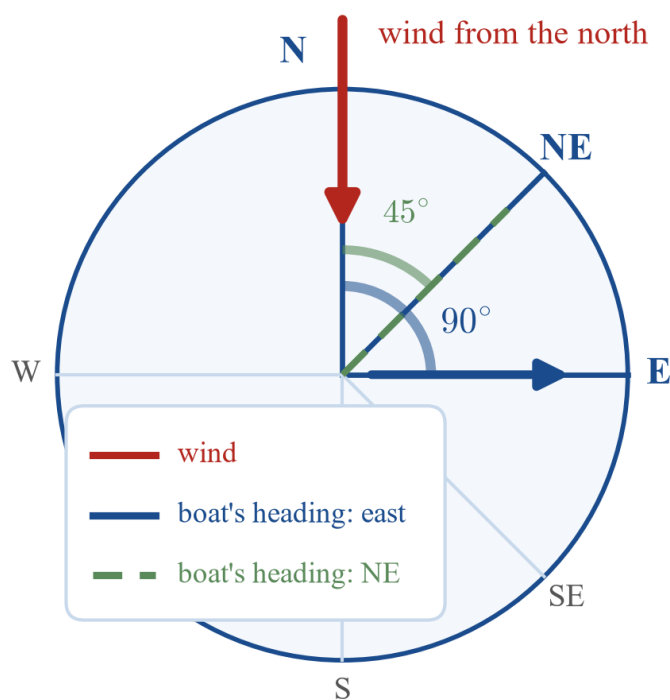
Made-up data: the games-night wheel is made up for this section.

- Write $P(\text{gold})$ as a fraction.
- Write $P(\text{gold})$ as a percentage.
- Write $P(\text{not gold})$ as a fraction, and say which is more likely: gold, or not gold.

Q11. Matilda walks the whole Tea Tree Park course in Example 2: Start → control 1 → control 2 → control 3 → Finish.

- Find the total walking distance in squares, in metres and in kilometres.
- She completes the course in 30 minutes. Find her mean speed in km/h.
- Is that faster or slower than 4 km/h? Give one sensible reason for the difference.

Q12. At Lake Nardoo Sailing Club the wind is blowing from the north.



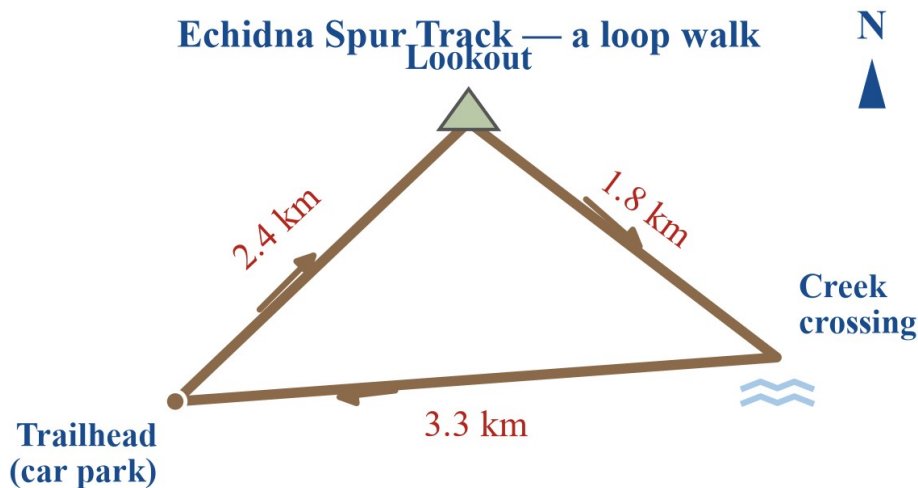
Lake Nardoo Sailing Club — wind and headings

Compass diagram with the six compass points, a red wind arrow from the north, a boat heading east at 90 degrees from the wind, and a dashed NE heading at 45 degrees from north.

Made-up diagram: drawn for this section.

- (a) Harley sails east. What is the angle between the wind's direction (north) and the boat's heading (east)? Name the turn as well.
- (b) Harley then heads northeast. What is the angle between north and northeast?
- (c) Late in the afternoon the wind shifts through a half turn (180°). From which compass point is the wind blowing now?

Q13. The Echidna Spur Track is a loop walk: 2.4 km from the trailhead to the lookout, 1.8 km from the lookout to the creek crossing, and 3.3 km from the creek crossing back to the trailhead.



Loop sketch of the Echidna Spur Track: trailhead to lookout 2.4 km, lookout to creek crossing 1.8 km, creek crossing back to trailhead 3.3 km.

Made-up map: the Echidna Spur Track loop is made up for this section.

- Find the total length of the loop, in kilometres.
- Alex's walking group averages 3 km/h on tracks like this. How long does the loop take them? Give your answer in hours and in hours-and-minutes.
- The group leaves the car park at 08:45 and takes a 15-minute rest at the lookout. What time are they back at the car park?

Q14. Two riders set out on the Mulga Road loop one morning. Stella rides 30 km in 2 h. Matilda rides 27 km in 1 h 30 min.

- Find Stella's mean speed in km/h.
- Find Matilda's mean speed in km/h.
- Which rider was faster, and by how many km/h?

Q15. Poppy's family drives to the Lake Nardoo Jazz Weekend. On their map the scale is 1 cm = 12 km, and the route measures 5 cm.

- Find the road distance in kilometres.
- At a mean speed of 80 km/h, how many minutes does the drive take?
- At 14:05 the car's GPS shows 20 km to go, and the family keeps averaging 80 km/h. What time do they arrive?

Q16. An article claims phone users pick up their phone "about 75 times a day on average". Stella's ScrollMeter counted her pick-ups for a week: 58, 65, 71, 62, 80, 99 and 90.

- Show that her total pick-ups for the week is 525, adding one day per line.
- Hence show that her mean pick-ups per day is exactly 75, and say whether the article's claim matches her week.
- On Saturday, 22 of her 99 pick-ups happened between 11 pm and midnight. Write that part of Saturday's pick-ups as a fraction in simplest form.

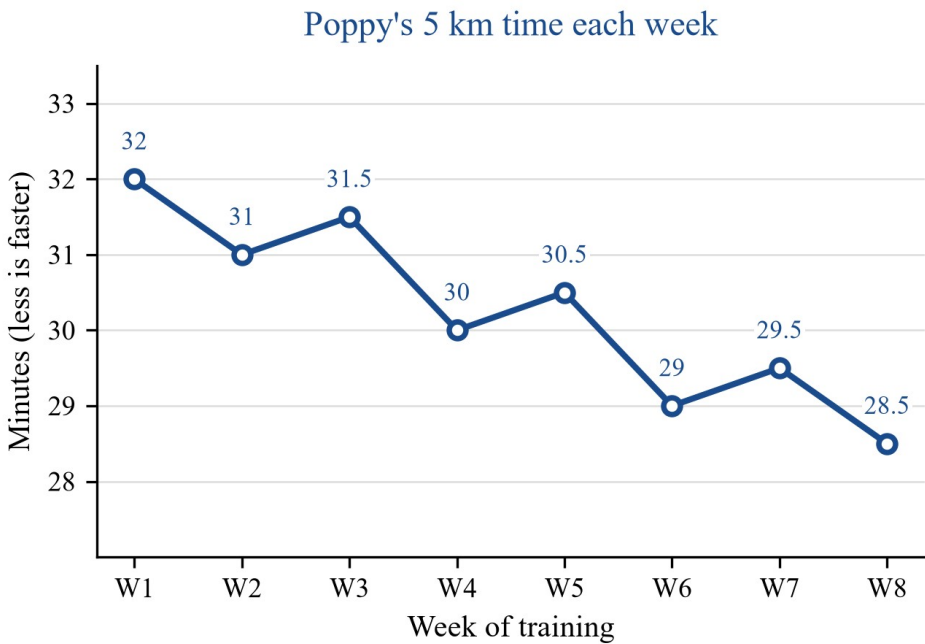
Q17. The Lake Nardoo Jazz Weekend sold tickets over three days.

Day	Tickets sold
Friday	340
Saturday	525
Sunday	410

Made-up data: the ticket figures are made up for this section.

- (a) Find the total tickets sold over the weekend.
- (b) Find the mean tickets sold per day.
- (c) Child tickets were one-fifth of all tickets sold. How many child tickets were sold?

Q18. Poppy times herself over 5 km each week of her training block.



Line chart of Poppy's 5 km time each week: W1 32, W2 31, W3 31.5, W4 30, W5 30.5, W6 29, W7 29.5, W8 28.5 minutes.

Made-up data: Poppy's weekly times are made up for this section.

- (a) Read from the chart: what was her time in week 6?
- (b) Find her mean time over the eight weeks. Give an exact answer — no rounding needed.
- (c) Find the range of the eight times, and say in words what the trend across the chart tells you about her running.

Answers

Q1. (a) 58 runners. (b) mean 53 runners a week. (c) range 21 runners; the finisher counts generally rise across the eight weeks.

Q2. (a) mean 110 minutes a day. (b) range 35 minutes. (c) no — her mean of 110 minutes is above the 90-minute target, over by 20 minutes a day.

Q3. (a) $\frac{1}{2} = 0.5 = 50\%$. (b) $\frac{1}{4} = 25\%$. (c) $\frac{1}{10} = 0.1 = 10\%$.

Q4. (a) 75%. (b) 60%. (c) Charlie (Kelpies), 75% against 60%.

Q5. (a) north, 2 squares. (b) 4 squares = 800 m. (c) northeast.

Q6. (a) 1.5 h. (b) 16 km/h. (c) 2 h.

Q7. (a) 48.8 km, shown. (b) 9.8 km, to one decimal place. (c) 2.2 km.

Q8. (a) $\frac{11}{20}$. (b) 55%. (c) 45%.

Q9. (a) \$50. (b) $0.4 = 40\%$. (c) $0.2 = 20\%$; the board suggests the Kelpies are more likely to win.

Q10. (a) $\frac{3}{8}$. (b) 37.5%. (c) $\frac{5}{8}$; not gold is more likely.

Q11. (a) 9 squares = 1 800 m = 1.8 km. (b) 3.6 km/h. (c) slower than 4 km/h — she stops at each control to punch her card and read the map.

Q12. (a) 90° , a quarter turn (a right angle). (b) 45° . (c) from the south.

Q13. (a) 7.5 km. (b) 2.5 h, that is 2 h 30 min. (c) 11:30.

Q14. (a) 15 km/h. (b) 18 km/h. (c) Matilda, by 3 km/h.

Q15. (a) 60 km. (b) 45 minutes. (c) 14:20.

Q16. (a) 525, shown. (b) mean exactly 75 — yes, it matches the article's claim. (c) $\frac{2}{9}$.

Q17. (a) 1 275 tickets. (b) mean 425 tickets a day. (c) 255 child tickets.

Q18. (a) 29 minutes. (b) 30.25 minutes, exact. (c) range 3.5 minutes; the times generally fall, so Poppy is getting faster.

Fully-worked solutions

Q1. (a) The week-5 bar reaches 58. (b) Total = $42 + 46 + 45 + 52 + 58 + 61 + 57 + 63 = 424$; mean = $424 \div 8 = 53$ runners a week. (c) Range = $63 - 42 = 21$ runners. The bars climb overall (42 up to 63, despite the small dip in week 7), so finisher numbers are generally rising.

$\therefore$ (a) 58 runners (b) mean 53 (c) range 21, generally rising.

Q2. (a) Total = $100 + 115 + 95 + 120 + 105 + 130 + 105 = 770$; mean = $770 \div 7 = 110$ minutes a day. (b) Range = $130 - 95 = 35$ minutes. (c) The challenge asks for a mean of 90 minutes a day or less; 110 is above 90, so Stella missed it, over by $110 - 90 = 20$ minutes a day.

$\therefore$ (a) mean 110 min (b) range 35 min (c) not met, over by 20 min a day.

Q3. (a) A fair coin has 2 equally likely faces, 1 of them heads: $P(\text{heads}) = \frac{1}{2} = 0.5 = 50\%$. (b) “1 in 4” is the fraction $\frac{1}{4}$, and $\frac{1}{4} = 0.25 = 25\%$. (c) 1 winning token of 10: $P(\text{win}) = \frac{1}{10} = 0.1 = 10\%$.

$\therefore$ (a) $\frac{1}{2} = 0.5 = 50\%$ (b) $\frac{1}{4} = 25\%$ (c) $\frac{1}{10} = 0.1 = 10\%$.

Q4. (a) Charlie: $\frac{18}{24} = \frac{3}{4} = 0.75 = 75\%$. (b) Harley: $\frac{15}{25} = \frac{3}{5} = 0.6 = 60\%$. (c) $75\% > 60\%$, so Charlie converted the better rate.

$\therefore$ (a) 75% (b) 60% (c) Charlie (Kelpies).

Q5. (a) Control 1 (C4) to control 2 (C2) runs **north**, 2 squares. (b) Start $\rightarrow$ 1 is 2 squares and $1 \rightarrow$ 2 is 2 squares: $2 + 2 = 4$ squares, and $4 \times 200 = 800$ m. (c) Control 2 (C2) to control 3 (D1) is 1 square east plus 1 square north: **northeast**.

$\therefore$ (a) north, 2 squares (b) 4 squares = 800 m (c) northeast.

Q6. (a) 1 h 30 min = 1.5 h (since $30 \div 60 = 0.5$). (b) Speed = $24 \div 1.5 = 16$ km/h. (c) Time = $32 \div 16 = 2$ h.

$\therefore$ (a) 1.5 h (b) 16 km/h (c) 2 h.

Q7. (a) One game per line: $9.5 + 10.2 = 19.7$; $19.7 + 8.8 = 28.5$; $28.5 + 11.0 = 39.5$; $39.5 + 9.3 = 48.8$ km ✓. (b) Mean = $48.8 \div 5 = 9.76$, which rounds to **9.8 km to one decimal place**. (c) Range = $11.0 - 8.8 = 2.2$ km.

$\therefore$ (a) 48.8 km shown (b) 9.8 km (1 d.p.) (c) 2.2 km.

Q8. (a) Wins are 11 of 20 games, and 11 and 20 share no common factor: $\frac{11}{20}$. (b) $\frac{11}{20} = \frac{55}{100} = 55\%$. (c) Not a win is

$20 - 11 = 9$ games: $\frac{9}{20} = \frac{45}{100} = 45\%$. Check: $55\% + 45\% = 100\%$ ✓.

$\therefore$ (a) $\frac{11}{20}$ (b) 55% (c) 45%.

Q9. (a) Payout = bet $\times$ odds = $\$20 \times 2.50 = \$50$. (b) The suggested chance is $1 \div 2.50 = 0.4 = 40\%$. (c) For the Brolgas: $1 \div 5.00 = 0.2 = 20\%$. Since $40\% > 20\%$, the board suggests the Kelpies are more likely to win (which is why their odds number is lower).

$\therefore$ (a) \$50 (b) $0.4 = 40\%$ (c) $0.2 = 20\%$; Kelpies more likely.

Q10. (a) 3 of the 8 equal sectors are gold: $P(\text{gold}) = \frac{3}{8}$. (b) $\frac{3}{8} = 0.375 = 37.5\%$. (c) Not gold is the other $8 - 3 = 5$

sectors: $P(\text{not gold}) = \frac{5}{8}$; since $\frac{5}{8} > \frac{3}{8}$, not gold is more likely. (Each equal sector is a $360 \div 8 = 45^\circ$ slice, if you like checking with angles.)

$\therefore$ (a) $\frac{3}{8}$ (b) 37.5% (c) $\frac{5}{8}$; not gold more likely.

Q11. (a) Legs: Start $\rightarrow$ 1 is 2 squares, $1 \rightarrow$ 2 is 2, $2 \rightarrow$ 3 is 2, $3 \rightarrow$ Finish is 3: total $2 + 2 + 2 + 3 = 9$ squares, so $9 \times 200 = 1800$ m = 1.8 km. (b) 30 minutes = 0.5 h; speed = $1.8 \div 0.5 = 3.6$ km/h. (c) 3.6 km/h is slower than 4 km/h — sensibly, because Matilda stops at each control to punch her card and check the map, and that stopped time is inside her 30 minutes.

$\therefore$ (a) 9 squares = 1800 m = 1.8 km (b) 3.6 km/h (c) slower.

Q12. (a) North to east is a right angle: 90° , a quarter turn. (b) Northeast sits halfway between north and east: $90^\circ \div 2 = 45^\circ$. (c) A half turn (180°) from the north points to the opposite compass point: the wind now blows from the south.

$\therefore$ (a) 90° (a quarter turn) (b) 45° (c) from the south.

Q13. (a) Total = $2.4 + 1.8 + 3.3 = 7.5$ km. (b) Time = $7.5 \div 3 = 2.5$ h, and 0.5 h = 30 min, so 2 h 30 min. (c) Walking: $08:45 + 2$ h 30 min = $11:15$; add the 15-minute rest: $11:15 + 15$ min = $11:30$.

$\therefore$ (a) 7.5 km (b) 2.5 h = 2 h 30 min (c) back at 11:30.

Q14. (a) Stella: $30 \div 2 = 15$ km/h. (b) Matilda: 1 h 30 min = 1.5 h, so $27 \div 1.5 = 18$ km/h. (c) $18 - 15 = 3$ km/h: Matilda was faster, by 3 km/h.

$\therefore$ (a) 15 km/h (b) 18 km/h (c) Matilda, by 3 km/h.

Q15. (a) $5 \times 12 = 60$ km. (b) Time = $60 \div 80 = 0.75$ h, and $0.75 \times 60 = 45$ minutes. (c) $20 \div 80 = 0.25$ h = 15 minutes left at 14:05, so arrival = $14:05 + 15$ min = 14:20.

$\therefore$ (a) 60 km (b) 45 minutes (c) 14:20.

Q16. (a) One day per line: $58 + 65 = 123$; $123 + 71 = 194$; $194 + 62 = 256$; $256 + 80 = 336$; $336 + 99 = 435$; $435 + 90 = 525$ ✓. (b) Mean = $525 \div 7 = 75$ pick-ups a day exactly, so yes — the article's "about 75 a day" matches Stella's week. (c) $\frac{22}{99}$; both numbers divide by 11: $\frac{22}{99} = \frac{2}{9}$.

$\therefore$ (a) 525 shown (b) mean exactly 75, matches the claim (c) $\frac{2}{9}$.

Q17. (a) Total = $340 + 525 + 410 = 1\,275$ tickets. (b) Mean = $1\,275 \div 3 = 425$ tickets a day. (c) One-fifth of the total: $1\,275 \div 5 = 255$ child tickets. Check: $255 \times 5 = 1\,275$ ✓.

$\therefore$ (a) 1 275 tickets (b) mean 425 a day (c) 255 child tickets.

Q18. (a) The week-6 point sits at 29 minutes. (b) Total = $32 + 31 + 31.5 + 30 + 30.5 + 29 + 29.5 + 28.5 = 242$; mean = $242 \div 8 = 30.25$ minutes, exact. (c) Range = $32 - 28.5 = 3.5$ minutes. The line trends downward (32 down to 28.5 despite the small rise in week 5), and lower times mean faster running: Poppy is getting faster across the block.

$\therefore$ (a) 29 min (b) 30.25 min exact (c) range 3.5 min, getting faster.

Chapter 06 — Test A (multiple choice)

Chapter 6 (Numeracy in context), sections 6A to 6F. Materials: pen, paper; a basic calculator may be used. Test A: 12 multiple-choice questions (12 marks). Approximate time: 20 minutes.

About the data in this test. Every place, workplace, business, price and number in this test is **made up** (not real): pretend people, pretend places and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real business, person or place. The health items are simplified maths practice — they are not medical advice. The betting item is simplified maths practice — gambling is adults-only (18+).

Choose the response that is correct for the question.

Question 1

A train leaves the station at 9:25 am and arrives at the final stop at 11:05 am. How long is the trip?

- A. 1 h 20 min
- B. 2 h 20 min
- C. 1 h 40 min
- D. 2 h 40 min

Question 2

A soccer club is holding a sausage sizzle and needs 1 sausage for each of its 35 players. Sausages are sold in packs of 8. How many whole packs must the club buy?

- A. 4 packs
- B. 5 packs
- C. 4.4 packs
- D. 280 packs

Question 3

A street has 320 houses, and 15% of the houses have a vegetable garden. How many houses on the street have a vegetable garden?

- A. 4.8 houses
- B. 32 houses
- C. 64 houses
- D. 48 houses

Question 4

A health survey finds that about 1 in 16 adults walk to work. What percentage is 1 in 16?

- A. 6.25%
- B. 1.6%
- C. 16%
- D. 62.5%

Question 5

Sofia is comparing two brands of oats. Brand X sells 500 g for \$3.60. Brand Y sells 800 g for \$4.80. What is the cost per kilogram of the Brand Y oats?

- A. \$0.60
- B. \$4.80
- C. \$6.00
- D. \$7.20

Question 6

A plumber's bill is \$450 before GST. GST adds 10% to the bill. What is the total bill, with GST?

- A. \$4.50
- B. \$495
- C. \$405
- D. \$450

Question 7

A cleaner mixes floor cleaner using 1 part concentrate to 5 parts water. The cleaner needs to make 600 mL of the mix. How much water is needed?

- A. 100 mL
- B. 120 mL
- C. 600 mL
- D. 500 mL

Question 8

Ethan's step goal is 10 000 steps a day. On Tuesday he walked 7 500 steps. What percentage of his goal did Ethan reach on Tuesday?

- A. 7.5%
- B. 75%
- C. 25%
- D. 133%

Question 9

A timesheet shows a shift of 7.75 hours. What is this shift in hours and minutes?

- A. 7 h 15 min
- B. 8 h 15 min
- C. 7 h 45 min
- D. 7 h 30 min

Question 10

On a site plan, the scale is $1 \text{ cm} = 5 \text{ m}$. A shed measures 4.5 cm on the plan. What is the real length of the shed?

- A. 22.5 m
- B. 0.9 m
- C. 9.5 m
- D. 45 m

Question 11

A horse is at decimal odds of 3.75. Someone bets \$20 on the horse, and it wins. The return is the stake times the odds, and it includes the stake. How much do they get back in total?

- A. \$7.50
- B. \$55
- C. \$95
- D. \$75

Question 12

In a charity bike ride, a rider covers 30 km in 1 hour 30 minutes. What is the rider's average speed, in km/h?

- A. 20 km/h
- B. 15 km/h
- C. 30 km/h
- D. 45 km/h

End of Test A

Test A — Answers

Question	1	2	3	4	5	6	7	8	9	10	11	12
Answer	C	B	D	A	C	B	D	B	C	A	D	A

Test A — Fully-worked solutions

Question	Answer	Working
1	C	From 9:25 am to 10:25 am is 1 hour, and from 10:25 am to 11:05 am is 40 more minutes, so the trip takes 1 h 40 min (100 minutes). Check: adding 100 minutes to 9:25 am gives 11:05 am. Option A subtracts the minutes without borrowing ($25 - 5 = 20$); option B also forgets to borrow an hour ($11 - 9 = 2$); option D keeps the 2 hours instead of 1, with the minutes right.
2	B	$35 \div 8 = 4.375$. Four packs hold only $4 \times 8 = 32$ sausages — three players would miss out — so round up to the next whole pack: 5 packs ($5 \times 8 = 40$ sausages). Option A rounds down, which leaves players without a sausage; option C answers to 1 decimal place, but packs are sold whole; option D multiplies instead of dividing ($35 \times 8 = 280$).
3	D	15% of 320 is $0.15 \times 320 = 48$, so 48 houses have a vegetable garden. Option A has a decimal-place slip ($0.15 \times 32 = 4.8$); option B finds 10% of 320 instead (32); option C finds 20% of 320 instead (64).
4	A	1 in 16 means $1 \div 16 = 0.0625$, and $0.0625 \times 100 = 6.25$, so 1 in 16 is 6.25% . Option B moves the decimal point in 16; option C reads the 16 as the percentage; option D is out by a factor of 10 ($1000 \div 16 = 62.5$).
5	C	Cost per kg for Brand Y: $4.80 \div 800 = 0.006$ dollars per gram, and $0.006 \times 1000 = 6.00$, so Brand Y costs \$6.00 per kg. Check: Brand X is $3.60 \div 500 \times 1000 = \$7.20$ per kg, so Brand Y is the cheaper buy per kg. Option A is the price per 100 g ($4.80 \div 8 = \$0.60$); option B is the packet price, not a per-kg price; option D is the per-kg price of Brand X, not Brand Y.
6	B	GST is 10% added : $0.10 \times 450 = \$45$, and $450 + 45 = \$495$. The total bill is \$495 . Option A is the GST with a decimal slip; option C subtracts the GST instead of adding it (

Question	Answer	Working
7	D	$450 - 45 = \\$405$); option D forgets the GST altogether. The mix has $1 + 5 = 6$ parts in all, and water is 5 of them: $600 \times \frac{5}{6} = 500$, so 500 mL of water is needed. Check: the concentrate is $600 \times \frac{1}{6} = 100$ mL, and $500 + 100 = 600$ mL in total. Option A is the concentrate, not the water; option B divides by 5 instead of by the 6 parts in all; option C is the whole mix, not the water.
8	B	$7500 \div 10000 = 0.75$, and $0.75 \times 100 = 75$, so Ethan reached 75% of his goal. Option A is out by a decimal place; option C is the percentage still to walk ($100 - 75 = 25\%$); option D reverses the division ($10000 \div 7500 = 1.333\dots$, about 133%).
9	C	The 7 means 7 whole hours. The 0.75 is three-quarters of an hour: $0.75 \times 60 = 45$ minutes. The shift is 7 h 45 min. Option A swaps 0.25 and 0.75 (that is 7.25 h); option B reads the 0.75 as 75 minutes, so 7 h 75 min, which is 8 h 15 min; option D reads the shift as 7.5 h instead of 7.75 h.
10	A	Plan to real means multiplying by the scale: $4.5 \times 5 = 22.5$, so the shed is 22.5 m long. Option B divides instead of multiplying ($4.5 \div 5 = 0.9$); option C adds the scale number instead of multiplying ($4.5 + 5 = 9.5$); option D uses the wrong scale, as though 1 cm = 10 m ($4.5 \times 10 = 45$).
11	D	Decimal odds already include the stake: return = $20 \times 3.75 = \\$75$. They get back \$75 in total. Check: the profit is $75 - 20 = \\$55$. Option A is out by a decimal place; option B is the profit only, not the total returned; option C adds the stake on again ($75 + 20 = \\$95$).
12	A	Convert the time to hours first: 1 h 30 min = 1.5 h. Average speed = $30 \div 1.5 = 20$, so the average speed

Question	Answer	Working
		is 20 km/h. Check: $20 \times 1.5 = 30$ km. Option B divides by 2 instead of 1.5; option C treats 1 h 30 min as 1 hour ($30 \div 1 = 30$); option D multiplies instead of dividing ($30 \times 1.5 = 45$).

Chapter 06 — Test B (written response)

Chapter 6 (Numeracy in context), sections 6A to 6F. Materials: pen, paper; a basic calculator may be used. Test B: 7 questions (40 marks). Approximate time: 45 minutes. Answer all questions in the spaces provided. In all questions where a numerical answer is required, you should only round when instructed to do so, and then to the precision stated. Where more than one mark is available, appropriate working must be shown.

About the data in this test. Every place, workplace, business, price and number in this test is **made up** (not real): pretend people, pretend places and pretend numbers, built for this book so you can practise the maths. Nothing here is real data about a real business, person or place. The health items are simplified maths practice — they are not medical advice. The betting item is simplified maths practice — gambling is adults-only (18+).

Question 1 (5 marks)

Lucy catches the bus from the town centre to Cove Bay on Saturday morning. The timetable is shown below.

Service	Departs town centre	Arrives Cove Bay
1	08:15	09:05
2	09:00	09:50
3	09:45	10:35
4	10:30	11:20

Made-up data: the bus route, the towns and every number in this question are made up for this test.

a. Lucy gets to the bus stop in the town centre at 9:10 am. Which service can she catch, and what time does it arrive at Cove Bay? 2 marks

b. The bus trip covers 40 km, and the bus travels at an average speed of 48 km/h. Find how many minutes the trip takes, and say whether this agrees with the timetable. 2 marks

c. A one-way ticket costs \$7.50. Lucy and two friends each buy a one-way ticket. Find the total cost of the three tickets. 1 mark

Question 2 (6 marks)

The people of the made-up town of Banksia Crossing voted on building a new swimming pool. The results are shown in the table.

Vote result	Number
Voters enrolled	4 500
Votes cast	3 510
Votes in favour of the pool	1 170

Made-up data: the town and every number in this table are made up for this test.

- a.** Find the turnout — the votes cast as a percentage of the voters enrolled. 2 marks

- b.** What fraction of the votes cast were in favour of the pool? Give your answer in simplest form. 2 marks

- c.** Convert your fraction from part **b** to a percentage. Round to one decimal place. 1 mark

- d.** A reporter writes: ‘Fewer than 1 in 2 enrolled voters turned out to vote.’ Is the reporter correct? Use your answer to part **a** to show why. 1 mark

Question 3 (6 marks)

Oliver keeps a simple weekly budget. His income and expenses for one week are shown in the table.

Item	Type	Amount
Wages	Income	\$680
Weekend job	Income	\$40
Rent	Expense	\$290
Food	Expense	\$180
Phone	Expense	\$35
Transport	Expense	\$95
Other	Expense	\$60

Made-up data: Oliver and every number in this table are made up for this test.

- a.** Find Oliver’s total income for the week. 1 mark

- b.** Find Oliver’s total expenses for the week. 1 mark

- c.** Find income minus expenses. Is this a surplus or a deficit? 1 mark

d. Oliver uses about 6 GB of data a week. Plan A costs \$30 a week plus \$2.50 per GB. Plan B costs \$20 a week plus \$4.00 per GB. Find the weekly cost of each plan, and say which plan is cheaper. 2 marks

e. Find Oliver's rent as a percentage of his total income. Round to the nearest whole percent. 1 mark

Question 4 (5 marks)

A small factory has 180 workers. Last year the factory recorded 11 minor workplace incidents.

Made-up data: the factory and every number in this question are made up for this test.

a. The factory mixes floor cleaner using 1 part concentrate to 9 parts water. The workers need to make 2 L of the mix. How many millilitres of concentrate do they need? 2 marks

b. Find the incident rate per 100 workers. Round to one decimal place. 2 marks

c. The factory set a target of no more than 5 incidents per 100 workers. Did the factory meet its target? Give the numbers you compare. 1 mark

Question 5 (6 marks)

Nerida works in a warehouse. Her timesheet for Monday to Thursday is shown below.

Day	Hours worked
Monday	7.75
Tuesday	6.25
Wednesday	8.75
Thursday	8.25

Made-up data: Nerida, the warehouse and every number in this question are made up for this test.

a. Find the total number of hours Nerida worked from Monday to Thursday. 1 mark

b. Find the mean number of hours worked per day. 1 mark

c. How many more minutes did Nerida work on Wednesday than on Tuesday? 1 mark

d. The warehouse also packs bags of flour. Each bag should weigh between 495 g and 505 g. Nerida checks a sample of 50 bags and finds 3 bags outside this band. Find the percentage of the sample inside the band. The rule is that a sample passes if at least 95% of the bags are inside the band. Does this sample pass? 2 marks

e. A delivery van's odometer reads 87 412 km at the start of a run and 87 597 km at the end. How far did the van travel? 1 mark

Question 6 (6 marks)

Chloe is taking part in an orienteering event at Greenhill Reserve. On the event map, 1 square is 250 m on the ground.

Made-up data: the reserve, the event and every number in this question are made up for this test.

a. One leg of Chloe's course covers 6 squares on the map. How far is this leg, in metres and in kilometres? 2 marks

b. At one point Chloe is facing north. She turns 90° to her right. Which direction is she facing now? 1 mark

c. Chloe also plays netball. Her team scored 3, 5, 2, 7 and 3 goals in its last five matches. Find the mean number of goals, and the range. 2 marks

d. At the event tent, a prize wheel has 10 equal sections: 3 are gold and 7 are silver. Find the probability that one spin does not land on gold. Give your answer as a fraction in simplest form. 1 mark

Question 7 (6 marks)

Hugo drives from Greenhill to the Saturday markets at Pelican Bay. On his map, the scale is 1 cm = 9 km, and the trip from Greenhill to Pelican Bay measures 6 cm.

Made-up data: the towns, the markets and every number in this question are made up for this test.

- a.** Find the real distance, in km, from Greenhill to Pelican Bay. 1 mark

- b.** Hugo drives at an average speed of 72 km/h. Find how many minutes the drive takes. 2 marks

- c.** Hugo leaves Greenhill at 10:40 am. What time does he arrive at Pelican Bay? Give your answer in 24-hour time. 1 mark

- d.** At the markets, Hugo pays \$60 for a stall, and he sells 24 bars of homemade soap at \$5.50 each. The stall fee is his only expense. Find Hugo's income from sales, and his surplus for the day. 2 marks

End of Test B

Test B — Answers

Q1. a. service 3; arrives 10:35 **b.** 50 minutes; yes, every service on the timetable takes 50 minutes **c.** \$22.50

Q2. a. 78% **b.** $\frac{1}{3}$ **c.** 33.3% **d.** no; 78% is more than 50%

Q3. a. \$720 **b.** \$660 **c.** \$60; surplus **d.** Plan A \$45; Plan B \$44; Plan B is cheaper **e.** 40%

Q4. a. 200 mL **b.** 6.1 incidents per 100 workers **c.** no; 6.1 is more than 5

Q5. a. 31 h **b.** 7.75 h per day **c.** 150 minutes **d.** 94%; no, the sample does not pass **e.** 185 km

Q6. a. 1 500 m; 1.5 km **b.** east **c.** mean 4 goals; range 5 goals **d.** $\frac{7}{10}$

Q7. a. 54 km **b.** 45 minutes **c.** 11:25 **d.** income \$132; surplus \$72

Test B — Fully-worked solutions

Question 1.

a. At 9:10 am, service 2 has already left at 09:00, so Lucy cannot catch it. The first service she can catch is **service 3**, which departs at 09:45 and arrives at Cove Bay at **10:35**.

b. Time = distance $\div$ speed: $40 \div 48 = \frac{5}{6}$ of an hour. In minutes: $\frac{5}{6} \times 60 = 50$. The trip takes **50 minutes**, and this **agrees** with the timetable — every service takes 50 minutes (for example, 08:15 to 09:05).

c. $3 \times 7.50 = 22.50$. The three tickets cost **\$22.50** in total.

Question 2.

a. Turnout = $3\,510 \div 4\,500 \times 100 = 78\%$. The turnout was **78%**.

b. The fraction is 1 170 out of 3 510. Both numbers divide by 1 170: $1\,170 \div 1\,170 = 1$ and $3\,510 \div 1\,170 = 3$. In simplest form, the fraction is **1/3**.

c. $1 \div 3 = 0.3333\dots$, and $0.3333\dots \times 100 = 33.333\dots$. To one decimal place, the deciding digit is $3 < 5$, so round down: **33.3%**.

d. 1 in 2 is $1 \div 2 = 0.5 = 50\%$. The actual turnout, 78%, is **more than** 50%, so the reporter is **not correct** — more than 1 in 2 enrolled voters turned out.

Question 3.

a. Income = $680 + 40 = 720$. Oliver's total income is **\$720**.

b. Expenses = $290 + 180 + 35 + 95 + 60 = 660$. Oliver's total expenses are **\$660**.

c. $720 - 660 = 60$. Income is greater than expenses, so this is a **surplus** of **\$60**.

d. Plan A: $30 + 6 \times 2.50 = 30 + 15 = \$45$ a week. Plan B: $20 + 6 \times 4.00 = 20 + 24 = \$44$ a week. $\$44 < \$45$, so **Plan B is cheaper**, by \$1 a week.

e. Rent as a percentage of income = $290 \div 720 \times 100 = 40.2777\dots$. To the nearest whole percent, the deciding digit is $2 < 5$, so round down: **40%**.

Question 4.

a. The mix has $1 + 9 = 10$ parts in all. 2 L is 2 000 mL, and the concentrate is 1 of the 10 parts: $2\,000 \div 10 = 200$. They need **200 mL** of concentrate. Check: the water is $2\,000 \times \frac{9}{10} = 1\,800$ mL, and $1\,800 + 200 = 2\,000$ mL in all.

b. Rate per 100 workers = $11 \div 180 \times 100 = 6.1111\dots$. To one decimal place, the deciding digit is $1 < 5$, so round down: **6.1 incidents per 100 workers**.

c. The target is no more than 5 per 100 workers. $6.1 > 5$, so the factory **did not meet** its target — the rate is $6.1 - 5 = 1.1$ above the target.

Question 5.

- a. $\text{Total} = 7.75 + 6.25 + 8.75 + 8.25 = 31$. Nerida worked **31 hours** in all.
- b. $\text{Mean} = 31 \div 4 = 7.75$. The mean is **7.75 hours per day**.
- c. Wednesday minus Tuesday: $8.75 - 6.25 = 2.5$ h. In minutes: $2.5 \times 60 = 150$. Nerida worked **150 minutes** more on Wednesday.
- d. Bags inside the band: $50 - 3 = 47$. Percentage: $47 \div 50 \times 100 = 94\%$. The rule needs at least 95%, and $94\% < 95\%$, so this sample **does not pass**.
- e. $87\,597 - 87\,412 = 185$. The van travelled **185 km**.

Question 6.

- a. $6 \times 250 = 1\,500$ m. In kilometres: $1\,500 \div 1\,000 = 1.5$ km. The leg is **1 500 m**, which is **1.5 km**.
- b. A turn of 90° to the right is a quarter turn clockwise. From north, a quarter turn clockwise points east, so Chloe is facing **east**.
- c. $\text{Total} = 3 + 5 + 2 + 7 + 3 = 20$. $\text{Mean} = 20 \div 5 = 4$. $\text{Range} = \text{highest} - \text{lowest} = 7 - 2 = 5$. The mean is **4 goals** and the range is **5 goals**.
- d. $P(\text{gold}) = \frac{3}{10}$. $P(\text{not gold}) = 1 - \frac{3}{10} = \frac{7}{10}$. The probability is **7/10**, which is already in simplest form.

Question 7.

- a. $6 \times 9 = 54$. The real distance is **54 km**.
- b. $\text{Time} = 54 \div 72 = 0.75$ h. In minutes: $0.75 \times 60 = 45$. The drive takes **45 minutes**.
- c. 10:40 am plus 45 minutes: 20 minutes takes Hugo to 11:00, and 25 more minutes takes him to 11:25. He arrives at **11:25**.
- d. $\text{Income} = 24 \times 5.50 = \$132$. $\text{Surplus} = \text{income} - \text{expenses} = 132 - 60 = \$72$. Hugo's income is **\$132** and his surplus for the day is **\$72**.