

VCE VM Numeracy Units 3 & 4

Chapter 12 — Unit 3 outcome demonstration assessment

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Chapter 12 Unit 3 outcome demonstration assessment — 12A Unit 3 — Outcome 1 assessment: numeracy in context

A note for teachers. This paper is the Unit 3 Outcome 1 assessment in this book. It is one of three outcome-demonstration papers in Chapter 12: 12A for Outcome 1, 12B for Outcome 2 and 12C for Outcome 3. These papers **complement, and never replace**, the School-assessed Coursework tasks your school designs. The study design names the task types for those tasks: investigations and projects; a multimedia presentation, poster or report; and a portfolio. Your school writes its own tasks of those types; this paper gives students a further chance to show the Outcome 1 skills, in an exam shape they know from chapter tests.

The study design also sets an authentication rule for tasks that count towards a result (in its sections on flexible delivery and satisfactory completion). If a student uses a task to show one of the outcomes of a VCE Vocational Major unit, that task cannot be used again as evidence for a different unit or study — not for another VCE Vocational Major unit, a VCE study, a VET unit of competency or a Victorian Pathways Certificate unit.

Check the full task options and conditions in the VCAA *VCE Vocational Major Numeracy* study design — Unit 3, Outcome 1.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-07.

Unit 3, Outcome 1 — numeracy in context. Materials: one scientific calculator and paper. This paper has two sections. Section A has 25 multiple-choice questions, each worth 1 mark (25 marks). Section B has 6 short-answer questions (15 marks). The paper is worth 40 marks in all. Approximate time: 80 minutes. Choose the one correct response for each multiple-choice question. Where an answer needs rounding, the question says how far to round. Carry full precision through your working and round only at the step the question asks for.

*About the data in this paper. Every shop, council, clinic, workplace, club, person, price, timetable and data set in this paper is **made up** (not real): pretend names 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. Two real rules are used with made-up numbers and are stated where they are used: the GST is 10% of the GST-free price, and the conversion factors given in Questions 16 and 17.*

Section A — Multiple choice

Question 1

A shop sells the same rice in two packs. A 750 g pack costs \$4.35. A 2 kg pack costs \$9.60. What is the unit price, in dollars per kilogram, of the pack that is the better buy?

- A. \$ 4.35
- B. \$ 4.80
- C. \$ 5.80
- D. \$ 0.48

Question 2

A jacket with a marked price of \$89.95 is discounted by 20%. What is the sale price of the jacket?

- A. \$ 17.99
- B. \$ 69.95
- C. \$ 71.96
- D. \$ 107.94

Question 3

A council surveyed 1 800 residents. Of these, 450 said they catch a bus at least once a week. What percentage of the surveyed residents catch a bus at least once a week?

- A. 25 %
- B. 2.5 %
- C. 75 %
- D. 400 %

Question 4

An auto electrician's bill for a job is \$715.00 including GST. The GST rate is 10%. How much of the bill is GST?

- A. \$65.00
- B. \$71.50
- C. \$650.00
- D. \$78.65

Question 5

Hana's bank account balance is \$142.00. A bill of \$185.00 is then taken from the account, and the next day Hana puts in \$300.00. What is the balance after these two transactions?

- A. – \$43.00
- B. \$43.00
- C. \$257.00
- D. \$627.00

Question 6

A large muffin provides 1 740 kJ of energy. The daily energy guideline used here is 8 700 kJ. What percentage of the daily guideline does one muffin provide?

- A. 0.2 %
- B. 2 %
- C. 5 %
- D. 20 %

Question 7

A scone recipe for 8 people uses 320 g of flour. A club morning tea needs the same recipe for 20 people. How much flour is needed?

- A. 128 g
- B. 640 g
- C. 6 400 g
- D. 800 g

Question 8

A length of stormwater pipe has two parallel circular ends and one curved surface. Which solid name best describes the pipe?

- A. cone
- B. cylinder
- C. rectangular prism
- D. sphere

Question 9

A game spinner is divided into three parts that meet at the centre point. Two of the parts are 95° and 120° at the centre. What is the size of the third part at the centre?

- A. 145°
- B. 215°
- C. 85°
- D. 25°

Question 10

A wheel trim has 12 identical spokes, evenly spaced around the centre. The design matches itself after some turns. What is the smallest turn, in degrees, that maps the wheel trim onto itself?

- A. 15°
- B. 60°
- C. 30°
- D. 12°

Question 11

A club sign is cut in the shape of a parallelogram with no right angles. Which statement about its symmetry is correct?

- A. It has no lines of symmetry and no rotational symmetry.
- B. It has exactly 2 lines of symmetry and rotational symmetry of order 2.
- C. It has no lines of symmetry and rotational symmetry of order 2.
- D. It has exactly 2 lines of symmetry and no rotational symmetry.

Question 12

A photograph is 8 cm wide and 12 cm high. It is enlarged to a poster so that every length is multiplied by the same number. The poster is 36 cm wide. How high is the poster?

- A. 40 cm
- B. 54 cm
- C. 24 cm
- D. 48 cm

Question 13

A security guard's night shift starts at 2150 and finishes at 0620 the next morning. How long is the shift?

- A. 15 h 30 min
- B. 7 h 30 min
- C. 9 h 10 min
- D. 8 h 30 min

Question 14

A rectangular community garden is 12 m long and 8 m wide. Fencing runs all the way around the garden, with a 2 m wide gate on one side and no fencing across the gate opening. How many metres of fencing are needed?

- A. 38 m
- B. 36 m
- C. 40 m
- D. 96 m

Question 15

A circular rose garden in a park has a radius of 2.5 m. What is the area of the garden, correct to 2 decimal places?

- A. 19.63 m²
- B. 15.71 m²
- C. 7.85 m²
- D. 6.25 m²

Question 16

A workbench bought from overseas is listed as 5 feet 6 inches long. Use 1 foot = 30.48 cm and 1 inch = 2.54 cm. What is the length of the bench in centimetres?

- A. 142.24 cm
- B. 167.64 cm
- C. 152.40 cm
- D. 170.69 cm

Question 17

A patient's temperature reads 102.2 °F. To change °F to °C, subtract 32 and then divide by 1.8. What is the temperature in degrees Celsius?

- A. 56.8°C
- B. 126.4°C
- C. 39.0°C
- D. 70.2°C

Question 18

A rectangular rainwater tank measures 1.5 m by 0.8 m by 0.6 m inside. The tank is full. How many litres of water does it hold? ($1 \text{ m}^3 = 1000 \text{ L}$)

- A. 72 L
- B. 7 200 L
- C. 0.72 L
- D. 720 L

Question 19

A metal rod is specified as 12 ± 0.5 mm wide. A rod is accepted if its width lies inside this tolerance, and the two limits themselves count as accepted. Which measurement is accepted?

- A. 12.6 mm
- B. 11.4 mm
- C. 12.55 mm
- D. 12.5 mm

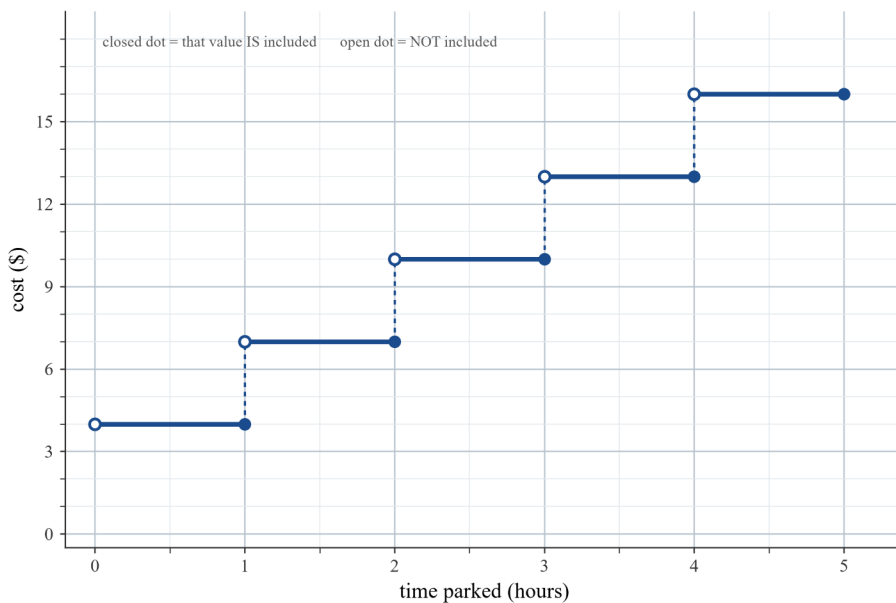
Question 20

Tomas earns \$28.40 per hour at a furniture store. On Saturdays he is paid time-and-a-half. Last Saturday Tomas worked 6 hours. What was his gross pay for those 6 hours?

- A. \$ 170.40
- B. \$ 255.60
- C. \$ 42.60
- D. \$ 340.80

Question 21

The step graph shows the cost of parking in a hospital visitor car park: \$4.00 for the first hour or part of an hour, then \$3.00 for each extra hour or part of an hour. Use the graph. What is the cost of parking for 3 and a half hours?



Made-up data: the car park and every number on this graph are made up for this paper.

- A. \$10.00
- B. \$13.00
- C. \$11.50
- D. \$16.00

Question 22

A floor cleaner label says to mix the cleaner with water in the ratio 1 : 9 (cleaner : water). How much cleaner is needed to make 5 L of the diluted mix?

- A. 500 mL
- B. about 556 mL
- C. 4500 mL
- D. 50 mL

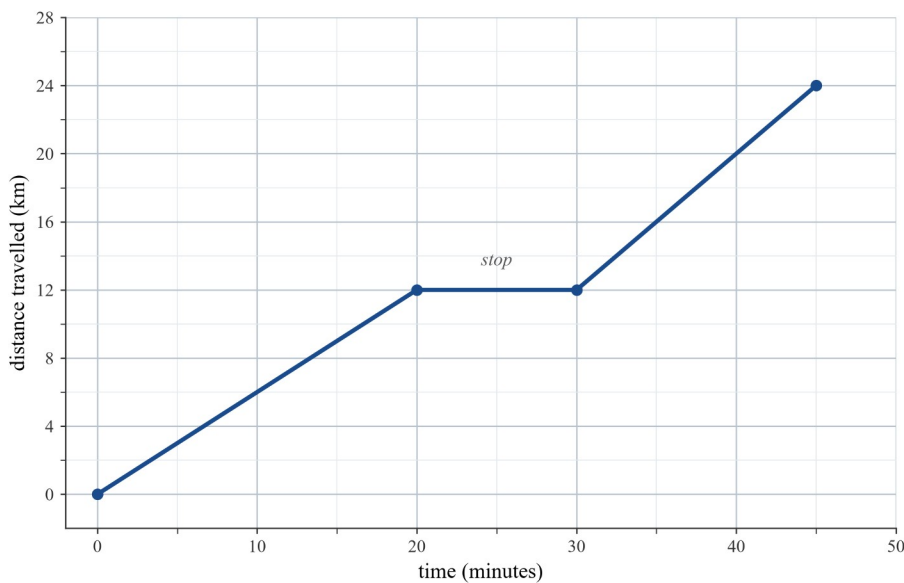
Question 23

In a darts league a team scores 4 points for each win and 1 point for each draw. A team plays 14 games: 8 wins, 3 draws and 3 losses. What is the team's point total?

- A. 44
- B. 14
- C. 20
- D. 35

Question 24

The graph shows a community bus trip: the distance travelled against the time since the trip began. How long was the bus stopped?



Made-up data: this bus trip and every number on the graph are made up for this paper.

- A. 10 minutes
- B. 20 minutes
- C. 30 minutes
- D. 15 minutes

Question 25

Use the graph in Question 24. What was the average speed of the bus over the first 20 minutes of the trip?

- A. 32 km/h
- B. 0.6 km/h
- C. 36 km/h
- D. 12 km/h

End of Section A

Section B — Short answer

Question 26 (2 marks)

Mia works in a shop. Her shift starts at 2:45 pm.

- a. Write the start time in 24-hour time.

1 mark

- b. The shift runs for 7 hours 40 minutes. At what time does Mia's shift finish? Give your answer in 24-hour time. 1 mark

Question 27 (2 marks)

A shire council records the mass of recycling it collects each month.

Month	Recycling collected (tonnes)
January	82
February	76
March	91
April	85

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

a. Find the total mass of recycling collected over the four months. 1 mark

b. The council's target is 80 tonnes in a month. Write the March collection as a percentage of this target. 1 mark

Question 28 (3 marks)

Ava has two job offers from car dealers. Each offer pays a weekly retainer (a fixed weekly amount) plus commission on her sales for the week.

Job 1: a retainer of \$620 per week, plus 2% commission on sales.

Job 2: a retainer of \$400 per week, plus 5% commission on sales.

In one week Ava sells \$12 000 worth of cars.

a. Find Ava's weekly pay under Job 1 for that week. 1 mark

b. Find Ava's weekly pay under Job 2 for that week. 1 mark

c. For that week, which job pays more, and by how much? 1 mark

Question 29 (3 marks)

A medicine label gives these rules for a child: the dose is 10 mg for each kg of the child's mass; the syrup strength is 250 mg in each 5 mL; doses are given every 8 hours. The child's mass is 30 kg.

The medicine rules here are made up for practice. Never use them for a real medicine — follow the real label, and follow your doctor, pharmacist or nurse.

- a.** Find the dose for this child, in milligrams. 1 mark

- b.** Find the dose for this child, in millilitres. 1 mark

- c.** The first dose is given at 0800. Write the times of all doses given in the next 24 hours, starting with 0800, in 24-hour time. 1 mark

Question 30 (3 marks)

A builder's site plan is drawn at a scale of 1 : 200. On the plan, a rectangular concrete slab measures 3.5 cm by 2 cm.

- a.** Find the real length of the slab, in metres. 1 mark

- b.** Find the real area of the slab, in square metres. 1 mark

- c.** The slab is 0.1 m thick. Find the volume of concrete needed for the slab, in cubic metres. 1 mark

Question 31 (2 marks)

A club is planning its anniversary dinner for 40 guests. Two halls quote as follows.

Hall 1: a fixed hire of \$240, plus \$18 per guest.

Hall 2: a fixed hire of \$80, plus \$27 per guest.

- a.** Find the total cost of Hall 1 for 40 guests. 1 mark

- b.** For 40 guests, which hall is cheaper, and by how much? 1 mark

End of Section B

Chapter 12 Unit 3 outcome demonstration assessment — 12B Unit 3 — Outcome 2 assessment: problem-solving cycle task

A note for teachers. This Outcome 2 paper is practice. It complements — it does not replace — the school-designed assessment tasks (SACs) that your school uses to decide whether a student has demonstrated the outcome. The study design names investigations and projects, a multimedia presentation, poster or report, and a portfolio as SAC task types; your school chooses and adapts these to its own settings. The study design's authentication rule (in its sections on flexible delivery and satisfactory completion) applies to this paper: if a student uses a task to show one of the outcomes of a VCE Vocational Major unit, that task cannot be used again as evidence for a different unit or study — not for another VCE Vocational Major unit, a VCE study, a VET unit of competency or a Victorian Pathways Certificate unit.

Check the full task options and conditions in the VCAA *VCE Vocational Major Numeracy* study design — Unit 3, Outcome 2.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-07.

Unit 3 — Outcome 2 (the problem-solving cycle). Materials: one scientific calculator and paper. Section A has 10 multiple-choice questions, each worth 1 mark (10 marks). Section B has one embedded real-world task, walked stage by stage through the four stages of the problem-solving cycle, worth 20 marks. The paper is out of 30 marks. Approximate time: 45 minutes. Answer every question in the space provided and show your working. Where an answer needs rounding, the question states the precision — round only as instructed.

Section A — Multiple choice (10 marks)

Choose the one correct response for each question. Each question is worth 1 mark.

Question 1

What is the correct order of the four stages of the problem-solving cycle?

- A. Act on and use mathematics; identify the mathematics; evaluate and reflect; communicate and report
- B. Identify the mathematics; evaluate and reflect; act on and use mathematics; communicate and report
- C. Identify the mathematics; act on and use mathematics; evaluate and reflect; communicate and report
- D. Communicate and report; identify the mathematics; act on and use mathematics; evaluate and reflect

Question 2

A student reads a real-world task and decides which numbers matter and which operation will answer the question. Which stage of the cycle is this?

- A. Stage 2 — act on and use mathematics
- B. Stage 1 — identify the mathematics
- C. Stage 3 — evaluate and reflect
- D. Stage 4 — communicate and report

Question 3

In the problem-solving cycle, when is the best time to make an estimate?

- A. Before the exact calculation, so there is a rough answer to check against
- B. After the report is written, to make the report look tidy
- C. Only if the exact answer turns out to be wrong
- D. Estimating is not part of the problem-solving cycle

Question 4

A student asks, “Is my answer a sensible size, in the right units, and does it fit the real-world story?” Which stage is the student in?

- A. Stage 1 — identify the mathematics
- B. Stage 2 — act on and use mathematics
- C. Stage 3 — evaluate and reflect
- D. Stage 4 — communicate and report

Question 5

A calculation shows that 2.95 buses are needed for an excursion. The student concludes “we need 3 buses”. This is best described as

- A. an estimating mistake that should be ignored
- B. looping back to stage 1 to re-read the task
- C. a communication error in the report
- D. a contextual judgement — part of a bus cannot be booked, so the answer is rounded up

Question 6

During which stage would you write your answer as a full sentence with units, such as “The total cost of the fence is \$1 240.00”?

- A. Stage 4 — communicate and report
- B. Stage 1 — identify the mathematics
- C. Stage 2 — act on and use mathematics
- D. Stage 3 — evaluate and reflect

Question 7

Why is the problem-solving process called a cycle?

- A. Because every task must be finished in one sitting
- B. Because a failed check in stage 3 can send you back to an earlier stage to adjust and redo
- C. Because a calculator is always used
- D. Because every task has exactly the same answer

Question 8

A task description carries several facts, and some of them will never be used. Deciding which facts matter and which can be ignored is part of

- A. Stage 4 — communicate and report
- B. Stage 2 — act on and use mathematics
- C. Stage 1 — identify the mathematics
- D. Stage 3 — evaluate and reflect

Question 9

Which of these is the best example of a formal written report for a customer?

- A. A text message: “tkts sold 150 check tin”
- B. A two-sentence spoken handover at the end of a shift
- C. A quick note stuck on the fridge
- D. A short written quote in full sentences, with correct units and a labelled total

Question 10

A student uses a calculator to work out 208×3.45 and a tape measure to check the length of a garden bed. Choosing and using tools and technology to carry out the mathematics is part of

- A. Stage 2 — act on and use mathematics
- B. Stage 1 — identify the mathematics
- C. Stage 3 — evaluate and reflect
- D. Stage 4 — communicate and report

End of Section A

Section B — The problem-solving cycle task (20 marks)

The task: a new garden bed for Greendale Neighbourhood House

Greendale Neighbourhood House wants to replant its bare front garden bed with flowering seedlings. A volunteer leader has to work out the cost and decide whether it fits within the grant budget. Walk with the volunteer leader through the four stages of the problem-solving cycle by answering Questions 11 to 14 in order.

About the data in this section. The garden bed, prices and grant here are **made up** (not real): a pretend neighbourhood house and pretend numbers, built for this book so you can practise the problem-solving cycle. Nothing here is real data about a real business, person or place.

The table below gives the information you need. The nursery that supplies the seedlings is open from 9 am to 5 pm on weekdays and can deliver on any Tuesday.

Information	Value
Shape of the garden bed	rectangle
Length of the garden bed	6.5 m
Width of the garden bed	4 m
Planting rate (nursery advice)	8 seedlings per square metre
Cost of one seedling	\$3.45
Community-group discount	15 % off the total seedling cost
Grant budget for the seedlings	\$650

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

Question 11 (5 marks)

Stage 1 — Identify the mathematics. Use the task information above.

a. State the question (the purpose) that this task needs to answer. 1 mark

b. Write down the two measurements from the table that you need in order to find the area of the garden bed. 1 mark

c. One piece of information in the description is not needed to work out the cost. Identify it. 1 mark

d. Write a short plan: list the steps, in order, that you would take to work out whether the seedlings fit within the \$650 budget. 2 marks

Question 12 (5 marks)

Stage 2 — Act on and use mathematics. Carry out your plan.

a. Estimate the cost of the seedlings before the discount, by rounding the number of seedlings to 200 and the cost of one seedling to \$3.50. Give your estimate. 1 mark

b. Calculate the area of the garden bed. 1 mark

c. Calculate the number of seedlings needed. 1 mark

d. Calculate the total cost after the 15 % discount. 2 marks

Question 13 (5 marks)

Stage 3 — Evaluate and reflect. Check your results against the real world.

a. The exact cost before the discount is \$717.60. Compare this with your estimate from Question 12a. Is the exact cost reasonable? Explain briefly. 2 marks

b. Does the order fit within the \$650 grant budget? Show how you know, and state how much money is left over. 2 marks

c. The house wants to spend the money left over on extra seedlings at \$3.45 each. How many extra whole seedlings can they buy? Explain why you rounded the way you did. 1 mark

Question 14 (5 marks)

Stage 4 — Communicate and report. Report your results clearly.

a. Write one sentence reporting whether the seedlings fit within the grant budget, and include the final cost after the discount (with units). 2 marks

b. For the house's summary table, give the cost of one seedling after the discount, correct to the nearest cent. 2 marks

c. Name one format you could use to present your findings to the house committee, and say why it suits that audience. 1 mark

End of Section B

12B — Answers

Section A (multiple choice)

Question	1	2	3	4	5	6	7	8	9	10
Answer	C	B	A	C	D	A	B	C	D	A

Section B (the problem-solving cycle task)

Q11. (a) Find the total cost of the seedlings for the garden bed, and whether that cost fits within the \$650 grant budget. (b) Length 6.5 m and width 4 m. (c) The nursery's opening hours and delivery day (9 am–5 pm, Tuesday delivery). (d) e.g. find the area; find the number of seedlings; find the cost before the discount; take off the 15 % discount; compare the cost after the discount with \$650. **Q12.** (a) About \$700. (b) 26 m². (c) 208 seedlings. (d) \$609.96. **Q13.** (a) Yes — \$717.60 is close to the estimate of \$700. (b) Yes, it fits; \$40.04 left over. (c) 11 extra whole seedlings (round down). **Q14.** (a) e.g. "The seedlings fit within the \$650 grant budget; the cost after the discount is \$609.96." (b) \$2.93. (c) e.g. a short written report — the committee can read it later and it stands alone.

12B — Fully-worked solutions

Question 1. The four stages always run in the same order: identify the mathematics; act on and use mathematics; evaluate and reflect; communicate and report. Only option C lists them in this order. **Answer C.**

Question 2. Picking out the numbers that matter and choosing the operation is the first stage, identify the mathematics. **Answer B.**

Question 3. An estimate is made *before* the exact calculation, so that there is a rough answer ready to check against in stage 3. **Answer A.**

Question 4. Asking whether an answer is a sensible size, in the right units, and fits the real-world story is stage 3, evaluate and reflect. **Answer C.**

Question 5. Part of a bus cannot be booked, so 2.95 is rounded up to 3. This real-world rounding decision is a contextual judgement, made in stage 3. **Answer D.**

Question 6. Writing the answer as a full sentence with units is stage 4, communicate and report. **Answer A.**

Question 7. It is called a cycle because a failed check in stage 3 sends you back to an earlier stage to adjust the working and redo it. **Answer B.**

Question 8. Deciding which facts are relevant and which can be ignored is part of stage 1, identify the mathematics. **Answer C.**

Question 9. A formal written report for a customer uses full sentences, correct units and a labelled total — the written quote. The text message, the spoken handover and the fridge note are all informal. **Answer D.**

Question 10. Using a calculator and a tape measure to carry out the mathematics is stage 2, act on and use mathematics. **Answer A.**

Question 11.

- a. The task must answer: *what is the total cost of the seedlings for the garden bed, and does that cost fit within the \$650 grant budget?*
- b. The area of a rectangle needs its length and width: length 6.5 m and width 4 m.
- c. The nursery's opening hours and delivery day (open 9 am–5 pm on weekdays, delivers on any Tuesday) are not needed to work out the cost.
- d. A suitable plan, in order:
1. Find the area of the bed: $\text{area} = \text{length} \times \text{width}$.
 2. Find the number of seedlings: $\text{area} \times 8$ (the planting rate).
 3. Find the cost before the discount: $\text{number of seedlings} \times \$3.45$.
 4. Take off the 15 % discount to find the cost after the discount.
 5. Compare the cost after the discount with the \$650 budget, and state whether it fits.

Question 12.

- a. Estimate: round the number of seedlings to 200 and the cost per seedling to \$3.50.

$200 \times \$3.50 = \$700$, so the estimate is about \$700.

- b. Area of the rectangle:

$$6.5 \times 4 = 26 \text{ m}^2.$$

- c. Number of seedlings = area $\times$ planting rate:

$$26 \times 8 = 208 \text{ seedlings.}$$

- d. First the cost before the discount:

$$208 \times \$3.45 = \$717.60.$$

The discount is 15 % of this: $0.15 \times \$717.60 = \$107.64$.

Cost after the discount: $\$717.60 - \$107.64 = \$609.96$.

$\therefore$ the total cost after the discount is \$609.96.

Question 13.

- a. The exact cost before the discount is \$717.60 and the estimate was \$700. The exact cost is only $\$717.60 - \$700 = \$17.60$ above the estimate, so the two are close. The answer is reasonable. (The estimate is a little low because it rounded the number of seedlings down from 208 to 200.)

- b. The cost after the discount is \$609.96. Since $\$609.96 < \$650$, the order fits within the grant budget.

Money left over: $\$650 - \$609.96 = \$40.04$.

$\therefore$ yes, it fits, with \$40.04 left over.

- c. Divide the money left over by the cost of one seedling:

$$\$40.04 \div \$3.45 = 11.61 \text{ (to 2 decimal places).}$$

Seedlings are sold whole, so round *down* to 11 extra seedlings. Rounding up to 12 would cost $12 \times \$3.45 = \$41.40$, which is more than the \$40.04 available.

$\therefore$ they can buy 11 extra whole seedlings.

Question 14.

a. e.g. “The seedlings fit within the \$650 grant budget; the total cost after the 15 % discount is \$609.96.” (A full sentence that answers the question and carries the units.)

b. Cost of one seedling after the discount = total cost after the discount $\div$ number of seedlings:

$$\text{\$ } 609.96 \div 208 = \text{\$ } 2.9325.$$

Rounded to the nearest cent, this is \$2.93.

$\therefore$ the cost per seedling after the discount is \$2.93 (correct to the nearest cent).

c. e.g. A short written report, or a labelled summary table. The committee receives it and reads it later, so a written format that stands alone — full sentences, correct units and a clear total — suits an audience that will not have you there to explain it.

Chapter 12 Unit 3 outcome demonstration assessment — 12C Unit 3 — Outcome 3 assessment: mathematical toolkit

A note for teachers. This Outcome 3 paper is practice. It complements — it does not replace — the school-designed assessment tasks (SACs) that your school uses to decide whether a student has demonstrated the outcome. The study design names investigations and projects, a multimedia presentation, poster or report, and a portfolio as SAC task types; your school chooses and adapts these to its own settings. The study design's authentication rule (in its sections on flexible delivery and satisfactory completion) applies to this paper: if a student uses a task to show one of the outcomes of a VCE Vocational Major unit, that task cannot be used again as evidence for a different unit or study — not for another VCE Vocational Major unit, a VCE study, a VET unit of competency or a Victorian Pathways Certificate unit.

Check the full task options and conditions in the VCAA *VCE Vocational Major Numeracy* study design — Unit 3, Outcome 3.

Source: VCAA, VCE Vocational Major Numeracy Study Design, retrieved 2026-10-07.

Unit 3 — Outcome 3 (the mathematical toolkit). Materials: one scientific calculator and paper. Section A has 12 multiple-choice questions, each worth 1 mark (12 marks). Section B has 2 short-answer questions, each worth 4 marks (8 marks). The paper is out of 20 marks. Approximate time: 40 minutes. Answer every question in the space provided and show your working. Where an answer needs rounding, the question states the precision — round only as instructed. Every measurement, price and reading in this paper is made up (not real): it is used only to give clean numbers for practising the mathematics.

Section A — Multiple choice (12 marks)

Choose the one correct response for each question. Each question is worth 1 mark.

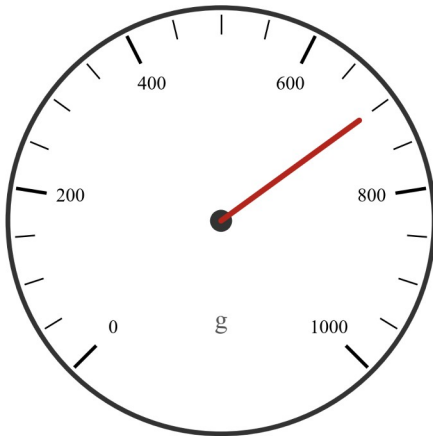
Question 1

A worker is fixing a whiteboard to a brick wall and wants to check that the board sits perfectly level (horizontal). Which tool is the best choice for this check?

- A. A tape measure
- B. A trundle wheel
- C. A kitchen scale
- D. A spirit level

Question 2

The dial of a kitchen scale is shown below. Numbers sit every 200 g, with four small spaces between each pair of numbers.



What reading does the needle show?

- A. 620 g
- B. 650 g
- C. 700 g
- D. 800 g

Question 3

A digital kitchen scale rounds to the nearest gram and shows 486 g for a bag of flour. Which pair of values gives the smallest and the largest possible true mass of the bag?

- A. 485 g and 487 g
- B. 485.5 g and 486.5 g
- C. 486 g and 487 g
- D. 480 g and 490 g

Question 4

Zoe is taking out a \$12 000 car loan and wants to compare the monthly repayment for two different loan options before she signs anything. Which tool is the most valid choice for this job?

- A. An online loan repayment calculator
- B. A currency converter app
- C. A tip calculator app
- D. A shopping-list spreadsheet

Question 5

Ana sets her calculator display to 2 decimal places. It shows 33.33 for $100 \div 3$. She then presses $\times 3 =$ and the display shows 100.00. Which statement best explains why the answer comes back to exactly 100.00?

- A. $100 \div 3$ is exactly 33.33, so multiplying by 3 returns exactly 100
- B. The calculator cancels out the rounding when it multiplies by 3
- C. The calculator multiplied the displayed 33.33 by 3 and rounded 99.99 up to 100.00
- D. The calculator kept the full stored value 33.333... and multiplied that by 3

Question 6

In a spreadsheet, cell B2 holds 15 and cell C2 holds 4.20. Which entry, typed into cell D2, will show the product of B2 and C2?

- A. =B2+C2
- B. =B2*C2
- C. SUM(B2:C2)
- D. B2*C2

Question 7

A spreadsheet adds up a column of daily takings: cell D6 holds =SUM(D2:D5) and shows \$486.50. A typing error is then fixed — B2 changes from 12 to 15, which changes D2 from \$102.00 to \$127.50. What does D6 show now?

- A. \$512.00
- B. \$489.50
- C. \$614.00
- D. \$127.50

Question 8

Josh estimates his rectangular lawn is about 5 m by 4 m. He types the two lengths into an area app and it answers 200 m². What is the most likely explanation?

- A. The app must be broken, because no two inputs could give 200
- B. The lawn really is 200 m² and Josh's estimate was wrong
- C. Josh typed 50 instead of 5, because $50 \times 4 = 200$
- D. The app multiplied by the height of the grass as well

Question 9

A conversion website says 1 mile is about 1.609 km. Dana asks the site to convert 5 miles and it answers 80.45 km. Which check best shows the site's output is wrong?

- A. 5×1.6 is about 8, so 80.45 km is about ten times too large
- B. 80.45 km is correct, because $5 \times 1.609 = 80.45$
- C. The site should have divided instead, giving about 3 km
- D. Miles and kilometres are about the same size, so 5 miles is about 5 km

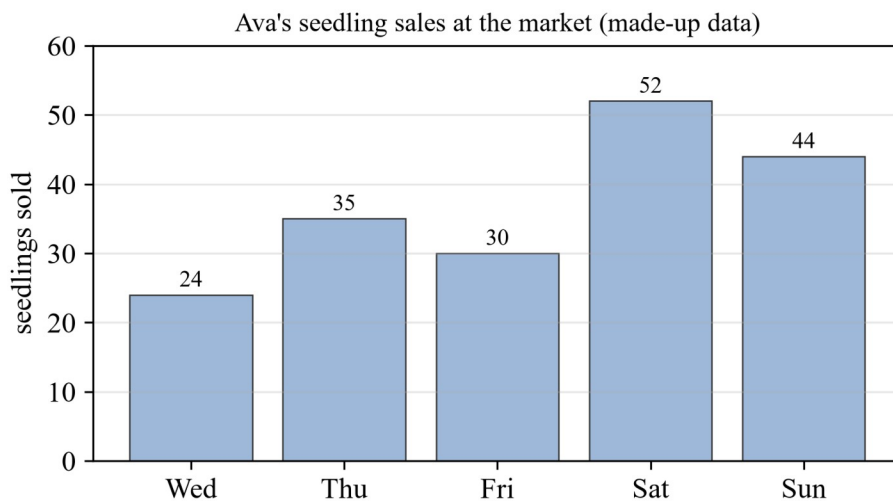
Question 10

A garden app works out the area of a circular garden bed using $\pi \approx 3.14$. Marco's calculator uses the π key. For a bed with diameter 4.6 m the app shows 16.61 m² and the calculator shows 16.62 m², both rounded to 2 decimal places. Which statement best explains the difference?

- A. The calculator always rounds area answers up
- B. 3.14 is slightly less than π , so the app's area comes out slightly smaller
- C. The app used the diameter instead of the radius in its formula
- D. The app and the calculator used different area formulas

Question 11

The column chart below shows the number of seedlings Ava sold at her market stall on each day from Wednesday to Sunday.



Ava's seedling sales at the market, Wednesday to Sunday

The sales figures in this chart are made up (not real).

How many seedlings did Ava sell altogether over the five days?

- A. 52
- B. 89
- C. 925
- D. 185

Question 12

Marcus gets this email: "Your power bill of \$39.50 is unpaid. Pay within 24 hours or your power will be cut off. Pay now at secure-powerlink-bill.xyz." What is the safest way for Marcus to respond?

- A. Pay at once through the link, so the power is not cut off
- B. Reply to the email and ask whether the bill is real
- C. Delete the email and check the bill in the official app or website — the link address is not the real site, and the tight deadline is a pressure trick
- D. Click the link to look at the page, then pay by card over the phone

End of Section A

Section B — Short answer (8 marks)

Answer both questions in the space provided. Show your working.

Question 13 (4 marks)

a. Ellie is setting out a garden bed along a fence. She paces the bed out in 6 steps, and her step is about 0.7 m. Estimate the length of the bed, in metres.

1 mark

b. Ellie then measures the bed with a tape measure whose zero mark is worn away. She holds the 20 cm mark at the start of the bed, and the tape reads 438.5 cm at the far end. Work out the length of the bed, in centimetres.

1 mark

c. Write this length in metres and compare it with your estimate from part a. Do the estimate and the measurement agree?

1 mark

d. The tape measure has marks every millimetre. State the smallest and the largest possible true length of the bed, in centimetres.

1 mark

Question 14 (4 marks)

Marco runs a plant stall and keeps his takings in a spreadsheet. Part of it is shown below.

	A	B	C	D
1	Day	Pots sold	Price per pot (\$)	Takings (\$)
2	Mon	14	6.50	91.00
3	Tue	22	6.50	143.00
4	Wed	19	6.50	123.50
5	Thu	25	6.50	162.50
6	Fri	31	6.50	201.50
7	Total			?

The stall and its numbers are made up (not real).

a. Write the formula that is typed into cell D2 to work out Monday's takings from the cells in row 2.

1 mark

b. Cell D7 holds =SUM(D2:D6). State the value that D7 shows.

1 mark

c. Marco finds Thursday's pot count was typed wrong: B5 should be 29, not 25. He corrects B5 and retypes nothing else. State the two cells that change, and the new value each one shows.

1 mark

d. Marco makes a column chart of the takings in D2:D6. Explain one way the chart helps him read his week more easily than the table of numbers does.

1 mark

End of Section B

Chapter 12 Unit 3 outcome demonstration assessment — Answers and fully-worked solutions

The three assessments in this booklet — 12A (Outcome 1: numeracy in context), 12B (Outcome 2: the problem-solving cycle) and 12C (Outcome 3: the mathematical toolkit) — have their answers and fully-worked solutions in this section. Where a question asked for a rounded answer, the question stated the precision, and the working here restates that precision at the rounding step. Full precision is carried through the intermediate steps; rounding happens only where the question says to. As each paper states, every context, price and data set in these assessments is made up for practice.

12A — Answers

Section A (multiple choice)

Questions

										1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
n	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5

A	B	C	A	A	C	D	D	B	A	C	C	B	D	A	A	B	C	D	D	B	B	A	D	A	C
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Rounding notes. Question 15: the area is **19.63 m²**, correct to 2 decimal places as the question asked. Every other answer in this paper is an exact value.

Section B (short answer)

Q26. a. 1445 **b.** 2225

Q27. a. 334 tonnes **b.** 113.75% (exact)

Q28. a. \$860.00 **b.** \$1 000.00 **c.** Job 2, by \$140.00

Q29. a. 300 mg **b.** 6 mL **c.** 0800, 1600 and 0000

Q30. a. 7 m **b.** 28 m² **c.** 2.8 m³

Q31. a. \$960.00 **b.** Hall 1, by \$200.00

12A — Fully-worked solutions

Section A (multiple choice)

Question	Answer	Working
1	B	Unit price = price ÷ kilograms. The 750 g pack is 0.75 kg, so $\$4.35 \div 0.75 = \$5.80$ per kg; the 2 kg pack is $\$9.60 \div 2 = \$4.80$ per kg. The better buy is the lower unit price, \$4.80. Option A is the 750 g pack's price, option C is the worse pack's unit price, and option D divides the 2 kg price by 20 instead of 2.
2	C	A 20% discount keeps 80% of the price: $0.80 \times \$89.95 = \$71.96$. Option A is the discount itself (\$17.99), option B takes 20 dollars off instead of 20%, and option D adds 20% on.
3	A	$450 \div 1800 = 0.25$, and $0.25 \times 100 = 25\%$. Option B moves the decimal point, option C is the share who do not catch a bus, and option D inverts the division (

Question	Answer	Working
4	A	$1800 \div 450 = 4$, read as 400%). A GST-inclusive price is 110% of the GST-free price, so the GST is one of those 110 parts — one eleventh: $\$715.00 \div 11 = \$65.00$. Option B takes 10% of the inclusive price, option C is the GST-free price, and option D adds GST on again.
5	C	Money out is subtracted: $\$142.00 - \$185.00 = -\$43.00$. Money in is added: $-\$43.00 + \$300.00 = \$257.00$. Option A stops after the first step, option B drops the negative sign, and option D adds the bill instead of taking it away.
6	D	$1740 \div 8700 = 0.2$, and $0.2 \times 100 = 20\%$. Options A and B move the decimal point, and option C inverts the division ($8700 \div 1740 = 5$).
7	D	Scale factor $= 20 \div 8 = 2.5$, so the flour is $2.5 \times 320 \text{ g} = 800 \text{ g}$. Option A divides by the scale factor, option B doubles, and option C multiplies by 20 instead of 2.5.
8	B	Two parallel circular ends joined by one curved surface is a cylinder. A cone has one circular end and a point, a rectangular prism has flat rectangular faces only, and a sphere has no flat ends.
9	A	Angles at a point add to 360° : $360^\circ - 95^\circ - 120^\circ = 145^\circ$. Option B adds the two given angles, option C uses a straight angle ($180^\circ - 95^\circ$), and option D subtracts the given angles from each other.
10	C	Twelve identical, evenly spaced spokes give rotational symmetry of order 12, so the smallest turn that maps the trim onto itself is $360^\circ \div 12 = 30^\circ$. Option A is half that turn, option B is the turn for six spokes, and option D reads the number of spokes as degrees.
11	C	A parallelogram with no right angles has no lines of symmetry, and a half turn maps it onto itself, so its rotational symmetry has order 2.

Question	Answer	Working
12	B	Options B and D give it lines of symmetry it does not have, and option A misses the half turn. Scale factor = new width $\div$ old width = $36 \div 8 = 4.5$. The height follows the same factor: $4.5 \times 12 \text{ cm} = 54 \text{ cm}$. Option A adds the width gain (28 cm) to the height, option C doubles the height, and option D quadruples it.
13	D	From 2150 to midnight is 2 h 10 min, and from midnight to 0620 is 6 h 20 min; together, 8 h 30 min. Option A subtracts the two clock times, and options B and C miscount the carry across midnight.
14	A	The full perimeter is $2 \times (12 + 8) = 40 \text{ m}$. The 2 m gate opening needs no fencing, so $40 - 2 = 38 \text{ m}$. Option B takes the gate off twice, option C forgets the gate, and option D is the area.
15	A	Area $= \pi \times r^2 = \pi \times 2.5^2 = 19.6349 \dots \text{ m}^2$, which is 19.63 m² correct to 2 decimal places , as the question asked. Option B is the circumference ($2\pi r$), option C uses $\pi \times r$, and option D is r^2 alone.
16	B	$5 \times 30.48 = 152.40 \text{ cm}$ and $6 \times 2.54 = 15.24 \text{ cm}$; together, $152.40 + 15.24 = 167.64 \text{ cm}$. Option A reads 5 feet 6 inches as 56 inches, option C counts the feet only, and option D converts the inches at ten times the inch rate.
17	C	Subtract 32: $102.2 - 32 = 70.2$. Divide by 1.8: $70.2 \div 1.8 = 39.0$, so the temperature is 39.0°C . Option A divides before subtracting, option B multiplies by 1.8 instead of dividing, and option D stops after the subtraction.
18	D	Volume = $1.5 \times 0.8 \times 0.6 = 0.72 \text{ m}^3$. Each cubic metre holds 1 000 L, so the tank holds $0.72 \times 1\,000 = 720 \text{ L}$. Option C leaves the answer in cubic metres, and options A and B move the conversion by a power of ten.
19	D	The tolerance band runs from $12 - 0.5 = 11.5 \text{ mm}$ to

Question	Answer	Working
		$12 + 0.5 = 12.5$ mm, and both limits count as accepted. 12.6 mm and 12.55 mm sit above the band and 11.4 mm sits below it; 12.5 mm is the upper limit, so it is accepted.
20	B	The time-and-a-half rate is $1.5 \times \\$ 28.40 = \\$ 42.60$ per hour. For 6 hours: $6 \times \\$ 42.60 = \\$ 255.60$. Option A pays the ordinary rate, option C is the hourly rate alone, and option D pays double time.
21	B	3 and a half hours sits in the fourth hour block: \$4.00 for the first hour plus \$3.00 for each of the next three gives $\\$4.00 + \\$9.00 = \\$13.00$ — the tread the graph shows between 3 and 4 hours. Option A counts only two extra blocks, option C pro-rates the half hour even though the graph charges per part hour, and option D counts four extra blocks.
22	A	The ratio 1 : 9 gives $1 + 9 = 10$ parts in the whole mix. 5 L = 5 000 mL, and one part is $5\,000 \div 10 = 500$ mL of cleaner. Option B divides by 9, option C is the water part, and option D moves the decimal point.
23	D	Points = $4 \times \text{wins} + 1 \times \text{draws}$ $= 4 \times 8 + 1 \times 3 = 32 + 3 = 35$. Option A scores the draws as wins, option B is the number of games played, and option C swaps the win and draw rates.
24	A	The graph is flat from 20 minutes to 30 minutes, so the bus was stopped for $30 - 20 = 10$ minutes. Options B and C take the flat section from the wrong gridlines, and option D halves it.
25	C	In the first 20 minutes the bus travelled 12 km. 20 minutes is $\frac{1}{3}$ of an hour, so the average speed is $12 \div \frac{1}{3} = 36$ km/h. Option B divides by 20 minutes instead of $\frac{1}{3}$ of an hour, option D reads the 12 km distance as the speed, and option A is the average speed over the whole

Question	Answer	Working
		trip (24 km in $\frac{3}{4}$ h = 32 km/h) — the wrong time window.

Section B (short answer)

Question 26.

- a. 2:45 pm is 2 h 45 min after noon, and $12 + 2 = 14$, so the start time in 24-hour time is **1445**.
- b. Add 7 h 40 min to 1445. Minutes: $45 + 40 = 85$ min, which is 1 h 25 min. Hours: $14 + 7 + 1 = 22$. The shift finishes at **2225**.

Question 27.

- a. $82 + 76 + 91 + 85 = 334$. $\therefore$ the total mass collected is **334 tonnes**.
- b. March against the target: $91 \div 80 = 1.1375$, and $1.1375 \times 100 = 113.75$. $\therefore$ the March collection is **113.75%** of the target (an exact value — no rounding is needed).

Question 28.

- a. Commission = 2 % of \$12 000 = $0.02 \times \$12\,000 = \$240.00$. Pay = \$ 620.00 + \$ 240.00 = **\$860.00**.
- b. Commission = 5 % of \$12 000 = $0.05 \times \$12\,000 = \$600.00$. Pay = \$ 400.00 + \$ 600.00 = **\$1 000.00**.
- c. \$1 000.00 is more than \$860.00, and $\$1\,000.00 - \$860.00 = \$140.00$. $\therefore$ for that week, **Job 2 pays \$140.00 more**.

Question 29.

- a. Dose = 30 kg $\times$ 10 mg per kg = **300 mg**.
- b. The syrup holds 250 mg in each 5 mL. $300 \div 250 = 1.2$ doses of 5 mL, and $1.2 \times 5 = 6$. $\therefore$ the dose is **6 mL**.
- c. $24 \div 8 = 3$ doses in 24 hours: 0800, then $0800 + 8 \text{ h} = 1600$, then $1600 + 8 \text{ h} = 0000$ (midnight). $\therefore$ the doses are at **0800, 1600 and 0000**.

Question 30.

- a. Real length = $3.5 \times 200 = 700$ cm = **7 m**.
- b. Real width = $2 \times 200 = 400$ cm = 4 m. Area = $7 \times 4 =$ **28 m²**.
- c. Volume = area $\times$ thickness = $28 \times 0.1 =$ **2.8 m³**.

Question 31.

- a. Hall 1: $\$240 + (40 \times \$18) = \$240 + \$720 =$ **\$960.00**.
- b. Hall 2: $\$80 + (40 \times \$27) = \$80 + \$1\,080 = \$1\,160.00$. Hall 1 is cheaper: $\$1\,160.00 - \$960.00 = \$200.00$. $\therefore$ **Hall 1 is cheaper by \$200.00**.

12B — Answers

Section A (multiple choice)

Question	1	2	3	4	5	6	7	8	9	10
Answer	C	B	A	C	D	A	B	C	D	A

Section B (the problem-solving cycle task)

Q11. a. e.g. What is the total cost of the seedlings for the garden bed, and does that cost fit within the \$650 grant budget? **b.** Length 6.5 m and width 4 m **c.** The nursery's opening hours and delivery day (open 9 am–5 pm on weekdays; delivers on any Tuesday) **d.** e.g. find the area of the bed; find the number of seedlings; find the cost before the discount; take off the 15 % discount; compare the cost after the discount with \$650

Q12. a. About \$700 **b.** 26 m² **c.** 208 seedlings **d.** \$609.96

Q13. a. Yes — \$717.60 is close to the estimate of \$700 (only \$17.60 above it), so the exact cost is reasonable **b.** Yes, it fits; \$40.04 left over **c.** 11 extra whole seedlings ($40.04 \div 3.45 = 11.61$ to 2 decimal places, rounded down to a whole number of seedlings)

Q14. a. e.g. “The seedlings fit within the \$650 grant budget; the total cost after the 15 % discount is \$609.96.” **b.** \$2.93 (correct to the nearest cent) **c.** e.g. a short written report or a labelled summary table — the committee reads it later, so a written format that stands alone suits that audience

12B — Fully-worked solutions

Section A (multiple choice)

Question	Answer	Working
1	C	The four stages always run in the same order: stage 1 identify the mathematics, stage 2 act on and use mathematics, stage 3 evaluate and reflect, stage 4 communicate and report. Only option C lists that order. Option A swaps stages 1 and 2, option B swaps stages 2 and 3, and option D starts at stage 4.
2	B	Deciding which numbers matter and which operation will answer the question is stage 1, identify the mathematics — the mathematics is being pulled out of the story before any calculating starts. Acting on the mathematics (stage 2) comes after that decision.
3	A	An estimate is made <i>before</i> the exact calculation, so there is a rough answer ready to check against in stage 3. That is why option A is correct and options B, C and D are not: an estimate made after the report cannot be used as a check, and estimating is part of the cycle.
4	C	Asking whether the answer is a sensible size, in the right units, and

Question	Answer	Working
5	D	fits the real-world story is checking the result against the context — stage 3, evaluate and reflect. A part of a bus cannot be booked, so 2.95 is rounded up to 3 whole buses. Using the real-world story to decide how to round is a contextual judgement, made when the result is evaluated. It is not a mistake, a loop back to stage 1, or a reporting error.
6	A	Writing the answer as a full sentence with units (“The total cost of the fence is \$1 240.00”) is presenting the result for the reader — stage 4, communicate and report.
7	B	The process is called a cycle because a check that fails in stage 3 sends you back to an earlier stage to adjust the working and redo it — the stages loop, they do not just run once. The other options are not what makes it a cycle.
8	C	Working out which of the given facts matter, and which can be ignored, is extracting the mathematics from the context — stage 1, identify the mathematics.
9	D	A formal written report for a customer uses full sentences, correct units and a labelled total — the short written quote. A text message with abbreviations, a spoken handover and a note on the fridge are all informal.
10	A	Choosing and using tools (the calculator and the tape measure) to carry out the mathematics is stage 2, act on and use mathematics.

Section B (the problem-solving cycle task)

Question 11. *Stage 1 — identify the mathematics.*

a. The purpose of the task: *what is the total cost of the seedlings for the garden bed, and does that cost fit within the \$650 grant budget?* (Accept any wording that asks for the total cost **and** the comparison with the budget.)

b. The area of a rectangle is found from its length and width, so the two measurements needed are the **length 6.5 m** and the **width 4 m**.

c. The nursery's opening hours and delivery day (open 9 am–5 pm on weekdays, delivers on any Tuesday) are **not needed** to work out the cost.

d. A suitable plan, in order:

1. Find the area of the garden bed: $\text{area} = \text{length} \times \text{width}$.
2. Find the number of seedlings: $\text{area} \times 8$ (the planting rate).
3. Find the cost before the discount: $\text{number of seedlings} \times \$3.45$.
4. Take off the 15 % discount to find the cost after the discount.
5. Compare the cost after the discount with the \$650 budget and state whether it fits.

(Accept any sensible plan with the steps in a workable order that ends with the comparison against \$650.)

Question 12. *Stage 2 — act on and use mathematics.*

a. Use the rounded numbers the question gives: $200 \times \$3.50 = \$700$.

$\therefore$ the estimate is **about \$700**.

b. Area of a rectangle = length $\times$ width:

$$6.5 \times 4 = 26$$

$\therefore$ the area of the garden bed is **26 m²**.

c. Number of seedlings = area $\times$ planting rate:

$$26 \times 8 = 208$$

$\therefore$ **208 seedlings** are needed.

d. Cost before the discount:

$$208 \times \$3.45 = \$717.60$$

The discount is 15 % of this amount:

$$0.15 \times \$717.60 = \$107.64$$

Cost after the discount:

$$\$717.60 - \$107.64 = \$609.96$$

(Check with the 85 % multiplier: $0.85 \times \$717.60 = \$609.96$. ✓)

$\therefore$ the total cost after the discount is **\$609.96**.

Question 13. *Stage 3 — evaluate and reflect.*

a. Exact cost before the discount = \$717.60; estimate from Question 12a = \$700. The difference is

$$\$717.60 - \$700 = \$17.60$$

so the exact cost sits only \$17.60 above the estimate — the two are close, and the exact cost is **reasonable**. (The estimate came out a little low mainly because it rounded the number of seedlings down from 208 to 200; rounding the price up from \$3.45 to \$3.50 did not make up the difference.)

b. Cost after the discount = \$609.96. Since \$609.96 is less than \$650, the order **fits within the grant budget**.

Money left over:

$$\$650 - \$609.96 = \$40.04$$

$\therefore$ yes, it fits, with **\$40.04** left over.

c. Divide the money left over by the cost of one seedling:

$$\$40.04 \div \$3.45 = 11.6057\dots, \text{ which is } 11.61 \text{ correct to 2 decimal places.}$$

Seedlings are sold whole, so round **down** to 11 extra seedlings: $11 \times \$3.45 = \$37.95$ fits within \$40.04, but rounding up to 12 would cost $12 \times \$3.45 = \$41.40$, which is more than the \$40.04 available.

$\therefore$ they can buy **11 extra whole seedlings**. (Rounding down here is a contextual judgement — part of a seedling cannot be bought.)

Question 14. *Stage 4 — communicate and report.*

a. e.g. “The seedlings fit within the \$650 grant budget; the total cost after the 15 % discount is \$609.96.”

The sentence answers the question directly, states the decision (it fits) and carries the final cost with its units.

b. Cost of one seedling after the discount = total cost after the discount $\div$ number of seedlings:

$$\text{\$ } 609.96 \div 208 = \text{\$ } 2.9325$$

Correct to the nearest cent (2 decimal places), the deciding digit is the 2 in the thousandths place; $2 < 5$, so round down: **\\$2.93**.

$\therefore$ the cost per seedling after the discount is **\\$2.93** (correct to the nearest cent).

c. e.g. A short written report, or a labelled summary table. The committee receives the findings and reads them later, so a written format that stands alone — full sentences, correct units and a clear total — suits an audience that will not have you there to explain it.

12C — Answers

Section A (multiple choice)

Question	1	2	3	4	5	6	7	8	9	10	11	12
Answer	D	C	B	A	D	B	A	C	A	B	D	C

Rounding notes. Question 10: the app's **16.61 m²** and the calculator's **16.62 m²** are each correct to 2 decimal places — the difference comes from the value of π each tool uses, not from carelessness. Questions 3 and 13d give exact bounds (half a unit either side of the reading), not rounded values.

Section B (short answer)

Q13. a. About 4.2 m **b.** 418.5 cm **c.** 4.185 m — yes, they agree (the two are 0.015 m, or 1.5 cm, apart) **d.** 418.45 cm and 418.55 cm

Q14. a. $=B2 \times C2$ **b.** \$721.50 **c.** D5 shows \$188.50 and D7 shows \$747.50 **d.** e.g. the column heights put the five days side by side, so the tallest column (Friday) shows his best day at a glance

12C — Fully-worked solutions

Section A (multiple choice)

Question	Answer	Working
1	D	A spirit level is the tool made for checking that something sits level (horizontal). A tape measure and a trundle wheel measure length, and a kitchen scale measures mass — none of those can check level.
2	C	Numbers sit every 200 g with four small spaces between each pair, so one small space is $200 \div 4 = 50$ g. The needle sits two small spaces past 600: $600 + 2 \times 50 = 700$ g. Option A reads a small space as 10 g, option B reads one small space instead of two, and option D reads the next printed number.
3	B	Rounding to the nearest gram means the true mass lies within half a gram either side of the display: from $486 - 0.5 = 485.5$ g up to $486 + 0.5 = 486.5$ g. Option A uses whole grams either side, option C starts the range at the displayed value, and option D uses the nearest ten grams.
4	A	An online loan repayment calculator takes the loan amount and the loan option as inputs and returns the monthly repayment — exactly this job. A currency converter changes between currencies, a tip calculator

Question	Answer	Working
5	D	adds a tip to a bill, and a shopping-list spreadsheet stores prices. A display set to 2 decimal places rounds what is <i>shown</i>, but the calculator keeps the full value stored: $33.333... \times 3 = 100$ exactly, so the display shows 100.00. Option C would need the calculator to work from the displayed 33.33 (which would show 99.99), and options A and B are not how a calculator stores numbers.
6	B	Every spreadsheet formula starts with =, and * multiplies, so =B2*C2 shows $15 \times 4.20 = \\$63.00$. Option A adds instead ($15 + 4.20 = \\$19.20$), option C is the adding function typed without the =, and option D without the = is read as text, not as a formula.
7	A	Outputs follow inputs: the total recalculates by itself, so the new total is $\\$486.50 - \\$102.00 + \\$127.50 = \\$512.00$. (Check: 3 extra sales at \$8.50 add $3 \times 8.50 = \\$25.50$, and $486.50 + 25.50 = 512.00$. ✓) Option B adds the 3 extra sales as \$3, option C adds the new day's takings without taking the old one out, and option D reads the single day as the total.
8	C	Josh's own estimate puts the area near $5 \times 4 = 20 \text{ m}^2$, and the app's 200 m^2 is ten times that. Typing 50 instead of 5 gives exactly $50 \times 4 = 200$, so a mistyped input is the most likely explanation — wrong input, wrong output. Option A rules out the commonest cause without checking, option B trusts the app over the estimate, and option D invents an input the app never received.
9	A	One mile is about 1.6 km, so 5 miles is about $5 \times 1.6 = 8 \text{ km}$. The site's 80.45 km is about ten times that check (in fact $5 \times 1.609 = 8.045$, and $8.045 \times 10 = 80.45$), so the output fails against the estimate. Option B repeats the site's wrong arithmetic, option C divides where

Question	Answer	Working
10	B	the conversion multiplies, and option D treats the two units as the same size. Both tools use the same formula, $A = \pi r^2$, with $r = 4.6 \div 2 = 2.3$ m, so $r^2 = 5.29$. The app's 3.14 is slightly less than π, so $3.14 \times 5.29 = 16.6106$, which is 16.61 m^2 to 2 decimal places, comes out slightly below the calculator's $\pi \times 5.29 = 16.6190\dots$, which is 16.62 m^2 to 2 decimal places. Options A, C and D do not fit those numbers.
11	D	Add the five bar labels: $24 + 35 + 30 + 52 + 44 = 185$ seedlings. Option A takes one bar alone, option B stops after three bars, and option C is not the sum of the five bars.
12	C	The link address is not the energy company's real web address, and a 24-hour cut-off threat is a pressure trick — both are scam signs. The safe move is to delete the email and check the bill in the official app or website. Paying through the link (option A), replying to the sender (option B) or clicking the link at all (option D) hands details to the sender.

Section B (short answer)

Question 13.

- a. Estimate = steps $\times$ step length = $6 \times 0.7 = 4.2$. $\therefore$ the bed is **about 4.2 m** long.
- b. The tape started at the 20 cm mark, so take 20 off the end reading: $438.5 - 20 = 418.5$. $\therefore$ the bed is **418.5 cm** long.
- c. $418.5 \text{ cm} = 4.185 \text{ m}$. The estimate was 4.2 m, and $4.2 - 4.185 = 0.015 \text{ m}$, which is 1.5 cm. $\therefore$ **yes, the estimate and the measurement agree** — they are within a couple of centimetres of each other.
- d. Marks every millimetre mean the smallest division is 0.1 cm, so the true length lies within half a division (0.05 cm) of the reading: smallest $418.5 - 0.05 = 418.45 \text{ cm}$, largest $418.5 + 0.05 = 418.55 \text{ cm}$. $\therefore$ the bounds are **418.45 cm and 418.55 cm** (exact bounds, not rounded values).

Question 14.

a. Takings = pots sold $\times$ price per pot, so D2 multiplies B2 by C2: **=B2*C2**.

b. =SUM(D2:D6) adds the five daily takings: $91.00 + 143.00 + 123.50 + 162.50 + 201.50 = 721.50$. $\therefore$ D7 shows **\$721.50**.

c. Outputs follow inputs. D5 (which holds =B5*C5) recalculates to $29 \times 6.50 = \$188.50$, and the total in D7 recalculates to $721.50 - 162.50 + 188.50 = \$747.50$. No other cell changes and no formula is retyped. $\therefore$ **D5 shows \$188.50 and D7 shows \$747.50**.

d. e.g. The column heights put the five days side by side, so the eye compares them at a glance: Friday's column is the tallest, so Friday was his best day, without reading five separate numbers off the table.