

2025 VCE Foundation Mathematics external assessment report

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

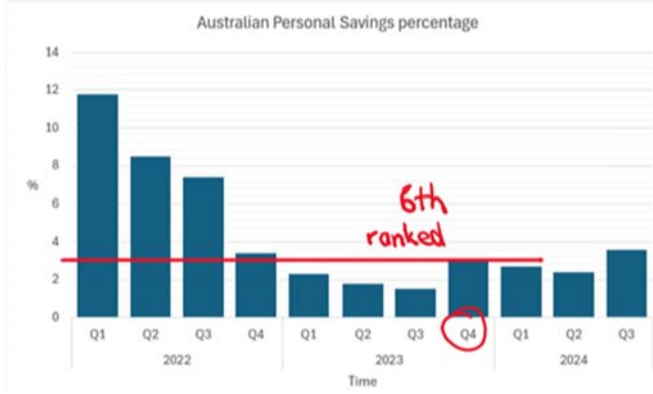
Section A – Multiple-choice questions

The table indicates the percentage of students who chose each option. Grey shading indicates the correct response.

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
1	D	5	7	17	70	1	$\frac{420}{100} \times 35 \times \$1.91 = \$280.77$
2	C	9	33	17	41	1	Actual cost is $\$1.31 \times 420 = \550.20 Estimated cost is $\$1.50 \times 420 = \630 Percentage error = $\frac{630 - 550.2}{550.2} \times 100\%$ $= 14.50\%$ Round down to the nearest whole number for the floor value $\Rightarrow 14\%$
3	D	1	0	67	32	0	27 and 28 January: decrease = $0.632 - 0.625 = 0.007$
4	B	35	45	7	13	0	Percentage increase = $\frac{ \text{new value} - \text{original value} }{\text{original value}} \times 100\%$ Percentage increase = $\frac{ 26.8 - 3.8 }{3.8} \times 100\%$ $= 605.26\dots\%$ $\approx 605\%$
5	C	4	8	76	12	1	$\frac{h}{2.5} = \frac{9}{4}$ $\Rightarrow h = 2.5 \times \frac{9}{4}$ $\Rightarrow h = 5.625$

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
6	A	29	17	51	3	1	$\text{Annual} = \frac{30}{100} \times 74752 = \22425.60 $\text{Monthly} = \frac{22425.60}{12} = \1868.80
7	D	18	10	9	62	0	<p>Run score total from first four games is $68 + 70 + 72 + 82 = 292$</p> <p>Total run score needed to reach a mean of 75 is $5 \times 75 = 375$</p> <p>Minimum run score in the fifth game is $375 - 292 = 83$</p>
8	B	9	76	9	6	0	$\text{tax} = \$31288 + 0.37 \times (146700 - 135000)$ $\text{tax} = \$35617$
9	A	78	9	11	2	0	<p>Total working time is 17.5 h</p> <p>Gross pay = \$25.80</p> <p>Super = 12%</p> <p>Total contribution is $17.5 \times \\$25.80 \times 0.12 = \\54.18</p>
10	B	30	20	44	6	1	<p>Using one of the right-angled triangles shown (with r as the length of the unknown side of triangle),</p> $r^2 = 16^2 - 8^2$ $r = 13.8564\dots$ <p>Rhombus area = $4 \times (\text{triangle area})$</p> $= 4 \times \left(\frac{1}{2} \times 8 \times 13.8564 \right)$ $= 221.7 \text{ (cm}^2\text{)}$
11	C	11	22	55	12	1	<p>Using the scale, approximation is $(4.8 \times 20) \times (2.9 \times 20) = 5568 \text{ (km}^2\text{)}$</p> <p>Closest approximation is 5400 (km²)</p>
12	B	9	34	31	24	1	$\frac{4}{5} \times \frac{3}{5} = 0.48$
13	A	49	22	20	8	1	<p>Each part is $\frac{60}{2+13} = \frac{60}{15} = 4$</p> <p>Volume of bleach added is $2 \times 4 = 8 \text{ L}$</p>

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
14	B	23	57	10	10	0	<p>Continuing the lines, 300 candles must be made to reach the break-even point.</p>
15	A	35	25	21	19	1	<p>% of Year B compared to Year A is</p> $\frac{4.28 + 2.08 + 3.56 + 6.8 + 2.54}{4.2 + 2 + 3.5 + 6.7 + 2.5} \times 100\% = 101.90\%$ <p>representing an increase of 1.90%.</p> <p>Therefore, inflation in 2018 is closest at 1.90%.</p>
16	C	9	23	42	25	1	$\begin{aligned} \text{carpet} + \text{installation} &= (2 \times 24 + 20) \times (\$89.99 + \frac{20}{60} \times \$80.50) \\ &= \$6119.32 + \$1824.67 \\ &= \$7943.99 \end{aligned}$ <p>Closest approximation = \$8000</p>
17	A	63	4	28	4	0	<div style="border: 2px solid black; padding: 5px; display: inline-block; margin-right: 10px;">E01AM</div> <p>Reflection in a vertical line</p>
18	D	32	5	5	58	0	$\frac{60}{100} \times 1250 = 750$
19	B	9	43	39	7	1	<p>Daily interest rate = $\frac{20.99}{365} = 0.0575\%$</p> $\begin{aligned} \text{Total balance} + \text{interest} &= P + \frac{P \times r \times t}{100} \\ &= \$2750 + \frac{\$2750 \times 0.0575\% \times 3}{100} \\ &= \$2786.37 \end{aligned}$

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
20	C	11	31	36	21	1	<p>Median = $\frac{11+1}{2}$ = sixth ranked data value</p>  <p>Quarter 4, 2023</p>

Section B

Question 1a.

Marks	0	1	Average
%	41	59	0.6

$$\frac{500}{50} = 10$$

Many responses recognised that 500 and 50 were to be combined. However, incorrect combinations of operations were applied, for example $\frac{50}{500}$ or 50×500

A number of students did not attempt this question.

Question 1b.

Marks	0	1	2	Average
%	49	2	49	1.0

Smallest volume is $1.8 \times 100 = 180$

Largest volume is $12 \times 100 = 1200$

Some responses to this question incorrectly quoted 1.8 L and 12 L as the converted values. Others incorrectly multiplied by 10 or divided by 100.

A number of students did not attempt this question.

Question 1c.

Marks	0	1	2	Average
%	56	19	25	0.7

AI consumption:

$$\text{Percentage} = \frac{6600}{13449} \times 100\% = \frac{6.6}{13.449} \times 100\% = 49.07\% \approx 9\%$$

A number of responses incorrectly applied the percentage error rule rather than just finding a percentage using the two quoted values. Other errors included inaccurate conversions for 6.6 billion m^3 or 13 449 GL.

Question 2a.

Marks	0	1	Average
%	31	69	0.7

$$\text{Mean} = \frac{87.003 + 88 + 86.998 + 87.004 + 86.990}{5} = 87.199$$

This question was answered quite well.

A number of responses incorrectly transcribed the answer as 87.119 or incorrectly applied the hierarchy of arithmetic operations. Students are encouraged to use the formatting templates available on calculators or use brackets in their calculations where appropriate.

The inaccurate calculation of $87.003 + 88 + 86.998 + 87.004 + 86.990 \div 5$ was often observed.

Question 2b.

Marks	0	1	2	Average
%	26	39	35	1.1

Tolerance range: 86.995 to 87.005

Piston diameters within tolerance range: 87.003, 86.998, 87.004

Students who wrote down the lower and upper values of the tolerance range were generally more successful in identifying the correct piston diameters.

Common inaccurate responses showed only 87.003 and 87.004 within the tolerance range.

Other common inaccurate responses applied the tolerance range to each individual piston value.

Question 2c.

Marks	0	1	2	Average
%	49	42	9	0.6

Cylinder dimensions: Height = $60 - 3 = 57$ mm

$$\text{Radius} = \frac{93.01 - 6}{2} = 43.505 \text{ mm}$$

$$\begin{aligned} \text{Volume} &= \pi (43.505)^2 \times 57 \\ &= 338924.5861? \text{ mm}^3 \\ &= 339.9245861 \text{ m}^3 \\ &= 339 \text{ cm}^3 \text{ (rounded)} \end{aligned}$$

Many responses ignored the 3 mm thickness of the cylinder and subsequently calculated incorrect dimensions. Others calculated the surface area or incorrectly rounded to three significant figures and wrote 338 cm^3 .

Question 3a.

Marks	0	1	2	Average
%	53	30	18	0.7

2002/2003 and 4 January

Many responses correctly identified the financial year but not the start date. Responses that identified only a single year were insufficient because it was unclear whether 2001/2002 or 2002/2003 was intended.

Some responses did not correctly identify the start date, with common incorrect responses including 1, 10 and 3/4 January.

Question 3b.

Marks	0	1	Average
%	89	11	0.1

11

This question was not well answered.

Common incorrect responses omitted the dates before 19 December and quoted only six start dates.

Question 3c.

Marks	0	1	Average
%	79	21	0.2

Monsoon season started on 19 December.

OR

Monsoon season started zero days from 19 December.

This question was not well answered.

Common incorrect responses indicated there was no monsoon season or that no data had been included.

Question 3d.

Marks	0	1	Average
%	98	2	0.0

16

This question was not well answered.

Common inaccurate responses mentioned one, five or six times while others included dates instead of a number.

Question 4a.

Marks	0	1	2	3	Average
%	16	5	16	63	2.3

	Amount
	300.00
	900.00
	750.00
	360.00
	190.00
Total	2500.00
GST	250.00

Incorrect responses saw the GST being included with each individual amount, which caused flow-on errors for the total GST amount. Other responses wrote 10% in the GST space rather than writing the amount, while others created a running total for the item descriptions throughout the table.

Question 4b.

Marks	0	1	2	Average
%	61	16	23	0.6

$$135n = 3200 + 75n \quad n = \text{number of guests}$$

$$60n = 3200$$

$$n = 53.3$$

⇒ 54 guests

Successful responses generally pursued a solution via the standard simultaneous equations or an iterative trial and error technique.

Those that substituted and evaluated a number did not often continue their calculations to find the minimum number of guests and did not receive any marks.

Question 5a.

Marks	0	1	Average
%	46	54	0.6

$$\text{Area (in ha)} = \frac{1200 \times 800}{10000} = 96 \text{ ha}$$

OR

$$\text{Area} = 1200 \times 800 = 960000$$

$$\text{Conversion} = \frac{960000}{10000} = 96 \text{ ha}$$

This was a 'Show that ...' question that required students to write a complete mathematical statement with correct algebraic structure and where 96 emerged from that correct working. Some students engaged with the question but did not clearly 'show' the intended answer, for example quoting 960 000 m² and then 96 ha but not showing the conversion.

Question 5b.

Marks	0	1	2	Average
%	48	24	28	0.8

Method 1:

$$\begin{aligned} \text{Cost/ha} &= 6 \times \$46 + 2 \times \$35 \\ &= \$276 + \$70 \\ &= \$346/\text{ha} \end{aligned}$$

$$\text{Total cost } \$346 \times 96 = \$33\,216$$

OR

Method 2:

$$\text{Total weight of fertiliser for land} = 200 \times 96 = 19\,200 \text{ kg}$$

$$\text{Number of bags of ingredient A} = \frac{19\,200}{4 \times 25} = 192$$

$$\text{Number of bags of ingredient B} = \frac{19\,200}{4 \times 25} \times 3 = 576$$

$$\begin{aligned} \text{Total Cost} &= 192 \times \$35 + 576 \times \$46 \\ &= \$6\,720 + \$26\,496 \\ &= \$33\,216 \end{aligned}$$

Responses that correctly identified the ratio of bags were also generally successful in finding a solution. A number of responses correctly identified the costing for 100 kg of fertiliser but did not establish a connection to the 200 kg of fertiliser.

Question 5c.

Marks	0	1	2	Average
%	79	15	6	0.3

$$\text{Distance} = \frac{800}{20} \times 1200 \text{ or } \frac{1200}{20} \times 800 = 48\,000 \text{ m} = 48 \text{ km}$$

$$\text{Time} = \text{spray} + \text{turns} = \frac{48}{16} + \frac{1}{3} = \frac{10}{3} \text{ h} = 200 \text{ min}$$

OR

$$\frac{800}{20} = 40 \text{ 'runs' and time for one 'run' } = \frac{1.2}{16} \times 60 = 4.5 \text{ min}$$

$$\text{Time} = \text{'runs'} \times \text{time for one 'run'} + \text{turns} = 40 \times 4.5 + 20 = 200 \text{ min}$$

This question was not well answered.

Responses frequently identified the requirement to convert the area but were not successful in demonstrating this through calculation. Some tried to identify the number of turns that would occur but did not include the extra 20 minutes for turning. A common incorrect response was $16 \times 20 + 20 = 340$

Question 6a.

Marks	0	1	2	Average
%	22	28	50	1.3

$$\begin{aligned} \text{Cost} &= 250 \times 52 + 12 \times 80 + 12 \times 2500 + 12 \times 50 + 12 \times 650 \\ &= 250 \times 52 + 12 \times (80 + 2500 + 50 + 650) \\ &= 13000 + 960 + 30000 + 600 + 7800 \\ &= 13000 + 12 \times 3280 \\ &= 13000 + 39360 \\ &= \$52360 \end{aligned}$$

This was also a 'Show that ...' question.

Many responses demonstrated correctly how to convert the given amounts into annual expenses but did not always record this process with a complete mathematical statement with correct algebraic structure (multiplication and addition) and with \$52 360 emerging from correct working.

Question 6b.

Marks	0	1	Average
%	85	15	0.2

$$\text{Monthly saving} = 5000 - \frac{52360}{12 \times 2} = \$2818.33$$

This question was not well answered.

Many responses incorrectly calculated annual savings rather than monthly savings. Other responses did not round correctly, while others misinterpreted 'the nearest cent' to mean one decimal place.

Question 6c.

Marks	0	1	2	Average
%	77	11	12	0.4

$$2800 \times 26 = 9212 + 0.7 \times \text{annual before-tax income}$$

$$72800 = 9212 + 0.7 \times \text{annual before-tax income}$$

$$\begin{aligned} \text{annual before-tax income} &= \frac{2800 \times 26 - 9212}{0.7} \\ &= \$90840 \end{aligned}$$

This question was not well answered.

Many responses incorrectly substituted the annual after-tax income in the given rule while others ignored the given rule.

Responses that did substitute correctly sometimes did not transpose the equation correctly.

Question 7a.

Marks	0	1	Average
%	8	93	0.9

'send/receive texts'

Question 7b.

Marks	0	1	Average
%	13	87	0.9

'call friends'

Question 7c.

Marks	0	1	2	Average
%	26	51	24	1.0

$$\text{Extra} = \frac{80 - 61}{100} \times 700 = 133$$

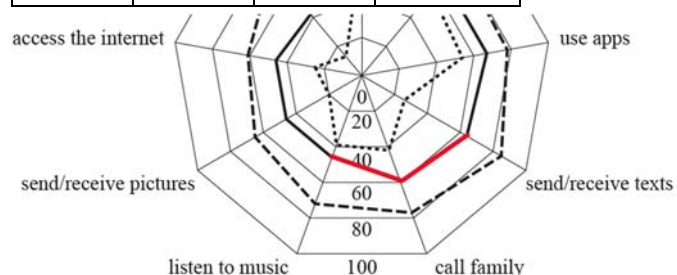
OR

$$\begin{aligned} \text{Extra} &= \frac{80}{100} \times 700 - \frac{61}{100} \times 700 \\ &= 560 - 427 \\ &= 133 \end{aligned}$$

Numerous responses correctly identified 19% as the percentage linked to the extra children. Very few went on to calculate the number of children as being 133.

Question 7d.

Marks	0	1	Average
%	46	54	0.6



A number of students did not attempt this question.

Numerous responses did not use straight-line segments. Many of those that did began the segments at incorrect start points and joined them at an incorrect intersection point.

Question 8a.

Marks	0	1	Average
%	61	39	0.4

$$\frac{900 \text{ mm}}{2} = \frac{0.9\text{m}}{2} = 0.45$$

Many responses used millimetres and did not convert to metres as the question required. Other responses incorrectly identified the given value as the radius or applied area/perimeter rules to find a related numeric answer.

Question 8b.

Marks	0	1	2	Average
%	66	12	22	0.6

$$\begin{aligned} \text{Area} &= 36.6 \times 21.35 - 30.5 \times 15.25 \\ &= 781.41 - 465.125 \\ &= 316.285 \approx 316 \end{aligned}$$

OR

$$\begin{aligned} \text{Area} &= 2 \times 36.6 \times 3.05 + 2 \times 15.25 \times 3.05 \\ &= 223.26 + 93.025 \\ &= 316.285 \approx 316 \end{aligned}$$

OR

$$\begin{aligned} \text{Area} &= 2 \times 30.5 \times 3.05 + 2 \times 21.35 \times 3.05 \\ &= 186.05 + 130.235 \\ &= 316.285 \approx 316 \end{aligned}$$

OR

$$\begin{aligned} \text{Area} &= 2 \times 30.5 \times 3.05 + 2 \times 15.25 \times 3.05 + 4 \times 3.05^2 \\ &= 186.05 + 93.025 + 37.21 \\ &= 316.285 \approx 316 \end{aligned}$$

Many responses included information related to calculating and combining the area of rectangles without finding the related areas. A number of responses calculated the area of the four shorter rectangles adjacent to each side of the playing area but did not include the squares in the corners. Other approaches were possible.

Question 8c.

Marks	0	1	2	Average
%	79	16	5	0.3

$$\text{Length} = 4 \times 15.25 + 2 \times 30.50 + 2\pi(0.45) + 2 \times \frac{2\pi(4.9)}{2}$$

$$\text{Length} = 61 + 61 + 2.8274\dots + 30.7876\dots$$

$$\text{Length} = 155.615\dots \approx 155.6$$

This question was not well answered.

Numerous responses did not account for all the lines that created the playing area, particularly missing the semicircles and centre circle from the calculations. Other responses showed the area of a circle rule being used rather than circumference.

Question 9a.

Marks	0	1	Average
%	63	37	0.4

$$4.8\% \text{ of } \$5.50 = 0.048 \times \$5.50 = \frac{4.8}{100} \times 5.5 = \$0.26 \text{ or } 26 \text{ cents}$$

Numerous responses correctly included the percentage component of the calculation, but the omission of units produced an answer that was ambiguous. This was a 'Show that ...' question where calculations were expected to produce a complete mathematical statement with correct algebraic structure (multiplication and units) and with \$0.26 or 26 cents emerging from correct working.

Question 9b.

Marks	0	1	2	Average
%	67	26	7	0.4

$$\frac{11.9}{100} \times 236 = 28.08 \approx 30$$

Many responses did not correctly identify 11.9% as the associated percentage for milk. Other responses that correctly included the percentage component did not apply the leading digit approximation technique correctly, often finishing with the inaccurate answer of 28.08 or 28.

Question 9c.

Marks	0	1	2	Average
%	51	45	4	0.5

$$\text{Cost towards wage} = \frac{34.6}{100} \times 5.50 = \$1.903 \approx \$1.90$$

$$\text{Number of coffees} = \frac{26}{1.9} \times 8 = 109.47 \text{ cups} = 110 \text{ cups (must be rounded up)}$$

OR

$$\frac{26}{1.903} \times 8 = 109.30 \approx 110 \text{ cups}$$

Many responses omitted one of the items of shift length, percentage for wages, cost of coffee or hourly rate, which were all crucial to calculating a correct answer. A very common incorrect calculation observed was

$$26 \times 8 \div 5.5 = 37.8182 = 38 \text{ cups}$$

Question 10a.

Marks	0	1	2	Average
%	91	5	5	0.2

$$\text{Interest added} = \frac{0.5}{100} \times 400\,000 = \$2000$$

$$\text{Reduction in principal} = \$4803 - \$2000 = \$2803$$

This question was not well answered.

Many responses showed an interest calculation on the repayment amount or a subtraction of the repayment amount from the principal amount. Other responses included a simple interest calculation based on the principal amount.

Question 10b.

Marks	0	1	Average
%	76	24	0.3

$$\text{Number of repayments} = 9 \times 12 = 108$$

This question was not well answered.

Many responses included calculations that ignored the impact of the interest added each month over the life of the loan. Very common incorrect responses combined the principal and repayment amount in the calculation of $400\,000 \div 4803 = 83.2813 \approx 84$ payments

Question 10c.

Marks	0	1	2	Average
%	83	7	9	0.3

$$\text{Total interest} = \$518\,724 - \$400\,000 = \$118\,724$$

$$\text{Average interest paid/year} = \frac{\$118\,724}{9} = \$13191.56 \approx \$13190$$

This question was not well answered.

Responses that found the total interest typically went on to correctly calculate the average interest per year. Many responses showed a division between the total interest and the total number of years for the loan, neglecting to include the principal amount in the calculation.

Question 11a.

Marks	0	1	Average
%	86	14	0.2

New Zealand : Chile = 5:4 OR $\frac{5}{4}$ OR 5 to 4

This question was not well answered.

Many responses showed a ratio, but it was not converted to simplest form. The responses of 0.205 : 0.164 or 1.25 : 1 were common errors.

Question 11b.

Marks	0	1	2	Average
%	72	20	8	0.4

Cost per hour = $\frac{0.192}{0.64} = \$0.30$ (correct to two decimal places)

Cost per year = $0.30 \times 1.8 \times 35 \times 12 = \$226.80 \approx \$227$

OR

Cost per year = $0.300156? \times .8 \times 35 \times 12 = \$226.92 \approx \$227$

This question was not well answered.

Many responses omitted one of the items of cost per kilowatt hour for Australia, the currency conversion factor, the power consumption of the dishwasher or the running time of the dishwasher, which were all crucial to calculating a correct answer. A very common incorrect calculation observed was $1.8 \times 12 \times 35 = 756$

Question 11c.

Marks	0	1	2	Average
%	88	5	7	0.2

$$\begin{aligned} \text{Weighted score} &= (0.4 \times 8.5) + (0.2 \times 8) + (0.2 \times 6) + (0.1 \times 7.5) + (0.1 \times 9) \\ &= 3.4 + 1.6 + 1.2 + 0.75 + 0.9 \\ &= 7.85 = 7.9 \end{aligned}$$

This question was not well answered.

Responses that recognised a weighted average was involved generally recorded the complete calculations to arrive at the correct answer.

Many responses simply found the sum of the *AR* column of values and divided by the total weighting, giving the answer of 39. Other responses found the sum of the *AR* column and divided by five, producing an answer of 7.8. Both of these responses applied incorrect methods and received zero marks.

Question 12a.

Marks	0	1	2	Average
%	82	10	8	0.3

$$1600 = \frac{20}{\text{volume}}$$

$$\Rightarrow \text{volume} = \frac{20}{1600} = 0.0125 \text{ m}^3$$

$$\text{Volume} = 0.0125 \text{ m}^3 = 12.5 \text{ L}$$

This question was not well answered.

Many responses showed a correct substitution of values, which was then followed by an inaccurate transposition of the equation.

Question 12b.

Marks	0	1	Average
%	95	5	0.1

$$\text{Full volume} = \frac{3}{2} \times 12.5 = 18.75 \text{ L}$$

OR

$$20 \times \frac{3}{2} = 30 \Rightarrow \text{volume} = \frac{30}{1600} = 0.01875 \text{ m}^3 = 18.75 \text{ L}$$

A number of students did not attempt this question.

Some responses correctly identified the involvement of 30 but then did not proceed to correctly calculate the volume. Some responses calculated that one-third of the bag size was linked to 6.25 L and the correct answer was extrapolated from there.

Question 12c.

Marks	0	1	2	Average
%	85	14	2	0.2

$$\text{Number of bags for length} = 1 + \frac{18.3 - 0.9}{0.6} = 30 \text{ bags}$$

Number of bags for height = 6 bags

Number of bags in total = 180 bags

A number of students did not attempt this question.

Many responses correctly calculated the number of bags needed for the height as being six. In calculating the number of bags for the width, many did not recognise that the overlap did not impact the last bag in the wall. Very common incorrect responses showed the calculation of $30.5 \times 6 = 183$