General Mathematics marking guide and response

External assessment 2025

Paper 1: 57 marks

Paper 2: 38 marks

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. select, recall and use facts, rules, definitions and procedures drawn from Units 3 and 4
2. comprehend mathematical concepts and techniques drawn from Units 3 and 4
3. communicate using mathematical, statistical and everyday language and conventions
4. evaluate the reasonableness of solutions
5. justify procedures and decisions by explaining mathematical reasoning
6. solve problems by applying mathematical concepts and techniques drawn from Units 3 and 4.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

For all Queensland schools

Purpose

This document consists of a marking guide and a sample response.

The marking guide:

- provides a tool for calibrating external assessment markers to ensure reliability of results
- indicates the correlation, for each question, between mark allocation and qualities at each level of the mark range
- informs schools and students about how marks are matched to qualities in student responses.

The sample response:

- demonstrates the qualities of a high-level response
- has been annotated using the marking guide.

Mark allocation

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

Allow FT mark/s — refers to 'follow through', where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can still be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.

This mark may be implied by subsequent working — the full mathematical reasoning and/or working, as outlined in the sample response and associated mark, is not explicitly stated in the student response, but by virtue of subsequent working there is sufficient evidence to award the mark/s.

Marking guide

Multiple choice

Question	Response
1	D
2	A
3	B
4	A
5	C
6	B
7	B
8	B
9	C
10	C
11	A
12	D
13	B
14	D
15	D

Paper 1: Short response

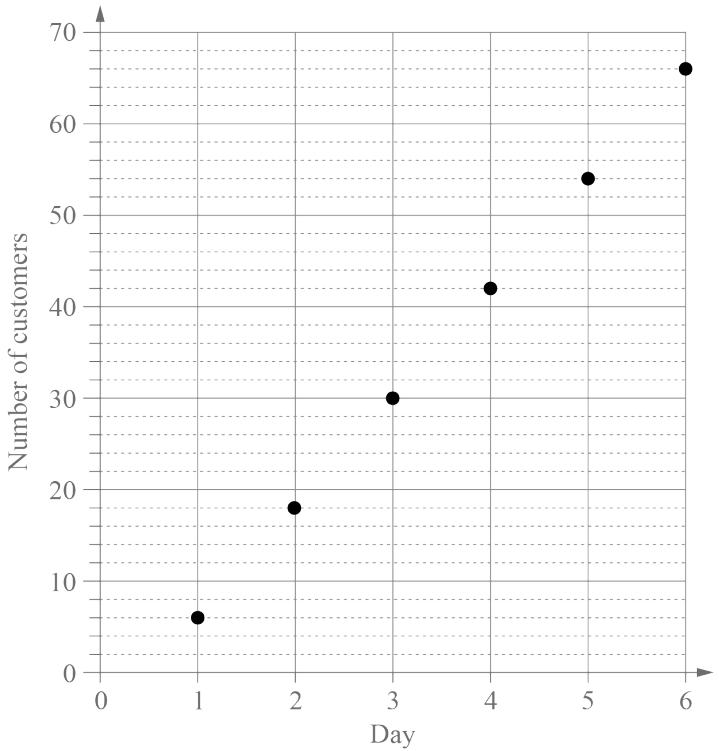
Q	Sample response	The response:
16	Time difference = (+9) – (– 8) = 17 hours behind Time in Santa Cruz = Time in Nagano – 17 hours = 2:00 pm Monday – 12 hours – 5 hours = 2:00 am Monday – 5 hours	• correctly provides mathematical reasoning or working to support the answer **[1 mark]**
	The time in Santa Cruz is 9:00 pm.	• determines time in Santa Cruz **[1 mark]**
	The day in Santa Cruz is Sunday.	• determines day in Santa Cruz **[1 mark]**

Q	Sample response	The response:
17a)	Total number of Year 6 students: 17 Total number of Year 10 students: 12	• correctly identifies both totals **[1 mark]**
17b)	Percentage of Year 6 students who travel less than 15 minutes $= \frac{11}{17} \times 100$ $= 64.7\%$	• calculates percentage of Year 6 students who travel less than 15 minutes **[1 mark]**
	Percentage of Year 10 students who travel less than 15 minutes $= \frac{3}{12} \times 100$ $= 25\%$	• calculates percentage of Year 10 students who travel less than 15 minutes **[1 mark]**
	The large difference in the percentages for the different year levels (64.7% is more than double 25%) suggests there is an association between a student's year level and their travel time.	• compares percentages to justify suggested association **[1 mark]**

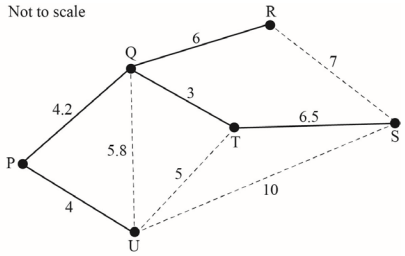
Q	Sample response	The response:
18a)	Christchurch	• correctly names the location **[1 mark]**
18b)	Angular distance $= 178° - 176°$ $= 2°$	• correctly calculates the angular distance **[1 mark]**
	Distance $= 111.2\cos\theta \times$ angular distance $= 111.2\cos(38.7) \times 2$ $= 173.56$	• substitutes into appropriate distance formula **[1 mark]**
	The distance between Taupo and Gisborne is approximately 174 km.	• calculates distance, rounded to nearest kilometre **[1 mark]**

Q	Sample response	The response:
19a)	2024 average quarterly sales = $31 375	• correctly calculates average quarterly sales for 2024 **[1 mark]**
19b)	94 000 ÷ 32 500 = 2.89	• correctly determines ratio of Q3 sales to average quarterly sales for 2023 **[1 mark]**
	82 000 ÷ 31 375 = 2.61	• determines ratio of Q3 sales to average quarterly sales for 2024 **[1 mark]**
	(2.89 + 2.61) ÷ 2 = 2.75	• calculates seasonal index for third quarter **[1 mark]**

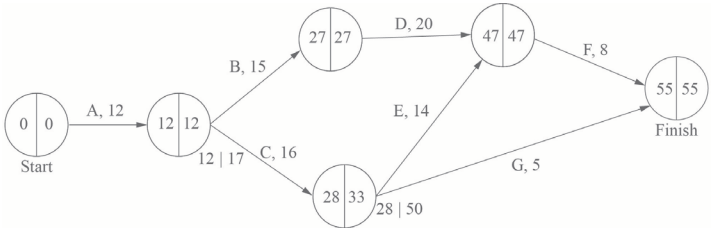
Q	Sample response	The response:
20a)	$A_{n+1} = rA_n - R$ $A_{n+1} = \left(1 + \frac{5.4}{1200}\right) A_n - 557$ $A_{n+1} = 1.0045A_n - 557$ $A_0 = 24000$	• correctly determines recurrence relation **[1 mark]**
20b)	$A_1 = 1.0045(24000) - 557 = 23551$ $A_2 = 1.0045(23551) - 557 = 23099.98$	• provides mathematical reasoning or working to support the answer **[1 mark]**
	Amount owing after two months is $23 099.98	• calculates amount owing after two months **[1 mark]**
20c)	Reduction in initial loan balance after two months $= 24000 - 23099.98$ $= \$900.02$	• determines reduction in initial loan balance after two months **[1 mark]**

Q	Sample response	The response:
21a)	The customer numbers form an arithmetic sequence.	• correctly identifies type of sequence **[1 mark]**
	$42-30=30-18=18-6=12$ The customer numbers have a common difference of 12.	• correctly justifies type of sequence by identifying common difference of 12 **[1 mark]**
21b)		• correctly plots the number of customers for the first four days **[1 mark]** • plots number of customers for 5th day and 6th day **[1 mark]**

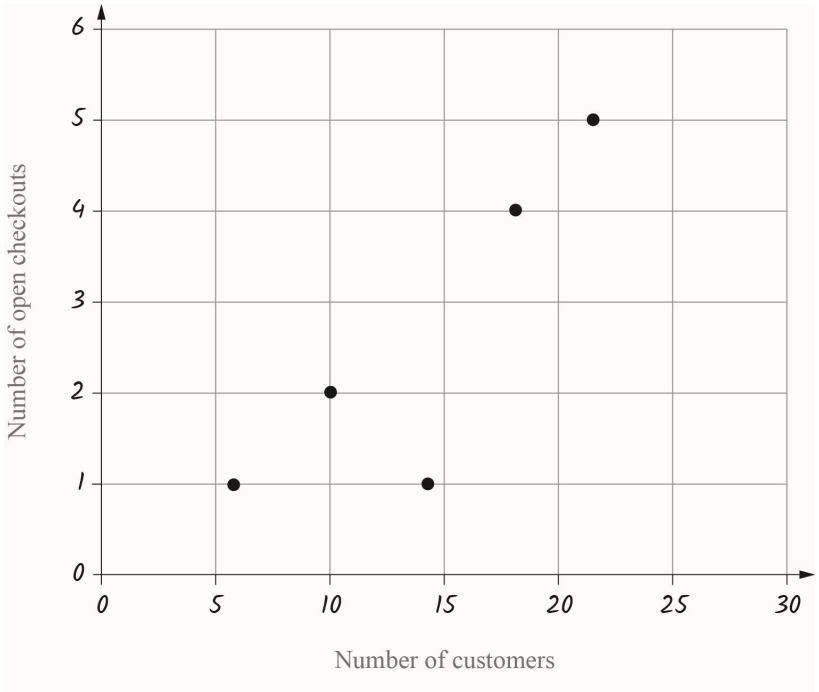
Q	Sample response	The response:
22a)	$\text{Fortnightly payment} = \frac{0.0494}{26} \times 50\,000$	• correctly provides mathematical reasoning or working to support the answer **[1 mark]**
	$\text{Fortnightly payment} = \$95$	• calculates fortnightly payment **[1 mark]**
22b)	$i_{\text{effective}} = \left(1 + \frac{i}{n}\right)^n - 1$ $= \left(1 + \frac{0.0494}{26}\right)^{26} - 1$ ≈ 0.05059	• correctly provides mathematical reasoning or working to support the answer **[1 mark]**
	The effective annual rate of interest is 5.06% p.a.	• calculates effective interest rate as a percentage **[1 mark]**

Q	Sample response	The response:
23a)	The given outlets and connecting cables form a cycle.	• correctly identifies that the given features form a cycle **[1 mark]**
	The subgraph is not a tree because a tree is a connected graph that has no cycles.	• correctly identifies that a tree has no cycles **[1 mark]**
23b)		• correctly identifies the minimum spanning tree **[1 mark]**
	Length of minimum spanning tree $= 4 + 4.2 + 6 + 3 + 6.5$ $= 23.7$ m	• determines length of minimum spanning tree **[1 mark]**
	$23.7 < 25$, so the claim is reasonable.	• provides decision **[1 mark]**

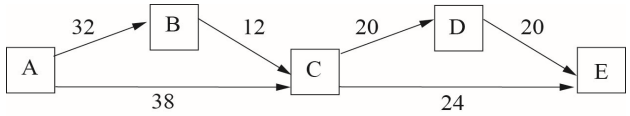
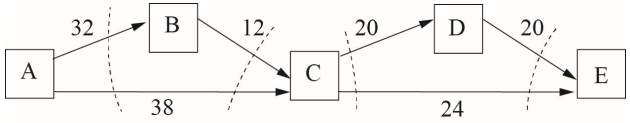
Q	Sample response	The response:
24a)	$0.997 \times 100\% = 99.7\%$	• correctly states the percentage **[1 mark]**
24b)	slope = 49	• correctly identifies the slope value as 49 **[1 mark]**
	Australia's average weekly earnings increased each year by $49.	• correctly interprets the slope as an increase per year **[1 mark]**
24c)	Substitute $x = 2035$ into $y = 49x - 97\,140$ $y = 49(2035) - 97\,140$	• correctly substitutes into the least-squares line equation **[1 mark]**
	$y = 2575$ Predicted value for average weekly earnings in 2035 is $2575.	• predicts value **[1 mark]**

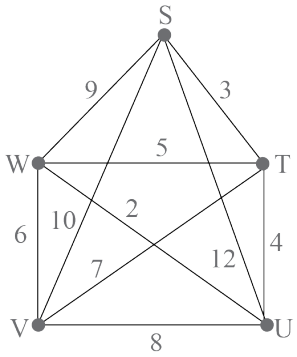
Q	Sample response	The response:
25a)	EST (D) = 12 + 15 = 27 minutes	• correctly states EST for activity D **[1 mark]**
25b)	 Minimum completion time = 12 + 15 + 20 + 8 = 55 minutes	• correctly determines minimum completion time **[1 mark]**
25c)	LST (E) = 55 – 8 – 14 = 33 minutes	• correctly states LST for activity E **[1 mark]**
25d)	Float time (G) = LFT (G) – EST (G) – activity time (G) = 55 – 28 – 5	• provides mathematical reasoning or working to support the answer **[1 mark]**
	Float time for activity G = 22 minutes	• calculates float time for activity G **[1 mark]**

Paper 2: Short response

Q	Sample response	The response:
1		• correctly formats scatterplot with appropriate scaling shown on axes **[1 mark]** • accurately plots points **[1 mark]**
	The scatterplot shows an anomaly at 4 pm. At 4 pm, three checkouts should have been open.	• provides mathematical reasoning or working to support the answer **[1 mark]**
	$3 - 1 = 2$ Two additional checkouts should have been open at 4 pm.	• determines number of additional checkouts that should have been open at 4 pm **[1 mark]**

Q	Sample response	The response:
2	$t_1 = 83\,600$ $\text{common ratio} = \frac{71\,060}{83\,600} = \frac{60\,401}{71\,060}$ $r = 0.85$	• correctly determines the values for t_1 and r **[1 mark]**
	Using rule for nth term of geometric sequence, where t_n = value and n = year since end of 2020 $t_n = t_1 r^{(n-1)}$ $t_n = 83600 \times 0.85^{(n-1)}$	• shows use of appropriate method for geometric sequence **[1 mark]**
	Substituting $n = 8$ (for end of 2028): $t_8 = 83600 \times 0.85^{(8-1)}$ $= 26800.24$	• predicts value at the end of 2028 **[1 mark]**
	$\frac{83600}{3} = \$27866.67$	• determines value for the one third comparison **[1 mark]**
	26 800.24 < 27 866.67 The value at the end of 2028 will be lower than one third of the value at the end of 2021.	• provides decision **[1 mark]**

Q	Sample response	The response:
3		• correctly constructs flow network diagram showing all 5 vertices and 6 directed edges and their correct weights **[1 mark]**
	Flows across cuts from left to right: Cut 1 : 38 + 32 = 70 Cut 2 : 38 + 12 = 50 Cut 3 : 24 + 20 = 44 Cut 4 : 24 + 20 = 44 	• applies an appropriate method for determining maximum flow **[1 mark]**
	Original maximum flow from source to river = minimum cut = 44 L/s	• determines original maximum flow from source to river **[1 mark]**
	For the maximum flow from the source to the river to be 45 L/s, the maximum flow rate needs to increase for the pipe from C to E.	• identifies upgraded pipe **[1 mark]**
	New maximum flow rate for the pipe from C to E = 24 + 1 = 25 L/s	• determines new maximum flow rate for upgraded pipe **[1 mark]**

Q	Sample response	The response:
4		• correctly represents the road network in a graph showing all 10 edges with correct weights **[1 mark]**
	STUWVS is the shortest closed walk from S.	• identifies shortest closed walk from S **[1 mark]**
	Total distance for shortest closed walk from S = 3 + 4 + 2 + 6 + 10 = 25 km	• determines total distance for shortest closed walk from S **[1 mark]**
	Total driving allowance = 25 km × 80 c/km = 2000 cents = $20	• determines total driving allowance **[1 mark]**
	Total payment = total maintenance allowance + total driving allowance = (12 × $25) + ($20) = $300 + $20 = $320	• determines total payment **[1 mark]**

Q	Sample response	The response:
5	Let a be distance between A and B, b be distance between B and C, and c be distance between A and C. Using Pythagoras' theorem: $c^2 = a^2 + b^2$ $c^2 = 208^2 + 105^2$ $c^2 = 54\ 289$ $c = 233$ Distance for walkway between A and C is 233 m.	• correctly calculates the distance for the walkway between A and C **[1 mark]**
	Open Eulerian trail starting at A when all walkways can be used is A–B–C–D–E–C–A–E. This is a possible route for Helen's usual daily walk.	• correctly identifies an open Eulerian trail starting at A as a possible route for Helen's usual daily walk **[1 mark]**
	The only closed Eulerian trail starting at A when one walkway could not be used is A–B–C–D–E–C–A. This is the route for Helen's walk on Tuesday.	• correctly identifies the closed Eulerian trail starting at A as the route for Helen's walk on Tuesday **[1 mark]**
	Total distance for Helen's usual daily walk (A–B–C–D–E–C–A–E) = 208 + 105 + 140 + 140 + 208 + 233 +105 = 1139 m	• determines total distance for Helen's usual daily walk **[1 mark]**
	Distance for A–E is 105 m 1139 – 105 = 1034 m Helen walked 1034 m on Tuesday.	• determines total distance for Helen's walk on Tuesday **[1 mark]**
	Using $s = \frac{d}{t}$ Helen's walking speed, s	

Q	Sample response	The response:
	$= \frac{1139}{17}$ = 67 m/min Duration of Helen's walk on Tuesday, t $= \frac{1034}{67}$ = 15.4 min	• provides mathematical reasoning or working to support the decision **[1 mark]**
	15.4 > 15 Helen did not complete her walk on Tuesday in under 15 minutes.	• provides decision **[1 mark]**

<table>
<tr><th>Q</th><th>Sample response</th><th>The response:</th></tr>
<tr><td>6</td><td>Let $F_n = G_n$
Goran's distance from car park at start of hike:
Substitute $n = 0$ into $G_n = 12 - 3(n-1)$
$G_0 = 12 - 3(0-1)$
$G_0 = 15$ km
Fiore's distance from car park, $F_n = 2n$
<table>
<tr><td>n</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>F_n</td><td>0</td><td>2</td><td>4</td><td>6</td></tr>
</table>
Goran's distance from car park, $G_n = 12 - 3(n-1)$
<table>
<tr><td>n</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>G_n</td><td>15</td><td>12</td><td>9</td><td>6</td></tr>
</table></td><td>• correctly uses an appropriate method for determining when and where Fiore and Goran meet on the track [1 mark]</td></tr>
<tr><td></td><td>Time since start of hike when Fiore and Goran meet on the track = 3 hours.</td><td>• determines time since start of hike when Fiore and Goran meet on the track [1 mark]</td></tr>
<tr><td></td><td>Distance from car park where Fiore and Goran meet on the track = 6 km.</td><td>• determines distance from car park where Fiore and Goran meet on the track [1 mark]</td></tr>
<tr><td></td><td>Time when Fiore and Goran meet on the track:
10 am + 3 hours = 1 pm
Time when Fiore and Goran finish their break:
1 pm + 30 minutes = 1:30 pm</td><td>• determines time of day when Fiore and Goran finish their break [1 mark]</td></tr>
<tr><td></td><td>Average hiking speed from finishing break to arriving at car park.
4 pm – 1:30 pm = 2.5 hours</td><td></td></tr>
</table>

Q	Sample response	The response:
	$s = \frac{d}{t}$ $= \frac{6 \text{ km}}{2.5 \text{ h}}$ $= 2.4$ km/h Hiking speed from when Fiore and Goran finish their break to when they arrive at the car park is 2.4 km/h.	• determines hiking speed **[1 mark]**
		• shows logical organisation **[1 mark]**

Q	Sample response	The response:
7	Sum of 2025 annual profits | | B_1 | B_2 | Sum | |---|---|---|---| | 2022 | 300 000 | 250 000 | 550 000 | | 2023 | 500 000 | 280 000 | 780 000 | | 2024 | 400 000 | 430 000 | 830 000 | | 2025 | 650 000 | 550 000 | 1 200 000 |	• correctly sums B_1 and B_2 **[1 mark]**
	Let x = number of years after end of 2025 and y = annual profit (thousands of $) $y = 200\,000x + 1\,200\,000$	• determines a model **[1 mark]**
	Linear model for C's annual profit after end of 2025 is $y = 200\,000x + 1\,200\,000$ Predicting C's annual profit at end of 2040 2040 – 2025 = 15 years Substituting x = 15 $y = 200\,000 \times 15 + 1\,200\,000$	• determines suitable substitution **[1 mark]**
	$y = 4\,200\,000$ Predicted annual profit for C at end of 2040 is $4 200 000.	• determines C's predicted annual profit at end of 2040 **[1 mark]**
	4 200 000 > 4 000 000 The director's prediction is reasonable.	• provides decision **[1 mark]**
		• shows logical organisation **[1 mark]**