Essential Mathematics marking guide

Common internal assessment 2023 — Phase 3

Short response (50 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 all Unit 3 Topics

2. comprehend mathematical concepts and techniques drawn from all Unit 3 Topics

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 all Unit 3 Topics.

Purpose

This marking guide informs schools and students how marks are matched to characteristics in responses to the common internal assessment.

The marking guide provides:

- explicit statements about what is expected of students when they respond to a question

- sample responses that identify characteristics to assist the marker to make judgments

- where relevant, notes that provide further information to assist the marker in making a decision

- a tool for calibrating markers to ensure comparability of results.
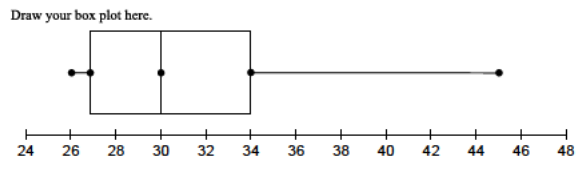
Mark allocation

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

Where no response to a question has been made, a mark of 'N' 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.

Marking guide

Q	Sample response	The response:
1a)	Bus length $= 1200 \times 5$ ≈ 6000 cm	• correctly uses an appropriate strategy **[1 mark]** • estimates length **[1 mark]**
1b)	Bus length $= 6000 \div 100$ $= 60$ m	• converts length **[1 mark]**
2a)	$V = \pi r^2 h$ $= \pi(1.3)^2 \times 5.4$ ≈ 28.67 m³	• correctly selects an appropriate rule **[1 mark]** • calculates volume including units **[1 mark]**
2b)	1 m³ $= 1$ kL Capacity $= 28.67$ kL	• determines capacity **[1 mark]**
2c)	Number of tanks $= \dfrac{250}{28.67}$ ≈ 8.72	• uses an appropriate strategy **[1 mark]** • calculates number of rainwater tanks **[1 mark]**
3a)	Side length $= 20$ cm	• correctly rounds side length **[1 mark]**
3b)	$A = 20^2$ $= 400$ cm²	• estimates area of one face **[1 mark]**
3c)	$V = 400 \times 20$ $= 8000$ cm³	• estimates volume **[1 mark]**

Q	Sample response	The response:
4a)	Draw your box plot here. 24 26 28 30 32 34 36 38 40 42 44 46 48	• correctly labels appropriate scale on number line **[1 mark]** • correctly draws box section **[1 mark]** • draws whisker sections connecting to box **[1 mark]**
4b)	The middle 50% of the scores are evenly spread out. There is an outlier BOLT score of 45 seconds.	• identifies data is evenly distributed around the box section **[1 mark]** • identifies an outlier **[1 mark]**
5a)	$V = \dfrac{1}{3}Ah$ $= \dfrac{1}{3} \times 1.2 \times 2.3 \times 2.6$ $= 2.392 \, \text{m}^3$	• correctly selects an appropriate rule **[1 mark]** • calculates volume **[1 mark]**
5b)	$1 \, \text{m}^3 = 1000 \, \text{L}$ Capacity = 2.392×1000 Capacity = $2392 \, \text{L}$	• identifies use of an appropriate strategy **[1 mark]** • calculates capacity **[1 mark]**
5c)	Mass = 2392×0.9 Mass = **2152.8 kg**	• determines mass **[1 mark]**

Q	Sample response					The response:

Minimum	Lower quartile (Q_1)	Median	Upper quartile (Q_3)	Maximum
98	102	114	120	125

6

98, 100, 102, 103, 110, 118, 120, 120, 125, 125

The response:
- correctly adds appropriate headings **[1 mark]**
- correctly orders values **[1 mark]**
- correctly determines minimum and maximum values **[1 mark]**
- correctly determines median **[1 mark]**

Q	Sample response	The response:
7a)	Measured length = **9** cm Measured width = **4.5** cm Length: $9 \times 200 = 1800$ cm Width: $4.5 \times 200 = \mathbf{900}$ cm	• correctly measures length and width **[1 mark]** • calculates length **[1 mark]** • calculates width **[1 mark]**
7b)	Perimeter = $2(L+W)$ $= 2 \times (18+9)$ $= 54$ m	• converts dimensions to metres **[1 mark]** • calculates perimeter **[1 mark]**
8a)	Mode = $1750	• correctly determines mode **[1 mark]**
8b)	$\text{Mean} = \dfrac{\sum x}{n}$ $= \dfrac{16500}{13}$ $\approx \$1269.23$	• correctly uses an appropriate strategy **[1 mark]** • calculates mean **[1 mark]**
8c)	$1269.23 < $1750 so the claim is not reasonable.	• provides a justified decision linked to prior reasoning **[1 mark]**

Q	Sample response	The response:
9a)	Parallelogram	• correctly identifies shape **[1 mark]**
9b)	4 vertices	• correctly states number of vertices **[1 mark]**
9c)	$A = L \times W$ $A = 1480 \times 2630$ $= 3\,892\,400 \text{ m}^2$	• correctly selects an appropriate rule **[1 mark]** • calculates area **[1 mark]**
9d)	$A = 3\,892\,400 \div 100^2$ $= 389.24 \text{ ha}$	• uses an appropriate strategy **[1 mark]** • determines area **[1 mark]**

Q	Sample response	The response:
10a)	$\cos \theta = \dfrac{adj}{hyp}$ $\cos 54° = \dfrac{6}{h}$ $h = \dfrac{6}{\cos 54°}$ $h \approx 10.2$ cm	• correctly selects an appropriate trigonometric ratio **[1 mark]** • calculates slant height **[1 mark]**
10b)	$A = \dfrac{b \times h}{2}$ Total surface area of four triangular faces: $TSA = \dfrac{12 \times 10.2}{2} \times 4$ $= 244.987$ cm^2 Area of square base: $A = 12^2$ $A = 144$ cm^2 Total surface area: $TSA = 144 + 244.8$ $TSA = 388.987$ cm^2	• selects an appropriate rule **[1 mark]** • calculates total surface area of triangular faces **[1 mark]** • calculates total surface area **[1 mark]**

Q	Sample response	The response:
11	Year 12 data: $mean = \dfrac{\sum x}{n}$ $mean = \dfrac{1929}{11}$ **mean ≈ 175.36 cm** **median ≈ 173 cm** Year 11 data: $mean = \dfrac{1936}{11}$ **mean ≈ 176 cm** **median ≈ 173 cm** The medians for both classes are the same but the mean for the Year 12 class is less than the mean for the Year 11 class. So 'on average' it is not reasonable for the teacher to claim that the Year 12 class is taller than the Year 11 class, because an outlier from the Year 11 class (197 cm) was included in the calculation, which greatly increased the mean.	• correctly calculates Year 12 mean **[1 mark]** • correctly calculates Year 12 median **[1 mark]** • correctly calculates Year 11 mean **[1 mark]** • correctly calculates Year 11 median **[1 mark]** • provides a justified statement of reasonableness **[1 mark]**

Instrument-specific standards — Common internal assessment

Foundational knowledge and problem solving	Cut-off (marks)	Grades
The student work has the following characteristics		
• comprehensive selection, recall and use of simple and complex facts, rules, definitions and procedures; comprehension and clear communication of simple and complex mathematical concepts and techniques; evaluation of the reasonableness of solutions and use of mathematical reasoning to justify procedures and decisions; and proficient application of simple and complex mathematical concepts and techniques to solve problems	> 40	A
• selection, recall and use of simple and some complex facts, rules, definitions and procedures; comprehension and communication of simple and some complex mathematical concepts and techniques; evaluation of the reasonableness of some solutions using mathematical reasoning; and application of simple and some complex mathematical concepts and techniques to solve problems	> 30	B
• selection, recall and use of simple facts, rules, definitions and procedures; comprehension and communication of simple mathematical concepts and techniques; discussion of the reasonableness of solutions using mathematical reasoning; and application of simple mathematical concepts and techniques to solve problems	> 20	C
• some selection, recall and use of facts, rules, definitions and procedures; basic comprehension and communication of mathematical concepts and techniques; some discussion of the reasonableness of solutions; and inconsistent application of mathematical concepts and techniques	> 10	D
• isolated and inaccurate selection, recall and use of facts, rules, definitions and procedures; disjointed and unclear communication of mathematical concepts and techniques; superficial discussion of the reasonableness of solutions.	≥ 0	E