Essential Mathematics marking guide and response

Common internal assessment 2024 — Ancillary phase

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.

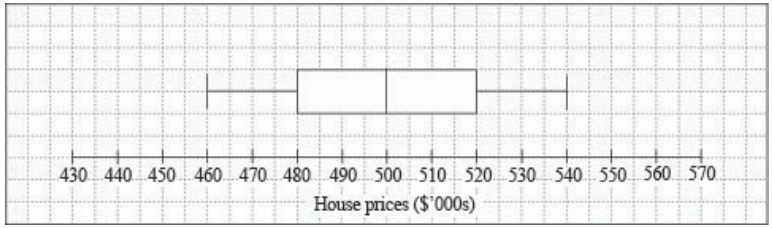
Allow FT mark/s — refers to 'follow through', where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can still be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.

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

Q	Sample response	The response:
1a)	$6\ \text{m}^2$	• correctly determines actual area of garden bed C **[1 mark]**
1b)	$2\ \text{m}^2$	• correctly estimates actual area of garden bed D **[1 mark]**
1c)	Total actual area $= A + B + C + D$ $= 4 + 3 + 6 + 2$ $= 15\ \text{m}^2$	• applies relevant strategy **[1 mark]** • calculates approximate total actual area **[1 mark]**
2a)	Number of paces $= (30 + 18) \times 2$ $= 96$ paces	• correctly determines perimeter in paces **[1 mark]**
2b)	Perimeter $= 96 \times 85$ $= 8160$ cm $= 81.6$ m	• applies relevant strategy **[1 mark]** • calculates perimeter **[1 mark]**
3a)	Rectangle	• correctly names shape **[1 mark]**
3b)	8 vertices	• correctly states number of vertices **[1 mark]**

Q	Sample response	The response:
4a)	$d = 20$ cm	• correctly estimates diameter using leading-digit approximation **[1 mark]**
4b)	$r \approx 10$ cm	• determines radius **[1 mark]**
4c)	$V = \frac{4}{3}\pi r^3$ $= \frac{4}{3}\pi \times (10)^3$ ≈ 4188.79 cm^3	• applies relevant strategy **[1 mark]** • calculates approximate volume of medicine ball **[1 mark]**
4d)	Amount $= 3 \times 4188.79$ $\approx 12\ 566.37$ mL	• applies relevant strategy **[1 mark]** • estimates amount of water for three medicine balls **[1 mark]**
5a)	87 kg	• correctly estimates mass **[1 mark]**
5b)	1 t = 1000 kg	• correctly converts tonnes to kilograms **[1 mark]**
5c)	Number of calves $= \frac{1000}{87}$ ≈ 11.49 $= 11$ calves	• applies relevant strategy **[1 mark]** • calculates maximum number of calves **[1 mark]**

<table>
<tr><th>Q</th><th>Sample response</th><th>The response:</th></tr>
<tr><td>6a)</td><td>460, 480, 480, 490, 500, 500, 520, 520, 540
<table><tr><td>Minimum</td><td>Lower quartile</td><td>Median</td><td>Upper quartile</td><td>Maximum</td></tr><tr><td>460</td><td>480</td><td>500</td><td>520</td><td>540</td></tr></table></td><td>• correctly arranges numbers in order [1 mark]
• correctly labels headings [1 mark]
• determines minimum, median and maximum [1 mark]</td></tr>
<tr><td>6b)</td><td> 
</td><td>• draws box section [1 mark]
• draws whisker sections connecting to box [1 mark]</td></tr>
<tr><td>7a)</td><td>23 runs</td><td>• correctly identifies mode [1 mark]</td></tr>
<tr><td>7b)</td><td>$\text{Mean} = \frac{\sum x}{n}$
$= \frac{301}{12}$
≈ 25.083 runs</td><td>• applies relevant strategy [1 mark]
• calculates mean [1 mark]</td></tr>
<tr><td>7c)</td><td>21.5 runs</td><td>• correctly determines median [1 mark]</td></tr>
<tr><td>7d)</td><td>There is a score of 88 runs that is considered an outlier.</td><td>• correctly describes spread of data [1 mark]</td></tr>
</table>

Q	Sample response	The response:
8a)	$c^2 = a^2 + b^2$ $= 4^2 + 10^2$ $= 116$ $c = \sqrt{116}$ $= 10.77$ $c \approx 11$ m	• correctly selects appropriate rule **[1 mark]** • determines value of c^2 **[1 mark]** • calculates diagonal brace length **[1 mark]**
8b)	Total length of billboard = 2 lengths + 2 widths + 2 diagonals $= (2 \times 4) + (2 \times 10) + (2 \times 11)$ $= 8 + 20 + 22$ $= 50$ m	• applies relevant strategy **[1 mark]** • determines total length required for billboard **[1 mark]**
9a)	Actual length $= 10.5 \times 9$ $= 94.5$ cm	• correctly applies relevant strategy **[1 mark]** • determines actual length **[1 mark]**
9b)	Actual perpendicular height $= 7 \times 9$ $= 63$ cm	• correctly applies relevant strategy **[1 mark]** • determines actual perpendicular height **[1 mark]**

Q	Sample response	The response:
9c)	$A = bh$ $= 94.5 \times 63$ $= 5953.5 \text{ cm}^2$ $= 5954 \text{ cm}^2$	• correctly applies relevant strategy **[1 mark]** • calculates area, rounded to the nearest square centimetre **[1 mark]**
10	Arrange numbers and identify Q_1, Q_3 and IQR for packing machine B to compare to packing machine A. Q_1 Q_2 Q_3 8, 11, 11, 14, 14, 14, 18, 18, 21 $Q_1 = 11$ $Q_3 = 18$ Packing machine B IQR $\text{IQR} = Q_3 - Q_1$ $= 18 - 11$ $= 7$ Packing machine A IQR $\text{IQR} = Q_3 - Q_1$ $= 16 - 12$ $= 4$ Packing machine B has an IQR of 7 whereas packing machine A has an IQR of 4. As a result, packing machine A is more consistent.	• correctly determines Q_1 for packing machine B **[1 mark]** • correctly determines Q_3 for packing machine B **[1 mark]** • determines IQR for packing machine B **[1 mark]** • correctly determines IQR for packing machine A **[1 mark]** • determines which packing machine is more consistent **[1 mark]**

Q	Sample response	The response:
11	A = 5 cm, B = 9 cm, C = 7.5 cm, D = 2.5 cm	• correctly measures lengths of A, B, C and D **[1 mark]**
	A = 5 cm × 80 = 400 cm = 4 m B = 9 cm × 80 = 720 cm = 7.2 m C = 7.5 cm × 80 = 600 cm = 6 m D = 2.5 cm × 80 = 200 cm = 2 m	• applies scale and converts to metres **[1 mark]**
	Area of driveway (composite shape) = area of rectangle + area of trapezium $= 4 \times 7.2 + \frac{(4+6) \times 2}{2}$	• applies relevant strategy **[1 mark]**
	$= 38.8 \text{ m}^2$	• calculates area of front driveway **[1 mark]**
	$40 \times 0.9 = 36$ Bella is wrong as 40 bags of concrete will not be enough to cover the driveway since 36 m^2 < 38.8 m^2.	• provides appropriate statement of reasonableness **[1 mark]**