

# Essential Mathematics marking guide

Common internal assessment 2023 — Phase 5

## 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)	$P = 3 \times 13.5$  $= 40.5 \text{ m}$	<ul style="list-style-type: none"> <li>correctly uses an appropriate strategy [1 mark]</li> <li>calculates perimeter [1 mark]</li> </ul>
1b)	$A = L \times W$ $= 2 \times 10$  $= 20 \text{ m}^2$	<ul style="list-style-type: none"> <li>correctly selects an appropriate rule [1 mark]</li> <li>estimates area [1 mark]</li> </ul>
2a)	2, 2, 3, 3, 3, 3, 4, 4, 4, 4, 5, 6, 10  Median = 4 hours	<ul style="list-style-type: none"> <li>correctly uses an appropriate strategy [1 mark]</li> <li>calculates median [1 mark]</li> </ul>
2b)	$\text{Mean} = \frac{\sum x}{n}$ $\bar{x} = \frac{53}{13}$ $\bar{x} \approx 4.0769 \text{ hours}$	<ul style="list-style-type: none"> <li>correctly uses an appropriate strategy [1 mark]</li> <li>calculates mean [1 mark]</li> </ul>
2c)	There is a possible outlier of 10 hours.	<ul style="list-style-type: none"> <li>correctly describes spread of the dataset [1 mark]</li> </ul>

Q	Sample response	The response:
3a)	2	<ul style="list-style-type: none"> <li>correctly states number of doors [1 mark]</li> </ul>
3b)	The scale states that every 10 mm on the plan represents 80 cm in real life for the house.	<ul style="list-style-type: none"> <li>correctly interprets scale [1 mark]</li> </ul>
3c)	$A = L \times W$ $= 3.44 \times 1.2$ $= 4.128 \text{ m}^2$	<ul style="list-style-type: none"> <li>correctly selects an appropriate rule [1 mark]</li> <li>calculates area [1 mark]</li> </ul>
3d)		<ul style="list-style-type: none"> <li>correctly determines mass [1 mark]</li> </ul>
4a)	Number of cylinders = $12 \times 5$  $= 60$ cylinders	<ul style="list-style-type: none"> <li>correctly shows use of an appropriate strategy [1 mark]</li> <li>estimates maximum number of cylinders [1 mark]</li> </ul>
4b)	$60 \times 200 = 12\,000 \text{ L}$	<ul style="list-style-type: none"> <li>estimates maximum capacity [1 mark]</li> </ul>
4c)	$12\,000 \times 0.25 = 3000 \text{ L}$	<ul style="list-style-type: none"> <li>determines amount of gas [1 mark]</li> </ul>

Q	Sample response	The response:										
5a)	4	<ul style="list-style-type: none"> <li>correctly identifies mode [1 mark]</li> </ul>										
5b)	<table border="1"> <thead> <tr> <th>Minimum</th> <th>Lower quartile (<math>Q_1</math>)</th> <th>Median</th> <th>Upper quartile (<math>Q_3</math>)</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>2.5</td> <td>4</td> <td>6.5</td> <td>9</td> </tr> </tbody> </table>	Minimum	Lower quartile ( $Q_1$ )	Median	Upper quartile ( $Q_3$ )	Maximum	2	2.5	4	6.5	9	<ul style="list-style-type: none"> <li>correctly identifies median [1 mark]</li> <li>correctly identifies minimum and maximum values [1 mark]</li> </ul>
Minimum	Lower quartile ( $Q_1$ )	Median	Upper quartile ( $Q_3$ )	Maximum								
2	2.5	4	6.5	9								
5c)	<p>Draw your box plot here.</p>	<ul style="list-style-type: none"> <li>draws box section [1 mark]</li> <li>draws whisker sections connecting to box [1 mark]</li> </ul>										

Q	Sample response	The response:
6a)	$r = \sqrt{c^2 - a^2}$ $r = \sqrt{2.5^2 - 1.5^2}$ $r = 2 \text{ m}$	<ul style="list-style-type: none"> <li>correctly selects an appropriate rule [1 mark]</li> <li>calculates radius [1 mark]</li> </ul>
6b)	$V = \frac{4}{3}\pi r^3$ $= \frac{4}{3}\pi(2)^3$ $\approx 33.51 \text{ m}^3$	<ul style="list-style-type: none"> <li>correctly selects an appropriate rule [1 mark]</li> <li>calculates volume [1 mark]</li> </ul>
6c)	Capacity = 33.51 kL Capacity $\approx$ <b>33510</b> L	<ul style="list-style-type: none"> <li>converts capacity to litres [1 mark]</li> </ul>
6d)	Number of times = $33\,510 \div 12\,600$ $\approx 2.66$	<ul style="list-style-type: none"> <li>determines number of times [1 mark]</li> </ul>

Q	Sample response	The response:
7a)	$177\,000 \div 10^3$ $= 177\text{ cm}^3$	<ul style="list-style-type: none"> <li>correctly converts volume to cubic centimetres [1 mark]</li> </ul>
7b)	$200 \div 4 \approx 50$	<ul style="list-style-type: none"> <li>estimates number of times [1 mark]</li> </ul>
7c)	$50 \times 3 = 150\text{ g}$	<ul style="list-style-type: none"> <li>estimates total mass of soap [1 mark]</li> </ul>
8a)	Area = $10\,000 \div 100^2$  $= 1\text{ m}^2$	<ul style="list-style-type: none"> <li>correctly shows use of conversion strategy [1 mark]</li> <li>calculates area in appropriate unit of measure [1 mark]</li> </ul>
8b)	Width $\approx 3\text{ m}$	<ul style="list-style-type: none"> <li>estimates width with a tolerance of <math>\pm 0.2\text{ m}</math> [1 mark]</li> </ul>
9a)	Triangular-based prism	<ul style="list-style-type: none"> <li>correctly identifies shape [1 mark]</li> </ul>
9b)	9 edges	<ul style="list-style-type: none"> <li>correctly states number of edges [1 mark]</li> </ul>
9c)	Rectangle	<ul style="list-style-type: none"> <li>correctly identifies shape [1 mark]</li> </ul>
9d)	$A = L \times W$ $= 2.7 \times 2.1$ $= 5.67\text{ m}^2$	<ul style="list-style-type: none"> <li>correctly selects an appropriate rule [1 mark]</li> <li>calculates area [1 mark]</li> </ul>

Q	Sample response	The response:
10a)	<p>Surface area of side rectangular walls</p> $S = \text{Area of shallow-end side} + \text{Area of deep-end side}$ $= 1.2 \times 6 + 2.5 \times 6$ $= 22.2 \text{ m}^2$ <p>Area of rectangular base</p> $A = 25 \times 6$ $= 150 \text{ m}^2$ <p>Surface area of parallelogrammatic walls</p> $S = \frac{(a + b)}{2} \times h \times 2$ $= \frac{(2.5 + 1.2)}{2} \times 25 \times 2$ $= 92.5 \text{ m}^2$ <p>Total surface area of pool to be painted</p> $TSA = 22.2 + 150 + 92.5$ $= 264.7 \text{ m}^2$	<ul style="list-style-type: none"> <li>• correctly calculates surface area of side rectangular walls [1 mark]</li> <li>• correctly calculates base area [1 mark]</li> <li>• correctly calculates surface area of parallelogrammatic walls [1 mark]</li> <li>• calculates total surface area of pool [1 mark]</li> </ul>
10b)	<p>The school will not have enough paint to cover the internal walls and base of the pool since <math>110 \text{ m}^2 &lt; 264.7 \text{ m}^2</math>.</p>	<ul style="list-style-type: none"> <li>• provides a justified statement of reasonableness [1 mark]</li> </ul>



Q	Sample response	The response:																				
11	<p>Dee's five-number summary (from table data):</p> <table border="1"> <thead> <tr> <th>Min</th> <th>Q<sub>1</sub></th> <th>Med</th> <th>Q<sub>3</sub></th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>12</td> <td>14</td> <td>19</td> <td>23</td> </tr> </tbody> </table> <p>Neighbour's five-number summary (from box plot):</p> <table border="1"> <thead> <tr> <th>Min</th> <th>Q<sub>1</sub></th> <th>Med</th> <th>Q<sub>3</sub></th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>13</td> <td>14</td> <td>17</td> <td>19</td> <td>20</td> </tr> </tbody> </table> <p>Almost 75% of the neighbour's plants were of the same height or greater than Dee's median, i.e. 50% of Dee's plants were smaller than the majority of the neighbour's plants.</p> <p>Neighbour's range has the same numerical value as Dee's IQR (i.e. neighbour's range = 7 cm and Dee's IQR = 7 cm).</p> <p>This suggests Dee's seedlings have less favourable growth heights, therefore not as consistent as the neighbour's. Neighbour's claim is reasonable and would be deemed as the better gardener due to more consistent growth heights.</p>	Min	Q <sub>1</sub>	Med	Q <sub>3</sub>	Max	10	12	14	19	23	Min	Q <sub>1</sub>	Med	Q <sub>3</sub>	Max	13	14	17	19	20	<ul style="list-style-type: none"> <li>• correctly determines five-number summary for growth heights for Dee's seedlings <b>[1 mark]</b></li> <li>• correctly determines five-number summary for growth heights for neighbour's seedlings <b>[1 mark]</b></li> <li>• interprets median growth heights of seedlings for Dee and neighbour <b>[1 mark]</b></li> <li>• interprets ranges of seedlings' growth heights for Dee and neighbour <b>[1 mark]</b></li> <li>• provides a justified statement of reasonableness <b>[1 mark]</b></li> </ul>
Min	Q <sub>1</sub>	Med	Q <sub>3</sub>	Max																		
10	12	14	19	23																		
Min	Q <sub>1</sub>	Med	Q <sub>3</sub>	Max																		
13	14	17	19	20																		

## Instrument-specific standards — Common internal assessment

Foundational knowledge and problem solving	Cut-off (marks)	Grades
<b>The student work has the following characteristics</b>		
<ul style="list-style-type: none"> <li>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</li> </ul>	> 40	<b>A</b>
<ul style="list-style-type: none"> <li>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</li> </ul>	> 30	<b>B</b>
<ul style="list-style-type: none"> <li>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</li> </ul>	> 20	<b>C</b>
<ul style="list-style-type: none"> <li>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</li> </ul>	> 10	<b>D</b>
<ul style="list-style-type: none"> <li>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.</li> </ul>	$\geq 0$	<b>E</b>



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