

# Essential Mathematics marking guide

Common internal assessment 2021

## 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* — 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.

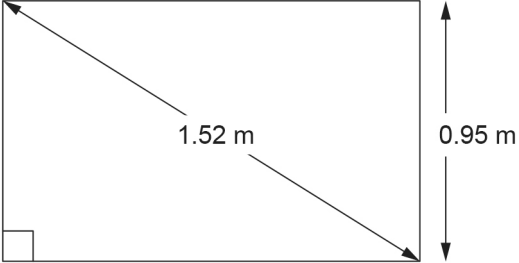
*This mark may be implied by subsequent working* — the full mathematical reasoning and/or working, as outlined in the sample response and associated mark, is not explicitly stated in the student response, but by virtue of subsequent working there is sufficient evidence to award the mark.

## Marking guide

Q	Sample response	The response:
1	<p>Percentage <math>\approx \frac{9}{240} \times 100\%</math></p> <p><math>= 3.75\%</math></p> <p>Approximately 3.75% of the RDA of magnesium for teenagers is contained in one apple.</p>	<ul style="list-style-type: none"> <li>correctly compares values <b>[1 mark]</b></li> <li>determines approximate percentage <b>[1 mark]</b></li> </ul>
2a)	<p>Volume of trailer, <math>V = Ah</math></p> <p><math>= 2 \times 1 \times 1</math></p> <p><math>= 2 \text{ m}^3</math></p>	<ul style="list-style-type: none"> <li>correctly rounds all dimensions to the leading digit <b>[1 mark]</b></li> <li>estimates volume of trailer <b>[1 mark]</b></li> </ul>
2b)	<p>Volume of mulch <math>= \frac{3}{4} \times 2</math></p> <p><math>= 1.5 \text{ m}^3</math></p>	<ul style="list-style-type: none"> <li>determines volume of mulch <b>[1 mark]</b></li> </ul>
2c)	<p>Mass of mulch</p> <p><math>= 1.5 \times 340</math></p> <p><math>= 510 \text{ kg}</math></p> <p><math>510 &gt; 450</math>. The mass of mulch in the tray is not within towing specifications.</p>	<ul style="list-style-type: none"> <li>determines mass of mulch <b>[1 mark]</b></li> <li>determines if mass of mulch is within towing specifications <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
3a)	Apex	<ul style="list-style-type: none"> <li>correctly states the apex <b>[1 mark]</b></li> </ul>
3b)	<p>325 cm = 3.25 m</p> <p>Total length = <math>3.25 \times 4</math> = 13 m</p>	<ul style="list-style-type: none"> <li>correctly converts centimetres to metres <b>[1 mark]</b></li> <li>determines total length of poles <b>[1 mark]</b></li> </ul>
3c)	<p>Volume of tent, <math>V = \frac{1}{3}Ah</math></p> $= \frac{1}{3} \times l \times w \times h$ $= \frac{1}{3} \times 4.6 \times 2.6 \times 1.9$ $\approx 7.57 \text{ m}^3$	<ul style="list-style-type: none"> <li>correctly substitutes into appropriate rule <b>[1 mark]</b></li> <li>calculates volume of tent <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
4a)	<p>Measured side length = 5 cm</p> <p>Actual side length = 5 cm × 30          = 150 cm          = 1.5 m</p>	<ul style="list-style-type: none"> <li>• correctly measures the side length [1 mark]</li>   <li>• applies scale of 1:30 [1 mark]</li>   <li>• converts to metres [1 mark]</li> </ul>
4b)	<p>Area of square frame, <math>A = bh</math>          = <math>1.5 \times 1.5</math>          = <math>2.25 \text{ m}^2</math></p> <p>The square piece of mesh <b>will not fit</b> the square frame,          since <math>2.25 &gt; 2</math>.</p>	<ul style="list-style-type: none"> <li>• calculates area of square frame [1 mark]</li>     <li>• determines if square piece of mesh will fit square frame [1 mark]</li> </ul>

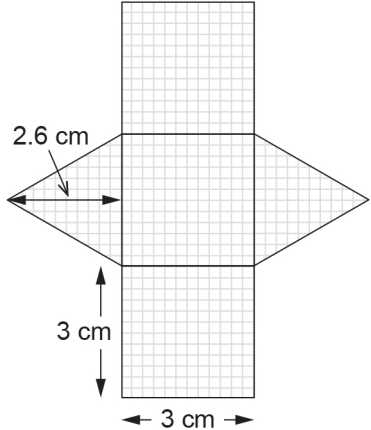
Q	Sample response	The response:
5a)	<p>152 cm = 1.52 m 95 cm = 0.95 m</p> 	<ul style="list-style-type: none"> <li>• correctly converts centimetres to metres [1 mark]</li> <li>• provides a sketch with height and diagonal labelled appropriately [1 mark]</li> </ul>
5b)	<p>Using Pythagoras' theorem  <math>c^2 = a^2 + b^2</math>  Width (b)  <math>b^2 = c^2 - a^2</math>  <math>b^2 = 1.52^2 - 0.95^2</math>  <math>b = \sqrt{1.52^2 + 0.95^2}</math></p> <p><math>b \approx 1.186 \dots</math></p> <p><math>b \approx 1.19</math> m (to 2 d.p.)  The width of the TV screen is 1.19 m.</p>	<ul style="list-style-type: none"> <li>• substitutes into appropriate rule [1 mark]</li> <li>• calculates width of TV screen [1 mark]</li> <li>• rounds to two decimal places [1 mark]</li> </ul>

Q	Sample response	The response:
6a)	Area of flag, $A = bh$ $= 2.4 \times 1.6$ $= 3.84 \text{ m}^2$	<ul style="list-style-type: none"> <li>correctly calculates the flag area <b>[1 mark]</b></li> </ul>
6b)	Area of triangular emblem, $A = \frac{1}{2}bh$ $= \frac{1}{2} \times 1.1 \times 1.8$ $= 0.99 \text{ m}^2$	<ul style="list-style-type: none"> <li>correctly calculates the area of triangular emblem <b>[1 mark]</b></li> </ul>
6c)	One quarter of flag area = $3.84 \div 4 = 0.96$  $0.96 \approx 0.99$  The designer's estimate of the triangular emblem covering one quarter of the flag area is reasonable because the areas are approximately the same.	<ul style="list-style-type: none"> <li>determines one quarter of flag area <b>[1 mark]</b></li> <li>compares area of triangular emblem to one quarter of flag area <b>[1 mark]</b></li> <li>provides a justified statement of reasonableness <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:										
7a)	4	<ul style="list-style-type: none"> <li>correctly identifies the mode <b>[1 mark]</b></li> </ul>										
7b)	The number of phone calls is clustered around 4. There is an outlier of 12 phone calls.	<ul style="list-style-type: none"> <li>correctly identifies data is clustered <b>[1 mark]</b></li> <li>correctly identifies presence of an outlier <b>[1 mark]</b></li> </ul>										
8a)	$\text{Mean} = \frac{\sum x}{n}$ $= \frac{152}{12}$ $= 12.66\dots$ $\approx 13 \text{ goals}$	<ul style="list-style-type: none"> <li>correctly substitutes into appropriate rule <b>[1 mark]</b></li> <li>calculates mean <b>[1 mark]</b></li> <li>rounds to whole number <b>[1 mark]</b></li> </ul>										
8b)	<p>5, 6, 8, 10, 11, 12, 14, 15, 16, 16, 18, 21</p> <p>Median = middle score = 13  Minimum = 5  Maximum = 21</p> <p>Five-number summary:</p> <table border="1"> <thead> <tr> <th>min</th> <th>Q<sub>1</sub></th> <th>median</th> <th>Q<sub>3</sub></th> <th>max</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>9</td> <td>13</td> <td>16</td> <td>21</td> </tr> </tbody> </table>	min	Q <sub>1</sub>	median	Q <sub>3</sub>	max	5	9	13	16	21	<ul style="list-style-type: none"> <li>correctly orders the values <b>[1 mark]</b></li> <li>correctly determines the median <b>[1 mark]</b></li> <li>correctly determines the minimum and maximum <b>[1 mark]</b></li> <li>enters appropriate labels and corresponding values into table <b>[1 mark]</b></li> </ul>
min	Q <sub>1</sub>	median	Q <sub>3</sub>	max								
5	9	13	16	21								



Q	Sample response	The response:
9a)	Perimeter of inner hexagon $= 28 \times 6 = 168$ mm Perimeter of outer hexagon $= 36 \times 6 = 216$ mm	<ul style="list-style-type: none"> <li>• correctly multiplies each side length by 6 <b>[1 mark]</b></li> <li>• correctly calculates both perimeters <b>[1 mark]</b></li> </ul>
9b)	The circle's circumference is approximately 190 mm	<ul style="list-style-type: none"> <li>• estimates circumference in the range of 175–200 mm <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
10a)	<p>Scaled dimensions:  Width of square face and base of triangle  <math>= 30 \text{ cm} \div 10 = 3 \text{ cm}</math>  Perpendicular height of triangular face  <math>= 26 \text{ cm} \div 10 = 2.6 \text{ cm}</math></p>  <p style="text-align: right;">* example only</p>	<ul style="list-style-type: none"> <li>• correctly converts actual side lengths and perpendicular height using scale <b>[1 mark]</b></li> <li>• constructs accurate scale drawing of net showing all faces of birdhouse <b>[1 mark]</b></li> </ul>
10b)	<p>Area of square face, <math>A = bh</math>  <math>= 30 \times 30 = 900 \text{ cm}^2</math>  Area of triangular face, <math>A = \frac{1}{2}bh</math>  <math>= \frac{1}{2} \times 30 \times 26 = 390 \text{ cm}^2</math></p> <p>Total area of plywood  <math>=</math> area of two triangular faces + area of three square faces  <math>= 2 \times 390 + 3 \times 900</math>  <math>= 3480 \text{ cm}^2</math>  <math>= 0.348 \text{ m}^2</math></p>	<ul style="list-style-type: none"> <li>• correctly calculates the square face area <b>[1 mark]</b></li> <li>• correctly calculates the triangular face area <b>[1 mark]</b></li> <li>• calculates area of plywood <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
11	<p>Data generated from the 1st histogram: 1 2 2 3 3 3 4 4 4 4 5 5 5 6 6 7</p> <p>Mode = 4</p> <p>Median = middle value = 4</p> <p>Mean = <math>\frac{\sum x}{n}</math> = <math>\frac{64}{16}</math> = 4</p> <p>Data generated from the 2nd histogram: 2 2 2 2 2 3 3 3 4 4 4 5 6 7 7 8</p> <p>Mode = 2</p> <p>Median = middle value = 3.5</p> <p>Mean = <math>\frac{\sum x}{n}</math> = <math>\frac{64}{16}</math> = 4</p> <p>The mean is the same for both datasets, as is the total number of washing loads. Therefore, the reader's conclusion is valid.</p> <p>The first histogram is <b>symmetrical</b> and shows that in most weeks the household currently completes 4 loads of washing. The second histogram is positively <b>skewed</b> and shows that in most weeks the household could complete 2 loads of washing.</p> <p>This led the newspaper to claim a reduction in the average number of washing loads completed per week.</p>	<ul style="list-style-type: none"> <li>• correctly identifies the mode for each dataset <b>[1 mark]</b></li> <li>• correctly calculates median for each dataset <b>[1 mark]</b></li> <li>• correctly calculates mean for each dataset <b>[1 mark]</b></li> <li>• provides a justified statement about the reasonableness of the reader's conclusion <b>[1 mark]</b></li> <li>• provides a comparative statement about the shape of the histograms <b>[1 mark]</b></li> </ul>

## 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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