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# **GCSE MARKING SCHEME**

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**AUTUMN 2021**

**GCSE  
MATHEMATICS – NUMERACY  
UNIT 2 – HIGHER TIER  
3310U60-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2021 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

# WJEC GCSE MATHEMATICS – NUMERACY

## AUTUMN 2021 MARK SCHEME

| Unit 2: Higher Tier                                                                                                                                                                                                      | Mark           | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 1. (Height) $1.18 \times 1.5$ or equivalent<br>1.77(m)<br>(Area of skin) 1.9(m <sup>2</sup> )                                                                                                                            | M1<br>A1<br>A1 | CAO. Ignore any units given<br>CAO. Ignore any units given                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2(a) $37 + 34 + 20 + 28 + 21$<br><br>140 (students)                                                                                                                                                                      | M1<br><br>A1   | Allow M1 for <ul style="list-style-type: none"> <li>any 4 of the 5 readings correct in a sum of 5 non-zero readings, or</li> <li>for a total (<math>\neq 140</math> but) <math>140 \pm 2</math></li> <li>total of 140 seen with further working with 'their' final answer <math>\neq 140</math></li> </ul> Mark final answer                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2(b)<br><br>10 (seconds) to 15 (seconds)                                                                                                                                                                                 | B2             | Allow if considering the $0.5(n+1)$ th term throughout<br>FT 'their 140' provided 'their 140' > 100 throughout<br><br>Not from incorrect working<br>Allow for an inclusive or exclusive range of times<br><br>B1 for any of the following: <ul style="list-style-type: none"> <li>appropriate sight of <math>70</math> or <math>140 \div 2</math></li> <li>the answer 12.5 seconds</li> </ul>                                                                                                                                                                                                                                                                                                                                                        |
| 2(c) Selects or unambiguously implies 'Yes' with a reason, e.g.<br>'no students in group 30 to 35 seconds',<br>'last students started in 25 to 30 second range'                                                          | E1             | Allow the term 'finished' as meaning 'finished starting the task', e.g. 'Yes' with 'no student finished after 30 seconds'<br><br>Allow, 'yes' with a reason, e.g.<br>'all students started before 30 seconds',<br>'data stopped after 30 seconds',<br>'no students in the last group'<br><br>Allow selection of 'Can't tell' with a reason based on thinking 30 seconds may be included in the group 25 to 30, so some students could have taken exactly 30 seconds to start and not started within 30 seconds, that is thinking 'within 30 seconds' does not include '30 seconds'<br><br>Do not accept 'Yes' with a reason, e.g.<br>'no students after 27.5 seconds',<br>'all students between 27.5 and 32.5 seconds could start within 30 seconds' |
| 2(d) $\frac{37}{140} (\times 100)$ or $0.25 \times 140$<br>or $0.25 \times (37 + 34 + 20 + 28 + 21)$<br>or $\frac{37}{37 + 34 + 20 + 28 + 21} (\times 100)$<br><br>$26(.42...\%)$ or 35 (students)<br>AND 'No' indicated | M1<br><br>A1   | FT 'their derived 140' from (a) provided >100 with numerator 37 or 'their 37' if seen in (a)<br><br>Accept 0.26(...) only if 0.25 is seen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| <p>3. (To spend on \$) OR (Convert to \$)</p> $\begin{array}{l} 13/20 \times 500 \\ = (\pounds) 325 \end{array} \quad \begin{array}{l} 500 \times 1.36 \\ = (\$) 680 \end{array}$ <p>(Buying \$) <math>13/20 \times 500 \times 1.36</math><br/> <span style="float: right;">(\$ ) 442</span></p> <p>(As lowest note \$5 can only buy) (\$ ) 440</p> <p>(This will cost) <math>440 \div 1.36</math><br/> or <math>13/20 \times 500 - (442 - 440) \div 1.36</math><br/> or <math>325 - 2 \div 1.36</math><br/> <span style="float: right;">(£) 323.53 or (£)323.52(9...)</span></p> <p>(Money left to buy euros <math>500 - 323.53</math>) (£)176.47</p> | <p>M1<br/>A1</p> <p>M1<br/>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> | <p>May be embedded in further calculation</p> <p>FT 'their incorrectly evaluated <math>13/20 \times 500</math>'</p> <p>Allow equivalent given unambiguously in possible notes<br/> FT 'their derived 442' rounded down to the nearest multiple of 5<br/> If (\$ )442 in the answer space, only award if clearly showing 'buying \$440'</p> <p>FT 'their derived 442' and 'their derived 440' provided it is a multiple of 5</p> <p>FT provided to the nearest penny<br/> Do not FT from incorrect rounding of 'their £323.52(9...)'<br/> Note: <math>500 - 323.52 = (\pounds)176.48</math> is A0</p> <p><i>If unambiguous and clear correct response seen in working, ignore a slip in transferring (£)176.47 to the answer space.<br/> Ignore answers reversed in the answer space</i></p> |
| <p>3. <u>Alternative method:</u></p> <p>(To spend on \$) OR (Convert to \$)</p> $\begin{array}{l} 13/20 \times 500 \\ = (\pounds) 325 \end{array} \quad \begin{array}{l} 500 \times 1.36 \\ = (\$) 680 \end{array}$ <p>(Buying \$) <math>13/20 \times 500 \times 1.36</math><br/> <span style="float: right;">(\$ ) 442</span></p> <p>(As lowest note \$5 can only buy) (\$ ) 440</p> <p>(\$2 is worth) <math>(442 - 440) \div 1.36</math> or <math>2 \div 1.36</math><br/> <span style="float: right;">(£) 1.47(05..)</span></p> <p>(Money left to buy euros <math>500 - 325 + 1.47</math>) (£)176.47</p>                                             | <p>M1<br/>A1</p> <p>M1<br/>A1</p> <p>B1</p> <p>M1<br/>A1</p> <p>A1</p>    | <p>May be embedded in further calculation</p> <p>FT 'their incorrectly evaluated <math>13/20 \times 500</math>'</p> <p>Allow equivalent given unambiguously in possible notes<br/> FT 'their derived 442' rounded down to the nearest multiple of 5<br/> May be implied by use of \$2</p> <p>FT 'their derived 442' and 'their derived 440' provided it is a multiple of 5</p> <p>FT provided to the nearest penny<br/> Do not FT from incorrect rounding of 'their £1.47(05...)'</p> <p><i>If unambiguous and clear correct response seen in working, ignore a slip in transferring (£)176.47 to the answer space.<br/> Ignore answers reversed in the answer space</i></p>                                                                                                                |

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| <p>4. (Volume of a jug) <math>\pi \times 5^2 \times 28</math><br/> Answer in the range 2198 (cm<sup>3</sup>) to 2200 (cm<sup>3</sup>)<br/> or 700<math>\pi</math> (cm<sup>3</sup>)</p> <p>(Number of jugs needed) <math>170 \times 80 \div 2199(\dots)</math><br/> 6.1(84... jugs) or 6.2 (jugs) or 6 (jugs)<br/> 3 (full jugs left over)</p>                                                                                                                                                                           | <p>M1<br/>A1</p> <p>M1<br/>A1<br/>A1</p>       | <p>May be implied in further working</p> <p>FT 'their derived volume of a jug' provided<br/> &gt; 'their <math>170 \times 80 \div 10</math>'</p> <p>FT 10 – 'their 6.18...' (depends on previous M1)</p> <p><i>Note: For final M and A marks, allow if found from listing the capacity of a number of jugs</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>4. <u>Alternative method 1:</u><br/> (Volume of 10 jugs) <math>10 \times \pi \times 5^2 \times 28</math><br/> Answer in the range 21980 (cm<sup>3</sup>) to 22000 (cm<sup>3</sup>)<br/> or 7000<math>\pi</math> (cm<sup>3</sup>)</p> <p>(Volume left over = volume 10 jugs – 80 servings)<br/> = <math>10 \times \pi \times 5^2 \times 28 - 80 \times 170</math></p> <p>(Number of jugs left over) <math>8380 \div 2199(\dots)</math><br/> 3 (full jugs left over)</p>                                               | <p>M1<br/>A1</p> <p>M1</p> <p>m1</p> <p>A1</p> | <p>May be implied in further working</p> <p>(= 21980 – 13600)<br/> FT 'their derived volume of 10 jugs' provided<br/> &gt; 'their <math>170 \times 80</math>'<br/> <i>(Note: Correct answer is the range 8380 to 8394 cm<sup>3</sup>)</i></p> <p>(= 3.81...)<br/> FT 'their derived volume of 10 jugs' provided<br/> &gt; 'their <math>170 \times 80</math>'</p> <p><i>Note: For final M and A marks, allow if found from listing the capacity of a number of jugs</i></p>                                                                                                                                                                                                                                                                    |
| <p>4. <u>Alternative method 2:</u><br/> (Volume of a jug) <math>\pi \times 5^2 \times 28</math><br/> Answer in the range 2198 (cm<sup>3</sup>) to 2200 (cm<sup>3</sup>)<br/> or 700<math>\pi</math> (cm<sup>3</sup>)</p> <p>(Number of jugs left over) <math>10 - 80 \div (2199(\dots) \div 170)</math><br/> (= <math>10 - 80 \div 12.935\dots</math>)<br/> 3 (full jugs left over)</p>                                                                                                                                 | <p>M1<br/>A1</p> <p>M2</p> <p>A1</p>           | <p>May be implied in further working</p> <p>FT 'their derived volume of a jug' provided<br/> &gt; 'their <math>170 \times 80 \div 10</math>'</p> <p>M1 for sight of<br/> <math>80 \div (2199(\dots) \div 170)</math> (=6.1(84...))<br/> Do not allow A1 from truncation of 12.9(...) to 12</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p>4. <u>Alternative method 3:</u><br/> (Volume of 10 jugs) <math>10 \times \pi \times 5^2 \times 28</math><br/> Answer in the range 21980 (cm<sup>3</sup>) to 22000 (cm<sup>3</sup>)<br/> or 7000<math>\pi</math> (cm<sup>3</sup>)</p> <p>(Number of glasses not needed)<br/> <math>10 \times \pi \times 5^2 \times 28 \div 170 - 80</math></p> <p>(Number of jugs left over)<br/> <math>49.29\dots \div (2199(\dots) \div 170)</math><br/> or <math>49.29\dots \div 12.9\dots</math><br/> 3 (full jugs left over)</p> | <p>M1<br/>A1</p> <p>M1</p> <p>m1</p> <p>A1</p> | <p>May be implied in further working</p> <p>(= <math>21980 \div 170 - 80 = 49.29\dots</math>)<br/> FT 'their derived volume of 10 jugs' &gt; 'their <math>170 \times 80</math>'</p> <p>(= 3.81...)<br/> FT 'their <math>10 \times \pi \times 5^2 \times 28 \div 170 - 80</math>'</p> <p><i>Do not allow A1 from truncation of 12.9(...) to 12</i></p>                                                                                                                                                                                                                                                                                                                                                                                         |
| <p>Organisation and communication</p> <p>Writing</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>OC1</p> <p>W1</p>                           | <p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• present their response in a structured way</li> <li>• explain to the reader what they are doing at each step of their response</li> <li>• lay out their explanations and working in a way that is clear and logical</li> <li>• write a conclusion that draws together their results and explains what their answer means</li> </ul> <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>• show all their working</li> <li>• make few, if any, errors in spelling, punctuation and grammar</li> <li>• use correct mathematical form in their working</li> <li>• use appropriate terminology, units, etc.</li> </ul> |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|--------|-------|--------|--------|-------|--------|--------|-------|--------|--------|--------------|--------|---------------|-------|--------|--------|-------|--------|--------|
| <p>5(a) (Length<sup>2</sup> =) <math>4.2^2 + 1.1^2</math></p> <p>Length<sup>2</sup> = 18.85 or (Length =) <math>\sqrt{18.85}</math></p> <p>(Length) 4.3(416...m)</p> <p>Selects 4.4 m length</p> <p>(Number of panels needed is ) 7 (panels)</p> <p>(Cost of the shelter roof £24 × 7) (£) 168</p> | <p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>B1</p> <p>B1</p> | <p>Or alternative <b>full</b> method</p> <p>FT from M1, A0 for the correctly evaluated square root of 'their 18.85' provided 'their answer' &gt; 4.2 (m)<br/>If 4.3(4...) not seen, this A1 may be implied by the sight of choice of panel 4.4(m)<br/>Do not accept an unsupported answer of 4.3 (m)</p> <p>May be implied by use of £24 in further working<br/>FT where possible the length immediately &gt; 'their 4.3416...' provided M1 previously awarded and 'their 4.3416...' has not been rounded down or truncated to give a different length from the table</p> <p>Allow B1 for 8 (panels) (thinking overlap may be as much as approximately <math>\frac{1}{4}</math> of the width of a panel)<br/>Do not award B1 for 7 or 8 panels if incorrect logic from misinterpretation seen, e.g. working with area 26.05m<sup>2</sup> so buy 7 of the 4.1m panels with area 28.7m<sup>2</sup></p> <p>FT provided B1 previously awarded<br/>FT 'their derived 4.4' provided &gt; 4.2 m</p> <table border="1" data-bbox="970 925 1332 1021"> <tr><td>4.3 m</td><td>23 × 7</td><td>(£)161</td></tr> <tr><td>4.5 m</td><td>25 × 7</td><td>(£)175</td></tr> <tr><td>4.6 m</td><td>26 × 7</td><td>(£)182</td></tr> </table> <p>Allow for 8 panels:</p> <table border="1" data-bbox="970 1052 1332 1182"> <tr><td>4.3 m</td><td>23 × 8</td><td>(£)184</td></tr> <tr><td><b>4.4 m</b></td><td>24 × 8</td><td><b>(£)192</b></td></tr> <tr><td>4.5 m</td><td>25 × 8</td><td>(£)200</td></tr> <tr><td>4.6 m</td><td>26 × 8</td><td>(£)208</td></tr> </table> | 4.3 m | 23 × 7 | (£)161 | 4.5 m | 25 × 7 | (£)175 | 4.6 m | 26 × 7 | (£)182 | 4.3 m | 23 × 8 | (£)184 | <b>4.4 m</b> | 24 × 8 | <b>(£)192</b> | 4.5 m | 25 × 8 | (£)200 | 4.6 m | 26 × 8 | (£)208 |
| 4.3 m                                                                                                                                                                                                                                                                                              | 23 × 7                                                      | (£)161                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| 4.5 m                                                                                                                                                                                                                                                                                              | 25 × 7                                                      | (£)175                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| 4.6 m                                                                                                                                                                                                                                                                                              | 26 × 7                                                      | (£)182                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| 4.3 m                                                                                                                                                                                                                                                                                              | 23 × 8                                                      | (£)184                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| <b>4.4 m</b>                                                                                                                                                                                                                                                                                       | 24 × 8                                                      | <b>(£)192</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| 4.5 m                                                                                                                                                                                                                                                                                              | 25 × 8                                                      | (£)200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| 4.6 m                                                                                                                                                                                                                                                                                              | 26 × 8                                                      | (£)208                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |
| <p>5(b) tan angle between roof and wall = <math>\frac{4.2}{1.1}</math></p> <p>75.3(°)</p>                                                                                                                                                                                                          | <p>M1</p> <p>A3</p>                                         | <p>Or alternative <b>full</b> method</p> <p>Ignore incorrect units<br/>Must be to 3 significant figures<br/>A2 for 75.32(3...°) or 75(°)<br/>OR<br/>A1 for <math>\tan^{-1} \frac{4.2}{1.1}</math></p> <p>From an alternative full method, award A2 maximum for 'their accurate answer' with errors due to rounding or truncation in stages of working, if the final answer is given correct to 3 significant figures, or A1 otherwise</p> <p><i>Note:</i><br/><i>Use of tan angle between roof and wall = 1.1/4.2 is awarded M0 A0</i></p> <p><i>If no marks, award SC1 for 'their derived angle' given correctly to 3 significant figures<br/>(<math>\tan^{-1} 1.1/4.2 = 14.7(^{\circ})</math> to 3 significant figures)</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |        |        |       |        |        |       |        |        |       |        |        |              |        |               |       |        |        |       |        |        |

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| 6(a) (Arc length =) $\frac{145 \times \pi \times 3 \times 2}{360}$ or equivalent<br>$(= 29\pi/12 \text{ or } 7.58 \text{ to } 7.6)$<br>$+ 1.5 + 1.5 + 4 + 4$<br>$= 18.58 \text{ to } 18.6 \text{ (cm)}$     | M2<br><br>m1<br><br>A1 | M1 for $\frac{145 \times \pi \times 3}{360}$ or equivalent<br>$(= 29\pi/24 \text{ or } 3.79 \text{ to } 3.8)$<br><br>FT from M1<br><br>CAO. Accept an answer of $29\pi/12 + 11$<br>Allow a final answer of 19 (cm) provided 18.58 to 18.6 seen                                                                                                |
| 6(b)(i) (Area of sector =)<br>$\frac{145 \times \pi \times 1.5^2}{360} (\times 2)$<br>$(= 29\pi/16 \text{ or } 5.68 \text{ to } 5.7)$<br>$+ 4 \times 1.5$<br>$= 11.6(9...) \text{ (cm}^2\text{)}$           | M1<br><br>m1<br><br>A1 | $\frac{145 \times \pi \times 1.5^2}{360} (= 29\pi/32 \text{ or } 2.84(5...) \text{ to } 2.85)$<br><br>CAO. Accept values in the range 11.68 to 11.7 (cm <sup>2</sup> )<br>Accept an answer of $29\pi/16 + 6$<br>Allow a final answer of 11.6<br>Allow a final answer of 12 (cm <sup>2</sup> ) provided 11.6 or values from 11.68 to 11.7 seen |
| 6(b)(ii) $11.6(9...) \times 200^2$<br>$\div 100^2$ or equivalent<br>$= 46.7(765...) \text{ (m}^2\text{)}$                                                                                                   | M1<br>m1<br>A1         | FT 'their 11.6(9...)' from (b)(i)<br><br>Accept values in the range 46.7 to 46.8<br>Accept an answer of $29\pi/4 + 24$<br>Allow a final answer of 46.4 (from use of 11.6)<br>Allow 47 (m <sup>2</sup> ) from correct working<br>If no marks awarded, then 'their 11.6(9...)' $\times 4$ with a place value error implies M1m0A0               |
| 6(b)(ii) <i>Alternative method 1:</i><br>(Area of sector =)<br>$\frac{145 \times \pi \times 300^2}{360} (\times 2) + 800 \times 300$<br>$\div 100^2$ or equivalent<br>$= 46.7(765...) \text{ (m}^2\text{)}$ | M1<br><br>m1<br><br>A1 | $\frac{145 \times \pi \times 300^2 \times 2}{360} = 227650 \text{ to } 227795$<br><br>CAO. Accept values in the range 46.7 to 46.8<br>Accept an answer of $29\pi/4 + 24$<br>Allow 47 (m <sup>2</sup> ) from correct working                                                                                                                   |
| 6(b)(ii) <i>Alternative method 2:</i><br>(Area of sector =) $\frac{145 \times \pi \times 3^2}{360} (\times 2)$<br>$+ 8 \times 3$<br>$= 46.7(765...) \text{ (m}^2\text{)}$                                   | M1<br><br>m1<br><br>A1 | $\frac{145 \times \pi \times 3^2 \times 2}{360} = 22.765 \text{ to } 22.8$<br><br>CAO. Accept values in the range 46.7 to 46.8<br>Accept an answer of $29\pi/4 + 24$<br>Allow 47 (m <sup>2</sup> ) from correct working                                                                                                                       |
| 6(c)<br>(£)9.72<br>$\div 0.9 \text{ OR } \div 90 \times 100 \text{ } (= (£)10.8(0))$<br>$\div 0.8 \text{ OR } \div 80 \times 100$<br>$= (£) 13.5(0)$                                                        | M1<br>M1<br><br>A1     | These M1 marks may be awarded in any order<br>The intermediate answer if done in reverse order is (£)12.15<br>OR M2 for $9.72 \div 0.72$<br>CAO<br><br>If no marks awarded,<br>SC1 for an answer of (£)13.88 or (£)13.89<br>(from $9.72 \div 0.7$ )                                                                                           |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                        |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| 7(a)                         | 225°                                                                                                                                                                                                                                                                                                                                                                                                   | B1                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 7(b)(i)                      | $(AC =) \sqrt{215^2 + 165^2 - 2 \times 215 \times 165 \times \cos 69^\circ}$ $(\quad = \sqrt{48023(.7 \dots)} \quad)$ $= 219(.1 \dots) \quad (\text{km})$ <p>(Average speed =) <math>\frac{219(.1 \dots)}{0.5}</math> or equivalent</p> $= 438(.286 \dots) \quad (\text{km/h})$                                                                                                                        | M2<br><br>A1<br><br>M1<br><br>A1 | M1 for $AC^2 = 215^2 + 165^2 - 2 \times 215 \times 165 \times \cos 69^\circ$ or<br>M1 for $AC^2 = 48023(.7 \dots)$<br><br>FT 'their 219(.1...)' provided sine/cosine rules attempted<br>Ignore a subsequent attempt to convert units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 7(b)(ii)                     | $(BAC =) \sin^{-1} \left( \frac{\sin 69^\circ \times 165}{219(.1 \dots)} \right) \quad \text{or}$ $\cos^{-1} \left( \frac{215^2 + 219(.1 \dots)^2 - 165^2}{2 \times 215 \times 219(.1 \dots)} \right)$ $= 44.6 \text{ to } 44.7^\circ \text{ or } 45^\circ$ <p>(Bearing =) <math>360 - (180 - 114 - 44.6(6 \dots))'</math><br/> or <math>360 - (21.3(\dots) \text{ to } 21.4)</math></p> $= 339^\circ$ | M2<br><br>A1<br><br>M1<br><br>A1 | FT 'their 219(.1...)'<br>If their speed from (b)(i) is used for 'their 219(.1...)' then FT for a possible M2A0M0A0 only<br>M1 for <ul style="list-style-type: none"> <li><math>\frac{\sin BAC}{165} = \frac{\sin 69^\circ}{219(.1 \dots)}</math> or <math>\frac{165}{\sin BAC} = \frac{219(.1 \dots)}{\sin 69^\circ}</math></li> <li><math>\sin BAC = \left( \frac{\sin 69^\circ \times 165}{219(.1 \dots)} \right)</math> or</li> <li><math>165^2 = 215^2 + 219(.1 \dots)^2 - 2 \times 215 \times 219(.1 \dots) \times \cos BAC</math> or</li> <li><math>\cos BAC = \left( \frac{215^2 + 219(.1 \dots)^2 - 165^2}{2 \times 215 \times 219(.1 \dots)} \right)</math></li> </ul> FT 'their derived 44.6(6...)'<br>Or full alternative method starting with the calculation of ACB<br><br>Allow 338.6(6...) to 338.7° |
| 7(b)(ii) Alternative method: | $(ACB =) \sin^{-1} \left( \frac{\sin 69^\circ \times 215}{219(.1 \dots)} \right) \quad \text{or}$ $\cos^{-1} \left( \frac{165^2 + 219(.1 \dots)^2 - 215^2}{2 \times 165 \times 219(.1 \dots)} \right)$ $= 66.3 \text{ to } 66.43^\circ \text{ or } 66^\circ$ <p>(Bearing =) <math>360 - (66.3(\dots) - (114 - 69))</math><br/> or <math>360 - (66.3(\dots) - 45)</math></p> $= 339^\circ$              | M2<br><br>A1<br><br>M1<br><br>A1 | FT 'their 219(.1...)'<br>If their speed from (b)(i) is used for 'their 219(.1...)' then FT for a possible M2A0M0A0 only<br>M1 for <ul style="list-style-type: none"> <li><math>\frac{\sin ACB}{215} = \frac{\sin 69^\circ}{219(.1 \dots)}</math> or <math>\frac{215}{\sin ACB} = \frac{219(.1 \dots)}{\sin 69^\circ}</math></li> <li><math>\sin ACB = \left( \frac{\sin 69^\circ \times 215}{219(.1 \dots)} \right)</math> or</li> <li><math>215^2 = 165^2 + 219(.1 \dots)^2 - 2 \times 165 \times 219(.1 \dots) \times \cos ACB</math> or</li> <li><math>\cos ACB = \left( \frac{165^2 + 219(.1 \dots)^2 - 215^2}{2 \times 165 \times 219(.1 \dots)} \right)</math></li> </ul> FT 'their derived 66.3(...)'<br>Or full alternative method starting with the calculation of BAC<br><br>Allow 338.6(6...) to 338.7°  |

|                                                                                                                                                                                                                                                                                                                                                                       |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>8. (Difference in monthly payments =)</p> $\frac{0.0025 \times 17000}{1 - (1 + 0.0025)^{-48}} \text{ or } \frac{0.0025 \times 17000}{1 - (1 + 0.0025)^{-60}}$ <p>= (£)376.28(...) or (£)305.46(7...)</p><br>$\frac{0.0025 \times 17000}{1 - (1 + 0.0025)^{-48}} - \frac{0.0025 \times 17000}{1 - (1 + 0.0025)^{-60}}$ <p style="text-align: right;">= (£)70.81</p> | <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>                              | <p>Each expression may be seen in stages</p><br><br><br><br><p>Accept (£)70.82 or (£)70.815(8...) if accurate monthly payments used</p> <p>If no marks awarded,<br/>SC1 for a final answer of (£)0.08 or (£)0.09 or (£)0.088(2...) from using 0.25 instead of 0.0025<br/>OR<br/>SC1 for a final answer of (£)62.09 or (£)62.094(...) from using 0.025 instead of 0.0025<br/>OR<br/>SC1 for a final answer of (£)851.05 or (£)851.06 or (£)851.053(...) from using the correct rate with n = 4 and n = 5</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>9(a) (Hzntl distance from C to A =) 450 (cm)</p><br><p>(AB =) <math>\sqrt{400^2 + 450^2 + 480^2}</math></p><br><br><br><br><br><br><br><br><br><br><p style="text-align: right;">(AB =) 770 (cm)</p>                                                                                                                                                               | <p>B1</p> <p>M3</p><br><br><br><br><br><br><br><br><br><br><p>A1</p> | <p>May be seen in stages</p> <p>FT ‘their 450’ provided &lt; 600 AND provided not an underived 300 or 400 or 480</p> <p>M2 for</p> <ul style="list-style-type: none"> <li>• <math>\sqrt{400^2 + 'their\ 450'^2 + 480^2}</math> where <math>600 \leq 'their\ 450' &lt; 1200</math> OR ‘their 450’ = an underived 300 or 400 or 480, or</li> <li>• <math>400^2 + 450^2 + 480^2</math> with the same FT as for M3</li> </ul> <p>M1 (may be embedded in further working), with the same FT as for M3, for</p> <ul style="list-style-type: none"> <li>• <math>400^2 + 450^2</math> OR <math>450^2 + 480^2</math> OR <math>400^2 + 480^2</math> or</li> <li>• <math>\sqrt{400^2 + 450^2}</math> OR <math>\sqrt{450^2 + 480^2}</math> OR <math>\sqrt{400^2 + 480^2}</math><br/> <div style="display: flex; justify-content: space-around; font-size: small;"> <span>(= <math>\sqrt{362500}</math>)<br/>(=602.0(7...))</span> <span>(= <math>\sqrt{432900}</math>)<br/>(=657.9(5...))</span> <span>(= <math>\sqrt{390400}</math>)<br/>(=624.8(1...))</span> </div> </li> </ul> <p>CAO. Must be from <math>\sqrt{592900}</math></p> <p>Note: an answer of 770.0 (cm) is evidence of rounding an incorrect answer and is awarded A0</p> |
| <p>9(b) <math>2 \times 770 \div 45</math> (=34.222...)<br/>(Number of strips =) 35</p>                                                                                                                                                                                                                                                                                | <p>M1</p> <p>A1</p>                                                  | <p>FT ‘their 770’ from (a)</p> <p>Needs to be correctly rounded up</p> <p>If FT ‘their 770’, must come from doubling then rounding, not rounding then doubling</p> <p>Note: if <math>2 \times 'their\ 770' \div 45</math> results in an integer, then award M1A0</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |