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# **GCSE MARKING SCHEME**

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**AUTUMN 2023**

**GCSE  
MATHEMATICS – NUMERACY  
UNIT 2 – INTERMEDIATE TIER  
3310U40-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2023 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 2022 MARKING SCHEME

GCSE Numeracy Unit 2: Intermediate Tier	Mark	Comments
<p>1.</p> <p>Number of units            730</p> <p>Charge for units            <math>730 \times (0.)19</math></p> <p style="text-align: right;">(£) 138.7(0)</p> <p>Standing charge (<math>3 \times £6.50 =</math>)    (£) 19.5(0)</p> <p>Total charges                            (£) 158.2(0)</p> <p>VAT at 5%                                (£) 7.91</p> <p>Amount to pay                            (£) 166.11</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>B1</p>	<p>Answer spaces take precedence throughout</p> <p>For use of 730 or a <b>strict</b> FT 'their 730' from the first entry in the bill Award for sight of digits 1387(0)</p> <p>Must be in pounds</p> <p>Must be in pounds FT 'their 138.7(0)' + 'their 19.50' correctly evaluated, i.e. the sum of their 2 previous entries FT if total charges was previously given in the standing charge box, provided 'their cost of units' + 19.50 is correctly evaluated</p> <p>Must be in pounds FT 5% of 'their 158.2(0)' correctly evaluated</p> <p>FT provided</p> <ul style="list-style-type: none"> <li>B1 for total charges and B1 for VAT are both previously awarded, or</li> <li>is correctly evaluated 'their total charges' <math>\times 1.05</math></li> </ul> <p>On FT throughout, allow rounded or truncated to a penny.</p>
<p>2(a) <math>5 \times 42 - (40 + 37 + 39 + 48)</math> or <math>210 - 164</math> or equivalent OR <math>40 + 37 + 39 + 48 + \dots = 5 \times 42</math> or <math>164 + \dots = 210</math></p> <p style="text-align: right;">(Friday) 46 (mm)</p>	<p>M2</p> <p>A1</p>	<p>May be shown in stages Allow missing brackets as the intention to subtract</p> <p>M1 for sight of any one of the following:</p> <ul style="list-style-type: none"> <li><math>5 \times 42</math> or 210 (mm)</li> <li>the idea that <math>(40 + 37 + 39 + 48 + x) \div 5 = 42</math>, where x may be a gap, variable or a trial</li> </ul> <p>CAO. Do not award from incorrect working Answer space takes precedence Do not allow an embedded answer</p>
<p>2(a) <i>Alternative methods</i> (Difference from mean) <math>42 + 2 + 5 + 3 - 6</math> OR (Contributions to the mean each day) <math>5 \times (42 - \frac{40}{5} - \frac{37}{5} - \frac{39}{5} - \frac{48}{5})</math> or equivalent (<math>= 5 \times 9.2</math>)</p> <p style="text-align: right;">(Friday) 46 (mm)</p>	<p>M2</p> <p>A1</p>	<p>M1 for <math>42 - \frac{40}{5} - \frac{37}{5} - \frac{39}{5} - \frac{48}{5}</math></p> <p>CAO. Answer space takes precedence</p>

<p>2(b) <math>5 \times 42 \div 7</math> or <math>210 \div 7</math></p> <p>30 (mm)</p>	<p>M1</p> <p>Allow 'their 46' from (a) has been truncated or rounded, FT any of the following:</p> <ul style="list-style-type: none"> <li>• 'their <math>5 \times 42 \div 7</math></li> <li>• ('their <math>40 + 37 + 39 + 48</math>' + 'their 46') <math>\div 7</math></li> <li>• <math>(164 + \text{'their 46'}) \div 7</math></li> </ul> <p>A1</p> <p>Answer space takes precedence On FT, accept rounded or truncated answers provided working is shown</p>
<p>3. (Volume of the ornament is) <math>\frac{1}{3} \times 15 \times 15 \times 30</math> or <math>\frac{1}{3} \times 6750</math> or <math>6750 - \frac{2}{3} \times 6750</math> or equivalent</p> <p>2250 (cm<sup>3</sup>)</p>	<p>M2</p> <p>Allow also any of the following:</p> <ul style="list-style-type: none"> <li>• <math>0.33(3...) \times 15 \times 15 \times 30</math></li> <li>• <math>6750 - 0.66(6..) \times 6750</math></li> <li>• <math>6750 - 0.67 \times 6750</math></li> </ul> <p>M1 for sight of any of the following, or equivalents:</p> <ul style="list-style-type: none"> <li>• (Volume of the box is) <math>15 \times 15 \times 30</math> (= 6750 cm<sup>3</sup>)</li> <li>• <math>0.3 \times 15 \times 15 \times 30</math> (= 2025 cm<sup>3</sup>)</li> <li>• <math>\frac{2}{3} \times 15 \times 15 \times 30</math> (= 4500 cm<sup>3</sup>)</li> <li>• <math>0.6 \times 15 \times 15 \times 30</math> (= 4050 cm<sup>3</sup>)</li> <li>• <math>0.66 \times 15 \times 15 \times 30</math> (= 4455 cm<sup>3</sup>)</li> <li>• <math>0.67 \times 15 \times 15 \times 30</math> (= 4522.5 cm<sup>3</sup>)</li> <li>• <math>0.7 \times 15 \times 15 \times 30</math> (= 4725 cm<sup>3</sup>)</li> </ul> <p>A2</p> <p>CAO. Must be indicated and not ambiguously embedded</p> <p>A1 for any of the following:</p> <ul style="list-style-type: none"> <li>• <math>(15 \times 15 \times 30 =)</math> 6750 (cm<sup>3</sup>) May be embedded in an inappropriate calculation</li> <li>• 'their <math>15 \times 15 \times 30 \div 3</math> correctly evaluated</li> <li>• <math>(0.3(33..) \times 15 \times 15 \times 30)</math> 2025 (cm<sup>3</sup>) <math>\leq</math> 'their answer &lt; 2250 (cm<sup>3</sup>)</li> <li>• <math>(\frac{2}{3} \times 6750 =)</math> 4500 (cm<sup>3</sup>)</li> <li>• <math>(0.6 \times 15 \times 15 \times 30 \text{ to } 0.7 \times 15 \times 15 \times 30)</math> 4050 (cm<sup>3</sup>) <math>\leq</math> 'their answer <math>\leq</math> 4725 (cm<sup>3</sup>)</li> <li>• sight of a correct product with only 1 stage of calculation to evaluate, e.g. <ul style="list-style-type: none"> <li>○ <math>225 \times 10</math></li> <li>○ <math>5 \times 450</math></li> <li>○ <math>15 \times 150</math></li> <li>○ <math>75 \times 30</math></li> </ul> </li> </ul>
<p>3. Organisation and communication</p> <p>Writing</p>	<p>OC1</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>W1</p> <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>

<p>4(a) (Sale price)  <math>45 - 0.18 \times 45</math> or <math>45 \times (1 - 0.18)</math>  or <math>45 - 8.1(0)</math> or <math>45 \times 0.82</math>  (£)36.9(0)</p> <p>(Maggie's mum pays)  <math>8 \times 36.9(0) \div (8 + 1)</math> or <math>36.9(0) - 36.9(0) \div (8 + 1)</math>  <math>8 \times 4.1(0)</math> or <math>36.9(0) - 4.1(0)</math>  (£)32.8(0)</p>	<p>M1 A1 M1 A1</p>	<p>May be seen or implied in further working</p> <p>FT 'their £36.90'</p> <p>On FT allow rounded or truncated to a penny</p>
<p>4(a) <u>Alternative method</u>  (Maggie's mum's share of original price)  <math>8 \times 45 \div (8 + 1)</math> or <math>45 - 45 \div (8 + 1)</math>  (£) 40</p> <p>(Maggie's mum pays)  <math>40 - 0.18 \times 40</math> or <math>40 \times (1 - 0.18)</math>  or <math>40 - 7.2(0)</math> or <math>40 \times 0.82</math>  (£)32.8(0)</p>	<p>M1 A1 M1 A1</p>	<p>May be seen or implied in further working</p> <p>FT 'their £40'</p> <p>On FT allow rounded or truncated to a penny</p>
<p>4(b) (Area) <math>\frac{1}{2} \times 1.5 \times (3.1 + 4.5)</math>  5.7 (m<sup>2</sup>)</p> <p>(Charge) <math>2.5(0) \times 5.7</math>  (£) 14.25</p>	<p>M1 A1 M1 A1</p>	<p>Accept rounding to 6 (m<sup>2</sup>)  May be seen or implied in further working</p> <p>FT 'their 5.7' (including if previously rounded to 6),  including if 'their 5.7' is not an area  Allow if 'their area' is costed in parts provided there is  an attempt to sum all of the part costs, provided 'their  5.7' <math>\neq</math> 1.5, 3.1 or 4.5</p> <p>CAO</p>
<p>5(a)</p> <p>a = 54°  b = 54°  c = 78°</p>	<p>B1 B1 B1</p>	<p>Answer spaces take precedence, if blank check the  diagram</p> <p>FT 'their a'</p> <p>FT 132 – 'their a' or 132 – 'their b'</p>

<p>5(b)(i) (Number of revolutions is) <math>\frac{1000}{\pi \times 29 \div 12}</math>  or <math>\frac{1000 \times 12}{\pi \times 29}</math>  or equivalent</p> <p>Answer in the inclusive range 131 to 132 (revolutions)</p>	<p>M3</p> <p>A1</p>	<p>Complete method  May be seen in stages</p> <p>M2 for any one of the following, or equivalents:</p> <ul style="list-style-type: none"> <li>• <math>\pi \times 29 \div 12</math></li> <li>• <math>\frac{1000}{\pi \times 29}</math></li> <li>• <math>\frac{\pi \times 29}{1000 \times 12}</math></li> <li>• <math>\frac{1000}{\pi \times (29 \div 2) \div 12}</math></li> <li>• <math>\frac{1000}{\pi \times (2 \times 29) \div 12}</math></li> </ul> <p>M1 for any one of the following, that may be embedded in other working:</p> <ul style="list-style-type: none"> <li>• <math>29 \div 12</math> (= 2.4(1666...))</li> <li>• <math>1000 \times 12</math> (= 12000)</li> <li>• <math>\pi \times 29</math> (= 91.06 to 91.118)</li> <li>• <math>\frac{1000}{\pi \times n \div 12}</math> where <math>n \neq 0</math>, e.g. <math>1000 \times 12 \div (\pi \times 29^2)</math></li> <li>• <math>\frac{1000}{29 \div 12}</math> (= 413.79...)</li> <li>• <math>1000 \times 12 \div 29</math> (= 413.79...)</li> </ul> <p>CAO</p>
<p>5(b)(ii) <math>(10 \times) 29 \times 30 \div 12</math> or equivalent  or for an answer of 72.5</p> <p>725 (mm)</p>	<p>M2</p> <p>A1</p>	<p>Allow embedded with an incorrect change of units  Allow <math>(10 \times) 2.4(16...) \times 30</math></p> <p>M1 for any one of the following:</p> <ul style="list-style-type: none"> <li>• <math>30 \div 12</math> (= 2.5)</li> <li>• <math>29 \div 12</math> (= 2.4166...)</li> <li>• sight of 2.4, 2.41, 2.416(6...) or 2.42</li> <li>• sight of (1 inch =) 2.5 (cm)</li> </ul> <p>Answer space takes precedence  Allow answers in the range 720 (mm) to 726 (mm)  from premature approximation, not from incorrect working</p>
<p>5(c) (Average speed in km/h =) <math>\frac{48}{1.5}</math>  or equivalent</p> <p>32 (km/h)</p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of <math>\frac{48}{1.3}</math> or <math>\frac{48}{90}</math> or for answers of  36.9(...) or 37 or 0.53(33...)</p> <p>CAO. Answer space takes precedence</p>

<p>6(a)(i) Unambiguously indicates or states 'Yes' with a reason, e.g.          'both 25 kg to 35 kg',          'the highest frequencies at the same mass'</p>	<p>E1</p>	<p><i>Ignore any additional spurious or contradictory statements provided 'Yes' selected</i></p> <p>Allow 'Yes' with a reason, e.g.          'both at 30 kg',          'both at the same mass',          'both have the same mass',          'tallest (highest frequency) is 30 kg for both polygons'</p> <p>Do not accept 'Yes' with a reason, e.g.          'don't know',          'both in the same place',          'the groups have the same width',          'the graph tells us this'</p>
<p>6(a)(ii) Unambiguously indicates or states 'Can't tell' with a reason, e.g.          'there were 30 dogs with a masses between 15 kg and 25 kg',          'no raw data is given',          'the actual mass of each dog is not given',          'the data is grouped'</p>	<p>E1</p>	<p><i>Ignore any additional spurious or contradictory statements provided 'Can't tell' selected</i></p> <p>Allow 'Can't tell' with a reason, e.g.          'doesn't show this',          'you can't tell the exact number of dogs',          'doesn't give the amount of dogs'</p> <p>Do not accept 'Can't tell' with a reason, e.g.          'don't know',          'it is an estimate',          'it isn't accurate',          'because they can be anywhere from 10 kg to 20 kg'</p>
<p>6(a)(iii) Unambiguously indicates or states 'Correct' with a reason, e.g.          'Pencwm polygon shows a greater drop for greater masses',          'fewer dogs but more large dogs in Glanafon',          'more dogs in Pencwm, but fewer large dogs',          'about the same number of large dogs, with fewer dogs in Glanafon',          'about the same number of large dogs, with more dogs in Pencwm',</p>	<p>E1</p>	<p><i>Ignore any additional spurious or contradictory statements provided 'Correct' selected</i></p> <p><b>Do not</b> allow a reason based on calculations of proportions <b>alone</b>, e.g. Pencwm 27.5%, Glanafon 41.6%</p> <p>Allow 'Correct' with a reason, e.g.          'Pencwm (polygon) shows a steeper drop from 30 kg',          'line for Pencwm is steeper (drop)',          'Glanafon (polygon) has a less steep drop for larger dogs',          'the greater masses are more frequent (in Glanafon)',          '2 of the 3 points for Glanafon are above Pencwm',          'Pencwm line drops below Glanafon after 40 (kg)'</p> <p>Do not accept 'Correct' with a reason, e.g.          '36 dogs in Pencwm and 37 dogs in Glanafon' alone without considering proportion,          'the greatest is 45 kg',          'higher frequency in Glanafon',          'Pencwm is bigger but doesn't have higher proportion',          'as seen by the skew in (the) Glanafon (polygon)',          'seen by the shape (of the polygon) for Glanafon'</p>

<p>6(b) (Total number of dogs  <math>20 + 30 + 45 + 25 + 7 + 4 =</math> 131</p> <p><math>10 \times 20 + 20 \times 30 + 30 \times 45 + 40 \times 25 + 50 \times 7 + 60 \times 4</math>  <math>(= 200 + 600 + 1350 + 1000 + 350 + 240)</math>  <math>(= 3740)</math></p> <p><math>\div 131</math></p> <p>(28.5(496.... kg) so) 3.95 (kg) (less)</p>	<p>B1</p> <p>M1</p> <p>m1</p> <p>A2</p>	<p>May be implied by the sight of  <math>((20 + 30 + 45 + 25 + 7 + 4) \div 6 =) 21.8(33\dots)</math></p> <p>Ignore any additional products seen  FT 'their midpoints' provided at least 5 are within or at the bounds of the relevant groups  e.g. use of</p> <ul style="list-style-type: none"> <li>lower bounds of each group gives 3085</li> <li>upper bounds of each group gives 4395</li> </ul> <p>FT an error in summing 20, 30, 45, 25, 7 and 4</p> <p>CAO  ISW further rounding or truncation  Allow 4 (kg) from correct working  Accept (29 (kg) and) 3.5 (kg) from correct working</p> <p>Award A1 for any of the following as the final answer</p> <ul style="list-style-type: none"> <li>28.5(496.... kg)</li> <li>29 (kg) (from correct working)</li> </ul> <p>OR</p> <p>Award A1 on FT from M1 m1 previously awarded for a correct evaluation of 'their estimate mean' e.g. use of lower bounds gives <math>(3085/131 =) 23.54\dots</math></p>
<p><i>6(b) Alternative MS if Glanafon's last 2 points used for possible award of B1 M1 m1 only</i>  <i>(Sight of <math>20 + 30 + 45 + 25 + 10 + 7 =</math>) 137</i></p> <p><math>10 \times 20 + 20 \times 30 + 30 \times 45 + 40 \times 25 + 50 \times 10 + 60 \times 7</math>  <math>(= 200 + 600 + 1350 + 1000 + 500 + 420)</math>  <math>(= 4070)</math></p> <p><math>\div 137</math></p>	<p>B1</p> <p>M1</p> <p>m1</p>	<p>May be implied by the sight of  <math>((20 + 30 + 45 + 25 + 10 + 7) \div 6 =) 22.8(33\dots)</math></p> <p>Ignore any additional products seen  FT 'their midpoints' provided at least 5 are within or at the bounds of the relevant groups  e.g. use of</p> <ul style="list-style-type: none"> <li>lower bounds of each group gives 3385</li> <li>upper bounds of each group gives 4755</li> </ul> <p>FT an error in summing 20, 30, 45, 25, 10 and 7</p>
<p>7(a) <math>8 \times 1172 \div 5</math> or <math>1172 \times 1.6</math></p> <p>1875.2 (km)</p>	<p>M1</p> <p>A1</p>	<p>Do not allow <math>1172 \times 1.5</math></p> <p>Accept 1875 (km) from correct working  Answer space takes precedence</p>
<p>7(b) <math>0.366 \times 1000 \div 60</math></p> <p>6.1 (m/s)</p>	<p>M1</p> <p>A1</p>	<p>Accept 6 (m/s) from correct working  Answer space takes precedence</p>



<p>7(c) (Difference 60 million – 41 000 000 =) 19 000 000 or 19 million</p> <p>(Underspend) <math>\frac{19\,000\,000}{60\,000\,000} (\times 100)</math> or equivalent</p> <p>31.67(%)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>May be implied in further working Allow 19 m(il)</p> <p>FT 'their 60 million – 41 000 000' including if a place value error made</p> <p>CAO (must be 2 d.p.)</p> <p>Answer space takes precedence</p>
<p>7(c) <u>Alternative method</u> (Underspend)</p> <p>(100 –) <math>\frac{41\,000\,000}{60\,000\,000} (\times 100)</math> or equivalent</p> <p>31.67(%)</p>	<p>M1</p> <p>A2</p>	<p>Allow place value error</p> <p>CAO (must be 2 d.p.) Answer space takes precedence</p> <p>A1 for 31.6(6...%), 31.7(%), 32(%) or 68.33(%)</p>
<p>7(d) <math>4 \times 10^6</math></p>	<p>B1</p>	
<p>7(e) (Change to \$) <math>350 \times 1.25</math></p> <p>(\$)<math>437.5(0)</math></p> <p>(Only \$10 and \$50 notes available so he can buy) (\$)<math>430</math></p> <p>(Fewest number of notes making up \$430) 8 \$50 (notes) and 3 \$10 (notes)</p> <p>(Cost in £ to buy \$430 is) <math>430 \div 1.25</math> or <math>350 - 7.5(0) \div 1.25 (= 350 - 6)</math></p> <p>(£)<math>344</math></p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p><i>Do not penalise slips in giving incorrect use of £ for \$</i></p> <p>FT 'their (\$)<math>437.5(0)</math>' (provided not a multiple of 10) rounded down to nearest multiple of 10 Accept stated or implied as (\$)<math>7.50</math> can't be converted (\$)<math>430</math> implies previous M1 A1, provided not from incorrect working</p> <p>FT 'their \$430' provided it is a multiple of 10 (and provided M1 previously awarded) Must be fewest number of notes, that may be listed Sight of correct number of notes with no incorrect working implies previous A1, unless contradicted</p> <p>FT 'their whole number multiple of \$10' <math>\div 1.25</math> Ignore attempt at any further calculation if <math>430 \div 1.25</math> seen</p> <p>Must be &lt;(£)<math>350</math> <b>and</b> depends on M1 M1 previously awarded Mark final answer</p> <p>If final M0 A0, then award SC1 for (£) 6 (left) or similar on FT, provided not from incorrect or inappropriate working</p>
<p>7(e) <u>Alternative method</u> <math>\pounds 40 = \\$50</math> and <math>\pounds 8 = \\$10</math> 8 \$50 notes, 3 \$10 notes</p> <p>(Cost to buy £350 is) <math>8 \times 40 + 3 \times 8</math></p> <p>(£)<math>344</math></p>	<p>M1</p> <p>A3</p> <p>M1</p> <p>A1</p>	<p>A2 for 8 \$50 notes <b>and</b> sight of <math>350 - 8 \times 40</math> or equivalent OR A1 for 8 \$50 notes</p>

8(a)(i) $440 \times 48 \div 2.2$  9600 (kg)	M1 A1	May be seen in stages  Mark final answer Allow answers in the inclusive range 9588 to 9601 from premature approximation Answer space takes precedence
8(a)(ii) 230 000 000 000	B1	
8(b)  (Area) $2.47 \times 40000 \div 10000$ or equivalent 9.88 (acres)  (Density of trees) $615 \div 9.88$ 62(.2...trees per acre) (>60)	M1 A1  m1 A1	<b><u>Throughout, if 4 marks are awarded, penalise -1 if conclusion 'Yes' is not indicated</u></b> <b><u>On FT the conclusion may be different to 'Yes'</u></b>  May be implied in further working Allow 9.8 (acres), 9.9 (acres) or 10 (acres)  Depends on M1 m1 previously awarded
8(b) <u>Alternative method 1</u> (Area) $2.47 \times 40000 \div 10000$ or equivalent 9.88 (acres)  (Maximum number of trees) $9.88 \times 60$ 592(.8) (trees) or 593 (trees) (< 615)	M1 A1  m1 A1	May be implied in further working Allow 9.8 (acres), 9.9 (acres) or 10 (acres)  Depends on M1 m1 previously awarded Allow suitable rounding, e.g. 590 or 600
8(b) <u>Alternative method 2</u> (Area) $2.47 \times 40000 \div 10000$ or equivalent 9.88 (acres)  (Minimum area) $615 \div 60$ 10.25 (acres) (> 9.88)	M1 A1  M1 A1	May be implied in further working Allow 9.8 (acres), 9.9 (acres) or 10 (acres)  Do not allow embedded in further working Allow rounded to 10 (acres) provided 'their area' (9.88m <sup>2</sup> ) has not been rounded to 10
8(b) <u>Alternative method 3</u> (Minimum area) $615 \div 60$ 10.25 (acres)  (Convert to m <sup>2</sup> ) $10000 \times 10.25 \div 2.47$ 41 497(.97 m <sup>2</sup> ) or 41 498(m <sup>2</sup> ) (>40 000)	M1 A1  m1 A1	May be implied in further working Allow 10 (acres)  Depends on M1 m1 previously awarded Accept suitable rounding, e.g. 41 000 or 41 500
8(b) <u>Alternative method 4</u> (Trees in 2.47 acres) $615 \div (40000 \div 10000)$ or equivalent 153.75 (trees)  (Density of trees) $153.75 \div 2.47$ 62(.2...trees per acre) (> 60)	M1 A1  m1 A1	May be implied in further working Allow 153, 153.8 or 154 (trees)  Depends on M1 m1 previously awarded
8(b) <u>Alternative method 5</u> (Forest area per tree) $40000 \div 615$ 65(.0406.. m <sup>2</sup> )  (Fire risk, area per tree) $10000 \div (60 \times 2.47)$ 67(.476...m <sup>2</sup> ) (> 65)	M1 A1  M1 A1	Do not allow embedded in further working

8(c)(i) (Height of the tree =) $21 \times \tan 39$  17.(.... m)	M2  A1	OR <i>alternative full method</i> M1 for $\tan 39 = \frac{\text{height of tree}}{21}$  CAO
8(c)(i) <u>Alternative method 1</u> <i>Hypotenuse</i> = $21/\cos 39$ (= 27.02...) <b>AND</b> Height = $\sqrt{(27.(02)^2 - 21^2)}$  16.9(7...m) to 17.(0..m)	M2  A1	M1 for <i>Hypotenuse</i> = $21/\cos 39$ (= 27.02...) <b>AND</b> Height <sup>2</sup> = $27.(02)^2 - 21^2$  CAO
8(c)(i) <u>Alternative method 2</u> (Angle of elevation) $\tan^{-1} \frac{17}{21}$  38.9(9...°) or 39(°)	M2  A1	M1 <i>tan (elevation)</i> = $\frac{17}{21}$  CAO
8(c)(i) <u>Alternative method 3</u> (Horizontal distance) $\frac{17}{\tan 39}$  20.9(98...m) or 21m	M2  A1	M1 for $\tan 39 = \frac{17}{\text{distance}}$  CAO
8(c)(ii) diameter = $\frac{1.75}{\pi}$ or (radius =) $\frac{1.75}{2 \times \pi}$  (Area of cross section =) $\pi \times (1.75 \div 2\pi)^2$  $\times 17 \div 2$  (Volume) answer in the range 2.07 (m <sup>3</sup> ) to 2.15 (m <sup>3</sup> )	M2  M1  m1  A1	M1 for any one of the following: <ul style="list-style-type: none"> <li>1.75 = <math>\pi \times \text{diameter}</math></li> <li>1.75 = <math>2 \times \pi \times \text{radius}</math></li> </ul> (Note: radius = $\frac{7}{8\pi}$ m, radius $\approx 0.28$ m)  FT for 'their derived radius' provided it is from a calculation involving the use of $\pi$ (Note: area of cross section = $\frac{49}{64\pi}$ m <sup>2</sup> area of cross section $\approx 0.24$ m <sup>2</sup> )  FT provided previous M1 awarded  CAO, accept an answer of 2 (m <sup>3</sup> ) from correct working without sight of premature approximation leading to an answer outside the range
9. $2500 \times (1 - 0.23) \times (1 - 0.04)^{39} \times (1 + 0.14)^{10}$ or $2500 \times 0.77 \times 0.96^{39} \times 1.14^{10}$ or equivalent  (£) 1452(.30)	M3    A1	May be seen in stages  M2 for a product with any 3 correct terms OR M1 for a product with any 2 correct terms  CAO, ignore premature rounding in working provided answer is (£) 1452.(...), allow rounded to (£)1450 from correct working