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# **GCSE MARKING SCHEME**

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**AUTUMN 2023**

**GCSE  
MATHEMATICS – NUMERACY  
UNIT 1 – HIGHER TIER  
3310U50-1**

## **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 2023 MARKING SCHEME**

GCSE Numeracy Unit 1: Higher Tier	Mark	Comments
<p>1(a)(i) Correct statement of Pythagoras' theorem</p> <ul style="list-style-type: none"> <li>• <math>(\text{Height}^2 =) 50^2 - (60 \div 2)^2</math></li> <li>• <math>(\text{Height}^2 =) 50^2 - 30^2</math></li> <li>• <math>50^2 = \text{height}^2 + (60 \div 2)^2</math></li> <li>• <math>50^2 = \text{height}^2 + 30^2</math></li> </ul> <p>Correct stage of evaluation</p> <ul style="list-style-type: none"> <li>• <math>(\text{Height}^2 =) 2500 - 900</math></li> <li>• <math>(\text{Height}^2 =) 1600</math></li> <li>• sight of <math>\sqrt{1600}</math></li> <li>• <math>(\text{Height} =) \sqrt{(50^2 - 30^2)}</math></li> </ul> <p style="margin-left: 40px;"> <math>(\text{Height} =) \sqrt{1600}</math>                      <math>(\text{Height} = 40 \text{ mm})</math>  or <math>\text{Height}^2 = 1600</math>                      <math>(\text{Height} = 40 \text{ mm})</math>  or <math>1600 = 40^2</math>                              <math>(\text{Height} = 40 \text{ mm})</math> </p>	<p>M1</p> <p>A1</p> <p>A1</p>	<p><u>Clear indication that all measurements have been converted to 3cm, 5cm, 4cm may be awarded all marks</u></p> <p>Working must be seen Allow M1 A1 for a slip in the initial notation then corrected at this evaluation stage</p> <p>Mark final answer A0 for an incorrect statement, e.g. <math>\sqrt{1600} = 40^2</math></p>
<p>1(a)(i) <u>Alternative method 1</u> Identifies the relationship '3, 4, 5' and relates to the given (right-angled) triangle, e.g. sight of</p> <ul style="list-style-type: none"> <li>• 3, 4, 5 and 30(mm), 40(mm), 50(mm)</li> <li>• 3cm, 4cm, 5cm</li> <li>• 3, 4, 5 and '× 10'</li> <li>• 30, 40, 50 and '÷ 10'</li> </ul> <p><b>AND</b> a statement or conclusion, e.g.</p> <ul style="list-style-type: none"> <li>• Pythagorean triple</li> <li>• Right-angled triangle</li> <li>• 3, 4, 5 triangle means it would be 30, 40, 50 triangle</li> </ul>	<p>B3</p>	<p>For B3 there <b>must</b> be an accompanying statement or conclusion</p> <p>B2 for identifying the relationship '3, 4, 5' and relates to the given(right-angled) triangle</p> <ul style="list-style-type: none"> <li>• without a conclusion or statement, or</li> <li>• with an incorrect conclusion or statement</li> </ul> <p>B1 for sight of any one of the following:</p> <ul style="list-style-type: none"> <li>• '3, 4, 5'</li> <li>• 30 (mm) and 40 (mm) appropriately indicated on the diagram</li> <li>• A <b>right-angled</b> triangle drawn (with or without 90° indicated) appropriately labelled 30 (mm), 40 (mm) and 50 (mm)</li> </ul>
<p>1(a)(i) <u>Alternative method 2</u> Assuming height as 40mm with use of 50mm or 30mm within a correct statement of Pythagoras' Theorem, e.g.</p> <ul style="list-style-type: none"> <li>• <math>((\frac{1}{2} \text{ base})^2 =) 50^2 - 40^2</math></li> <li>• <math>50^2 = 40^2 + x^2</math></li> <li>• <math>((\text{hypotenuse})^2 =) 40^2 + 30^2</math></li> </ul> <p>Correct stage of evaluation, e.g.</p> <ul style="list-style-type: none"> <li>• <math>((\frac{1}{2} \text{ base})^2 = 50^2 - 40^2 =) 900</math></li> <li>• <math>(\frac{1}{2} \text{ base} =) \sqrt{900}</math></li> <li>• <math>((\text{hypotenuse})^2 = 40^2 + 30^2 =) 2500</math></li> <li>• <math>(\text{hypotenuse} =) (\frac{1}{2} \text{ base} =) \sqrt{2500}</math></li> </ul> <p>Appropriate full evaluation, e.g.</p> <ul style="list-style-type: none"> <li>• <math>(\frac{1}{2} \text{ base} =) 30 \text{ (mm)}</math></li> <li>• <math>(\text{hypotenuse} =) 50 \text{ (mm)}</math></li> </ul>	<p>M1</p> <p>A1</p> <p>A1</p>	<p><u>Clear indication that all measurements have been converted to 3cm, 5cm, 4cm may be awarded all marks</u></p> <p>Working must be seen</p> <p>Mark final answer</p>
<p>1(a)(ii) (Volume) <math>\frac{1}{2} \times 60 \times 40 \times 20</math> or equivalent</p> <p style="margin-left: 100px;"><math>24\,000 \text{ (mm}^3\text{)}</math>      <math>(&gt; 20\,000 \text{ mm}^3)</math></p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of area of X-section possibly in stages, <math>\frac{1}{2} \times 60 \times 40</math> or <math>\frac{1}{2} \times 30 \times 40 + \frac{1}{2} \times 30 \times 40</math> (= 1200 mm<sup>2</sup>)</p> <p>CAO</p>

<p>1(b) Sight of or implication that:  <math>5 \times \text{number of people} + 105 = 207 + 3 \times \text{number of people}</math>  or <math>5x + 105 = 207 + 3x</math></p> <p><math>(5 - 3) \times \text{number of people} = 207 - 105</math></p> <p>or <math>\text{number of people} = \frac{207-105}{5-3}</math></p> <p>or <math>5x - 3x = 207 - 105</math>  or <math>2x = 102</math></p> <p style="text-align: right;">51 (people)</p>	<p>M1</p> <p>m1</p> <p>A1</p>	<p>Implication includes attempt to balance costing for the same number of people <math>\geq 3</math> at each venue, e.g.</p> <ul style="list-style-type: none"> <li>(10 people) <math>5 \times 10 + 105</math> with <math>207 + 3 \times 10</math></li> <li>(110, 115,) 120 with (210, 213,) 216</li> </ul> <p>Includes correctly evaluated trial to attempt to balance costing for the same number of people at each venue provided  'their trial for <math>30 \leq \text{the number of people} \leq 70</math>', e.g. correct costing for both venues for 40 people as (FH) (£)305 and (ML) (£)327</p> <p>From M1, allow 1 slip in the rearrangement of 'their equation' provided 'their equation' is then simplified to <math>ax = b</math>, where <math>a \neq 0</math> and <math>b \neq 0</math></p> <p>Sight of cost (£)360 for each venue implies M1 m1</p> <p>CAO</p> <p>If no marks, award SC1 for finding the number of (whole) people for the same cost at each venue, provided the cost is <math>&gt; (\text{£}) 220</math>, e.g.</p>
<p>2.</p> <p><math>(4(. )40 \div 3.3) \times 9 \div 10</math> <span style="float: right;"><math>(= \frac{4(00)}{3} \times \frac{9}{10})</math></span></p> <p>or <math>(\frac{9}{10} \times 4(. )40) \div 3.3</math> <span style="float: right;"><math>(= \frac{3.96}{3.3})</math></span></p> <p>or <math>4 \times \frac{9}{10} \div 3</math> <span style="float: right;"><math>(= \frac{3.60}{3})</math></span></p> <p>or equivalent full method</p> <p style="text-align: right;">(£)1.2(0) or 120(p)</p>	<p>M2</p> <p>A2</p>	<p><u>Accept equivalent in pence throughout</u>  M1 for any one of the following or equivalent:</p> <ul style="list-style-type: none"> <li>(1kg Sparkle costs) <math>4(. )40 \div 3.3</math> <span style="float: right;"><math>(= \frac{4(00)}{3})</math></span></li> <li>(3.3kg Dazzle costs) <math>\frac{9}{10} \times 4(. )40</math> <span style="float: right;"><math>(= 3(. )96)</math></span></li> <li>(3kg Dazzle costs) <math>4 \times \frac{9}{10}</math> <span style="float: right;"><math>(= 3(. )60)</math></span></li> <li>(3kg Sparkle costs) <math>4(. )00</math></li> </ul> <p>CAO. If units are given they must be correct</p> <p>Do not award A2 or A1 from incorrect working</p> <p>Award A1 (from M1 or M2) for any one of the following:</p> <ul style="list-style-type: none"> <li>(1kg Sparkle costs) <math>\frac{4(00)}{3}</math> or 1.33(...) or 133(..)</li> <li>(3.3kg Dazzle costs) 3(. )96</li> <li>(3kg Dazzle costs) 3(. )60</li> </ul> <p>Award A1 (from M2) for a correctly evaluated FT, with final answer rounded or truncated to a penny, for any one of the following:</p> <ul style="list-style-type: none"> <li>'their <math>4(. )40 \div 3.3' \times \frac{9}{10}</math></li> <li>'their <math>\frac{9}{10} \times 4(. )40' \div 3.3</math></li> <li>'their <math>4 \times \frac{9}{10}' \div 3</math></li> </ul>

<p>3(a)(i) (2.5, 42) stated with a suitable line of best fit drawn through this point</p>	<p>B2</p>	<p>For B2 do not ignore the answer space stating an incorrect point, or giving reverse coordinates</p> <p>Conditions of a suitable line of best fit:</p> <ul style="list-style-type: none"> <li>• The straight line (accept intention if a ruler is not used) must have points above and below it</li> <li>• The line must be of sufficient length, to illustrate trend for at least 6 points</li> <li>• The trend shows that there are points above and below the line towards each end of the line</li> </ul> <p>For B2 the point (2.5, 42) <b>must</b> be stated or plotted with a suitable line of best fit through this point. If (2.5, 42) is not stated or plotted, then it is only possible to award a maximum of B1</p> <p>Allow B2 for one of the following:</p> <ul style="list-style-type: none"> <li>• a blank answer space with (2.5, 42) plotted with a suitable line of best fit through (2.5, 42)</li> <li>• (2.5, 42) stated in the answer space, but not plotted, with suitable line of best fit passing through (2.5, 42)</li> </ul> <p>B1 for sight of any one of the following:</p> <ul style="list-style-type: none"> <li>• (2.5, 42) stated in the answer space</li> <li>• blank answer space with (2.5, 42) indicated by a correct plot</li> <li>• A suitable line of best fit for the given points: <ul style="list-style-type: none"> <li>○ with no additional point plotted</li> <li>○ passing through 'their additional incorrect point' (plotted)</li> <li>○ suitable if 'their additional incorrect point' plotted is ignored</li> </ul> </li> </ul>
<p>3(a)(ii) Reading from line of best fit for number of cups (tolerance to the nearest gridline) for rainfall of 2.0 mm</p>	<p>B1</p>	<p>Answer space takes precedence <b>STRICT FT</b> from (a)(i) 'their line of best fit' which must be drawn for negative correlation No mark is awarded if no line of best fit drawn in (a)(i)</p>
<p>3(b) <math>5 \times 18 + 5 \times 0.5</math> or <math>18.5 \times 5</math> 92.5 (cm)</p>	<p>M1 A1</p>	<p>Allow for <math>18 &lt; \text{'their 18.5'} \leq 19</math> CAO</p> <p>If no marks, award SC1 for sight of 18.5 (cm) or 18.4999(... cm) provided clearly a recurring 9 digit</p>
<p>3(c) Selects or unambiguously implies 'No' with a reason, e.g. '(Space) minimum 97.25 (cm) (which is less than 97.3 cm)'</p>	<p>E1</p>	<p>Allow 'No' with a reason, e.g. '97.25 (cm)' '(least) 97.25 and (greatest) 97.75'</p> <p>Do not accept 'No' with the reason, e.g. '97.75 (cm)'</p>

<p>4(a)(i) Entries 146 and 160 in the table and the cumulative frequency diagram completed correctly (correct plots (11, 146) and (13, 160) and all plots joined)</p>	<p>B2</p>	<p>B1 for any one of the following:</p> <ul style="list-style-type: none"> <li>• 146 and 160 in the table, correct plots but <b>not</b> joined</li> <li>• 146 and 160 in the table, with one correct plot and one incorrect plot in completing the <b>cumulative</b> frequency diagram with plots joined</li> <li>• one error in the table, including FT 'their 146' + 14 and these <b>cumulative</b> entries used correctly to complete the <b>cumulative</b> frequency diagram with plots joined</li> <li>• correct cumulative frequency diagram with plots joined, with incorrect, incomplete or not attempted entries in the table</li> </ul>
<p>4(a)(ii) 8.2 to 8.4 (minutes)</p>	<p>B1</p>	<p>Answer space takes precedence Allow 8 minutes 12 seconds to 8 minutes 24 seconds</p> <p>FT reading from the graph for 'their median', from <math>\frac{1}{2} \times</math> 'their 160', provided 'their 160' <math>\geq 110</math>, with a tolerance of <math>\frac{1}{2}</math> small square from 'their <b>cumulative</b> frequency graph', provided it is possible to read 'their median' from the vertical axis on the graph paper provided</p>
<p>4(a)(iii) 7.2 minutes</p>	<p>B1</p>	<p>Answer space in the statement takes precedence, if blank award for indication of '7.2' (circled) in the list</p> <p>Allow '7' in the answer space provided 7.2 indicated in the list Do not accept '8' in the answer space if 7.2 indicated in the list</p>
<p>4(a)(iv) <math>\frac{20}{160} (\times 100)</math> or <math>\frac{1}{2} \times 25</math> (%) or equivalent  12.5 (%) or 12½ (%)</p>	<p>M1  A1</p>	<p>FT for <math>(100 \times) 20</math>/'their 160', provided 'their 160' &gt; 106</p> <p>On FT allow rounding or truncation to 1 decimal place</p>
<p>4(b) (Costs are 180 + 220) (£) 400 <b>AND</b> (Profit is 700 – 180 – 220) (£) 300 <b>OR</b> (Receipts / Costs =) <math>\frac{700}{400} (\times 100)</math></p> <p>(Percentage profit is) <math>\frac{300}{400} (\times 100)</math> or <math>\frac{700}{400} (\times 100) - 1 (\times 100)</math>  75 (%)</p>	<p>B1  M1  A1</p>	<p>May be embedded, e.g. 700 – 400 = 300 (= 1.75 or 175%)</p> <p>FT 'their 400' and 700 – 'their 400' provided their costs or profit are <math>\neq 180</math>, <math>\neq 220</math> and <math>\neq 700</math></p> <p>CAO</p> <p>Allow if all costs and the total are consistently multiplied by 3.</p>
<p>4(c) <math>8(.)40 \div 1(.)20</math> or <math>8(.)40 - 8(.)40 \div 6</math> or equivalent  (£) 7 or 700 (p)</p>	<p>M1  A1</p>	<p>Accept a <b>complete</b> and <b>convincing</b> method of trial and improvement</p> <p>If units are given they must be correct</p> <p>Sight of <math>7 + 1.40 = 8.40</math> is awarded M1 A0 unless (£)7 is selected</p>

5(a)(i) King Edward and 90(g)	B1	
5(a)(ii) (90 – 52 =) 38(g)	B2	Do not award from sight of any incorrect working  B1 for sight of any of the following: <ul style="list-style-type: none"> <li>• 52 <b>and</b> 90</li> <li>• Sight of 90 and 50 &lt; ‘their lowest mass’ ≤ 54 <b>and</b> 90 – ‘their lowest mass’ correctly evaluated</li> <li>• Answer of 35(g) <b>and</b> unambiguous selection of <ul style="list-style-type: none"> <li>○ (King Edward) 98 and 63 or</li> <li>○ (Desiree) 88 and 53</li> </ul> </li> </ul>
5(b) Selects: Desiree, <b>and</b> Interquartile range <b>and</b> less than for the other 2 varieties	E1	
6. (Width of poster) $2 \times \frac{26.4}{2.4}$ or $2 \times 11$ or equivalent 22 (cm)	M1 A1	Mark final answer for the width of the poster
(Perimeter of poster $2 \times (22 + 26.4) =$ ) 96.8 (cm)	A1	FT ‘their 22’ provided M1 previously awarded
100 (cm)	B1	FT provided 95 < ‘their 96.8’ <100, as 100 correct to 1 significant figure  Accept working in mm or m, units must then be given in the final answer  Do not accept an unsupported answer of 100 (cm)
<u>6. Alternative method</u> (Perimeter of stamp) 8.8 (cm) <b>AND</b> sight of $\frac{26.4}{2.4}$ (= 11) or $\frac{2.4}{26.4}$ (= $\frac{1}{11}$ )	B1	
(Perimeter of poster) $(2 + 2.4 + 2 + 2.4) \times \frac{26.4}{2.4}$ or $8.8 \times \frac{26.4}{2.4}$ or $8.8 \times 11$ or equivalent	M1	FT ‘their 2 + 2.4 + 2 + 2.4’
96.8 (cm)	A1	
100 (cm)	B1	FT provided 95 < ‘their 96.8’ <100, as 100 correct to 1 significant figure  Accept working in mm or m, units must then be given in the final answer  Do not accept an unsupported answer of 100 (cm)

<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>
<p>7(a) <math>\frac{2 \times 10^3}{2 \times 10^5} (\times 100)</math> or equivalent = 1 (%)</p>	<p>M1</p> <p>A1</p>	<p>e.g. <math>\frac{2000}{200\,000} (\times 100)</math></p>
<p>7(b) <math>(0.02 \times 10^5) + (3.98 \times 10^5)</math> or <math>2000 + 398\,000</math> OR <math>(0.2 \times 10^6) + (1.2 \times 10^6)</math> or <math>200\,000 + 1\,200\,000</math> = 400 000 AND 1 400 000</p> <p>(Fraction that was electrified =) <math>\frac{400\,000}{1\,400\,000}</math> or equivalent</p> <p>= <math>\frac{2}{7}</math></p>	<p>M1</p> <p>A2</p> <p>B1</p> <p>B1</p>	<p>Or equivalents</p> <p>Or equivalents e.g. <math>(4 \times 10^5)</math> AND <math>(1.4 \times 10^6)</math> Note: these do not need to be in correct standard form notation A1 for each</p> <p>e.g. <math>\frac{4 \times 10^5}{1.4 \times 10^6}</math> Must not involve sums within the numerator or denominator FT 'their 400 000' and 'their 1 400 000' provided not the USA figures <i>e.g. for use of the rest of the world's data</i> B1 for <math>\frac{3.98 \times 10^5}{1.2 \times 10^6}</math> or equivalent</p> <p>Mark final answer FT 'their 400 000' and 'their 1 400 000' provided equivalent level of difficulty <i>e.g. for use of the rest of the world's data</i> B1 for <math>\frac{199}{600}</math> Ignore attempt to convert to a %</p>

<p>8.</p> $70 \times \left(\frac{1}{2} + \frac{1}{10}\right) \text{ or } \times \left(\frac{28}{56} + \frac{1}{10}\right) \text{ or } \times 0.6$ $\div 1.75 \text{ or } \times \frac{4}{7} \text{ or equivalent}$ $\times 11$ $= 264 \text{ (miles)}$	<p>M2</p> <p>M1</p> <p>m1</p> <p>A2</p>	<p>M2 and M1 can be performed in either order, but have to come from starting with 70</p> <p>May be embedded within incorrect work M1 for:</p> <ul style="list-style-type: none"> <li>• <math>\times \left(\frac{1}{2} + \dots\right) \text{ or } \times \left(\frac{28}{56} + \dots\right) \text{ OR}</math></li> <li>• <math>\times \left(\dots + \frac{1}{10}\right)</math></li> </ul> <p>Accept use of <math>\div</math> (1.748 to 1.76) or <math>\times</math> (0.568 to 0.572)</p> <p>FT from at least one M1 previously awarded</p> <p>CAO A1 for:</p> <ul style="list-style-type: none"> <li>• sight of 42 (pints) or</li> <li>• sight of 24 (litres) or</li> <li>• a correct answer on FT only from an error in converting to litres</li> </ul> <p>Allow (for possibly all marks) one rounding/truncation step from using an accepted conversion from pints to litres e.g. <u>use of <math>\times 0.57</math> for the conversion to litres</u>  <math>42 \times 0.57 = 23.94</math> (possibly rounded to 24) or  <math>42 \times 0.57 \times 11 = 263.34</math> (possibly rounded to 263)</p>
<p>8. <u>Alternative method:</u></p> $11 \div 1.75 \text{ or } \times \frac{4}{7} \text{ or equivalent}$ $\times \left(\frac{1}{2} + \frac{1}{10}\right) \text{ or } \times \left(\frac{28}{56} + \frac{1}{10}\right) \text{ or } \times 0.6$ $\times 70$ $= 264 \text{ (miles)}$	<p>M1</p> <p>M2</p> <p>m1</p> <p>A2</p>	<p><i>M1 and M2 can be performed in either order, but have to come from starting with 11</i></p> <p>Accept use of <math>\div</math> (1.748 to 1.76) or <math>\times</math> (0.568 to 0.572)</p> <p>May be embedded within incorrect work M1 for:</p> <ul style="list-style-type: none"> <li>• <math>\times \left(\frac{1}{2} + \dots\right) \text{ or } \times \left(\frac{28}{56} + \dots\right) \text{ OR}</math></li> <li>• <math>\times \left(\dots + \frac{1}{10}\right)</math></li> </ul> <p>FT from at least one M1 previously awarded</p> <p>CAO A1 for:</p> <ul style="list-style-type: none"> <li>• <i>sight of <math>\frac{44}{7}</math> (miles per pint) or equivalent</i></li> <li>• a correct answer on FT only from an error in converting 11 miles per litre into miles per pint</li> </ul> <p>Allow (for possibly all marks) one rounding/truncation step from using an accepted conversion from pints to litres e.g. <u>use of <math>\times 0.57</math> for the conversion to litres</u>  <math>11 \times 0.57 = 6.27</math> (truncated/rounded to 6.2 or 6.3, <b>but not 6</b>) or  <math>11 \times 0.57 \times 0.6 = 3.762</math> (truncated/rounded to 3.7 or 3.8, <b>but not 4</b>)</p>

<p>9(a)</p> <p>5</p> <p><math>\times \frac{240}{100}</math> or <math>\times 2.4</math> or equivalent</p> <p><math>\times \frac{4}{3}</math> or <math>\times 1.333\dots</math> or equivalent</p> <p>= 16 (delivery vans)</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p><u>A table method altering all 3 in the same manner at the same time is M0</u></p> <p>M marks may be seen in either order e.g. <math>\frac{\text{Time}}{4}</math> <math>\frac{\text{Houses}}{240}</math> <math>\frac{\text{Vans}}{12}</math></p> <p>FT from M0 previously awarded Must be from use of 5 e.g. if this calculation is performed first <math>\frac{\text{Time}}{3}</math> <math>\frac{\text{Houses}}{100}</math> <math>\frac{\text{Vans}}{6.66\dots}</math></p> <p>CAO</p>
<p>9(a) <u>Alternative method 1:</u></p> <p><math>\frac{100}{4 \times 5}</math> (=5 houses per hour per van)</p> <p><math>\frac{240}{100 \div (4 \times 5) \times 3}</math> or <math>\frac{240}{5 \times 3}</math></p> <p>= 16 (delivery vans)</p>	<p>M1</p> <p>m1</p> <p>A1</p>	<p>CAO</p>
<p>9(a) <u>Alternative method 2:</u></p> <p><math>\frac{\text{Time}}{3}</math> <math>\frac{\text{Houses}}{75}</math> <math>\frac{\text{Vans}}{5}</math> OR</p> <p>9.6 (or 9h36m) 240 5</p> <p><math>5 \times \frac{240}{75}</math> OR <math>5 \times \frac{9.6}{3}</math> or <math>5 \times 3.2</math> or equivalent</p> <p>= 16 (delivery vans)</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p>FT from 3 (time), n houses, 5 vans for <math>5 \times \frac{240}{n}</math></p> <p>FT from n (time), 240 houses, 5 vans for <math>5 \times \frac{n}{3}</math></p> <p>CAO</p>
<p>9(b)</p> <p>Sight of <math>\frac{\text{angle}}{360} \times \pi \times 3^2</math> or equivalent</p> <p><math>\frac{140 \times \pi \times 3^2}{360} + \frac{110 \times \pi \times 3^2}{360} + \frac{70 \times \pi \times 3^2}{360}</math> or equivalent</p> <p><math>(7\pi/2)</math> <math>(11\pi/4)</math> <math>(7\pi/4)</math></p> <p><math>+ 3 \times 12 \times 3 + 22 \times 3</math></p> <p>= <math>8\pi + 174</math> (cm<sup>2</sup>)</p>	<p>B1</p> <p>M2</p> <p>m1</p> <p>A2</p>	<p>Allow use of <math>\pi = 3.14</math> to <math>3.142</math> for B and M marks, but not for A marks</p> <p>For any of the angles <math>140^\circ</math>, <math>110^\circ</math>, <math>70^\circ</math>, <math>140+110+70</math> or <math>320</math></p> <p>e.g. <math>\frac{(140+110+70) \times \pi \times 3^2}{360}</math> or <math>\frac{320 \times \pi \times 3^2}{360}</math> or <math>8\pi</math></p> <p>M1 for the sum of any 2 correct terms OR M1 for <math>\frac{x}{360} \times \pi \times 3^2</math> where <math>300 \leq x &lt; 360</math> if <math>140+110+70</math> not seen The award of M2 or M1 implies the previous B1</p> <p>FT from M1</p> <p>CAO. Mark final answer A1 (does not depend on m1 being awarded) for any one of the following seen</p> <ul style="list-style-type: none"> <li><math>\frac{2880\pi}{360} + \dots</math> or equivalent</li> <li><math>7\pi/2 + 11\pi/4 + 7\pi/4 + \dots</math></li> <li><math>3.5\pi + 2.75\pi + 1.75\pi + \dots</math></li> <li><math>8\pi</math></li> </ul>

<p>9(c) <math>\sqrt{9} \times \sqrt{5} + \sqrt{5}</math> or <math>3\sqrt{5} + \sqrt{5}</math></p> <p style="text-align: right;"><math>= 4\sqrt{5}</math> (cm)</p>	<p>M2</p> <p>A1</p>	<p>M1 for <math>\sqrt{45} + \sqrt{5}</math> or M1 for sight of <math>3\sqrt{5}</math></p> <p>CAO</p>
<p>10(a) 62 000 (people)</p>	<p>B2</p>	<p>B1 for</p> <ul style="list-style-type: none"> <li>• sight of 77000 and 15000 (in workings or in the bars)</li> <li>• <math>(7700 - 1500) \times 10</math> or equivalent, with no more than 1 error in their readings from the vertical axis, and correctly evaluated</li> </ul>
<p>10(b) Working from the left of the graph</p> $\frac{360\,000}{2} - 4500 \times 20 - 7700 \times 10$ <p>OR (from the right)</p> $300 \times 30 + 2200 \times 10 + 3200 \times 10 + 4000 \times 20 + 5000 \times 10 - \frac{360\,000}{2}$ <p style="text-align: right;"><math>= 13\,000</math> (people needed from the 30-40 bar)</p> <p>(Median for Cardiff =)</p> $(30 +) \frac{13\,000}{50\,000} \times 10 \text{ or equivalent}$ <p style="text-align: right;"><math>= 32.6</math> (years)</p>	<p>M1</p> <p>A1</p> <p>m1</p> <p>A1</p>	<p>Allow M1 for either calculation with one error only, (not in the <math>\frac{360\,000}{2}</math>) possibly leading to calculations for the median being in the 20-30 or 40-60 groups</p> <p>CAO</p> <p>FT 'their 13 000' and the possible different calculation if their work is for the median being in the 20-30 or 40-60 groups i.e. <math>(20 +) \frac{\text{'their 13 000'}}{77\,000} \times 10</math> for the 20-30 group or <math>(40 +) \frac{\text{'their 13 000'}}{80\,000} \times 20</math> for the 40-60 group</p>
<p>10(b) <i>Alternative method:</i> <i>Working from the right of the graph</i></p> $\frac{360\,000}{2} - 300 \times 30 - 2200 \times 10 - 3200 \times 10 - 4000 \times 20$ <p>OR (from the left)</p> $4500 \times 20 + 7700 \times 10 + 5000 \times 10 - \frac{360\,000}{2}$ <p style="text-align: right;"><math>= 37\,000</math> (people needed from the 30-40 bar)</p> <p>(Median for Cardiff =)</p> $(40 -) \frac{37\,000}{50\,000} \times 10 \text{ or equivalent}$ <p style="text-align: right;"><math>= 32.6</math> (years)</p>	<p>M1</p> <p>A1</p> <p>m1</p> <p>A1</p>	<p>Allow M1 for either calculation with one error only, (not in the <math>\frac{360\,000}{2}</math>) possibly leading to calculations for the median being in the 20-30 or 40-60 groups</p> <p>CAO</p> <p>FT 'their 37 000' and the possible different calculation if their work is for the median being in the 20-30 or 40-60 groups i.e. <math>(30 -) \frac{\text{'their 37 000'}}{77\,000} \times 10</math> for the 20-30 group or <math>(60 -) \frac{\text{'their 37 000'}}{80\,000} \times 20</math> for the 40-60 group</p>

11(a)	100 days	B1	
11(b)	$\frac{1}{2} \times 40 \times (100 + 60 + 2(100 + 140 + 150 + 110))$ $= 23\,200$ <p>(Average depth of water =) <math>23\,200 \div 200</math></p> $= 116 \text{ (ft)}$	M2 A1 m1 A1	M1 for 1 slip in substitution of values OR M1 for 1 of the vertical readings omitted with all others correct  May be implied in further working FT from M1 is available provided it comes from a calculation with no vertical readings omitted  FT 'their 23 200' provided M1 or M2 previously awarded
11(b) <i>Alternative method:</i>	$\frac{(100 + 100) \times 40}{2} + \frac{(100 + 140) \times 40}{2} + \frac{(140 + 150) \times 40}{2} + \frac{(150 + 110) \times 40}{2} + \frac{(110 + 60) \times 40}{2}$ $[4000 + 4800 + 5800 + 5200 + 3400]$ $= 23\,200$ <p>(Average depth of water =) <math>23\,200 \div 200</math></p> $= 116 \text{ (ft)}$	M2 A1 m1 A1	M1 for the sum of these 5 areas with one error (may be repeated) in the substitution of values OR M1 for the sight of 5 correct areas with the intention to add them (possibly omitting one)  May be implied in further working FT from M1 is available provided it comes from the sum of 5 areas  FT 'their 23 200' provided M1 or M2 previously awarded  If no marks awarded, the following SC marks can be awarded for work that involves summing the mean of the 2 heights on either side of each bar, and then dividing by 5 to give an answer of 116 (ft): SC3 for work detailed above with no errors in substitution leading to $580/5 = 116$ or SC2 for work detailed above with only 1 error, either in substitution (may be repeated) OR in an answer to a calculation, to arrive at their answer, allowing truncation/rounding of their final answer or SC1 for work detailed above with at most 1 error in substitution AND at most 1 error in an answer to a calculation to arrive at their answer, allowing truncation/rounding of their final answer
11(c) Appropriate tangent drawn at the 60th day	<p style="text-align: center;">Difference in y ÷ difference in x</p> <p>Correctly evaluated gradient given in its simplest form and lies within the range 0.3 to 0.8 (ft/day) or equivalent</p>	M1 m1 A1	Allow m1A0 if one difference has been incorrectly calculated  Mark final answer Accept a correct proper fraction, decimal or percentage If they give a decimal answer, it needs to be correctly evaluated to at least 1 decimal place, rounded or truncated