

**General Certificate of Secondary Education**

**Tystysgrif Gyffredinol Addysg Uwchradd**

**MARKING SCHEMES**

**SUMMER 2006**

**MATHEMATICS  
(HIGHER TIER)**

**GCSE Mathematics**

**Higher Tier Paper 1**

2006 Summer Paper 1 Higher Tier	Marks	Comments
<p>1. (a) <math>12a - 8b - 6a + 9b</math> <math>= 6a + b</math></p> <p>(b) <math>w^4</math></p>	<p>B1 B1 B1 <b>3</b></p>	<p>CAO. Watch for compensating errors. B0 for -9, unless + shown later. F.T. their first line C.A.O.</p>
<p>2. (a) Line of best fit by eye.  Line through (55, 52)</p> <p>(b) Science reading from their line at 68.</p>	<p>M1  A1  B1  <b>3</b></p>	<p>Must have positive gradient AND 3 points above their line and 3 points below their line AND be fit for purpose. Points ON the line should be counted to the advantage of gaining this mark. If point not plotted, then the line must pass through the point.  F.T. if their line has a positive gradient. Reading should be exact, if the point is on the grid lines, else it should be read to either side of the 2mm square, if the point is inside a square. <i>If reversed axes for mean &amp; (b) treat as MR-1</i></p>
<p>3. (a)  2, 2, 3, 5, 5, 7 <math>2^2 \times 3 \times 5^2 \times 7</math></p> <p>(b) <math>3 \times 7</math> OR 21</p>	<p>M1  A1 B1  B1  <b>4</b></p>	<p>For a method that produces 2 prime factors from the set {2, 2, 3, 5, 5, 7} before their second error. If their 2<sup>nd</sup> prime and 2<sup>nd</sup> error occurs at the same 'level' then allow M1. C.A.O. for sight of the six correct factors. (Ignore 1s). F.T. their answer if at least one index form used with at least a square. Ignore prime number requirement for this B mark. Use of brackets (2<sup>2</sup>)(3)(5<sup>2</sup>)(7) OR dot 2<sup>2</sup>.3. 5<sup>2</sup>.7 gets the B1. The inclusion of any 1s in their index form gets B0. F.T. if the M1 awarded in (a) OR implied by 2<sup>2</sup> × 5<sup>2</sup> or 100</p>
<p>4. (a) -6</p> <p>(b) Plots  Curve</p> <p>(c) Line <math>y = -2</math> x-values</p>	<p>B1  P2  C1  L1 B1  <b>6</b></p>	<p>C.A.O.  F.T. their table, - 1 on 1<sup>st</sup> and 3<sup>rd</sup> error. If table is empty then no plot at (2, -6) is the first error. If a point is plotted at (2, -6) and table is empty then award B1. Must be a curve  F.T. their graph if at least 2 readings and a straight line is unambiguously offered. <u>(Points on the 2mm grid should be read accurately. Points between 2 grid points should be read to within the values of the ends of the 2mm square.)</u></p>

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<p>5. (a) Part of the arc of a circle centre X radius as on overlay. In the section bounded by the building and the wall.</p> <p>(b) Complete arc defined in (a)</p> <p>(c) Second arc centre corner of building and radius as on overlay.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p><b>3</b></p>	<p>Loci do not have to be accurate as long as the intention is clear.  <u>At least 1 cm</u> is required to identify the loci. (Ignore other arcs).  Allow series of dots for arc if locus recognised.</p> <p><i>-1 if 1cm or more within building</i></p>
<p>6. (a) Correct image (2, 0) (3, -2) (0, -3)</p> <p>(b) Correct image (-2, -2) (1, -2) (-2, -4)</p>	<p>B2</p> <p>B2</p> <p><b>4</b></p>	<p>B1 for correct x translation  B1 for the correct y translation</p> <p>B1 for anticlockwise rotation of 90° about (-1,2).  (-3, 6) (0, 6) (0, 8)  The last point will require extra grid lines.  B1 for clockwise rotation of 90° about (2,-1).  (4, -2) (4, -4) (7, -2)  The last point will require extra grid lines.</p>
<p>7. (a) Least = 299.5  Greatest = 300.5</p> <p>(b) Use of 10 × "largest length"  = 10 × 300.5  = 3005</p> <p>3015 (mm) ≤ passageway (&lt; 3025 mm)</p> <p>Use of smallest passageway with largest tile (3005 is enough) <b>AND</b> deduce that the passageway is always wide enough.</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>E2</p> <p><b>7</b></p>	<p>C.A.O.</p> <p>C.A.O. Accept 300.49 (recurring needs to be shown)</p> <p>F.T. "their largest tile" × 10, with or without "their smallest tile" × 10, provided &gt;300.  <b><i>In (b) accept alternate division arguments for all marks</i></b></p> <p>C.A.O.</p> <p><u>Numerical errors are allowed, but must remain consistent with the tile always being large enough.</u></p> <p>E1 for an explanation, correct idea, but refers to 302cm</p> <p><i>SC1 for 10x300 = 3000 and states less than 3020</i></p>
<p>8. (a) <math>x^2 - 28 - 3x</math></p> <p>(b) <math>3d - 2r = 28 - 8r</math>  <math>6r = 28 - 3d</math> <u>OR</u> <math>3d - 28 = -6r</math></p> $r = \frac{28 - 3d}{6}$ <p>(c) <math>2x(3x + 1)</math></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B2</p> <p><b>7</b></p>	<p>B2 only if written as a trinomial, e.g. <math>x^2 - 3x - 28</math> (any order)  If B2 then penalise -1, once only, if any subsequent incorrect or inappropriate algebra such as using equations .</p> <p>Clearing bracket correctly F.T. until second error</p> <p>Collecting terms</p> <p>F.T. until 2<sup>nd</sup> error</p> <p>B1 for <math>x(6x + 2)</math> OR <math>2(3x^2 + x)</math> OR <math>2x(3x + \dots)</math>  OR <math>2x(\dots + 1)</math></p>

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<p>9. (a) C = 95 OR D = 36 A statement such as: 'the angles are NOT the same in both triangles'.</p> <p>(b) <math>\frac{\text{largest}}{\text{largest}} = \frac{18}{12} = (1.5)</math></p> <p><math>\frac{\text{middle}}{\text{middle}} = \frac{12}{9} = (1.3)</math></p> <p><math>\frac{\text{smallest}}{\text{smallest}} = \frac{8}{6} = (1.3)</math></p> <p>So the 3 sides are not in the same ratio</p>	<p>B1 B1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>Could be embedded calculation An explanation along these lines.</p> <p>Finding either of the 2 pairs of unequal corresponding ratios. Or reciprocal of these shown, or ratios with the same triangle</p> <p>Stating that this means the triangles are not similar or that the sides are not in the same proportion.</p>
<p>10. (a) <math>\frac{3}{4}</math> on the first branch</p> <p><math>\frac{2}{3}</math> and <math>\frac{1}{3}</math> on the correct parts of the top second branch AND <math>\frac{2}{3}</math> and <math>\frac{1}{3}</math> on the correct parts of the bottom second branch</p> <p>(b) <math>\frac{1}{4} \times \frac{1}{3} + \frac{3}{4} \times \frac{2}{3}</math></p> <p>= 7/12</p>	<p>B1 B1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>C.A.O. Accept equivalents such as .75 or 75%.</p> <p>C.A.O. Allow if one branch ok, other left blank</p> <p>For the complete sum of the 2 products. F.T. their tree if probabilities are between 0 and 1 <u>exclusive</u> and NOT all <math>\frac{1}{2}</math>.</p>
<p>11. (1) 3 2 1 2</p>	<p>B2</p> <p>2</p>	<p>For all 4 correct. B1 for any 3 correct. OR B1 for all 4 dimensions implied by the indices in, for example, <math>\text{cm}^3</math>, <math>\text{cm}^2</math>, <math>\text{cm}</math>, <math>\text{cm}^2</math> OR mixed as in <math>\text{cm}^3</math>, 2, <math>\text{km}</math>, <math>\text{m}^2</math></p>
<p>12. <math>5x + 3 - 2(x + 10) = 4</math></p> <p><math>3x = 21</math></p> <p><math>x = 21/3 (=7)</math></p>	<p>M1 M1</p> <p>A1</p> <p>A1</p> <p>4</p>	<p>For correctly clear fractions by a valid method for any 2 terms. For correctly clear fractions by a valid method for all 3 terms. <u>NOTE: <math>5x + 3 - 2x + 20 = 4</math> would get M1, M1, A0 and the final A1 can be gained for correct follow through (-19/3)</u> The two A1s are dependent on only one M1 being awarded Collecting terms <u>F.T. until 2<sup>nd</sup> error starting after the M marks.</u> <u>If 0 marks awarded, SC1 for <math>\frac{3x-17}{6} = 4</math> OR <math>\frac{3x+23}{6} = 4</math></u></p> <p>Unsupported answer of <math>x = 7</math> gets all 4 marks.</p>

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<b>13.</b> Triangle with vertices at (-1,-1) (-1, -3) (-4,-1)	B3  <b>3</b>	Features required : $\frac{1}{2}$ enlargement, location, orientation. Award B2 for any 2 correct features OR B1 for any 1 correct feature OR B2 for vertices correct but no triangle								
<b>14.</b> $47x - x(x+1) = 360$ $x^2 - 46x + 360 = 0$ $(x-36)(x-10) \text{ or } x = \{46 \pm \sqrt{676}\}/2$ $x = 10 \text{ and } x = 36$ Pairs are 10 & 11 and 36 & 37	B1 M1 M1  m1  A1 A1  <b>6</b>	Needs brackets, or implied later. FT their $x(x+1)$ , i.e. $47x - \dots = 360$ . Accept missing brackets. FT $x(x+1) - 47x = 360$ to give $x^2 - 46x - 360 = 0$ , OR FT their $47x - \dots = 360$ only if it leads to a quadratic. Both M marks must have been awarded for this m1  Must have both values for A1, irrespective of method Must have both pairs for A1, irrespective of method SC1 for 10 & 11 OR 36 & 37 if neither A mark awarded								
<b>15.</b> (a) $14^\circ$ Angle in same segment, angles in triangle  (b) $60^\circ$ Alternate segment theorem	B1 B1  B1 B1  <b>4</b>	Accept calculations shown, or appropriate description  Or appropriate description, mark does not depend on $60^\circ$								
<b>16.</b> (a) $y \propto 1/x$ OR $y = k/x$ $2 = k/5$ $y = 10/x$  (b) <table border="1" style="margin-left: 40px;"> <tr> <td>x</td> <td>5</td> <td>10</td> <td>1/2</td> </tr> <tr> <td>y</td> <td>2</td> <td>1</td> <td>20</td> </tr> </table>	x	5	10	1/2	y	2	1	20	B1 M1 A1  B2  <b>5</b>	FT non linear only in (a) and (b) Maybe implied in part (b)  B1 for each value
x	5	10	1/2							
y	2	1	20							
<b>17.</b> $4n(3+g) = 7(5+n)$ $12n + 4ng = 35 + 7n$  $n(5+4g) = 35$  $n = \frac{35}{5+4g}$	B1 B1  B1  B1  <b>4</b>	Brackets maybe implied in further working FT until 2nd error ( $12n+4ng = 35 + n$ gets B1 here as a FT from B0) Collect & factorise. If simplified, i.e. no factorising B0, but possible FT to final B1 ISW								
<b>18.</b> $(3x-5)(5x+2)$  $x = 5/3$ and $x = -2/5$	B2  B1 3  <b>3</b>	B1 for $(3x \dots 5)(5x \dots 2)$ OR $(3x \dots 2)(5x \dots 5)$ OR B1 for middle term splitting method FT their pair of brackets. Ignore incorrect cancelling <i>Use of formula gains no marks</i>								
<b>19.</b> (a) $\frac{6}{21} \times \frac{5}{20}$ $= \frac{30}{420} (=1/14)$ (b) $1 - P(\text{no caramel})$ $P(\text{no caramel}) = \frac{11}{21} \times \frac{10}{20} \{= \frac{110}{420} (=11/42)\}$  $\frac{310}{420} (=31/42)$	M1 A1 B1 M1  A1  <b>5</b>	Or equivalent. Ignore incorrect cancelling Or equivalent complete strategy Seen alone not part of further probabilities. OR $P(\text{caramel, other}) + P(\text{other, caramel}) + P(\text{caramel, caramel})$ OR full alternative with correct values. CAO. Ignore incorrect cancelling in final answer								

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<p><b>20.</b> <math>x(4x + 3)</math> as a common denominator  <math>(3x - 2)(4x + 3) + 4x</math> as a numerator</p> <p><math>12x^2 + 9x - 8x - 6 = (12x^2 + x - 6)</math> in working</p> <p><math>\frac{12x^2 + 5x - 6}{x(4x + 3)}</math> or equivalent</p>	<p>M1 M1</p> <p>B1 A1</p> <p><b>4</b></p>	<p>Brackets required, unless implied later  If no M marks for numerator or denominator due to missing brackets then SC1</p> <p>CAO. Penalise -1 for further working</p>
<p><b>21.</b> (a) (i) <math>12x + 8y</math>  (ii) <math>4x + 2y</math></p> <p>(b) (i) <math>EC = AC - x</math> (<math>= 3x + 2y</math>)  <math>k = 4</math>  (ii) <math>EC : CB = 1 : 3</math></p>	<p>B1 B1</p> <p>M1 A1 B1</p> <p><b>5</b></p>	<p>If both (i) &amp; (ii) correct but not simplified then SC1  FT their <math>AC - x</math>  Accept embedded answer  FT for their <math>k</math> (<math>1 : k-1</math>)</p>
<p><b>22.</b> (a) Correct sketch</p> <p>(b) Correct sketch with (2,0) indicated</p> <p>(c) (i) Correct sketch (reflection in x-axis)  (ii) Correct sketch (reflection in x-axis and shift up) with (0,3) indicated</p>	<p>B1</p> <p>B2</p> <p>B1</p> <p>B2</p> <p><b>6</b></p>	<p>B1 for any horizontal shift of given curve to the right</p> <p>FT their reflection passing through (0,0).  B1 if (0,3) not indicated</p> <p>SC1 for <math>x^2 + 3</math> with (0,3) indicated</p>
<p><b>23.</b> Use of <math>x=0, y=2</math>, to give <math>2 = b c^0</math>  <math>b = 2</math></p> <p>Use of another pair of values with value for <math>b</math>, e.g. <math>x=1, y=5, 5 = 2 c^1</math>  <math>c = 2.5</math></p>	<p>M1 A1 M1</p> <p>A1</p> <p><b>4</b></p>	<p>FT their <math>b</math></p>

GCSE Mathematics

Higher Tier Paper 2

2006 Summer Paper 2 Higher Tier	Marks	Comments
<p>1. <math display="block">\frac{10 \times 62 \cdot 5 + 12 \times 67 \cdot 5 + 22 \times 72 \cdot 5 \text{ etc}}{80}</math> (OR 5895)</p> <p style="text-align: center;">5895</p> <p>= 73·6(875) <u>truncated or rounded to any number of decimal places</u> OR 74</p>	<p>M1</p> <p>B1</p> <p>A1</p> <p style="text-align: center;"><b>3</b></p>	<p><b>For a complete method. Must be division by 80. Allow this M1, if candidates use a set of 'mid-points' which are in the corresponding intervals (including either of the end points) and go up in 5s. Allow 1 error.</b></p> <p>C.A.O.</p> <p>Accept answers rounded to whole numbers. 73 gets A0. F.T. their 'mid-points' as for the M mark.</p> <p><u>UNSUPPORTED 73·68(75) truncated or rounded to any number of decimal places OR 74 GETS THE 3 MARKS.</u></p>
<p>2. 1<sup>st</sup> charity gets <math>\frac{3}{15} \times 6000</math> = (£)1200</p> <p>2nd gets (£) 1600</p> <p>3rd gets (£) 3200</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p style="text-align: center;"><b>3</b></p>	<p>For the correct method for finding any share</p> <p>For the share assoc. with the M1</p> <p>For the other 2 shares</p>
<p>3. <math display="block">\begin{array}{r} 5000\cdot00 \\ \underline{1200\cdot00} \\ 3800\cdot00 \\ \underline{912\cdot00} \\ 2888\cdot00 \\ \underline{693\cdot12} \\ 2194\cdot88 \\ \text{or } 2195 \end{array}</math></p> <p style="text-align: center;">OR</p> <p><math display="block">\begin{array}{r} 5000(1 - \cdot24)^3 \\ \underline{2194\cdot88} \\ \text{or } 2195 \end{array}</math></p> <p>Value = (£) 2200</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p style="text-align: center;"><b>4</b></p>	<p>For the evaluation of a correct 24%.</p> <p>Alternatively they may get the B1 for (£)3600 OR (£)1400.</p> <p>For the overall method (3 stages of subtracting <u>different</u> 24%).</p> <p>C.A.O. Ignore subsequent working. (SC1 for <math>5000(1+0.24)^3</math>)</p> <p>C.A.O. for amount OR for the correct 3 depreciations</p> <p>If 2 years used, then mark it as if correct, then MR-1 provided A or B marks have been awarded.</p> <p><i>Candidates using appreciation : SC1 (as well as B1) for amount (£)9533.12 OR (£)4533.12, also FT to rounding for another SC1</i></p> <p>F.T. rounding nearest £100 only if M mark awarded</p> <p>If 4 years used, then mark up to 3 years and ignore subsequent working. (Maximum of 3 marks)</p>
<p>4. (a) DF = 3·2 (cm)</p> <p><math>8\cdot4^2 (70\cdot56) = CF^2 + 3\cdot2^2 (10\cdot24)</math></p> <p><math>(CF^2) = 60\cdot32</math></p> <p>CF = 7·76(6559) OR 7·8</p> <p>(b) Area of parallelogram = 12·5 × CF</p> <p style="text-align: right;"><math>= 97\cdot0(824)</math> cm<sup>2</sup></p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>U1</p> <p style="text-align: center;"><b>7</b></p>	<p>C.A.O.</p> <p>Correct substituted Pythagoras. FT their DF</p> <p>F.T. from their CF<sup>2</sup> if M awarded.</p> <p>SC1 for 8·9(8888) and first B1</p> <p>F.T. their CF, but not 8·4</p> <p>Full alternative method (e.g. <math>7.8 \times 15.7 - 2 \times \frac{1}{2} \times 3.2 \times 7.8</math>)</p> <p>CF=7.8 used leads to 97.5(cm<sup>2</sup>))</p> <p><i>Ignore incorrect writing of their process if their answers are correct.</i></p>



2006 Summer Paper 2 Higher Tier	Marks	Comments
<p>9. (a) (i) <math>8.3(7) \times 10^9</math> OR <math>8 \times 10^9</math> OR <math>8.4 \times 10^9</math></p> <p>(ii) <math>5.9 \times 10^{-4}</math> OR <math>6 \times 10^{-4}</math></p> <p>(b) <math>5.6(626) \times 10^2</math></p>	<p>B1</p> <p>B1</p> <p>B2</p> <p><b>4</b></p>	<p>C.A.O.</p> <p>C.A.O.</p> <p>B1 for the digits 56(626) with a correct power of 10, for example <math>56(626) \times 10^3</math>, <math>566</math>, <math>56.6 \times 10</math></p> <p>Accept numbers given to 1 decimal place throughout. Penalise -1, once only for consistent use of incorrect notation, e.g. <math>8.3^9</math>, <math>5.9^{-4}</math></p>
<p>10. (a) Height = <math>4.8 \times \tan 51^\circ</math></p> <p>Height = <math>5.9(275)</math> (m)</p> <p>(b) <math>BD = 4.7(275)</math> (m)</p> <p><math>\sin BCD = BD/5.3</math> OR <math>\sin BCD = 0.891(9823)</math></p> <p><math>\angle QPR = 63 \cdot (1234)</math></p>	<p>M2</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p><b>6</b></p>	<p>Correct substituted tan ratio with no fractions.</p> <p>OR M1 for the stage <math>\tan 51^\circ = BE/4.8</math></p> <p>C.A.O.</p> <p>F.T. 'their BE', i.e. BE-1.2 (Using BD as BE gets B0, but may possibly get M1, however A0)</p> <p>Correct substituted sin ratio. Allow FT of 'their BE' (<math>4.7</math> leads to <math>0.88679\dots</math> and then to <math>62.(47\dots)^0</math>)</p> <p>F.T. 'their BE'</p>
<p>11. (a) Reading at 90 – reading at 30 (<math>[24.5</math> to <math>25</math> inc.] – <math>16</math>) = <math>8.5</math> to <math>9</math></p> <p>(b) <math>120</math> – reading at <math>28</math> = <math>16</math></p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p><b>4</b></p>	<p>Look for marks at the correct cumulative frequencies. Misread of scale on time axis M1, A0</p> <p>Look for marks at time = <math>28</math> C.A.O. <i>SCI for an answer of 18 AND a mark on polygon at time=28 OR on cum.freq. scale at 104</i></p>
<p>12. Graph of <math>x = 3</math> Graph of <math>y = -1</math> Graph of <math>y = 3x - 2</math></p> <p>Correct region clearly marked</p>	<p>B3</p> <p>B1</p> <p><b>4</b></p>	<p>B1 for each graph Award the marks for the lines if their shading indicates that the correct line is being considered. Ambiguity, such as (unlabelled <math>x=3</math> and <math>y=3</math>) OR (unlabelled <math>x=3</math> and other vertical lines), gets no credit for that line. <u>IGNORE the 'boundary' lines <math>x=-3</math>, <math>x=5</math>, <math>y=10</math> and <math>y=-6</math></u> FT provided similar region, <math>x=a</math>, <math>y=b</math> and <math>y=mx+c</math> (<math>m&gt;0</math>, <math>c \neq 0</math>)</p>
<p>13. (a) 1</p> <p>(b) <math>y^8</math></p> <p>(c) 4 a</p> <p>(d) <math>5x^{-8}(7x+y)^3</math> or <math>\frac{5(7x+y)^3}{x}</math></p>	<p>B1</p> <p>B1</p> <p>B2</p> <p>B2</p> <p><b>6</b></p>	<p>B1 any pair of original indices worked correctly (fractional), unsimplified</p> <p>B1 for <math>x^{-8}</math> or <math>\dots/x^8</math> or <math>(7x+y)^3</math>. ISW</p>

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<b>14.</b> Arc length = $46/360 \times \dots$ Circumference = $2 \times \square \times 8.2 = 16.4 \times \square (= 51.5)$ Arc length = $6.58\dots$	M1 M1 A1  <b>3</b>	Or divide by $360/46$  CAO. Accept rounded or truncated to at least 1 d.p
<b>15.</b> $\frac{PR}{\sin 76^\circ} = \frac{12.6}{\sin 31^\circ}$  $PR = \sin 76^\circ \times 12.6 / \sin 31^\circ$ $= 23.7(\dots)$	M1  M1 A1  <b>3</b>	
<b>16.</b> Total = 12 000 $\dots / 12000 \times 20$ or "1 for every 600" or divide by 600 2.58..., 6.16..., 1, 1.08..., 9.16... 3, 6, 1, 1, 9	B1 M1 M1 A1  <b>4</b>	B0 for incorrect total FT their total Any three correct (allow two errors)
<b>17.</b> Volume scale factor = $4^3$ $3.8 \times$ volume scale factor  Volume larger tetrahedron = $243(.2) \text{ (cm}^3\text{)}$	B1 B1  B1  <b>3</b>	FT their <b>volume</b> scale factor $4^3$ incorrectly evaluated $\times 3.8$ , $n^3 \times 3.8$ , BUT B0 for $4 \times 3.8$ <b>CAO</b> <i>(<math>3.8^3</math> no marks)</i>
<b>18.</b> (a) Use of Pythagoras Theorem ( with " $=23.6^2$ ") $x^2 + (x + 6.2)^2 = 23.6^2$ $x^2 + x^2 + 12.4x + 38.44 = 556.96$  (b) $x = \{ -6.2 + \sqrt{(6.2^2 - 4 \cdot 1 \cdot -259.26)} \} / 2$ $= [ -6.2 + \sqrt{1075.48} ] / 2$ $13(-297\dots) \quad (-19.497\dots)$  PQ = 13.3 and QR = 19.5	M1 M1 A1 M1 A1 A1  A1     <b>7</b>	Brackets maybe omitted. Attempt based on Pythagoras' Thm.  CAO Allow one error  FT if M1 awarded and $b^2 - 4ac > 0$ and denominator treated as common FT their PQ and $PQ + 6.2$ to 1dp provided M1 awarded <i>Trial &amp; Improvement in (b): SC2 for <math>PQ = 13.3</math> and further SC1 for <math>QR = 19.5</math></i>
<b>19.</b> (a) $100x = 83.737\dots$ and $x = 0.83737\dots$ <b>and</b> attempt to subtract  829/990  (b) prime number $\times \dots$ or square number $\times \dots$ or $2\sqrt{48}$ or $4\sqrt{12}$  $8\sqrt{3}$  (c) $3 + \sqrt{15} + \sqrt{15} + 5 \quad (-8)$  $2\sqrt{15}$	M1  A1   M1  A1  M1 A1  <b>6</b>	Or equivalent method. ( $82.9/99$ is M1)   Examples of M0 $2\sqrt{96}$ , $64\sqrt{3}$ , $1 \times 192$   $\sqrt{5}\sqrt{3}$ needs to be expressed as $\sqrt{15}$ <i>Penalise -1 for further incorrect working</i>



