



GCSE MARKING SCHEME

**METHODS IN MATHEMATICS
(LINKED PAIR PILOT)**

SUMMER 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were 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 conferences was to ensure that the marking schemes were 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' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Methods Unit 1 Foundation Tier Summer 2012		FINAL
<p>8. (a) 12 18 24 30 36 10 15 20 25 30 12 16 20 24 9 12 15 18 12</p> <p>(b) $\frac{8}{36}$ ISW</p> <p>(c) $\frac{8}{36} \times 720$ = 160</p>	<p>B2</p> <p>B2</p> <p>M1 A1</p> <p>6</p>	<p>Award B1 for 12 correct.</p> <p>FT their table. B1 for a numerator of 8 in a fraction <1. B1 for the 36 in a fraction <1. Do not penalize incorrect reduction of fractions.</p> <p>FT their (b) $\times 720$ ($\neq \frac{1}{2}$) A0 here if there is incorrect reduction M1 A0 for 160/720</p> <p><u>Notes</u> Penalise -1 for use of words such as “8 out of 36”, “8 in 36” OR “8:36”. When fraction and wrong notation seen, DO NOT penalise wrong notation.</p>
<p>9. At least 3 additional given shapes tessellating correctly with at least one that meets given shapes At least 6 additional given shapes tessellating correctly</p>	<p>M1</p> <p>A1 2</p>	<p>The additional shapes must consist of at least 1 square and 1 hexagon. Award A0 for any error in their tessellation.</p>
<p>10. $4.5 \times 40 = 180$ (Cooking time \Rightarrow) 180mins (or 3hrs) + 25 mins = 205 mins or 3 hours 25 mins (Chef begins cooking at) 10.05 (am)</p> <p>$4.5 \times 40 = 180 + 25$ will lose at least QWC1</p> <p>Look for</p> <ul style="list-style-type: none"> • spelling • clarity of labels • Use of correct notation for time • the use of simplified notation (watch for the use ‘=’ being appropriate) <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining process or steps <p>AND</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining process or steps <p>OR</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer 	<p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>Q</p> <p>W</p> <p>C</p> <p>2</p> <p>6</p>	<p>FT their 4.5×40</p> <p>FT their cooking time</p> <p>QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</p> <p>QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.</p> <p>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</p>
<p>11. (a) plots Curve</p> <p>(b) x-values from their graph</p>	<p>P1</p> <p>C1</p> <p>B1</p> <p>3</p>	<p>FT their plots. Must be a curve through the points. Polygon gets C0 For both x-values. FT their graph if at least 2 points of intersection</p>
<p>12.(a) (6, -6) or (-10,-6) or (4,2)</p> <p>(b) Method to find midpoint – on diagram or calculation shown</p> <p>(1.5,-4) or (-2.5, -4) or (1,-2)</p>	<p>B2</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>B1 for either coordinate correct OR B1 for a correct point plotted (with assumed scale from other points or default 1-1 scale)</p> <p>FT their parallelogram. Accept point plotted by the candidate as a method, hence M1 <i>If calculation method shown, then one correct coordinate implies M1.</i> <i>No method shown, one correct coordinate M0, A0</i></p>

Methods Unit 1 Foundation Tier Summer 2012		FINAL
13.(a) A suitable triangle shown or described (b) E.g. $32+8+2$, $32+8+2$, $16+16+4+4+1+1$ (side length 42 cm)	B1 B2 3	Any use of subtraction ideas must be shown (justified) B1 for showing selection of rods that make a smaller equilateral triangle of side length >10 cm, OR for knowing sides are 42(cm)
14. (a) $7n - 1$ (b) $-6n + 32$	B2 B2 4	B1 for $7n \pm \dots$ B1 for $-6n \pm \dots$
15. (a) $2680/10 (=268)$ with method to find 5, 3 or 2 shares 1340, 804, 536 (b) Method to find prime factors, 2 correct before 2 nd error 2, 2, 2, 2, 3, 5, 5 $2^4 \times 3 \times 5^2$	M1 A2 M1 A1 B1 6	A1 for any one of these correct <i>Unsupported answers, need sight of 2 of the 3 correct responses to imply the method</i> <i>Incorrect method seen implies M0, A0</i> Ignore 1s for A1 but not for B1 FT provided an index >1 involved. Accept " " for multiply

UNIT 1 (HIGHER TIER)

Methods Unit 1 Higher Tier Summer 2012		FINAL																																																	
1.(a) 16 or equivalent (b) 180 or equivalent (c) 71, 73 and 79 (d) Attempt to evaluate 11×11 <div style="text-align: right;">121</div>	B1 B1 B1 M1 A1 5	Accept a product of factors Accept a product of factors Not just sight of 11×11																																																	
2.(a) (6, -6) or (-10,-6) or (4,2) (b) Method to find midpoint – on diagram or calculation shown <div style="text-align: center;">(1.5,-4) or (-2.5, -4) or (1,-2)</div>	B2 M1 A1 4	B1 for either coordinate correct OR B1 for a correct point plotted (with assumed scale from other points or default 1-1 scale) FT their parallelogram. Accept point plotted by the candidate as a method, hence M1 <i>If calculation method shown, then one correct coordinate implies M1.</i> <i>No method shown, one correct coordinate M0, A0</i>																																																	
3.(a) A suitable triangle shown or described (b) E.g. $32+8+2$, $32+8+2$, $16+16+4+4+1+1$ (side length 42 cm) (c) Strategy of working to find 4 equal sides Explanation, could be by example; e.g. 32, 32, 16+16, rods left only make 30, or similar	B1 B2 B1 E1 5	Any use of subtraction ideas must be shown (justified) B1 for showing selection of rods that make a smaller equilateral triangle of side length >10 cm, OR for knowing sides are 42(cm) Knowing that 4 equal sides are needed Do not accept 'can't find 4 rods the same length', B1, E0 Accept 'not enough to make 4 numbers the same', B1, E1																																																	
4.(a) <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <th>1</th> <td>3</td> <td>5</td> <td>7</td> <td>9</td> <td>11</td> <td>13</td> </tr> <tr> <th>2</th> <td>5</td> <td>8</td> <td>11</td> <td>14</td> <td>17</td> <td>20</td> </tr> <tr> <th>3</th> <td>7</td> <td>11</td> <td>15</td> <td>19</td> <td>23</td> <td>27</td> </tr> <tr> <th>4</th> <td>9</td> <td>14</td> <td>19</td> <td>24</td> <td>29</td> <td>34</td> </tr> <tr> <th>5</th> <td>11</td> <td>17</td> <td>23</td> <td>29</td> <td>35</td> <td>41</td> </tr> <tr> <th>6</th> <td>13</td> <td>20</td> <td>27</td> <td>34</td> <td>41</td> <td>48</td> </tr> </tbody> </table> (b)(i) 8/36 (ii) 4/36 (iii) 28/36		1	2	3	4	5	6	1	3	5	7	9	11	13	2	5	8	11	14	17	20	3	7	11	15	19	23	27	4	9	14	19	24	29	34	5	11	17	23	29	35	41	6	13	20	27	34	41	48	B3 B1 B1 B1 6	 B2 for any 20 to 26 correct entries, B1 for any 10 to 19 correct entries <u>FT for their completed table in (b) and ignore incorrect cancel</u> ISW ISW ISW FT 1 – (i)
	1	2	3	4	5	6																																													
1	3	5	7	9	11	13																																													
2	5	8	11	14	17	20																																													
3	7	11	15	19	23	27																																													
4	9	14	19	24	29	34																																													
5	11	17	23	29	35	41																																													
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5.(a) $2680/10 (=268)$ with method to find 5, 3 or 2 shares 1340, 804, 536 (b)(i) Method to find prime factors, 2 correct before 2 nd error 2, 2, 2, 2, 3, 5, 5 $2^4 \times 3 \times 5^2$ (ii) 3 (c) 0.1313... or 0.13' (d) 0.005	M1 A2 M1 A1 B1 B1 B2 B1 10	A1 for any one of these correct <i>Unsupported answers, need sight of 2 of the 3 correct responses to imply the method</i> <i>Incorrect method seen implies M0, A0</i> Ignore 1s for A1 but not for B1 FT provided an index >1 involved. Accept "." for multiply FT from their (i) B1 for 0.13 or 0.13... or 0.13' as an answer or seen in working																																																	

Methods Unit 1 Higher Tier Summer 2012		FINAL
9. $3A = 4\pi r^2$ $\frac{3A}{4\pi} = r^2$ $r = \sqrt{3A/4\pi}$	B1 B1 B1 3	FT until 2 nd error Accept multiplication signs shown throughout
10.(a) A and D selected Gradients are both 3 or gradients are the same (b) A and E selected	B1 E1 B1 3	Depends on B1 being awarded. Accept 'slope' or similar. m = 3 or 'both 3x' is insufficient, needs interpretation
11.(a) -7 and 5 (b) All plots correct All their 8 plots joined with a curved line (c) -3 and 1.5 (± 0.1) (d) y = 6 seen or implied 2.1 (± 0.1) and -3.6 (± 0.1)	B2 B2 B1 B2 M1 A1 9	B1 for each correct answer FT from (a). B1 for any 5 correct plots FT from (a) FT from (b). B1 for each correct answer FT from (b).
12. $30 \times 80 = 25 \times CE$ OR $30 \times (30 + 50) = 25 \times CE$ CE = 96 (cm) DE = 96 - 25 = 71 (cm)	M1 A1 m1 A1 4	
13.(a) 0.25 (b) $4(x - 20)(x + 20)$ (c) 27 (d) $10 + 15\sqrt{2} - 2\sqrt{2} - 6$ $= 4 + 13\sqrt{2}$	B2 B3 B1 B2 B1 9	B1 for 2 correct steps, following through 1 error: reciprocal, cube root, square. B1 for an answer of 1/4 B2 for $(2x - 40)(2x + 40)$ or other correct partially factorised including a correct pair of brackets B1 for $4(x \dots 20)(x \dots 20)$ or $(2x \dots 40)(2x \dots 40)$ B1 for any 3 of the 4 terms correct CAO. Mark final answer
14.(a) Correct region shaded (b) Correct region shaded (c) Correct region shaded	B1 B1 B1 3	Intersection of the two regions A and B indicated Outside A and B but within rectangle indicated A together with outside B indicated
15. Sight of numbers (on the cards): 1, 2, 5, 7, 10, 14, 35, 70 (a) Strategy, need to find P(even, odd) and P(odd, even) $4/8 \times 4/7$ seen $4/8 \times 4/7 + 4/8 \times 4/7$ OR $2 \times 4/8 \times 4/7$ $= 32/56$ or equivalent (b) Strategy, e.g. $1 - P(\text{no even})$ $1 - P(\text{no even}) = 1 - 4/8 \times 3/7$ $= 44/56$ or equivalent	B1 S1 M1 M1 A1 S1 M1 A1 8	FT in (a) and (b) from incorrect factors, provided all unique and at least four numbers are correct factors of 70 OR full alternative Mark final answer Or equivalent complete strategy Or other full method Mark final answer
16.(a) $(x - 8)^2 + 2$ (b) Attempt to use common denominator $\frac{3(2x+3) - 4(3x-2) + 2}{12}$ or equivalent $\frac{6x + 9 - 12x + 8 + 2}{12}$ or equivalent $= \frac{19 - 6x}{12}$ with statement (c) $\frac{(2x + 7)(x - 1)}{5(2x + 7)}$ $\frac{x - 1}{5}$	B2 B1 M2 A1 A1 B2 B1 B1 11	B1 for a = -8, B1 for b = 2, only award B2 for $(x - 8)^2 + 2$ M1 for 2 of the three terms correct. May be expressed as separate fractions, or working without consideration of the denominator Convincing step. FT from 1 error, i.e. A1. Denominator must be seen Must follow from correct working Accept LHS=RHS or writing $(19 - 6x)/12 = (19 - 6x)/12$ B1 for $(2x \dots 7)(x \dots 1)$ CAO. Mark final answer

UNIT 2 (FOUNDATION TIER)

Methods 2 Foundation June 2012		FINAL						
<p>1.(a)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">1/4</td> <td style="width: 33%; text-align: center;">0.25</td> <td style="width: 33%;"></td> </tr> <tr> <td style="text-align: center;">7/10</td> <td></td> <td style="text-align: center;">70(%)</td> </tr> </table> <p>(b) $38/100 \times 790$ 300.2</p> <p>(c) $4/9 \times 117$ 52</p> <p>(d) $1/4 \times 40 (= 10)$ 30 scarves left 20% of 30 = 6 (30 – 6=) 24 left</p> <p>(e) 1/8</p>	1/4	0.25		7/10		70(%)	<p>B2</p> <p>B2</p> <p>M1 A1 M1 A1 M1 A1 M1 A1</p>	<p>Award B1 for each. Accept equivalent fractions for 1/4</p> <p>Award B1 for each. Accept equivalent fractions for 7/10</p> <p>CAO Or equivalent CAO Or equivalent. Sight of 10 implies M1</p> <p>FT 'their 30' or 40</p> <p>Award SC3 for 45% of 40 = 18, 40 – 18 = 22 Award SC2 for 45% of 40 = 18 Award SC1 for 45/100 × 40</p>
1/4	0.25							
7/10		70(%)						
<p>2.(a) Correct diagram</p> <p>(b) $\begin{matrix} 4 & 1 & 0 \\ & 4 & 1 & 2 \end{matrix}$</p>	<p>B2</p> <p>B3</p> <p>5</p>	<p>-1 for each incorrect vertex</p> <p>Award B3 for all correct Award B2 for 4 or 5 correct Award B1 for 2 or 3 correct Accept 1 for shape B 0</p>						
<p>3. Correct indication of</p> <p>Diameter</p> <p>Chord</p> <p>Sector</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>3</p>							
<p>4.(a) Perimeter = 30 (Area =) 4×11 = 44</p> <p>(b) Showing a strategy of trialling a length & width that multiply to 20 and would make a perimeter of 24</p> <p>(Length =) 10(cm) and (Width =) 2(cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>M2</p> <p>A1</p> <p>6</p>	<p>Award M1 for 4×11 seen but award M0 for perimeter = 11×4</p> <p>Award M1 Showing a strategy of trialling a length & width that multiply to 20 or would make a perimeter of 24</p> <p>CAO. Do not penalise if length = 2(cm) and width = 10(cm)</p>						
<p>5. Congruent shape drawn</p> <p>Similar shape drawn</p> <p>Correct "Full" explanation given</p> <p>Eg. A congruent shape is exactly the same size and a similar shape is a different size.</p>	<p>B1</p> <p>B1</p> <p>E2</p> <p>4</p>	<p>Do not penalise incorrect labelling for diagrams drawn</p> <p>E1 for each</p> <p>If own shapes correctly drawn for congruent or similar shapes it must have a correct explanation to get B1 E1 for congruent shapes and/or B1 E1 for similar shapes.</p>						
<p>6.(a) $x = 16$</p> <p>(b) $x = 6$</p> <p>(c) $x = 56$</p> <p>(d) $3x = 12$ $x = 4$</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>5</p>	<p><i>Accept embedded answers throughout question</i></p> <p>FT from one error eg $3x = 22$ $x = 22/3$ award B0 B1</p>						

UNIT 2 (HIGHER TIER)

Methods 2 Higher Summer 2012		FINAL
1. (a) $x = 24 \times 4/3$ $x = 32$ (b) $x = 1/2$ or 0.5 or equivalent (c) $35x - 28 = 77$ OR $5x - 4 = 77/7$ $35x = 105$ $x=3$ $5x = 15$ (d) $6x < 42$ $x < 7$ (e) $x > 67/3$ or $x > 22.3...$ 23	B1 B1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) FT from 1 error Mark final answer FT until 2 nd error No marks for use of "=", unless finally replaced to give $x < 7$ then award M1 A1. SC1 for $x < 52/6$ ISW Or sight of $3 \times 22 = 66$ with $3 \times 23 = 69$ Accept unsupported 23, or a unique answer of 23 from a trial and improvement method. Do not accept $x > 23$
2.(a) $5w+w+5w+w$ or $12w$ $5w^2$ or $5w \times w$ $P = 12w$ AND $A = 5w^2$ (b) $1/2 \times 4 \times (5 + 9)$ or equivalent $= 28 \text{ (cm}^2\text{)}$	B1 B1 B1 M1 A1 5	Expression B0 for $5w + w \times 2$ or similar Expression Equations, CAO
3.(a) $(432/960) \times 100$ $45(\%)$ (b) $820 - 820 \times 24/100$ OR 820×0.76 623.2 (c) 1.7 (e) $635 + ...$ $... + 12070$ $= 12705$	M1 A1 M1 A1 B3 B1 B1 B1 10	Or equivalent full method Or equivalent full method B2 for 1.71(313...), OR B1 for 2.9(3483...) FT from B1, i.e. either 635 or 12070 correct, with sum of their 2 values calculated correctly
4.(a) Enlargement scale factor 2 Correct position (b) Correct reflection in $y = 2$ (c) Correct translation (d) Correct rotation	B2 B1 B2 B1 B2 8	B1 for any 3 lines correct, or consistent incorrect scale B1 for a reflection in $x=2$ or either axis, OR for sight of the line $y = 2$ B1 near miss ($\pm 2\text{mm}$ from grid lines), or anticlockwise rotation B0 if rotation shown in all quadrants
5.(a)(i) 2/5 (ii) 3/5 (b)(i) 4:3 (ii) $(28/49) \times 100$ $57.1(\%)$ (c) 1: 2.5	B1 B1 B2 M1 A2 B1 8	FT 1 – (i) B1 for 28:21 with an attempt to find a common factor, or sight of $1.3 \bullet : 1$ or $1:0.75$, or reverse answer 3:4 FT their 28, may be 21 used A1 for 57.142857.... rounded or truncated Accept $2 \frac{1}{2}$. Do not accept 30/12

Methods 2 Higher Summer 2012		FINAL
<p>6. Correct use of area cross section or volume, $\frac{1}{2} \times \text{base} \times 4 \times 10 (= 120)$ (Base of the cross section is) 6(cm) Use of Pythagoras' Theorem $5^2 = 4^2 + (\text{RHS base})^2$ RHS base = 3(cm)</p> <p>Conclusion e.g. 'small left hand side triangle is also 3cm, 4cm, 5cm (so cross section has two sides of length 5cm, so it is isosceles)', 'isosceles as 3 is half of 6'</p> <p>Look for</p> <ul style="list-style-type: none"> • spelling • clarity of text explanations and statements • the use of notation • units, cm, cm² and cm³ <p>For QWC2 there must be sufficient process steps shown, with text connecting throughout, or in full summary within a conclusion. Also units must be shown.</p> <p>Candidates not showing two stages working with the problem do not have sufficient process steps to be awarded QWC2.</p> <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining process or steps <p>AND</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining process or steps <p>OR</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer 	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>E1</p> <p>Q</p> <p>W</p> <p>C</p> <p>2</p> <p>7</p>	<p>OR M1 for finding the area of the cross section 12(cm²) Accept as a reverse calculation, i.e. using 6cm to show volume 120(cm³) or area 12(cm²)</p> <p>Accept M1, A1 if $4^2 + 3^2$ used to show side 5cm, or M1, A1 for reference to 3, 4, 5 triple</p> <p>Depends on all previous marks</p> <p><u>**If M1, A1 for base 6(cm), but M0, A0 or M1, A0 for Pythagoras' Theorem & E0 then possible award of:</u> <i>SC1 for clear conclusion that it is an isosceles and its dimensions are (5cm,) 5cm with base 6cm</i> OR <i>SC1 for a clear conclusion that it is not isosceles based on incorrect use of, or an error in using Pythagoras' Theorem</i></p> <p>QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</p> <p>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar</p> <p>OR</p> <p>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.</p> <p>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</p>
<p>7. $5x + x/4 = 18.9$ $20x + x = 4 \times 18.9$ OR $21x/4 = 189$</p> <p>$21x = 75.6$ $x = 3.6$</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>4</p>	<p>FT until 2nd error</p> <p>FT provided similar format, equivalent level of difficulty Accept FT from $5x + \frac{1}{4} = 18.9$, giving $5x = 18.9 - \frac{1}{4}$</p> <p>CAO</p> <p><i>If B0, and similar level of difficulty but trial and improvement used, check their answer in their equation, if correct then award SC2. If SC2 not awarded, then for 2 correctly evaluated trials, 1 either side of the required value award SC1</i></p>

Methods 2 Higher Summer 2012		FINAL
8. Area of circle = $\pi \times 8.2^2$ (211.(...)) Area of square = 23.4^2 or 23.4×23.4 (547.56) Area remaining, between 336.3 to 336.5(cm ²) inclusive Percentage = (area remaining/ 23.4^2) \times 100 = 61(4... %)	M1 M1 A1 M1 A1 5	CAO FT their area remaining provided at least M1 CAO <i>Alternative:</i> <i>M1 Area of circle = $\pi \times 8.2^2$ (=211.(...))</i> <i>M1 area of square = 23.4^2 (=547.56)</i> <i>A1 $\pi \times 8.2^2 / 23.4^2 (\times 100)$ correctly evaluated, 0.38, 0.385... and 0.386, or 38, 38.5, 38.6 or 39 (or as percentages) CAO</i> <i>M1 % remaining = $100 \times (1 - \text{Area circle} / \text{Area square})$ (FT areas provided at least M1 awarded) or $1 - 38.5$ or 38.6 or 39</i> <i>A1 61(4..%) CAO</i>
9.(a) $\cos x = 25.8/62.3$ 65.5(3576...°) rounded or truncated (b) $z = 14.3 \times \tan 34$ 9.6(454..) or 9.65	M1 A2 M1 A1 5	A1 for $\cos^{-1} 0.4(141...)$ 65.8 comes from premature rounding, award M1 and A1 implied If 9.6... seen in working, award M1 A1, however if not seen and incorrectly rounded then M1, A0. An answer of 9.64 or 9.8 from correct working is M1, A0 An unsupported answer of 9 gets M0, A0.
10.(a)(i) $230 \times 100 \times 10$ or 230 000 2.3×10^5 (ii) $8 \times 6 \div 3$ 16 (days) (b) $T = xd/w$	B1 B1 M1 A1 B3 7	FT 'their 230 000', but not 230, correctly expressed in standard form B2 for xd/w or $T = xd/\dots$ or $T = xd \times \dots$ B1 for sight of xd
11. Sight of $9.6 \div 7.8$ or $9.8/(3.25 + 4.55)$ or $9.6 \div 2.4$ or $9.6 \times 0.416(66..)$ or equivalent AB = 4(cm) BC = 5.6(cm)	B2 B1 B1 4	May be within a calculation or implied ($2.4 = 7.8/3.25$ and $0.4166... = 3.25/7.8$) B1 for sight of 3.25:4.55 (or 5:7) or 3.25:7.8 or $AB/BC = 3.25/4.55$ or $AB/9.6 = 3.25/(3.25+4.55)$ or equivalent <i>Alternative method:</i> <i>B1 $x/(9.6-x) = 3.55/4.55$ or simplified versions</i> <i>B1 $4.55x = 3.25(9.6 - x)$ or equivalent rearrangement</i> <i>B1 $AB = 4(\text{cm})$</i> <i>B1 $BC = 5.6(\text{cm})$</i>
12.(a) $y = 8 - x$ OR $x = 8 - y$ $3x^2 + x(8-x) + 6 = 0$ OR $3(8-y)^2 + (8-y)y + 6 = 0$ $2x^2 + 8x + 6 = 0$ OR $2y^2 - 40y + 198 = 0$ $(x + 1)(x+3) = 0$ OR $(y - 11)(y - 9) = 0$ $x = -1, x = -3$ OR $y = 11, y = 9$ $y = 9, y = 11$ OR $x = -3, x = -1$ (b) $x = \{-5 \pm \sqrt{(5^2 - 4 \times 2 \times -4)}\} / 2 \times 2$ $x = \{-5 \pm \sqrt{57}\} / 4$ 0.64 and -3.14	M1 M1 A1 m1 A1 A1 M1 A1 A1 9	Allow 1 error in substitution Or by halving $x^2 + 4x + 3 = 0$ OR $y^2 - 20y + 99 = 0$ FT equivalent level of difficulty provided M1 Or alternative method to solve, e.g. formula with correct substitution and $b^2 - 4ac$ correct simplified OR SCI for $x = -1, y = 9$ OR $x = -3, y = 11$ Allow 1 slip in substitution. Must be correct formula
13. Idea to work with £90.27 as 85% or considering the 2 nd step as 118% of original price $90.27 \div 0.85$ or equivalent 106.2(0) $106.2(0) \div 1.18$ (£)90	S1 M1 A1 M1 A1 5	Maybe implied in further working FT their 106.2(0) provided >90.27

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14.(a) Idea of right angled triangle shown or used with height b, base a $\sin \theta = b/1$ $\tan \theta = b/a$ (b) Use of Pythagoras' Theorem $x^2 + y^2 = 1$ or $x^2 = 1 - y^2$ or $y^2 = 1 - x^2$	M1 A1 A1 M1 A1 5	Either answer correct implies M1 Or $b/\sqrt{a^2 + b^2}$ M1 for $a^2 + b^2 = 1$ or $x^2 + y^2 = r^2$ CAO. Correct equation in any form
15. $AC^2 = 8.2^2 + 7.6^2 - 2 \times 8.2 \times 7.6 \times \cos 42$ $AC^2 = 32(.37\dots)$ $AC = 5.689\dots$ or 5.7 (cm) $\frac{1}{2} \times 8.2 \times 7.6 \times \sin 42 + \frac{1}{2} \times 9.7 \times AC \times \sin 48$ Answers in the range 41.35 (cm ²) to 41.4 (cm ²) inclusive	M1 A1 A1 M1 A1 5	FT their AC, but not 8.2, 7.6 or 9.7 (20.85... + 20.50...)
16. $AB = 2x - y$ Parallel CD twice length AB OR AB is $\frac{1}{2}$ length CD	M1 A1 A1 3	



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