

Marking Scheme: 2016 Paper 2

The Left Side shows the solution.

The Right Side shows how marks were awarded.

Q1	Model Solution – 15 Marks	Marking Notes
(a)	$x = 6$ $y = 2 + 9 = 11$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answers without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> • One correct value • Indication that the median is the middle number (when ranked) • Indication that the range is the difference between the highest and lowest numbers
(b)	$b = 16$ <p>Sum: $64 + a + c = 6 \times 18 = 108$</p> $\Rightarrow a + c = 44$ <p>And $c - a = 30$</p> $\Rightarrow 2c = 74$ $\Rightarrow c = 37$ $\Rightarrow a = 7$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication of understanding of the median in this context • Indication of the sum of the numbers • Indication that the range is the difference between the highest and lowest numbers • Values of c and a with $c - a = 30$ <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • One correct value <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two correct values • b correct and work towards a and c

Q2	Model Solution – 40 Marks	Marking Notes															
(a)	<table border="1"><tr><td>2</td><td>3</td><td></td><td>5</td><td>6</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>4</td><td></td><td>6</td><td>7</td><td>8</td></tr></table>	2	3		5	6	3	4	5	6	7	4		6	7	8	<p>Scale 15C (0, 6, 10, 15)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none">Three correct values <p><i>High Partial Credit</i></p> <ul style="list-style-type: none">Nine correct values <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none">Twelve correct values and one incorrect value in the table
2	3		5	6													
3	4	5	6	7													
4		6	7	8													
(b)	$\frac{1}{15}$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none">Fraction with 15 as denominatorIndication of 3 on A and 5 on B															
(c)	$\frac{3}{15} \times 320 = 64$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer without work</p> <p>Accept an interval centred on 64</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none">Fraction with 15 as denominator$\frac{3}{15}$ or equivalentIndication of multiplication by 320Indication of 1,1 and 2,2 and 3,3, or of 3															
(d)	$320 - 74 = 246$ $246 - 110 = 136$ $136 \div 8 = 17$ <p style="text-align: center;">OR</p> <p>Let x = number who got €8 back.</p> <p>€ in: 320</p> <p>€ out: $74 + 8x$</p> <p>Profit: $320 - (74 + 8x) = 110$</p> <p style="margin-left: 40px;">$8x = 136$</p> <p style="margin-left: 40px;">$x = 17$</p>	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none">One relevant operation e.g. $320 - 74$ or $74 + 110$ or $320 - 110$ <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none">Two relevant operations e.g. $246 - 110$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none">136$\frac{210-74}{8}$ or equivalent															

Q2	Model Solution – 40 Marks	Marking Notes																												
(e)	<p>Answer: Paul is not correct.</p> <table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr></table> <p>P(getting money back) before change:</p> $\frac{4}{15} = \frac{24}{90} \text{ or } 0.2666\ldots$ <p>P(getting money back) after change:</p> $\frac{5}{18} = \frac{25}{90} \text{ or } 0.2777\ldots > \frac{4}{15}$		1	2	3	4	5	6	1	2	3	4	5	6	7	2	3	4	5	6	7	8	3	4	5	6	7	8	9	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept the two-way table with (1, 1), (1, 2), etc. filled in</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none">• Correct answer with no justification• New table with at least 10 correct entries• $\frac{4}{15}$• $\frac{5}{18}$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none">• Any two of the <i>Low Partial</i> bullet points <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none">• Correct for €1 or €8 (i.e. misreading)• Table correct and comparable probabilities correct, no conclusion or incorrect conclusion
	1	2	3	4	5	6																								
1	2	3	4	5	6	7																								
2	3	4	5	6	7	8																								
3	4	5	6	7	8	9																								

Q3	Model Solution – 50 Marks	Marking Notes																		
(a)	Median: 26% Upper Quartile: 36.5%	Scale 5C (0, 2, 4, 5) Accept correct answer without work <i>Low Partial Credit</i> <ul style="list-style-type: none">Indication of understanding of the median or upper quartile <i>High Partial Credit</i> <ul style="list-style-type: none">One correct value <i>Full Credit – 1</i> <ul style="list-style-type: none">Value(s) for 2005 (20.5%, 33.5%)																		
(b)	In one quarter of the countries, less than 19.5% of the members of parliament were female in 2015, <i>or equivalent</i> .	Scale 5B (0, 3, 5) <i>Partial Credit</i> <ul style="list-style-type: none">Indication of one quarter or three quarters																		
(c)	<table><tr><td></td><td>0–9</td><td>10–19</td><td>20–29</td><td>30–39</td><td>40–49</td></tr><tr><td>2005</td><td>2</td><td>10</td><td>8</td><td>7</td><td>1</td></tr><tr><td>2015</td><td>0</td><td>7</td><td>10</td><td>8</td><td>3</td></tr></table>		0–9	10–19	20–29	30–39	40–49	2005	2	10	8	7	1	2015	0	7	10	8	3	Scale 10C (0, 5, 7, 10) <i>Low Partial Credit</i> <ul style="list-style-type: none">Four correct values <i>High Partial Credit</i> <ul style="list-style-type: none">Eight correct values <i>Full Credit – 1</i> <ul style="list-style-type: none">Tallies or relative frequencies in percentage, fraction, or decimal form
	0–9	10–19	20–29	30–39	40–49															
2005	2	10	8	7	1															
2015	0	7	10	8	3															

Q3	Model Solution – 50 Marks	Marking Notes
(d)	$\frac{2(4\cdot5)+10(14\cdot5)+8(24\cdot5)+7(34\cdot5)+1(44\cdot5)}{28}$ $= \frac{636}{28}$ $= 22\cdot71\dots$ $= 22\cdot7\% \text{ [1 DP]}$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication of division by 28 • One correct mid-interval value • Numerator with consistent incorrect mid-interval values <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Consistent incorrect mid-interval values and finished correctly • $2(4\cdot5)+10(14\cdot5)+8(24\cdot5)+7(34\cdot5)+1(44\cdot5)$ • 636
(e)	<p>(i) The mid-interval values assumes every value in a given interval is the same, e.g. everyone in 10–19 is 14·5. The actual values in this interval are not all 14·5.</p> <p>(ii) $\frac{27-26\cdot86}{26\cdot86} \times 100$</p> $= \frac{0\cdot14}{26\cdot86} \times 100$ $= 0\cdot521\dots$ $= 0\cdot52\% \text{ [2 DP]}$	<p>Scale 5C (0, 2, 4, 5)</p> <p>In (ii), correct answer without work is counted as work of merit (not correct)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Work of merit in (ii), e.g. $27 - 26\cdot86$, or correct denominator, or multiplication by 100, or correct answer with no supporting work • Correct explanation in (i) <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $\frac{0\cdot14}{26\cdot86}$ or 100·52 • Correct explanation in (i) and work of merit in (ii)

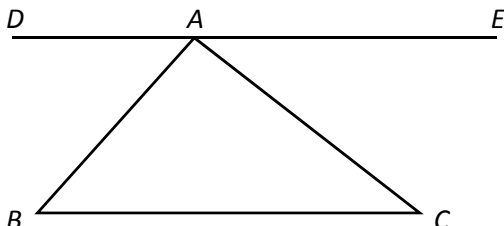
Q3	Model Solution – 50 Marks	Marking Notes																																																																																																																																																																																														
(f)	<p><i>Suitably-labelled graph(s) allowing comparison of two data sets, e.g.</i></p> <div><table><thead><tr><th>% of members who are female</th><th>2005</th><th>2015</th></tr></thead><tbody><tr><td>0-9</td><td>2</td><td>0</td></tr><tr><td>10-19</td><td>10</td><td>7</td></tr><tr><td>20-29</td><td>8</td><td>10</td></tr><tr><td>30-39</td><td>7</td><td>8</td></tr><tr><td>40-49</td><td>1</td><td>3</td></tr></tbody></table></div> <p style="text-align: center;">OR</p> <div><table><thead><tr><th colspan="13">2005</th><th colspan="13">2015</th></tr></thead><tbody><tr><td colspan="13">9 9 0</td><td colspan="13"></td></tr><tr><td>9</td><td>7</td><td>7</td><td>6</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>3</td><td>3</td><td>4</td><td>6</td><td>8</td><td>9</td><td></td><td></td><td></td></tr><tr><td></td><td>3</td><td>2</td><td>2</td><td>2</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>3</td><td>3</td><td>4</td><td>4</td><td>6</td><td>6</td><td>8</td><td>9</td></tr><tr><td></td><td>8</td><td>7</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td><td>1</td><td>1</td><td>1</td><td>3</td><td>1</td><td>1</td><td>1</td><td>6</td><td>7</td><td>7</td><td>7</td><td>9</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>5</td><td>4</td><td>1</td><td>4</td><td>1</td><td>2</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table><p>Key: 2 3=23% of members are female</p></div> <p style="text-align: center;">OR</p> <div><div><p>2005: % of members who are female</p><ul style="list-style-type: none">0 - 9 %10-19 %20-29 %30-39 %40-49 %</div><div><p>2015: % of members who are female</p><ul style="list-style-type: none">0 - 9 %10-19 %20-29 %30-39 %40-49 %</div></div> <p style="text-align: center;">OR</p> <div><table><thead><tr><th>Rank order of country</th><th>2005</th><th>2015</th></tr></thead><tbody><tr><td>1</td><td>10</td><td>10</td></tr><tr><td>5</td><td>12</td><td>15</td></tr><tr><td>9</td><td>15</td><td>20</td></tr><tr><td>13</td><td>18</td><td>25</td></tr><tr><td>17</td><td>20</td><td>30</td></tr><tr><td>21</td><td>25</td><td>35</td></tr><tr><td>25</td><td>40</td><td>45</td></tr></tbody></table></div>	% of members who are female	2005	2015	0-9	2	0	10-19	10	7	20-29	8	10	30-39	7	8	40-49	1	3	2005													2015													9 9 0																										9	7	7	6	3	3	2	2	2	1	1	0	0	1	0	3	3	4	6	8	9					3	2	2	2	1	1	0	0	0	0	0	0	2	0	0	3	3	4	4	6	6	8	9		8	7	7	6	5	4	3	3	3	1	1	1	3	1	1	1	6	7	7	7	9													5	4	1	4	1	2	4								Rank order of country	2005	2015	1	10	10	5	12	15	9	15	20	13	18	25	17	20	30	21	25	35	25	40	45	<p>Scale 15C (0, 6, 10, 15)</p> <p>Tolerance: $\pm 2^\circ$ for a pie chart</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none">• Scaled axes drawn• One angle correctly calculated or similar• Two comparable pie charts, each with the correct number of sectors <p><i>High Partial Credit</i></p> <ul style="list-style-type: none">• Correct graph for 2005 or 2015 drawn• Graph(s) correct, but necessary calculations not shown – e.g. pie charts correctly drawn but angle calculations not shown <p><i>Full Credit –1</i></p> <ul style="list-style-type: none">• Graph(s) correctly drawn but not labelled• Data from Table 1 graphed with just one incorrect value
% of members who are female	2005	2015																																																																																																																																																																																														
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Q4	Model Solution – 45 Marks	Marking Notes
(a)	<p>A: (-1, 3)</p> <p>B: (5, 3)</p> <p>C: (-1, 8)</p>	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • One point correct • All three points with co-ordinates reversed, but otherwise correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Two points correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answers in incorrect boxes, otherwise correct
(b)	<p>AB: $y = 3$</p> <p>AC: $x = -1$</p> <p>BC: $m = -\frac{5}{6}$</p> <p>Eqn: $y - 3 = -\frac{5}{6}(x - 5)$</p> <p>or $5x + 6y - 43 = 0$</p>	<p>Scale 15D (0, 6, 9, 12, 15)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula for slope or equation of a line • Equation of AB or AC correct <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • Equation of AB and AC correct • Equation of BC correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Equation of AB and AC correct and slope for BC correct • Equation of BC correct and AB or AC correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Answers in incorrect boxes, otherwise correct • $y = -\frac{5}{6}x + c$, where $c \neq 7\frac{1}{6}$ is between 7.1 and 7.2 (inclusive), with no supporting work

Q4	Model Solution – 45 Marks	Marking Notes
(c)	$\tan (\angle ABC) = \frac{\text{opposite}}{\text{adjacent}}$ $= \frac{5}{6}$ $\Rightarrow \angle ABC = \tan^{-1} \left(\frac{5}{6} \right)$ $= 39.81^{\circ} \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $ BC = \sqrt{5^2 + 6^2}$ $= \sqrt{61}$ $\Rightarrow \angle ABC = \sin^{-1} \left(\frac{5}{\sqrt{61}} \right)$ $= \cos^{-1} \left(\frac{6}{\sqrt{61}} \right)$ $= 39.81^{\circ} \text{ [2 DP]}$	<p>Scale 5B (0, 3, 5)</p> <p>Accept correct answer in degrees without degree symbol</p> <p><i>Partial Credit</i></p> <ul style="list-style-type: none"> Any correct trigonometric ratio $\tan (\angle ABC) = \frac{5}{6}$ or similar $\angle ABC = \tan^{-1} \left(\frac{5}{6} \right)$ or similar Correct answer without work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Calculator in incorrect mode, otherwise correct $\angle ACB$ correctly found: 50.19°
(d)	<p>(i) $BC = \sqrt{5^2 + 6^2}$ $= \sqrt{61}$</p> <p>(ii) Diameter $= \sqrt{61}$ $\Rightarrow \text{Radius} = \frac{\sqrt{61}}{2}$ $\Rightarrow \text{Area} = \pi \left(\frac{\sqrt{61}}{2} \right)^2$ $= \frac{61\pi}{4}$</p>	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Some correct use of a relevant formula – Pythagoras’ Theorem, distance formula, area formula, mid-point formula Error in (i) but answer divided by 2 <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Radius $= \frac{\sqrt{61}}{2}$ Error in (i) but (ii) correct (i) correct, and answer of 61π or 30.5π or equivalent in (ii) <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> (i) correct, and answer of $\pi \left(\frac{\sqrt{61}}{2} \right)^2$ in (ii) Answer in (ii) not in terms of π, otherwise correct BC not in surd form in (i), finished correctly

Q4	Model Solution – 45 Marks	Marking Notes
(e)	$m = \frac{6}{5}$ $\text{Eqn: } y - 3 = \frac{6}{5}(x - (-1))$ <p>or $6x - 5y + 21 = 0$</p>	<p>Scale 5B (0, 3, 5) Accept correct answer without work <i>Partial Credit</i></p> <ul style="list-style-type: none"> Reference to relevant property of perpendicular lines – e.g. invert and change the sign, or the product of the slopes is -1 Indication that “perpendicular” means that the lines make an angle of 90° (including on diagram) Correct formula for equation of a line with some relevant substitution $m = \frac{6}{5}$

Q5	Model Solution – 15 Marks	Marking Notes
(a)	<p>No</p> $5(3) + 3(-5) + 6 = 6 \text{ (not 0)}$ <p><i>or any other valid justification involving calculation</i></p>	<p>Scale 5B (0, 3, 5) <i>Partial Credit</i></p> <ul style="list-style-type: none"> Correct answer with no justification Some correct substitution into line equation <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Correct substitution with no or incorrect conclusion (i.e. doesn’t write “no” or equivalent)
(b)	<p>Sub E2 into E1:</p> $3x + 2(-2x + 5) = 7$ $\Rightarrow 3x - 4x + 10 = 7$ $\Rightarrow x = 3$ $\Rightarrow y = -2(3) + 5$ $\Rightarrow y = -1$ <p>Answer: (3, -1)</p> <p style="text-align: center;">OR</p> <p>E1: $3x + 2y = 7$ -2E2: $-4x - 2y = -10$</p> $\Rightarrow x = 3$ $\Rightarrow y = -2(3) + 5$ $\Rightarrow y = -1$ <p>Answer: (3, -1)</p>	<p>Scale 10C (0, 5, 7, 10) Accept correct graphical solution <i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Some work of merit in solving the simultaneous equations E2 or E1 rearranged Attempt at graphical solution $-2x + 5$ substituted into E1 Attempt at trial and improvement <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> One value correct with supporting work Fully complete with one error x and y correct without supporting work <p><i>Full Credit</i></p> <ul style="list-style-type: none"> x and y correct and fully justified (i.e. subbed into both equations)

Q6	Model Solution – 10 Marks	Marking Notes											
	<p>Step 1: <i>Diagram:</i></p>  <p><i>Given:</i> Triangle ABC.</p> <p><i>To Prove:</i> $\angle ABC + \angle BAC + \angle ACB = 180^\circ$</p> <p><i>Construction:</i> Draw line <i>DE</i> through <i>A</i> parallel to <i>BC</i></p> <p>Step 2: <i>Proof:</i></p> <table><tr><td>$\angle ABC = \angle DAB$</td><td>Alternate angles</td></tr><tr><td>$\angle ACB = \angle EAC$</td><td>Alternate angles</td></tr></table> <p>Step 3:</p> <table><tr><td>$\angle DAE = 180^\circ$</td><td>Straight angle</td></tr><tr><td colspan="2">$\Rightarrow \angle DAB + \angle BAC + \angle EAC = 180^\circ$</td></tr><tr><td colspan="2">Protractor axiom</td></tr></table> <p>Step 4:</p> <table><tr><td>$\Rightarrow \angle ABC + \angle BAC + \angle ACB = 180^\circ$</td></tr></table>	$ \angle ABC = \angle DAB $	Alternate angles	$ \angle ACB = \angle EAC $	Alternate angles	$ \angle DAE = 180^\circ$	Straight angle	$\Rightarrow \angle DAB + \angle BAC + \angle EAC = 180^\circ$		Protractor axiom		$\Rightarrow \angle ABC + \angle BAC + \angle ACB = 180^\circ$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none">• Diagram <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none">• Two steps correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none">• Three steps correct with no reason given
$ \angle ABC = \angle DAB $	Alternate angles												
$ \angle ACB = \angle EAC $	Alternate angles												
$ \angle DAE = 180^\circ$	Straight angle												
$\Rightarrow \angle DAB + \angle BAC + \angle EAC = 180^\circ$													
Protractor axiom													
$\Rightarrow \angle ABC + \angle BAC + \angle ACB = 180^\circ$													

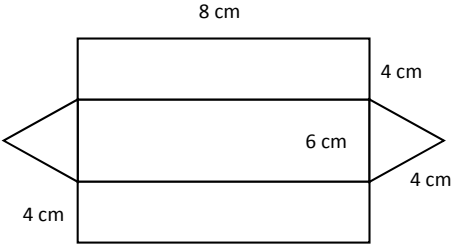
Q7	Model Solution – 15 Marks	Marking Notes
(a)	$x = 180 - 100 = 80$	Scale 5B (0, 3, 5) Accept correct answer without work <i>Partial Credit</i> <ul style="list-style-type: none"> Indication that the opposite angles in a cyclic quadrilateral add to 180°
(b)	$y = 180 - \left(\frac{100}{2}\right) - \left(\frac{80}{2}\right)$ $\Rightarrow y = 90$ <p style="text-align: center;">OR</p> $y = 180 - \left(\frac{180-100}{2}\right) - \left(\frac{180-80}{2}\right)$ $\Rightarrow y = 90$ <p style="text-align: center;">OR</p> <p>Draw the diagonal AC Consider $\triangle ACD$ and $\triangle ACB$ $AD = AB$ [given] $CD = CB$ [given] $AC = AC$ [common side] $\Rightarrow \triangle ACD$ is congruent to $\triangle ACB$ [S.S.S.] $\Rightarrow \angle ADC = \angle ABC$ [corresponding angles] But $\angle ADC + \angle ABC = 180^\circ$ [opposite angles in cyclic quadrilateral] $\Rightarrow y + y = 180^\circ$ $\Rightarrow y = 90^\circ$</p>	Scale 10C (0, 5, 7, 10) Accept: " $y + y = 180 \Rightarrow y = 90$ " or similar for <i>Full Credit</i> <i>Low Partial Credit</i> <ul style="list-style-type: none"> Indication in (b) that the opposite angles in a cyclic quadrilateral add to 180° Indication that the sum of the angles in a quadrilateral is 360° Indication that in an isosceles triangle the angles opposite the equal sides are equal A diagonal drawn Indication of congruent triangles <i>High Partial Credit</i> <ul style="list-style-type: none"> $y + y = 180$ or similar $y = 90$ with no working out

Q8	Model Solution – 25 Marks	Marking Notes
(a)	<p>(i) 2.72° [2 DP]</p> <p style="text-align: center;">OR</p> $2 + \frac{43}{60} + \frac{5}{60^2} = 2.72^\circ$ [2 DP] <p>(ii) $3^\circ 8' 24''$</p> <p style="text-align: center;">OR</p> $0.14 \times 60 = 8.4'$ $0.4 \times 60 = 24''$ $3.14^\circ = 3^\circ 8' 24''$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answers without work Accept correct answer in (a)(i) without degree symbol</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Indication of the relationship between degrees/minutes/seconds <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> One part correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Rounding error in (i), otherwise correct
(b)	$\cos A = \sin A$ $\Rightarrow \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\text{opposite}}{\text{hypotenuse}}$ $\Rightarrow \text{adjacent} = \text{opposite}$	<p>Scale 10C (0, 5, 7, 10)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Any correct trigonometric ratio Indication of the properties of an isosceles triangle <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> $A = 45^\circ$ $\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\text{opposite}}{\text{hypotenuse}}$, <p>with no conclusion</p>
(c)	$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$ $= \frac{7}{25}$ $\Rightarrow A = \sin^{-1}\left(\frac{7}{25}\right)$ $= 16.3^\circ$ [1 DP] <p style="text-align: center;">OR</p> $A = \cos^{-1}\left(\frac{24}{25}\right)$ $= 16.3^\circ$ [1 DP] <p style="text-align: center;">OR</p> $A = \tan^{-1}\left(\frac{7}{24}\right)$ $= 16.3^\circ$ [1 DP]	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Correct diagram drawn Indication that the smallest angle is opposite the smallest side Any correct trigonometric ratio <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> $\sin A = \frac{7}{25}$ or similar $A = \sin^{-1}\left(\frac{7}{25}\right)$ or similar Other angle found: 73.7° <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Correct answer without units

Q9	Model Solution – 20 Marks	Marking Notes
(a)	$\text{T.S.A.} = (6 \times 1^2) + (6 \times 2^2) - (2 \times 1^2)$ $= 28 \text{ [square units]}$ <p style="text-align: center;">OR</p> $\text{T.S.A.} = (6 \times 2^2) + (4 \times 1^2)$ $= 28 \text{ [square units]}$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula: $A = l \times w$ • Correct formula : $\text{S.A.} = 6 \times l^2$ or similar • (6×1^2) or (6×2^2) or (4×1^2) • 23 or 5 <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 30 or 29 [square units] • 23 and 5
(b) (i)&(ii)	<p>(i) $\sqrt{2^2 + 2^2}$</p> $= \sqrt{8} \text{ or } 2\sqrt{2} \text{ [units]}$ <p>(ii) $\sqrt{\sqrt{8}^2 + 3^2}$</p> $= \sqrt{17} \text{ [units]}$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Work of merit in either part, e.g. some correct use of Pythagoras' theorem, base redrawn as right-angled with at least one measurement shown, relevant right angle marked on diagram with at least one measurement shown <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • (i) or (ii) correct <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Not in surd form, otherwise correct
(b)(iii)	<p>Let required length = x</p> $\frac{x}{\sqrt{17}} = \frac{2}{3}$ $\Rightarrow x = \frac{2\sqrt{17}}{3} \text{ or } 2.748\dots$	<p>Scale 5C (0, 2, 4, 5)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Indication of similar triangles • One correct ratio <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $\frac{x}{\sqrt{17}} = \frac{2}{3}$ <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Length of BC inside smaller cube correctly found, i.e. $\frac{\sqrt{17}}{3}$

Q10	Model Solution – 15 Marks	Marking Notes
(a)	$7y = 7 + y + 7 + y$ $5y = 14$ $y = \frac{14}{5} \text{ or } 2.8$	<p>Scale 10C (0, 5, 7, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula: Area = $l \times w$ • Correct formula: Perimeter = $2l + 2w$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • $7y = 7 + y + 7 + y$ or similar
(b)	$xy = x + y + x + y$ $xy - 2y = 2x$ $y(x - 2) = 2x$ $y = \frac{2x}{x-2} \text{ or } \frac{-2x}{2-x}$	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Area or perimeter found in terms of x and y (i.e. xy or $x + y + x + y$ or similar) • $xy = x + y + x + y$ or similar <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • All terms including y on LHS, all other terms on RHS (or vice versa) • All terms including x on LHS, all other terms on RHS (or vice versa) • Correct answer without work <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Correctly finds x in terms of y

Q11	Model Solution – 15 Marks	Marking Notes																		
(a)	<table border="1"> <thead> <tr> <th>Radius (cm)</th><th>Height (cm)</th><th>Volume (cm³)</th></tr> </thead> <tbody> <tr> <td>1</td><td>K</td><td>πK</td></tr> <tr> <td>2</td><td>K</td><td>$4 \pi K$</td></tr> <tr> <td>3</td><td>K</td><td>$9 \pi K$</td></tr> <tr> <td>4</td><td>K</td><td>$16 \pi K$</td></tr> <tr> <td>5</td><td>K</td><td>$25 \pi K$</td></tr> </tbody> </table>	Radius (cm)	Height (cm)	Volume (cm ³)	1	K	πK	2	K	$4 \pi K$	3	K	$9 \pi K$	4	K	$16 \pi K$	5	K	$25 \pi K$	<p>Scale 10D (0, 4, 6, 8, 10)</p> <p>Accept correct answer without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct formula: $V = \pi r^2 h$ • 1 correct volume <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • 2 correct volumes <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • 3 correct volumes <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> • Not in required form, otherwise correct
Radius (cm)	Height (cm)	Volume (cm ³)																		
1	K	πK																		
2	K	$4 \pi K$																		
3	K	$9 \pi K$																		
4	K	$16 \pi K$																		
5	K	$25 \pi K$																		
(b)	<p><i>Ans:</i> The sequence is quadratic.</p> <p><i>Jus:</i> 1st diff: $3 \pi K, 5 \pi K, 7 \pi K, 9 \pi K$ 2nd diff: All the same ($2 \pi K$)</p> <p style="text-align: center;">OR</p> <p>The formula for the volumes has an r^2 in it and no other variables (as h is fixed)</p>	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Correct answer with no justification • Indication of first difference or second difference • $1^2, 2^2, 3^2, \dots$ <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • First differences found and stated not linear or exponential • Second difference found with no or incorrect conclusion 																		

Q12	Model Solution – 35 Marks	Marking Notes
(a)	<p>Valid net constructed, including supporting work for at least one of the triangles (e.g. construction lines drawn, or the measure of at least one angle in the triangle, or the perpendicular height of the triangle, calculated). May be laid out in any valid configuration, for example:</p> 	<p>Scale 15D (0, 6, 9, 12, 15)</p> <p>Tolerance: $\pm 0.1\text{cm}$</p> <p>Tolerance: $\pm 2^\circ$ if angle calculated</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> • Rough sketch drawn with five relevant shapes correctly joined • One triangle correctly constructed with construction lines shown • One rectangle correctly constructed • One angle in triangle calculated: 41.4° or 97.2° • Perpendicular height of triangle found: 2.6 cm (with 6 cm as base) <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> • One triangle and one rectangle constructed (in correct net formation), with supporting work for the triangle <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> • Four faces constructed (in correct net formation) with supporting work for at least 1 triangle • Fully correct net constructed with no supporting work for the triangles <p><i>Full Credit – 1</i></p> <ul style="list-style-type: none"> • Net fully correct, but with at least one interior line missing

Q12	Model Solution – 35 Marks	Marking Notes
(b)(i)	<p>Drop a line from the apex perpendicular to the base. In the right-angled triangle:</p> $\cos 70^\circ = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\Rightarrow \cos 70^\circ = \frac{3.5}{x}$ $\Rightarrow x = \frac{3.5}{\cos 70^\circ}$ $= 10.23 \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $\frac{x}{\sin 70^\circ} = \frac{7}{\sin 40^\circ}$ $\Rightarrow x = \frac{7 \sin 70^\circ}{\sin 40^\circ}$ $= 10.23 \text{ [2 DP]}$ <p style="text-align: center;">OR</p> $\tan 70^\circ = \frac{h}{3.5} \Rightarrow h = 9.6162...$ $x^2 = 3.5^2 + 9.6162^2$ $= 104.7213024$ $\Rightarrow x = 10.23 \text{ [2 DP]}$	<p>Scale 5C (0, 2, 4, 5)</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Any correct trigonometric ratio Some correct use of Pythagoras' Theorem $\cos 70^\circ = \frac{x}{3.5}$ and finished correctly 40° or 20° or 3.5 $\sin 70^\circ = \frac{7}{x}$ or similar and finishes correctly <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> $\cos 70^\circ = \frac{3.5}{x}$ or similar $x = \frac{7 \sin 70^\circ}{\sin 40^\circ}$ $x^2 = 3.5^2 + 9.6162^2 = 104.7213024$ Correct answer without work <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Calculator in incorrect mode, otherwise correct

Q12	Model Solution – 35 Marks	Marking Notes
(b)(ii)	<p>A: $7 \times 12 = 84 \text{ cm}^2$</p> <p>B: $12 \times 10.23 = 123 \text{ cm}^2$ [nearest cm^2]</p> <p>C: Let h be the perpendicular height of this face. Then: $h^2 + 3.5^2 = 10.23^2$ $\Rightarrow h^2 = 104.6529 - 12.25$ $\Rightarrow h = \sqrt{92.4029}$ $= 9.6126...$</p> <p>$\Rightarrow \text{Area} = \frac{1}{2} \times 7 \times 9.6126...$ $= 34$ [nearest cm^2]</p> <p style="text-align: center;">OR</p> <p>Let h be the perpendicular height of this face. Then: $\tan 70^\circ = \frac{\text{opposite}}{\text{adjacent}}$</p> <p>$\Rightarrow \tan 70^\circ = \frac{h}{3.5}$</p> <p>$\Rightarrow h = 3.5 \tan 70^\circ$ $= 9.6161...$</p> <p>$\Rightarrow \text{Area} = \frac{1}{2} \times 7 \times 9.6161...$ $= 34$ [nearest cm^2]</p>	<p>Scale 15D (0, 6, 9, 12, 15)</p> <p>Accept correct answers without work</p> <p><i>Low Partial Credit</i></p> <ul style="list-style-type: none"> Correct relevant formula, e.g. $\text{area} = l \times w$ or $\frac{1}{2} (\text{base} \times \text{perpendicular height})$ or Pythagoras' Thm or $\frac{1}{2} ab \sin C$ $x = 10.23$ Area of A or B correct <p><i>Mid Partial Credit</i></p> <ul style="list-style-type: none"> Area of A and B correct Area of C correct <p><i>High Partial Credit</i></p> <ul style="list-style-type: none"> Area of A and B correct and $h = 9.6126...$ Area of C correct and areas of A or B correct <p><i>Full Credit –1</i></p> <ul style="list-style-type: none"> Answers in incorrect boxes, otherwise correct