

Question No	WORKING	CRITERIA	Marks	Total Mark
<p>1i</p> <p>Rotation by -90° about origin or Rotation by 90° clockwise about origin or Rotation by 270° about origin or Rotation by 270° anticlockwise about origin</p> <p>1ii 1iii 1iv</p> <p>See transparency for solution of parts 1ii, 1iii and 1iv. A copy of the transparencies used is given at the end of the marking scheme.</p>		<p>Mentions angle 90° or 270° Fully accurate answer <i>In 1i, no marks awarded for “rotation” only</i></p> <p>Correct Image R Correct Image S Correct Image T</p> <p><i>For parts 1ii- 1iv: Where candidates use incorrect labelling– Give 0 marks. Where candidates use NO labelling, give 0 marks unless all transformations are correct. In such case, award 2 out of 3 marks</i></p>	<p>M1 A1</p> <p>A1 A1 A1</p>	<p>6</p>
<p>1v</p> <p>$y = x$</p>		<p>$y = x$</p>	<p>A1</p>	
<p>2ai</p> <p>$3(a - 4) = b(a + 5)$ Since $b = 2$, $3a - 12 = 2a + 10$ $a = 22$</p> <p>2aai</p> <p>$3(a - 4) = b(a + 5)$ $3a - 12 = ab + 5b$ $3a - ab = 5b + 12$ $a(3 - b) = 5b + 12$ $a = \frac{5b + 12}{3 - b}$</p> <p>2b</p> <p>$x + 4y = 8$ $2x + 8y = 16$ $2x - 12y = 1$ gives $2x - 12y = 1$ So $20y = 15$, i.e $y = 0.75$ or $3/4$ and $x = 5$</p>		<p>Opens out one of the brackets $3(a - 4)$ or $b(a + 5)$ or $2(a + 5)$ correctly</p> <p>$a = 22$</p> <p>Terms in a arranged to one side of equation</p> <p>factorising $a = \frac{5b + 12}{3 - b}$</p> <p>Uses a correct strategy to eliminate one of the unknowns $x = 5$ or $y = 0.75$</p> <p>Uses a correct strategy to find other unknown Correct value for other unknown</p>	<p>M1 A1</p> <p>M1 A1</p> <p>M1 A1 A1</p>	<p>9</p>

Question No	WORKING	CRITERIA	Marks	Total Mark	
3i	See transparency	Line AB is parallel to CD (within 0.2cm at vertices using transparency) Uses arcs appropriately to draw triangle ADB (need two arcs at one of the vertices of this triangle) Three or more of the following correctly measured, accept answers to within ± 0.1 cm of values: AD=8cm, AB=9.3cm, BD=12cm and DC=12.5cm Trapezium considered accurate if it fits template within ± 0.2 cm at the vertices. Arcs are not required for position of C.	M1 M1 M1 A1	8	
3ii	See transparency BX= 8.0 ± 0.2 cm This represents $16\text{m} \pm 0.4\text{m}$	Line drawn from B is perpendicular to DC ($\pm 2^\circ$) Uses arcs appropriately to draw either a perpendicular from B to DC or a perpendicular to AB at B BX= 8.0 ± 0.2 cm Distance represented $16\text{m} \pm 0.4\text{m}$	M1 A1 A1 A1		
4i	$r = 6378.1$ km $\text{Area} = 4\pi \times 6378.1^2 = 511201962.3$ $= 5.11 \times 10^8 \text{ km}^2$	Correct computation giving a number close to 511201962 Correct standard Form Answer correct to 3s.f., ignore units <i>Note: The answer 511 is NOT a correct answer to 3sf</i>	A1 M1 M1	7 FNW*	
4iia	Area of land is 1.49×10^8 % covered by land is $\frac{1.49 \times 10^8}{5.11 \times 10^8} \times 100 = 29.158\% = 29\%$ If using unrounded value for Area of Earth- % covered by land is 29.14699%	Finds % area covered by land appropriately Accept answer between 29.1% and 29.2% Answer to 2 sf, ignore units, do not accept 29.0%	M1 A1ft* M1		
4iib	Area covered by water is 71%	71%- rounding not penalised	A1ft		

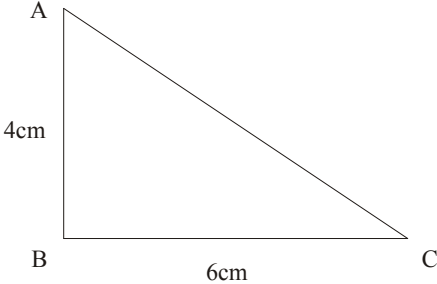
* ft stands for Follow Through whilst FNW stands for Full Marks No Working.

Question No	WORKING	CRITERIA	Marks	Total Mark
5	$\frac{10}{\frac{3}{4}} = \frac{40}{3} = 13 \frac{1}{3}$ <p>13 pieces of $\frac{3}{4}$ cm each left over- $\frac{1}{3}$ of $\frac{3}{4} = \frac{1}{4}$</p> <p>OR- left over = $10 - 13 \times \frac{3}{4} = \frac{1}{4}$ cm</p>	<p>Uses $10 \div \frac{3}{4}$ or attempts to find values so that $? \times \frac{3}{4} = 10$ 13 pieces</p> <p><i>If answer is $13\frac{1}{3}$, award M1A0</i></p> <p>left over = $\frac{1}{4}$ cm, ignore units <i>Do not give this last mark unless candidate shows correct working for this last part, either by finding $\frac{1}{3}$ of $\frac{3}{4}$ or by showing they are finding the exact length of 13 strips to find the left over.</i></p>	<p>M1 } A1 } FNW</p> <p>A1</p>	3
6a	$\frac{\pi(3.5 - 2.1)^3}{8} - (1.3 \times 2.1^2) =$ $\frac{\pi(1.4)^3}{8} - (1.3 \times 2.1^2) =$ $\frac{8.62053}{8} - 5.733 = 1.0776 - 5.733 = -4.6554$ <p style="text-align: center;">= -4.655 to 3dp</p>	<p>1.078 or more accurate 5.733</p> <p>-4.65543372 or less accurate, i.e. rounding errors not penalised here</p> <p>Correct answer with correct rounding i.e. -4.655</p>	<p>A1 } A1 } FNW A1 } A1 }</p>	9
6b	<p>3.5kg at €7.5 = €26.25 4kg at €10.80 = €43.20 Total cost of chocolates = €69.45</p> <p>Using 7.5kg, she filled 30 boxes each containing 250g</p> <p>30 boxes at €0,75 = €22.50 Cost of chocolates and boxes = €91.95</p> <p>Tania sold 28 boxes at €4, Sales = €112 Profit = €112 – €91.95 = €20.05</p>	<p>Adds 3.5×7.5 and 4×10.8 to find total cost of chocolates</p> <p>30 boxes</p> <p><i>This A1 mark is not linked to the method mark above it</i></p> <p>cost of boxes = no of boxes $\times 0.75$</p> <p>Works out sales by using (No of boxes – 2) $\times 4$</p> <p style="text-align: right;">€20.05</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p>	

Question No	WORKING	CRITERIA	Marks	Total Mark
7i	<p>Equal arcs subtend the same angle at the centre, so $\frac{180^\circ}{9} = 20^\circ$</p> <p>Some candidates' explanations, considered to be incomplete, are marked below as examples:</p> <p><i>Because the angles are equal - 0 marks</i> <i>The outer semicircle is cut into equal parts -0 marks</i> <i>For that circumference to fit 9 equal pieces meaning that every piece will have the same angle which is 20 - 1 mark</i> <i>Because all of the nine sections are equal and if they are 20 each they enter exactly in the semicircular arc - 1mark</i> <i>When added together they form a 180 arch - 1 mark</i></p>	<p>Works $180 \div 9$ OR $20 \times 9 = 180$ <i>Note: An explanation is awarded full marks if it includes a meaningful reference, both to 180° and to 9 equal sections.</i></p>	2	6
7ii	<p>Required area = (Area of large circle – Area of small circle) $\div 18$ $= \frac{\pi(160^2 - 140^2)}{18} =$ $\frac{80424.771932 - 61575.216010}{18} = \frac{18849.55592}{18}$ $= 1047.198 \text{ cm}^2 = 1047 \text{ to the nearest cm}^2$</p>	<p>Uses $A = \pi r^2$ for area of circle M1 or uses $A = \frac{\pi r^2}{18}$ for area of sector of a circle with $r = 140$ or $r = 160$ Subtracts area of two appropriate circles or sectors M1 Divides by 18 or 9 appropriately M1 1047 A1</p> <p><i>The following incorrect methods are marked as follows:</i> $\frac{20}{360} \times \pi \times 140^2$ M1 M0 M1 A0 $\frac{20}{360} \times \pi \times 20^2$ M0 M0 M1 A0 $\frac{20}{360} \times 2\pi \times 140$ M0 M0 M1 A0</p>	<p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	

Question No	WORKING	CRITERIA	Marks	Total Mark
8ai	Total no of student members = $15 + 26 = 41$ $P(\text{girl is chosen}) = \frac{26}{41}$	total no of student members = 41 $\frac{26}{41}$; <i>Accept also 26:41, 63 % or more accurate, 0.63 or more accurate</i>	M1 A1	8
8aii	Samuel is not correct. Explanation: The ratio of boys working to those studying is 2:3. Ratio of girls working to those studying is $2 : \frac{26}{7}$ ie $2 : 3\frac{5}{7}$ OR $P(\text{girl works}) = \frac{14}{40} = 0.35$ $P(\text{boy works}) = \frac{10}{25} = 0.4$ OR The percentage of boys employed is greater than the percentage of girls employed	Samuel is not correct Explanation- see the three explanations given in previous column	B1 M1	
8b	Salary that year = $\text{€}1212.50 \times 12 = \text{€}14550$ Salary Jan- Nov = $\text{€}1200 \times 11 = \text{€}13200$ Salary in Dec = $\text{€}1350$ Increase in salary = $\text{€}150$ OR Difference in mean $\text{€}1212.50 - \text{€}1200 = \text{€}12.50$ Increase in salary = $\text{€}12.50 \times 12 = \text{€}150$ OR Salary that year = $\text{€}1212.50 \times 12 = \text{€}14550$ Salary that year had there been no increase = $\text{€}1200 \times 12 = \text{€}14400$ Increase in Dec salary = $\text{€}14550 - \text{€}14400 = \text{€}150$	Finds salary for yr correctly Finds salary Jan-Nov correctly Correct subtraction to find Dec salary $\text{€}150$ OR $\text{€}1212.50 - \text{€}1200 = \text{€}12.50$ $\text{€}12.50 \times 12 = \text{€}150$ <i>Candidates who just subtract 1200 from 1212.50 and stop there or continue with some workings which simply do not make sense do not gain any marks for qn 8(b).</i> OR Finds salary for yr correctly Finds salary for yr – without increase Correct subtraction to find Dec salary $\text{€}150$	M1 M1 M1 A1 M1 A1 M1 A1 M1 M1 M1 A1	

Question No	WORKING	CRITERIA	Marks	Total Mark
9i	€1800	€1800	B1	6
9ii	€200	€200	B1	
9iii	Gradient = $\frac{1600}{10} = €160$ per night	Uses appropriate reasoning to work out cost per night, e.g. finds gradient or subtracts travel cost from €360 €160 per night	M1 A1	
9iv	$C = 200 + 160x$	$C = 200 + 160x$ No follow through is allowed for this part question. Do not penalise if answer is written as a linear expression in x without writing “ $C = \dots$ ” Mark as follows: $160x + 200$ – 2 marks $160x + 10$ – 1 mark $160x$ – 1 mark $10x + 200$ – 1 mark 200 – 0 marks	2	

Question No	WORKING	CRITERIA	Marks	Total Mark
10i		<p>Sketch has right shape, with angle B approx 90°: Sides AB and AC in ratio 2:3; written or implied from part (ii)</p> <p><i>Correct measurements are not required for 10i</i></p>	<p>M1 A1</p>	<p>12</p>
10ii	$AC^2 = AB^2 + BC^2 = 16 + 36 = 7.211 = 7.21 \text{ to } 2 \text{ dp}$	<p>Uses Pythagoras thm appropriately Correct value of AC, depending on values taken for AB and BC Correct rounding to 2 dp</p>	<p>M1 A1ft A1ft</p>	
10iii	$\tan \angle A = \frac{3}{2}$, so $\angle A = 56.309^\circ = 56 \frac{1}{2}^\circ$ OR 56.5° to the nearest half of a degree	<p>Correct use of trig ratio $\angle A = 56^\circ$ or more accurate. <i>Do not penalise rounding at this stage and accept also 56.0°</i> Correct rounding to the nearest half of a degree- $\angle A = 56 \frac{1}{2}^\circ$ OR 56.5°</p>	<p>M1 A1 A1</p>	
10iv(a)	<p>The sides of Paul’s triangle need not be the same size as those of Maria’s triangle. Paul could use $AB = 4$, $BC = 6$ while Maria could have $AB = 8$, $BC = 12$</p>	<p>States that the sides of the two triangles need not be equal Correct explanation: E.g. gives examples of different correct triangles; OR says that the triangles need not be the same size, but the ratio of AB:BC needs to be 2:3. See also marking examples on page 9.</p>	<p>B1 M1</p>	
10iv(b)	<p>The angles of Paul’s triangle have to be the same size as those of Maria’s triangle.</p> <p>The two triangles are similar OR $\angle B$ is the same in both cases. Also $\angle A$ is the same in both triangles because $\tan \angle A = 1.5$ in each case. OR One triangle is an enlargement of the other.</p>	<p>States that the angles of the two triangles have to be equal Correct explanation – makes meaningful connection to trigonometry or similarity or enlargement –</p> <p>The explanation <i>Angles are the same because ratio is the same</i> is not considered sufficient. See also marking examples on page 10.</p>	<p>B1 M1</p>	

		WORKING							CRITERIA	Marks	Total Mark	
11	Shape Number	1	2	3	4		10		n	16, 100	B1	6
	Number of Grey Squares	1	4	9	16		100		n^2	n^2 6, 12	B1 B1	
	Length of Side of Border	3	4	5	6		12		$n+2$	$n+2$ 20, 44	B1 B1	
	Number of White Squares	8	12	16	20		44		$4n+4$ or $(n+2)^2 - n^2$	$4n+4$ or $(n+2)^2 - n^2$	B1	
										For the n^{th} term, do not award marks when candidates give a verbal explanation of the pattern rather than the requisite algebraic expression.		

Q10iv(a): Marking of some candidates' responses

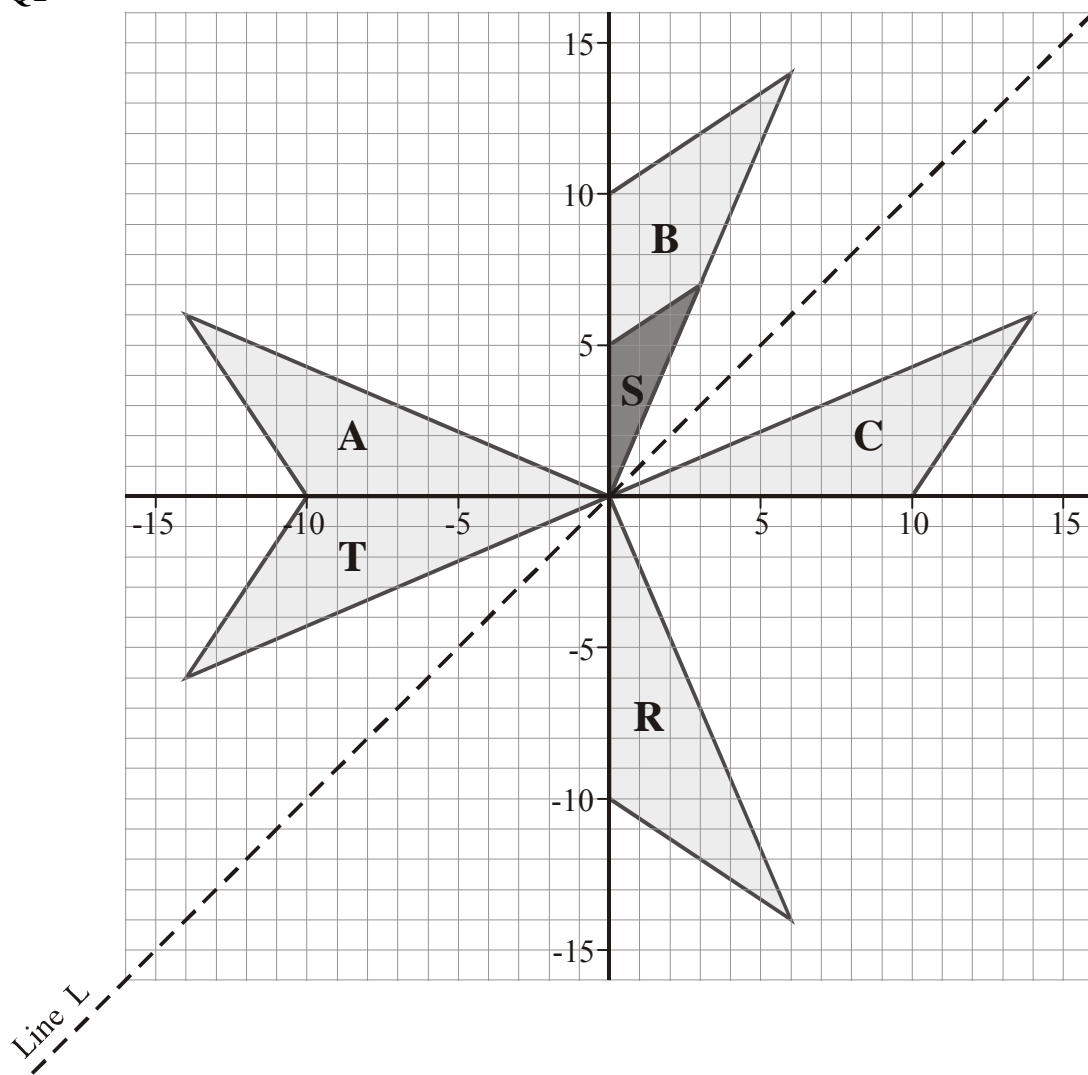
- *No there is no need for sides to be the same length as long as they are in same ratio. (B1 M1)*
- *No as they could have worked with different numbers. (B1 M0)*
- *No they do not have to be equal but they must be in the same ratio of 2 : 3 when simplified. (B1 M1)*
- *No, they can be different in the ratio but the final answer has to be the same (B1 M0)*
- *No, because they can be any but have to follow the ratio given. (B1 M1)*
- *No, since the ratio 2:3, he can make any sides with different lengths but giving a ratio of 2:3 eg. 12:18 (B1 M1)*
- *No, triangles are similar when they have the same angle but different lengths still they are good. (B1 M1)*
- *They don't have to be equal sides but the sides must be in the ratio of 2:3 (B1 M1)*
- *No, because they may take different ratios (B1 M0)*
- *No, because Paul could have drawn his bigger or smaller than Maria's (B1 M0)*
- *No, because of the ratio (B1 M0)*
- *2 : 3 and 4 : 6 both worked out the same (B1 M1)*
- *No because he could have used different measures from hers as it is not stated how long each side should be (B1 M0)*
- *No this is because it depends how you construct the triangle (B1 M0)*
- *No, Paul could use a different number in the ratio. ex 0.4, 0.6. In part (i), this candidate used other numbers for the size of his/her triangle. (B1 M1)*
- *No they could have chosen different interpretations for the ratios. (B1 M0)*
- *No because the question gave no indication of the length of the triangle (B1 M0)*
- *No not necessarily because they could have took AB and BC different length (B1 M0)*
- *No because if the triangles lengths are in the same ratio then the angles of the triangles wouldn't change. (B1 M1)*
- *No since it is a sketch and gives no length. (B1 M0)*
- *No because you are only taking the ratio of the angles. (B1 M0)*
- *No because the 2 of them might not have their same calculations. (B1 M0)*
- *No they can be bigger or smaller. (B1 M0)*
- *No because they can be of different lengths. (B1 M0)*

Q10iv(b): Marking of some candidates' responses

- *Yes since the sides are in the same ratio. (B1 M0)*
- *Yes because it depends on the ratio and that is standard. (B1 M0)*
- *Yes as first you plot the 90° and the other angle will automatically be the same. (B1 M0)*
- *Yes the angles would be equal as when using trigonometry you divide two sides which are made from the same ratio although the multiplication of the ratio was different. (B1 M1)*
- *Yes, because if the angles are different the trigonometry doesn't work. The triangles become different and the angles and sides also different. (B1 M1) Explanation mark awarded because of linking it with trigonometry.*
- *Yes, they have to be equal since only the lengths are different, not the shape eg. $\tan A = 18/12$ $A = 56.3^\circ$ (B1 M1)*
- *Yes, if not triangles are not similar. (B1 M1) Explanation mark awarded because of link to similarity.*
- *Yes they have to be equal as if she used different lengths she uses the same ratios the angle is not different from Paul! $\tan = \frac{0.6}{0.4}$, Angle = 56.5°. In part (iii) candidate found $\angle C$ using $\tan^{-1} \frac{6}{4} = 56.5^\circ$. (B1 M1)*
- *Yes the angles stay the same no matter what the lengths of the triangle are. (B1 M0). No explanation or further connection is given here. There is therefore no justification of the assertion made.*
- *Yes angles do have to be the same of those of Maria because when we work out trigonometry the ratio of the sides would be equal although the size of sides are not the same (B1 M1)*
- *Yes because even though the dimensions are smaller or larger the angles must remain the same size (B1 M0)*
- *Yes they do because the length of the sides doesn't have to do with the angles and they both have a right angle. (B1 M0)*
- *Yes the angle of Paul's triangle have to be equal to Maria's because they have used the same ratio and the angles are always the same when the ratio is applied. (B1 M0)*
- *Yes because they are drawing the same triangle but with different lengths but same ratio. (B1 M0)*
- *Yes as it is not the same triangle. (B1 M0)*
- *Yes as triangles are similar as they have the same ratio of lengths. (B1 M1)*
- *Yes because they have to be similar and when changing the angles it won't stay so. (B1 M1)*
- *Yes because the triangles will be congruent because they have the same ratio and so they will have the same angles. (B1 M0)*
- *Yes the angles have to be the same because in trigonometry when you use fractions, the fraction will always have to be 2/3. (B1, M1)*

Transparencies

Q1



Transparencies

Q3

