Assessment Schedule – 2014

Mathematics and Statistics: Apply geometric reasoning in solving problems (91031)

Evidence Statement

One	Expected coverage	Achievement	Merit	Excellence
(a)(i)	$AC = \sqrt{12^2 + 12^2}$ AC = 16.97 (4 sf) cm	Correctly calculates length (units not required).		
(ii)	Isosceles and right-angled.	Both terms used correctly.		
(b)(i)	$h = \dfrac{AC}{2} = \dfrac{16.97}{2}$ = 8.485 (4sf) cm $H = 12\sin45 = 8.485$ (4sf) cm (since *h* is one side of another isos, right triangle.) OR equivalent, eg halving the triangle and using Pythagoras.	One step towards Answer	Correct calculation of *h*.	
(ii)	Halving the triangle and using Pythagoras. $\sqrt{(8.5^2 - 6^2)} = 6$ OR recognising that it is right angled isosceles triangle and dividing 12 by 2 = 6 cm. OR accept any equivalent method	Working is not clear, but correct new height is identified.	Clear working leads to correct new height.	
(c)(i)	$x = \tan^{-1}(3/8) = 20.56°$	Angle *x* correctly calculated.		
(ii)	$y = \tan^{-1}(5/2) = 68.20°$		Angle *y* correctly calculated.	
(iii)	*x* + *y* is the size of the angle in the bottom LH corner of the rectangle in Diagram 2. X + Y = 88.76°, not 90° So the shape is not a rectangle and cannot multiply 5 × 13 for area. OR The diagonal of the rectangle runs at an angle of $\tan^{-1}(13/5) = 68.96°$. This means that the sloped side of piece 4 is below the diagonal, leaving a gap in the middle so it is not a rectangle and you cannot multiply 5 × 13 for area.		Identifies that the bottom LH corner is not 90°.	Concludes that the shape is not a rectangle (t) Concludes that the shape is not a rectangle and the area cannot be calculated by base × height. (t) OR equivalent coherent chain of reasoning.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	One point made incompletely.	1 of u	2 of u	3 of u	2 of r	3 of r	1 of t	2 of t

Two	Expected coverage	Achievement	Merit	Excellence
(a)(i)	$m = 84°$ (angles on line).	Both correct angle and valid reasoning.		
(ii)	$n = 84°$ (opp ∠'s cyc quad) $j = 180 – 84 – 41$ (∠'s tri) $j = 55°$	Correct answer for angle j. or one step with reason $n = 84°$ (opp ∠'s cyc quad)	Correct answer for angle j with valid geometric reasoning clearly stated.	
(b)(i)	$r = 32°$ (alt ∠'s //) $p = q$ (isos tri) $2p = 180 – 32$ $p = 74°$ OR $p = q$ (isos tri) $2p + 32 = 180$ (co-int ∠'s //) $p = 74°$	Correct answer for angle p. or one step with reason $r = 32°$ (alt ∠'s //)	Correct answer for angle p with valid geometric reasoning clearly stated.	
(ii)	$r = w$ (alt ∠'s //) $p = q$ (isos tri) $2p = 180 – w$ $p = 90° – w/2$ accept equiv. OR $p = q$ (isos tri) $2p + w = 180$ (co-int ∠'s //) $p = 90° – w/2$	Correct expression angle p without valid geometric reasoning.	Correct expression for angle p with valid geometric reasoning.	
(c)(i)	$C = D$ (∠'s same arc) $A = E$ (∠'s same arc) $ABC = DBE$ (vert opp ∠'s) So all angles match and thus the 2 triangles must be similar.		Argument is essentially valid but lacks completeness *or* minor error in reasoning.	Complete and valid argument.
(ii)	ABC is similar to EBD so $$\frac{AB}{BC} = \frac{BE}{BD}$$ And thus $AB × BD = EB × BC$ other acceptable ratio: $$\frac{AB}{BE} = \frac{BC}{BD}$$ (As well as reciprocals of the two shown.)			Accurate and clear derivation of the result using similarity of the triangles.

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No response; no relevant evidence.	One point made incompletely.	1 of u	2 of u	3 of u	2 of r	3 of r	1 of t	2 of t

Three	Evidence	Achieved	Merit	Excellence
(a)(i)	The angle of 70° could not be correct because it is obtuse (or it is greater than 90°). AND The angles in a quad add up to 360°, so he must have made a mistake since his angles only add to 320° OR The exterior angles in a polygon add up to 360° so he must have made a mistake since his angles add to 400°	One of the reasons stated clearly.	Both reasons stated clearly.	
(ii)	He must have read the wrong side of the scale on his protractor.	Valid explanation relating to side or scale.		
(b)	1: When you look at the central vertex of the tessellation, you can see that there are 4 angles gathered around it. These are the angles Q, U, A and D. 2: For a shape to tessellate, the angles that meet at a point in the tessellation must add up to 360° so that there are no gaps left. 3: In this case, $Q + U + A + D = 360°$ because the shape is a quadrilateral, and this is always true for any quadrilateral. 4: Hence any quadrilateral will tessellate.	Makes 1 valid point.	Makes the link between angles at a point and angles in a quadrilateral.	Complete, clear and coherent geometric explanation given for any quadrilateral
(c)(i)	The total of the exterior angles of any polygon (is 360°).	Reason given.		
(ii)	This occurs when we have a concave polygon (or when one of the angles points inwards). Since the "exterior angle" is inside the shape, the rotation is in the other direction so angle c needs to be considered as a negative number.		Identifies that it occurs when we have a concave shape OR when one of the exterior angles is inside the shape OR identifies change in direction	Identifies when it occurs as well as giving a clear explanation that a negative measurement is due to a change in rotation or direction
(d)(i)	EGR and GRA are co-interior angles and, since they add to 180°, the lines must be parallel.	States the co-interior angles on parallel lines rule.	Uses the property of co-interior angles to conclude lines GE and RA are parallel.	
(ii)	Add a line through P, parallel to GE and use alternate angles on parallel lines to show that APE = PEG +PAR OR reasoning equivalent to: The interior angles in a pentagon add to 540°. Since EGR + GRA = 180°, PEG + EPA + PAR = 360° So PEG + (360° – w) + PAR = 360° (angles at a point) PEG + (–w) + PAR = 0 Thus w = PAR + PEG		Geometric proof given but lacks completeness, clarity or coherence (flow of logic from beginning to end).	Complete, clear and coherent proof with correct geometric reasoning.

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Cut Scores

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 12	13 – 18	19 – 24