Assessment Schedule – 2013

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

Evidence Statement

One	Expected coverage	Achievement	Merit	Excellence
ONE (a)(i)	XW = 7cos42° = 5.2020 cm (4 dp)	Correctly calculates length XW.		
(a)(ii)	Angle BAC = 180 – 110 – 42 = 28 (angles in triangle) AX = 8.8, BX = 4.7 AC = AX + XC = 10cos28° + 7cos42° = 14.0315 cm (4 dp) (OR equivalent method.)	Correctly calculates length AX or BX. CAO	Correctly or consistently calculates length AC and gives clear explanation or working.	
(b)(i)	Angle GFH = $\tan^{-1}(9/10)$ = 41.9872 (4 dp) = 42.0 (1 dp)	Correctly calculates angle GFH.		
(b)(ii)	FX = 10cos42° = 7.4314 (4 dp) XH = 9cos48° = 6.0222 (4 dp) FH = FX + XH OR $\text{FH} = \frac{10}{\cos 42}$ OR $\text{FH} = \frac{9}{\sin 42}$ = 13.4536 (4dp) … to be exact 13.45362371, if you use 42 and 48; 13.45362405 if you use $\tan^{-1}(0.9)$. [OR equivalent method] $\text{FH} = \sqrt{10^2 + 9^2} = 13.4536\text{ (4 dp)}$ … to be exact 13.45362405 FH is the same by both methods, which verifies that Pythagoras' Rule works in this case.	Correctly calculates length FH by Pythagoras' Rule.	Correctly calculates FH by both approaches.	Correctly calculates FH by both approaches and makes a valid conclusion about Pythagoras' Rule.

(c)(i)	He firstly considers the whole triangle, PQR: $\frac{QR}{PR} = \cos(\angle PRQ)$ Then in triangle RXQ : $\frac{RX}{QR} = \cos(\angle PRQ)$ Therefore, $\frac{QR}{PR} = \frac{RX}{QR}$ So $QR^2 = RX.PR$		Connects the mathematics in the previous part by deriving the correct expression for QR^2.	Connects the mathematics in the previous part by deriving the correct expression for QR^2. AND Completes the proof with the given derivations.
(ii)	$PQ^2 + QR^2 = PX.PR + RX.PR$ $= PR(PX + RX)$ $= PR.PR$ $= PR^2$ as Pythagoras' Rule requires.		Completes the proof with the given derivations.	
Judgement:	NØ no reponse, no relevant evidence N1: one point made incompletely N2: 1 of u	A3: 2 of u A4: 3 of u	M5: 2 of r M6: 3 of r	E7: 1 of t E8: 2 of t

Question	Expected coverage	Achievement	Merit	Excellence
TWO (a)	$m = 80°$ (angles line) $g = 80°$ (isos triangle) $e = 180° - 2 \times 80°$ $= 20°$ (angles in triangle)	e correctly calculated.	e correctly calculated, with reasons.	
(b)	$m = 180° - (x + y)$ (angles line) $g = m$ (isos triangle) $e = 180° - 2 \times (180° - (x + y))$ $= 2(x + y) - 180°$ (angles in triangle) $r = y - e$ (alt angles //) So $r = y - (2x + 2y - 180°)$ $= y - 2x - 2y + 180°$ $= 180° - 2x - y$	Angle g or n or e in terms of x. Correctly calculated with reasons.	Complete essentially correct derivation of expression for r but with minor errors (algebraic or geometric).	Complete correct derivation of expression for r with geometric reasons at each step.
(c)(i)	Total of interior angles $= 180°(9 - 2) = 1260°$ Each interior angle $= 1260° / 9 = 140°$ Each Edge Angle $= 360° - 140°$ (angles at point) $= 220°$ OR equivalent method using exterior angles.	Correct calculation of the total of the interior angles. OR Use of formula from part (ii).	Correct calculation of each edge angle with clear chain of reasoning.	
(c)(ii)	Total of interior angles $= 180(n - 2) = 180n - 360$ Total of all angles at each vertex $= 360n$ Total of edge angles = sum all angles – sum of int angles $= 360n - (180n - 360)$ $= 180n + 360 = 180(n + 2)$ OR using exterior angles: Total of ext angles = 360 Each corner has another 180 Total edge angles = $360 + 180n$ $= 180(n + 2)$ For regular polygons only: Total of interior angles $= 180(n - 2) = 180\text{n} - 360$ Each interior angle $= (180n - 360) / n = 180 - 360 / n$ Each edge angle $= 360 - (180 - 360 / n)$ (angles at point) $= 180 + 360 / n$ Total of edge angles $= n(180 + 360 / n)$ $= 180n + 360 = 180(n + 2)$		Correct derivation of the result for regular polygons, which is not generally true.	Correct derivation of the result for any polygon.

Judgement:	NØ no reponse, no relevant evidence N1: one incomplete point N2: 1 of u	A3: 2 of u A4: 3 of u	M5: 2 of r M6: 3 of r	E7: 1 of t E8: 2 of t

Question	Expected coverage	Achieved	Merit	Excellence
THREE (a)(i)	$b = 55°$ (int angles //) $c = 180° – 44° – 55°$ (angles triangle) $= 81°$ (or equivalent)	Angle c correctly calculated.	Angle c correctly calculated, with reasons.	
(ii)	Since $a = b$ and $d = c$ (corr angles //) the little triangle is similar to the large triangle (or similar). $\frac{x}{18} = \frac{10}{15} = \frac{2}{3}$ $x = \frac{2}{3}$ of 18 $x = 12$	Correct answer only.	Apparent use of similarity but unclear explanation of reasoning.	Length x correctly calculated with reasoning that includes explanation of similarity.
(b)(i)	$x = 360° – 120° = 240°$ (angles at point) $j = ½$ of x (angles at centre) $j = 120°$	BOTH angles correctly calculated.	TWO angles correctly calculated, with reasons.	
(ii)	$k = 180 – j = 60°$ (co-int angles //) $h = 180° – 120° = 60°$ (co-int angles //)	BOTH angles correctly calculated, no reasons required.		
(iii)	Since HJK = HXK = 120°, and JHX = JKX = 60°, we have 2 pairs of co-interior angles: JKX and HXK show that HX // JK. Hence HJKX is a parallelogram. Also, since HX = XK (radii) and opposite sides of a parallelogram are equal, HX = JK and XK = HJ, and hence HJKX is a rhombus		Clear argument that explains why HJKX is a parallelogram OR a rhombus.	Complete, well-reasoned argument that explains why HJKX is a parallelogram and a rhombus.
Judgement:	NØ no reponse, no relevant evidence N1: one point made incompletely N2: 1 of u	A3: 2 of u A4: 3 of u	M5: 2 of r M6: 3 of r	E7: 1 of t E8: 2 of t

Judgement Statement

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