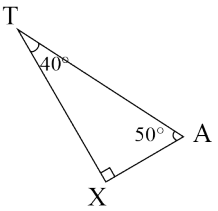
Assessment Schedule – 2012

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

Evidence Statement

Q	Expected coverage	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)(i)	KJL = $\tan^{-1}(6/4)$ = 56.30993… so he is correct.	Correctly calculates size of KJL.		
(ii)	JLK = 180 – 90 – 56.3 (angles in triangle) = 33.7 MLN = 33.7° (opposite angles)	Correctly calculates size of MLN.	Correctly calculates size of MLN and gives coherent geometric reasoning.	
(iii)	KLJ and NLM are similar, sf = 2 So MN = 8 cm MN = tan33.7 x12 = 8 cm OR equivalent method.	Calculates the length MN with some reasoning based on similar figures. OR solved using trig.		
(b)	NLM = 50 (angles on a line) LMN = 65 (alt angles) LNM = 180 – 65 – 50 (angles in triangle) = 65°	Correctly calculates size of LNM.	Correctly calculates size of LNM and gives coherent geometric reasoning.	
(c)(i)	JKL = x (isos triangle) JLK = 180 – 2x (angles triangle) = NLM (opposite angles) Since LNM = LMN (isos triangle) 2LNM = 180 – NLM (angles triangle) = 180 – (180 – 2x) = 2x LNM = x = NML Now, JKL = x = LNM so these are alternate angles and are equal, so the lines KJ and NM must be parallel.	Derivation of a correct expression for JLK or NLM.	Significant progress towards a completely documented logical argument for why the lines are parallel.	Almost completely documented logical argument for why the lines are parallel.
(c)(ii)	We know: KJL = LMN (alt angles) JKL = LNM (alt angles) This does not mean that KJL = JKL, so there is no reason why triangle KLJ must be isosceles just because the lines are parallel. OR A counterexample is clearly indicated, with working, showing the same idea.		Almost completely documented logical argument for why the triangles may not be isosceles.	Completely documented logical argument for why the triangles may not be isosceles.
Judgement:	**N1: one point made incompletely** **N2: u**	**A3: 2u** **A4: 3u**	**M5: 1r** **M6: 2r**	**E7: t** **E8: 2t**

TWO (a)(i)	$ST^2 = 2800^2 + 2800^2$ $= 15\ 680\ 000$ ST = 3959.80m (2dp) Length of course = $3959.8 + 2800 \times 2 = 9559.8$ m	Total length of course found correctly.		
(a)(ii)	Angle AST = 45° (isosceles triangle) SA is due East, so is on a bearing of 090° Thus bearing of T from S is 90 – 45 = 045°	Angle AST correctly derived.	Bearing of T from S correctly derived.	
(b)(i)	Angle SAT is 90° so $AT^2 = 3100^2 - 2000^2$ $= 5\ 610\ 000$ AT = 2368.54 m (2dp) Length of course = 3100 + 2000 + 2368.54 = 7468.54 m (2dp)	Angle SAT recognised to be 90^o and length of AT correct.	Total length of course found correctly.	
(b)(ii)	Angle AST $= \cos^{-1}(2000/3100)$ = 49.8 (1dp) Bearing of T from S is 360 – (49.8 – 45) = 355.2°	Angle AST found correctly or consistently.	Bearing of T from S found consistently. OR Bearing given as 4.8°.	Bearing of T from S found correctly.
(c)(i)	Bearing of AT is 330°, so angle TAB is 30 (angles at a point) Angle SAX = 50° (alt angles) So angle SAT = 100° (angles on a line)	Angle SAT derived with working clear but one or more reasons missing.	Angle SAT derived with complete and correct reasoning.	
(c)(ii)	AST is an isosceles triangle, so split it in half by bisecting angle SAT:  XT = 2800 cos40° = 2144.92 (2dp) So ST = 2 × 2144.92 = 4289.85 m (2dp) Total length = 4289.85 m + 5600 = 9889.85 m (2dp)	One correc right angled triangle found and correct usage of Pythagoras or trig ratios.	Correctly finds length XT or XA. OR Total obtained correctly but with lack of clear logical chain of reasoning	Total length of course obtained correctly with clear chain of reasoning.
Judgement:	**N1: one point made incompletely** **N2: 1u**	**A3: 2u** **A4: 3u**	**M5: 1r** **M6: 2r**	**E7: t** **E8: 2t**

THREE (a)	No: the total of the angles inside the pentagon is $3 \times 180 = 540°$, so each angle is $540/5 = 108°$	Clearly explaining that each interior angle is 108°.		
(b)	Triangle APX is isosceles because A and P are both the same distance from X.		Observing that triangle is isosceles with size of angles or lengths of sides stated.	
(c)(i)	$h = 5\tan(54°) = 6.882$ cm (3dp)	Correctly finding the height of the triangle. OR Correctly finding the area of one triangle.	Correctly finding the area of the whole pentagon. OR Equivalent expression for total area assembled with one element incorrect.	Correct equivalent expression for the total area assembled.
(c)(ii)	Area of pentagon $= 5 \times ½ \times 10 \times 5\tan 54°$ $= 172.05$ cm^2 (5sf)			
(c)(iii)	Area of polygon = $n \times \frac{1}{2} \times 10 \times 5\tan\left(\frac{1}{2} \times \frac{180(n-2)}{n}\right)$			
(d)(i)	Angle PAT is the "angle in a semi-circle", so it will be 90°.	Clear explanation based on angle in a semi-circle or angle at centre.		
(ii)	PEX = 52 (isos triangle) PXE = $180 - 2 \times 52 = 76$ (angles in triangle) XEN = 76 (alt angles to PXE) XNE = 76 (isos triangle) NXE = $180 - 2 \times 76 = 28$ (angles in triangle)	Correct derivation of angle NXE.	Correct or consistent logical derivation of angle NXE with geometric reasons and one major flaw.	Correct and essentially complete logical derivation of angle NXE with geometric reasons.
(iii)	Since $4w - 180 > 0$, XPE must be larger than 45° and XPE < 90°.	Statement about being > 0 or < 180.	Statement and ONE limit or both statements.	Identifies that w must be larger than 45° and less than 90°.
Judgement:	**N1: one point made incompletely** **N2: 1u**	**A3: 2u** **A4: 3u**	**M5: 1r** **M6: 2r**	**E7: t** **E8: 2t**

Judgement Statement – 2012

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 13	14 – 19	20 – 24