Assessment Schedule – 2016

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

Evidence Statement

ONE	Expected coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	$L=\sqrt{3^2+43^2}$ $L=43.10$ m	Correctly calculates length (units not required).		
(ii)	$\tan x=\frac{3}{43}$ $x=4.0°$	Correctly calculates angle (units not required).		
(iii)	$k=\frac{4.05}{3}$ $k=1.35$ $42.9+p=42.9\times 1.35$ $42.9+p=57.915$ $p=15.02$ m OR $\tan 86=\frac{42.9+p}{4.05}$ $42.9+p=4.05\tan 86$ $p=15.05$ m OR $\tan 86=\frac{h}{4.05}$ $h=57.92$ $p=14.91$ Accept with 42.9 or 43 in calculation.	Multiplies the height, h, by k (1.35). OR Sets up trigonometric equation correctly.	Correctly calculates p using either method.	
(b)	$\frac{360}{8}=45°$ $\frac{45}{2}=22.5°$ $\sin 22.5=\frac{x}{10}$ $x=3.83$ m $d=2\times 3.83-2$ $d=5.66$ m	Forming a right-angled triangle (or similar) and finding correct angle to use.	Correct calculation of x. OR Consistent final answer from an incorrect length in the triangle.	Subtraction of 2 m off $2x$.

(c)	$\angle KYS = \angle TKY = \frac{6\times 180}{8}$ $= 135°$ ($\angle$s in a polygon) $\angle TSY = \angle x$ (symmetry of isosceles trapezium) $\angle x = \frac{360 - 270}{2}$ $= 45°$ (sum $\angle$s in quad $= 360°$) $\therefore \angle TSY = 45°$ $\angle SYO = 67.5°$ ($135 \div 2$) $\angle SYO = \angle YSO$ (base $\angle$s isos $\triangle$=) so $\angle TSO = 67.5 - 45 = 22.5°$ $\therefore \angle y = 22.5°$ which is half of $\angle x$	Correctly finds angle x or y.	Correctly finds angle x or y, with reasons.	Justifies the size of the other angle with reasons.

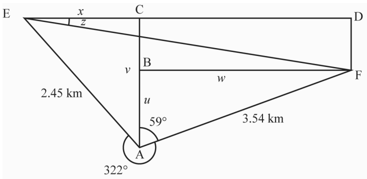
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	One incomplete step towards solution.	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

TWO	Expected coverage	Achievement (u)	Merit (r)	Excellence (t)
(a)(i) (ii)	∠LDB = 90° (BD perpendicular to LM) ∠x = 90 – 2 = 88° OR equivalent. (Accept ∠'s on a line.) AND ∠DHN = 92° (coint ∠s || lines add to 180°) ∠ANH = ∠y = 92° (alt ∠s) Or equivalent.	BOTH x and y correct. OR Any one angle found with correct reason.	BOTH x and y correctly found with valid reasons.	
(iii)	Upper half of ∠x is 2° (corr ∠s) Lower half of ∠x = 6° (∠s on st line) So ∠x = 8° Or equivalent. OR (also accept for merit) ∠SYP = 6° (coint ∠s) ∠SYT = 172° (alt ∠s) (∠'s on a line) ∠x = 8° (coint ∠s) OR equivalent.	Angle x correct. OR ONE angle correct with reason.	Correct angle found with sufficient working and reasons (at least 2 of each).	
(iv)	Candidate adds a line between K and L. ∠F = 176° (∠s in a triangle) ∠CFG = 176 (vert opp) ∠CFG and ∠EGJ = 176 and are (corr ∠s) Therefore AB and CD are parallel. OR Candidate adds a horizontal line through point F. (Label, e.g. RS.) They then create 2 angles of 2° each. ∠DFS = 2° (alt ∠s) ∠JFS = 2° (corres ∠s) ∠DFJ = 4° and ∠JGB = 4° (∠ on a line) ∠DFJ and ∠JBG are = (corres ∠s) Therefore AB and CD are parallel. OR equivalent.	Any angle correct with at least 1 reason leading towards a proof.	Any two angles correct with valid reasons leading towards proof.	Proof of parallel lines completed with valid justification.
(b)(i)	(1) Find lower height, x. Form a right angled triangle with 2° angle and hyp. length L. $\sin 2 = \frac{x}{L}$ $x = L\sin 2$ $x = 0.034899L$ OR $x = L\cos 88$ OR equivalent.	Finds the lower height, x, in terms of L.		

(ii)	(2) Find horizontal distance, t, between pillars. $t=\sqrt{L^2-(0.034899L)^2}$ $t=\sqrt{0.99878L^2}$ OR $\tan 2=\frac{0.034899L}{t}$ $t=0.9994L$ OR $t=\sin 88L$ (3) Find upper height, d. $d=\sqrt{10^2-(0.99878L)^2}$ OR $d=\sqrt{10^2-(0.99875L)^2}$ So total height, h is $x+d$: $h=0.034899L+\sqrt{100-0.9988L^2}$		Uses either trigonometry or Pythagoras to find horizontal distance, t.	Makes a consistent total height statement from finding height d and adding to height x.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	One incomplete step towards solution.	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

THREE	Evidence	Achievement (u)	Merit (r)	Excellence (t)
(a)(i)	$\angle$OQN = 19° ($\angle$s in $\frac{1}{2}$ circle = 90°) $\angle p$ = 19° (base $\angle$s isos Δ =) Or equivalent.	Angle p correct. OR 1 angle shown with reason	Angle p correct with at least 2 valid reasons.	
(ii)	37 + 75 + e = 180 (opp $\angle$s cyclic quad = 180°) e = 68° Or equivalent.	Angle e correct OR One angle shown with reason.	Angle e correct with valid reason(s)	
(iii)	$\angle$RON = 180 – y ($\angle$s on st line = 180°) $\angle$ORM = $\frac{180-y}{2}$ = $90 - \frac{y}{2}$ (base $\angle$s isos Δ =) So $\angle$SRM = $75 + 90 - \frac{y}{2} = 165 - \frac{y}{2}$ $\angle$SNO = $180 - (165 - \frac{y}{2})$ $= 15 + \frac{y}{2}$ (opp $\angle$s of cyclic quad = 180°) $\therefore z = 360 - 75 - (180 - y)$ $- (15 + \frac{y}{2})$ $= 90 + y - \frac{y}{2} = 90 + \frac{y}{2}$ ($\angle$s in quad = 360°) OR $\angle$RMO = $\angle$ORM = $\frac{180-y}{2}$ (base $\angle$s isos Δ =) $z + \frac{180-y}{2} = 180$ (opp $\angle$s cyclic quad = 180°) $z = 90 + \frac{y}{2}$ Or equivalent.	Finds 1 relevant angle with at least 1 reason towards proof.	Finds 2 relevant angles with at least 2 reasons towards proof.	Proof completed and well explained and justified.

(b)	 AB : $\cos 59 = \frac{u}{3.54}$ $u = 1.82$ km AC : $\cos 38 = \frac{v}{2.45}$ $v = 1.93$ km BC = 0.11 km BF : $\sin 59 = \frac{w}{3.54}$ $w = 3.03$ km (= CD) EC : $\sin 38 = \frac{x}{2.45}$ $x = 1.51$ km $\tan z = \frac{0.11}{4.54}$ $z = 1.4°$ $\therefore$ bearing is 091.4° (accept 091°)	Finds any 1 correct length using trigonometry or Pythagoras.	Finds any 3 correct lengths using trigonometry or Pythagoras.	Correct bearing found with clear reasoning and working shown.

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No response; no relevant evidence.	One incomplete step towards solution.	1 of u	2 of u	3 of u	1 of r	2 of r	1 of t	2 of t

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24