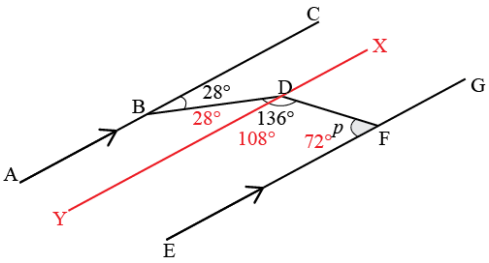
Assessment Schedule – 2020
Mathematics and Statistics: Apply geometric reasoning in solving problems (91031)

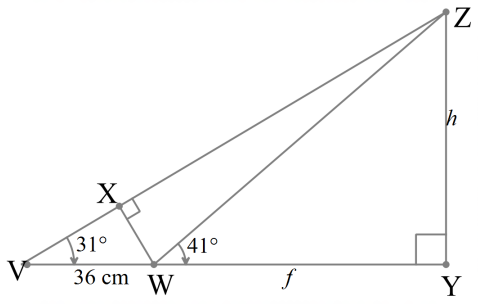
Evidence

Do not penalise incorrect rounding if sufficient evidence provided.

"Evidence of working" could be an appropriate calculation.

"Valid reason" involves words.

Q ONE	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)(i)	Use of trigonometry to find PQ = 16.4 × cos 63° = 7.445 cm	Showing, with evidence of working, that PQ = 7.445 cm.		
(ii)	Use of trigonometry to find $y = \tan^{-1}\left(\frac{7.5}{16.4}\right)$ or $y = \sin^{-1}\left(\frac{7.5}{18}\right)$ = 24.58°	Showing, with evidence of working, that $y = 24.58°$.		
(b)	∠BDY = 28° (Alternate ∠s, // lines =) p = ∠DFG = 180° – 108° = 72° (co-interior ∠s, // lines add to 180°) **OR** alternative method, extending either BD or DF to meet the 2nd parallel line.  	Correct angle OR ONE step shown (an intermediate angle with some support).	Correct angle found with at least one valid reason.	
(c)	Use of trigonometry to find JM = 12.5 × sin 32° JM = 6.624 cm. Use of Pythagoras to find $JN = \sqrt{21.2^2 - 9.4^2}$ $JN = \sqrt{361.08}$ JN = 19.002 cm. So w = JN – JM = 19.002 – 6.624 = 12.378 cm. **OR** alternative method.	Showing, with evidence of working, that JM = 6.624 cm. OR Showing, with evidence of working, that JN = 19.002 cm.	Correct value of w = 12.378 cm with evidence of working.	

(d)	Use of trigonometry to find $\tan 41^\circ = \frac{h}{f}$ $h = f \times \tan 41^\circ$ $h = 0.8693f$ Also $\tan 31^\circ = \frac{h}{36+f}$ $(36 + f) \times 0.6009 = h$ $(36 + f) \times 0.6009 = 0.8693\, f$ $21.631 + 0.6009f = 0.8693\, f$ $21.631 = 0.2684f$ $f = 80.59$ cm. **OR** alternative method: Draw WX ⊥ VZ WX = 36 × sin31 = 18.54 cm WZ = 18.54 ÷ cos80 = 106.78 f =106.78 × cos41 = 80.58  	Showing, with evidence of working, that $h = 0.8693f$ OR $h = f \tan 41$ OR Showing that $\tan 31^\circ = \frac{h}{36+f}$. OR Showing that WX = 18.54	Finding an equation involving only one variable, f i.e. $(36 + f) \times \tan 31 = f \tan 41$ OR Showing that WZ = 106.78	Finding the length f i.e. WY $f = 80.59$ cm. Examples of E7: - an unsimplified value or expression for f that is otherwise correct. - *a minor error* made in a correct strategy for solving the problem.

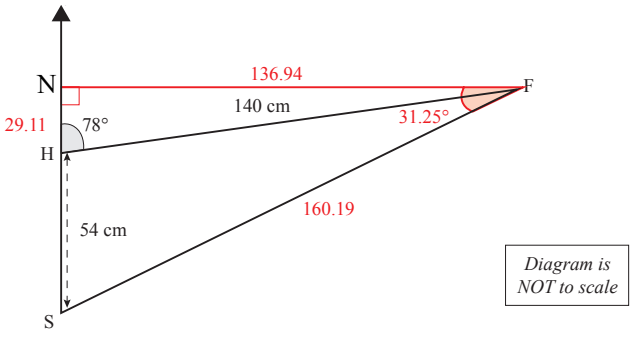
N0	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	One point made incompletely.	1 of u	2 of u	3 of u	1 of r	2 of r	Q1 (d) with minor error.	Q1 (d)

Q TWO	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	∠CPR = 25° (base angles of isosceles triangle equal) ∠PCR = 180° – 25° – 25° = 130° (angle sum of triangle = 180°) a = ∠PQR = 65° (angle at centre is twice that at circumference). **OR** alternative method.	Showing, with some evidence of working, that $a = 65°$.		
(b)	$\angle D = \frac{(5-2)180^\circ}{5} = 108°$ OR interior angles of a pentagon add to 540°. $x = \angle CED = \frac{180^\circ - 108^\circ}{2} = 36°$	Showing, with some evidence of working, that $x = 36°$.		
(c)	∠JSC = 90° (angle between tangent and radius is a right angle). Since ∠JSC ≠ ∠SCT, the lines FSJ and GCT are NOT parallel, as alternate angles between parallel lines are not equal. OR Alternative method ∠JSC = 90° (angle between tangent and radius is a right-angle) ∠SCG = 80° (adjacent angles on a straight line are 180°) ∠CGS = ∠GSC = 50° (base angles of an isosceles triangle are equal) ∠JSG = 90 – 50 = 40° Since ∠JSG ≠ ∠CGS, the lines FSJ and GCT are NOT parallel, as alternate ∠s, // lines are NOT equal to each other here. OR Alternative method ∠JSC = 90° (angle between tangent and radius is a right angle) ∠SCG = 80° (adjacent angles on a straight line are 180°) Since the sum of these two angles is only 170°, the lines FSJ and GCT are NOT parallel, as co-interior angles, between parallel lines, do not sum to 180°.	Finding ∠JSC or ∠FSC = 90° with reason OR TWO angles from: • ∠JSC / ∠FSC = 90° • ∠SCG = 80° • ∠CGS = 50° • ∠JSG = 40° OR clear and valid reasoning as to why the lines JSG and CGS are not parallel, that references either cointerior angles not being supplementary or alternate angles not being equal.	Required angle(s) found with at least one valid reason AND clear and valid reasoning as to why the lines JSG and CGS are not parallel, that references either cointerior angles not being supplementary or alternate angles not being equal.	

(d)	∠MCN = 216° (reflex angle at centre is twice that at circumference). ∠MCN = 144° (angles at a point is 360°) ∠MCP = 72° (line PC bisecting ∠MCN) ∠PMC = 90° (angle between tangent and radius is a right angle). Use of trigonometry to find $CM = \frac{18}{\tan 72}$ CM = radius = 5.85 cm **OR** alternative method.	Finding TWO angles from: • ∠MCN (reflex) = 216° • ∠MCN (obtuse) = 144° • ∠MCP = 72° • ∠PMC = 90° Angles shown on the diagram only are acceptable.	Correct value of CM = radius = 5.85 cm with at least one valid reason.	
(e)	∠FAE = x (base angles of isosceles triangle AEF equal). ∠FBA = x (angles in the same segment / arc are equal) ∠FBE = x (angles in the same segment / arc are equal) ∠EBD = $180 - 2x$ (angle on a straight line is 180°) ∠BED = $180 - (180 - 2x) - y$ $= 2x - y$ (angle sum of triangle BED = 180) $\angle w = 180 - x - (2x - y)$ $\angle w = 180 - 3x + y$ (angle on straight line FED is 180°). **OR** alternative method.	One step shown involving calculation of an angle involving x i.e. Finding ∠FAE or ∠FBA or ∠FBE OR two steps, having substituted a numerical value for x.	Finding two angles, involving calculations including x, with at least one valid reason.	Finding ∠w, in terms of x, with clear justification. Examples of E7: - an unsimplified expression for w in terms of x and y that is otherwise correct. - *a minor error* made in a correct strategy for solving the problem.

N0	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	1 of r	2 of r	Q2 (e) with justification not fully clear.	Q2 (e)

Q THREE	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
(a)	∠ADB = 64° (Alternate ∠s, // lines =) ∠DAB = 64° (base angles of isosceles triangle ABD equal) ∠EBC = p = 64° (corresponding ∠s, // lines =) **OR** alternative method.	Showing, with some evidence of working, that p = 64°.		
(b)	Similar triangles recognised and ratio of 1.4 calculated. PS = 1.4 × 12 = 16.8 cm. ST = 16.8 – 12 = 4.8 cm. SR = 1.4 × 9.6 = 13.44 cm. Perimeter = 35.84 cm. Justification of similar triangles not required.	Finding length of PS = 16.8 cm OR Finding length of SR = 13.44 cm. OR ST = 4.8	Calculation of Perimeter = 35.84 cm.	
(c)(i)	Use of Trigonometry to find BT BT = 80 × sin 12 or BT = 80 × cos 78°	Evidence of working for finding BT.		
(ii)	Use of Pythagoras to find $ST = \sqrt{120^2 + 80^2}$ $ST = \sqrt{20\,800}$ ST = 144.222 cm. Use of Trigonometry to find $\angle S = \sin^{-1}\frac{16.63}{144.222}$ $\angle S = \sin^{-1} 0.1153$ $\angle S = \angle TSB = 6.62°$ **OR** alternative method.	Showing, with evidence of working, that ST = 144.222 cm. OR Showing, with evidence of consistent working, that $\angle S = \angle TSB = 6.62°$	Correct value of $\angle S = \angle TSB = 6.62°$ with enough working to confirm that the correct 3-D triangle is involved. This could be on the diagram.	

(d)	Having drawn a horizontal line from F joining SH extended at N. In triangle NFH: NF = 140 × sin 78° = 136.94 cm NH = 140 × cos 78° = 29.11 cm So NS = 29.11 + 54 = 83.11 cm In triangle NFS: Use of Pythagoras to find $FS = \sqrt{136.94^2 + 83.11^2}$ $FS = \sqrt{25\,659.44}$ FS = 160.19 cm Use of Trigonometry to find $\angle NFS = \tan^{-1}\left(\frac{83.11}{136.94}\right)$ $\angle NFS = \tan^{-1}(0.6069)$ $\angle NFS = 31.25°$ So required bearing = 360° – 90° – 31.25° = 238.75° (or 239°)	ONE correct length with evidence of working from: • NF = 136.9 cm Note that the incorrect use of sin102° will also return this length • NH = 29.11cm • FS using consistency.	Correct direct distance FS = 160.19 cm. OR Correct bearing, 238.75° OR Correct angle ∠NFS = 31.25° OR ∠HSF = 58.75°	Correct direct distance FS = 160.19 cm. AND Correct bearing of 238.75° (or 239°) Examples of E7: - a correct bearing of F from S, 058.75°. - *a minor error* made in a correct strategy for solving the problem.
				

N0	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	1 of r	2 of r	Q3 (d) with minor error.	Q3 (d)

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 19	20 – 24