Assessment Schedule

2017 Mathematics and Statistics: Apply geometric reasoning in solving problems (91031)

Evidence Statement

Q	Expected coverage	Achievement	Merit	Excellence
ONE (a)	GH // CD (property of a rectangle) ∠HGJ = 360 – 2 × 120° = 120° (∠s in a regular hexagon and ∠s at a point add to 360°) ∠DIJ = 120° (corr. ∠s =, // lines) ∴∠x = 60° (adj ∠s on line) (x would be 33 grads or 0.52 rads)	Gives correct angle only. OR Gives an intermediate angle / step with reason.	Solves the problem by finding the correct angle with at least one valid reason.	
(b)(i)	$\sin z = \frac{r}{2r}$, so $\sin z = \frac{1}{2}$ hence $z = 30°$ OR ∠ABC = 120° (∠s in a regular hexagon) ∠ABD = 60° (∠s on a straight line = 180°) Hence $z = 30°$ (∠s in a Δ = 180°)	Incomplete trigonometric working. OR One relevant step with reason to support the given value of z.	Proof completed with clear working OR geometric reasoning to support the given value of z.	
(ii)	$x^2 = (2r)^2 - r^2$ (uses Pythagoras) $x^2 = 3r^2$ $x = \sqrt{3r^2}$ or $\sqrt{3}r$ or $1.73r$ OR $\cos 30° = \frac{x}{2r}$ (uses trigonometry with cosine) $x = 2r\cos 30°$ $x = \sqrt{3r^2}$ or $\sqrt{3}r$ or $1.73r$ OR $\tan 30° = \frac{r}{x}$ (uses trigonometry with tangent) $x = \frac{r}{\tan 30°}$ $x = \frac{r}{0.577} = 1.73r$	Attempts to use either Pythagoras or trigonometry to form a relationship involving x and r.	Simplifies a correct relevant relationship involving x and r, as far as (e.g.) $x^2 = \ldots$(Pythag) or $x = \ldots$(trig)	Simplifies further, to x equals either $\sqrt{3r^2}$ or $\sqrt{3}r$ or $1.73r$ (any rounding)
(c)	∠ABS + ∠ABT = 90° (tangent ⊥ rad) ∠BAT = 90° (∠ in a semi-circle = 90°) ∠ABT + ∠ATB = 90° (∠s in a Δ = 180°) ∠ABS = 90° – ∠ABT ∠ATB = 90° – ∠ABT ∴∠ABS = ∠ATB and ∠ATB = ∠AQB (∠s on same arc = 180°) so ∠ABS = ∠AQB	One relevant step with reason. Stating: ∠ABS = ∠AQB (alt seg theorem) is not a proof of the theorem, so only gets "u".	Two relevant steps with reasons.	Proof completed with clear reasoning throughout.

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	1 of r	2 of r	1 of t	2 of t

Q	Expected coverage	Achievement	Merit	Excellence
TWO (a)(i)	$\tan m = \frac{1}{2}$ $m = 26.6°$ (m would be 29.5 grads or 0.46 rads)	Angle stated (accept 26° or 27° with some working).		
(ii)	$\cos 26.6° = y$ (using trigonometry) $y = 0.894$ units OR $y = \frac{2}{\sqrt{5}}$ or $\frac{2\sqrt{5}}{5}$ (using Pythagoras with surd answers) Consistency working with answer from part (i).	Showing angle BDG / FDG is 26.6° or the length BD / FD is 1.	Solves the problem by finding $y = 0.894$ units or 0.8 or 0.9 with working.	
(b)(i)	$\frac{8+g}{8} = \frac{5+2}{5}$ (using similar triangles) $g = 3.2$ cm OR $\frac{g}{8} = \frac{2}{5}$ (using propery of // lines and transversals) $g = 3.2$ cm OR $k = \frac{7}{5} = 1.4$ $8 + g = 8 \times 1.4$ (using scale factor) $g = 3.2$ cm	Calculates scale factor. OR Forms a relationship using similar triangles or // line properties. OR CAO	Solves the problem by finding g supported with relevant working.	
(ii)	∠PDE = 180° – z (∠s on a straight line = 180°) ∠DCB = 180° – z (corr. ∠s =, // lines) ∠DPE = 180° – 47° – y =133° – y (∠s on a straight line = 180°) ∠x = 180° – (180° – z) – (133° – y) $x = z + y - 133°$ (∠s in a Δ = 180°) NOTE: If angles in quadrilateral DECB are used, the relationship is: $x = 133° - z + y$. The two expressions both reduce to $z = 133°$ Because in fact x is equal to y (corr. ∠s =, // lines)	Attempts to establish a relationship between one pair of the angles x, y or z with one relevant reason, such as: $x = y$ OR $z = 133$	Attempts to establish relationships between two pairs of the angles x, y or z with relevant reasons, such as: $x = y$ AND $z = 133$	Forms a SINGLE expression for x in terms of y and z, well explained and justified.
(c)	Draw in the radii AO and BO (or AO and CO) ∠DAB = x (given) ∠DAO = 90° (tangent ⊥ rad = 90°) ∠BAO = 90° – x (∠s add to 90°) ∠ABO = 90° – x (base ∠s isos Δ =) ∠AOB = $2x$ (∠s in a Δ = 180°) ∠y = x (∠ centre = 2 × ∠ at circum.)	One relevant step with reason. Stating: ∠x = ∠y (alt seg theorem) is not a proof, so only gets "u".	Two relevant steps with reasons.	Proof completed with clear reasoning throughout.

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	1 of r	2 of r	1 of t	2 of t

Q	Expected coverage	Achievement	Merit	Excellence
THREE (a)(i)	∠BEC = 90° – 38° (tangent ⊥ rad = 90°) = 52° x = 52° (base ∠s isos Δ =)	Correct angle: x = 52° OR One relevant step with reason.	Solves the problem by finding the correct angle with at least one valid reason.	
(ii)	∠CBE = 76° (∠s in a Δ = 180°) ∠CFE = 38° (∠ centre = 2 × ∠ at circum.) ∴∠DFE = 2 x 38° (symmetry) y = 76°	Angle CBE = 76° OR One relevant step with reason. (consistent with part (i) above)	Solves the problem by finding the correct angle with valid reasoning. (consistent with part (i) above)	
(iii)	∠ACB = 60° (∠s in equil. Δ) ∠DCE = 196° (∠s at a pt C= 360°) ∠DGE = 88° (∠s in quad DGEC = 360°) ∠JHI = 88° (symm. of rhombus) ∠z = 92° (∠s in quad = 360°)	Correct angle answer only, 92°. OR One relevant step with reason. (consistent with parts (i) and (ii) above)	Two relevant steps with reasons. (consistent with parts (i) and (ii) above).	Solves the problem by finding the correct angle; well explained and justified.
(b)	Joins D and E, thus forming triangle DEG which is equilateral (all sides equal), giving: ∠DGE = 60° (∠s in equil. Δ) ∠DGB = 30° (symmetry of equil. Δ) $\overline{DG} = \overline{GB}$ so Δ is isosceles ∠DBG = 75° (∠s in a Δ = 180°) Therefore: ∠x = 150° OR ∠DEG = 60° can be established using trigonometry: If M is the midpoint of DE, then in ΔMGE: cos∠DEG = $^1/_2$ → ∠DEG = 60° etc	Correct angle answer only, 150°. OR One relevant step with reason.	Two relevant steps with reasons.	Solves the problem by finding the correct angle; well explained and justified.

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

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 18	19 – 24