Question	Answer	Marks	Guidance
5(c)	$\cot\theta = \frac{\sqrt{7}+2}{9\left(\sqrt{7}-1\right)}$ or $\frac{1}{9\left(3-\sqrt{7}\right)}$ oe	**B1**	May have factors of 9 multiplied out
	$\frac{\left(\sqrt{7}+2\right)}{9\left(\sqrt{7}-1\right)} \times \frac{\left(\sqrt{7}+1\right)}{\left(\sqrt{7}+1\right)}$ or $\frac{\left(3+\sqrt{7}\right)}{9\left(3-\sqrt{7}\right)\left(3+\sqrt{7}\right)}$	**M1**	For rationalisation of *their* $\cot\theta$
	$\frac{\sqrt{7}}{18}+\frac{1}{6}$	**A1**	
	Alternative		
	$\cot\theta = \frac{\sqrt{7}+2}{9\left(\sqrt{7}-1\right)}$	**(B1)**	
	$\sqrt{7}+2 = \left(r\sqrt{7}+s\right)\left(9\left(\sqrt{7}-1\right)\right)$ $1 = -9r+9s$ $2 = 63r-9s$	**(M1)**	Obtain 2 simultaneous equations from *their* $\cot\theta$. Allow one error
	$\frac{\sqrt{7}}{18}+\frac{1}{6}$	**(A1)**	
6(a)	$5\theta = 3.75$ so $\theta = 0.75$ **AG**	**B1**	Allow $\theta = \frac{3.75}{5}$ as a starting point

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Question	Answer	Marks	Guidance
6(b)	$AB^2 = 5^2 + 5^2 - (2 \times 5 \times 5\cos 1.75)$ $\sin(0.875) = \frac{0.5AB}{5}$ $\frac{AB}{\sin 1.75} = \frac{5}{\sin 0.696}$ or $DC^2 = 5^2 + 5^2 - (2 \times 5 \times 5\cos 0.75)$ $\sin(0.375) = \frac{0.5DC}{5}$ $\frac{DC}{\sin 0.75} = \frac{5}{\sin 1.196}$	**M1**	For attempt to find the length of at least one chord. May be implied by a correct length.
	$AB = 7.67(5)$ soi	**A1**	
	$DC = 3.66(3)$ soi	**A1**	
	Arc length AD or BC : 5×0.5 soi oe	**B1**	Allow unsimplified
	16.3	**A1**	

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Question	Answer	Marks	Guidance
Choose one scheme to mark to the advantage of the candidate			
6(c)	$\left(\frac{1}{2}\times 5^2\left(1.75-\sin 1.75\right)\right)$ $-\left(\frac{1}{2}\times 5^2\left(0.75-\sin 0.75\right)\right)$	**M2**	**M2** for a fully correct method with no extra terms **M1** for attempt at the area of at least one segment – may be implied by different methods
	8.7	**A1**	
	Alternative 1		
	Triangle ODC + sectors OCB and AOD only $\left(\frac{1}{2}\times 5^2\times\sin 0.75\right)+2\left(\frac{1}{2}\times 5^2\times 0.5\right)$	**(M1)**	
	Triangle OAB $\frac{1}{2}\times 5^2\times\sin 1.75$	**(M1)**	
	8.7	**(A1)**	
	Alternative 2		
	Area of trapezium formed by Triangle ODC – triangle OPQ = $\left(\frac{1}{2}\times 5^2\times\sin 0.75\right)-\left(\frac{1}{2}\times OP^2\times\sin 0.75\right)$	**(M1)**	The points P and Q are where the lines OD and OC meet AB. Candidates may have different labels
	Area of APD and BQC = $2\times\left(\left(\frac{1}{2}\times 5^2\times 0.5\right)-\left(\frac{1}{2}\times 5\times OP\times\sin 0.5\right)\right)$	**(M1)**	
	8.7	**(A1)**	
	Alternative 3		
	Area of trapezium $ABCD=\frac{1}{2}\left(AB+CD\right)\times 1.45$	**(M1)**	Allow 8.21
	area of 2 remaining shaded segments $2\times\left(\left(\frac{1}{2}\times 5^2\times 0.5\right)-\left(\frac{1}{2}\times 5^2\times\sin 0.5\right)\right)$	**(M1)**	Allow **M1** for one segment
	8.7	**(A1)**	

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Question	Answer	Marks	Guidance
7(a)	$2x^2 - x(3x-2) + (3x-2)^2 = 2$ or $2\left(\frac{y+2}{3}\right)^2 - y\left(\frac{y+2}{3}\right) + y^2 = 2$	**M1**	For a quadratic equation in one variable
	$4x^2 - 5x + 1 = 0$ oe or $4y^2 + y - 5 = 0$ oe	**A1**	Allow multiples but must be a 3 term equation = 0
	$x = \frac{1}{4}$ $x = 1$ $y = -\frac{5}{4}$ $y = 1$	**2**	**A1** for each correct pair
	Midpoint: $\left(\frac{5}{8}, -\frac{1}{8}\right)$	**M1**	Allow for use of *their* coordinates
	Gradient of $AB = 3$	**M1**	**M1** for gradient of $AB = 3$ Allow for use of *their* coordinates
	Perpendicular gradient: $-\frac{1}{3}$	**M1**	**Dep** on previous **M** mark
	Perpendicular equation: $y + \frac{1}{8} = -\frac{1}{3}\left(x - \frac{5}{8}\right)$	**M1**	Allow for *their* perp gradient and *their* midpoint
	When $y = \frac{7}{8}$, $k = -\frac{19}{8}$ or -2.375 oe	**A1**	
7(b)	$\left(\frac{29}{8}, -\frac{9}{8}\right)$ or $(3.625, -1.125)$ oe	**2**	**B1** for each coordinate
8(a)	$\frac{\frac{1}{3}(6x)(3x^2-5)^{-\frac{2}{3}}(x+4) - (3x^2-5)^{\frac{1}{3}}}{(x+4)^2}$ or $\frac{1}{3}(6x)(3x^2-5)^{-\frac{2}{3}}(x+4)^{-1} + (3x^2-5)^{\frac{1}{3}}\left(-(x+4)^{-2}\right)$	**3**	**B1** for $\frac{1}{3}(6x)(3x^2-5)^{-\frac{2}{3}}$ soi **M1** for attempt at differentiation of a quotient or valid product **A1** for all other terms correct
	$\left(2x(x+4) - (3x^2-5)\right)$	**M1**	**M1 dep** on previous **M** mark for simplification of *their* numerator Allow one sign slip but must be dealing with two quadratic terms.
	$\frac{-x^2+8x+5}{(3x^2-5)^{\frac{2}{3}}(x+4)^2}$	**A1**	

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