Question			Answer	Marks	AO	Guidance	
7			[Perimeter =] $2r + r\theta = 10$	**M1**	**1.1**		
			$\theta = \frac{10-2r}{r}$	**B1**	**3.1a**	OR $r = \frac{10}{2+\theta}$	Expression for one of r, θ in terms of the other
			$A = \frac{1}{2}r^2\theta$ so $A = \frac{r(10-2r)}{2} = 5r - r^2$	**M1**	**3.1a**	OR $A = \frac{100\theta}{2(2+\theta)^2} = \frac{50\theta}{(2+\theta)^2}$	Area in terms of either *their* r or *their* θ. Need not expand brackets.
			$A = 2.5^2 - (2.5-r)^2$	**M1**	**3.1a**	Completing the square	
			This has a max when $2.5 - r = 0$	**B1**	**2.4**	Convincing explanation that there is a max	
			Max = 6.25 [cm^2]	**A1**	**2.2a**		
			Alternative method 1				
			$\frac{dA}{dr} = 5 - 2r$	**M1**			
			$\frac{d^2A}{dr^2} = -2$ so max	**B1**			
			$\frac{dA}{dr} = 0 \Rightarrow r = 2.5$; Max = 6.25 [cm^2]	**A1**			
			Alternative method 2				
			$\frac{dA}{d\theta} = \frac{50(2+\theta)^2 - 100\theta(2+\theta)}{(2+\theta)^4} = \frac{100-50\theta}{(2+\theta)^3}$	**M1**		Reasonable attempt at quotient rule	
			$\frac{dA}{d\theta} = 0 \Rightarrow \theta = 2$; A = 6.25 [cm^2]	**A1**		For information	
			$\theta = 1.5 \Rightarrow \frac{dA}{d\theta} > 0$, $\theta = 2.5 \Rightarrow \frac{dA}{d\theta} < 0$ so max	**B1**		$\frac{d^2A}{d\theta^2} = -\frac{200}{256} = -0.78125$ at $\theta = 2$	
				[6]			