Question	Scheme	Marks
3(a)	$\sin\left(\frac{\theta}{2}\right)=\frac{r}{2r}\Rightarrow\frac{\theta}{2}=\frac{\pi}{6}$	M1
	$\Rightarrow\theta=\frac{\pi}{3}$	A1 [2]
	ALT works in degrees	
	$\sin\left(\frac{\theta}{2}\right)=\frac{r}{2r}\Rightarrow 30^{\circ}$	[M1
	$\Rightarrow\theta=\frac{\pi}{3}$	A1]
(b)	Area of circle = πr^2	B1
	Area of sector = $\frac{3}{2}\times(3r)^2=\frac{3}{2}\pi r^2$	M1
	Shaded area: $8\pi=\frac{3}{2}\pi r^2-\pi r^2=\frac{\pi r^2}{2}\Rightarrow r^2=16\Rightarrow r=4$ (cm)	dM1A1 [4]
	ALT works in degrees	
	Area of circle = πr^2	[B1
	Area of sector = $\frac{60^{\circ}}{360^{\circ}}\times\pi\times(3r)^2=\frac{3}{2}\pi r^2$	M1
	Shaded area: $8\pi=\frac{3}{2}\pi r^2-\pi r^2=\frac{\pi r^2}{2}\Rightarrow r^2=16\Rightarrow r=4$ (cm)	dM1A1]
		Total 6 marks

Part	Mark	Notes
(a)	M1	For the correct use of sine with r and $2r$ to obtain $\frac{\theta}{2}=\frac{\pi}{6}$ Allow working in degrees for the M mark only. i.e $\frac{\theta}{2}=30^{\circ}$ **Any responses not based on trigonometry are M0A0** If you are not sure, please send to Review
	A1	For $\theta=\frac{\pi}{3}$ **ONLY**
(b)	B1	For the correct area of the circle seen anywhere in part (b)
	M1	For using the correct formula for the area of a sector with their θ **provided** θ is within the specified range. $\left[0<\theta<\frac{\pi}{2},\quad 0<\theta<1.57..\right]$ Allow working in degrees for the sector provided it is correct. Do not allow use of the radian formula for a sector with degrees.
	dM1	For subtracting the area of the circle from the area of the sector and finding a value for r $r=\sqrt{\frac{8\pi}{\left(\frac{1}{2}\times(3)^2\times\frac{\pi}{3}-\pi\right)}}$ **This mark is dependent on the previous M mark**
	A1	For $r=4$

USEFUL SKETCH