

7(a)	Obtain correct $\frac{1}{2}r^2 \times \frac{2}{3}\pi - \frac{1}{2}r^2 \sin \frac{2}{3}\pi$
	$0.614r^2$
7(b)(i)	Obtain $\left[\frac{dA}{dr} \right] = 1.228r$
	Use $\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dt}$, or equivalent, with $r = 20$
	Obtain 9.8
7(b)(ii)	State or imply $\frac{2}{3}\pi r$ for length of arc AB
	Differentiate and apply correct use of chain rule
	Obtain 0.84

10(a)

$$s^2 = r^2 + r^2 - 2r^2 \cos \frac{2\pi}{3}$$

$$\text{or } \frac{r}{\sin \frac{\pi}{6}} = \frac{s}{\sin \frac{2\pi}{3}}$$

$$\text{or } s = 2r \times \cos \frac{\pi}{6}$$

$$\text{or } \left(\frac{r}{2}\right)^2 + \left(\frac{s}{2}\right)^2 = r^2$$

$$\text{or } \left(\frac{3r}{2}\right)^2 + \left(\frac{s}{2}\right)^2 = s^2 \quad \text{oe}$$

$$\Rightarrow \text{E.g. } s = 2r \times \frac{\sqrt{3}}{2} \Rightarrow s = \sqrt{3} r$$

10(b)

$$[\text{Angle BAD, BAC or CAD} =] \frac{2\pi}{3} \text{ or } 120^\circ$$

$$[\text{Sector BAD} =] \frac{1}{2}r^2 \times \frac{2\pi}{3} \text{ oe}$$

$$[\text{Sector BCD} =] \frac{1}{2}s^2 \times \frac{\pi}{3} \text{ oe}$$

$$= \frac{3}{6}\pi r^2 \text{ or } \frac{1}{2}\pi r^2$$

$$\textbf{Either} [\text{Area triangle ABD, ABC or ACD} =] \frac{1}{2}r^2 \times \sin \frac{2\pi}{3} \text{ or } \frac{r}{2} \times \frac{s}{2} \text{ oe}$$

$$= \frac{\sqrt{3}}{4}r^2$$

$$\textbf{Or} [\text{Area triangle CBD} =] \frac{1}{2}s^2 \times \sin \frac{\pi}{3} \text{ or } \frac{3r}{2} \times \frac{s}{2} \text{ oe}$$

$$= \frac{3\sqrt{3}}{4}r^2$$

$$\left(\frac{\sqrt{3}}{2} - \frac{\pi}{6} \right) r^2 \text{ or e.g. } \left(\frac{12\sqrt{3} - 4\pi}{24} \right) r^2 \text{ oe in the required exact form}$$

9(a)	$\frac{1}{2}r^2\alpha = 8\alpha \Rightarrow r = 4$
	$\frac{1}{2}r^2 \sin \alpha = 4 \Rightarrow \alpha = \frac{\pi}{6}$
	Area of segment = $\frac{1}{2} \times 4^2 \times \frac{\pi}{6} - 4$
	$= \frac{4}{3}\pi - 4$
9(b)	$r^2 + r^2 - 2r^2 \cos \alpha = \frac{1}{2}r^2 \Rightarrow 2 \cos \alpha = \frac{3}{2}$
	$\alpha = 0.723 [0.72273...] \Rightarrow \frac{1}{2}r^2 \sin(\text{their } 0.723) [= 4]$
	$r = 3.48 [3.4777...]$
	Area of segment = $\frac{1}{2} \times 3.48^2 \times 0.723 - 4 = 0.371 [0.37068...]$