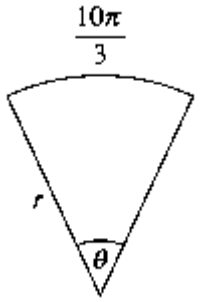
08	**7b**	The diagram shows a sector with radius r and angle θ where $0 \leq \theta \leq 2\pi$. The arc length is $\frac{10\pi}{3}$. (i) Show that $r \geq \frac{5}{3}$. (ii) Calculate the area of the sector when $r = 4$.	**2** **2**



i. Arc length $l = r\theta$

$$\frac{10\pi}{3} = r\theta$$

As $\theta \leq 2\pi$, then $r\theta \leq 2r\pi$

$$\therefore 2r\pi \geq r\theta$$

$$2r\pi \geq \frac{10\pi}{3}$$

$$r \geq \frac{5}{3}$$

ii. If r = 4, and $\frac{10\pi}{3} = r\theta$ from i., then

$$4\theta = \frac{10\pi}{3}$$

$$\theta = \frac{10\pi}{12}$$

$$= \frac{5\pi}{6}$$

Area of sector $A = \frac{1}{2}r^2\theta$

$$= \frac{1}{2} \times 4^2 \times \frac{5\pi}{6}$$

$$= \frac{20\pi}{3}$$

$\therefore$ area is $\frac{20\pi}{3}$ units^2

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

(i) Most candidates used the formula $l = r\theta$ and stated $l = \frac{10\pi}{3}$. The better responses used $\theta \leq 2\pi$ or $\frac{10\pi}{3} \leq 2\pi r$ to show $r \geq \frac{5}{3}$.

(ii) Typical responses applied the formula $A = \frac{1}{2}r^2\theta$ and substituted $r = 4$. Quality responses calculated $\theta = \frac{5\pi}{6}$ and correctly evaluated the area of the sector.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/