4.

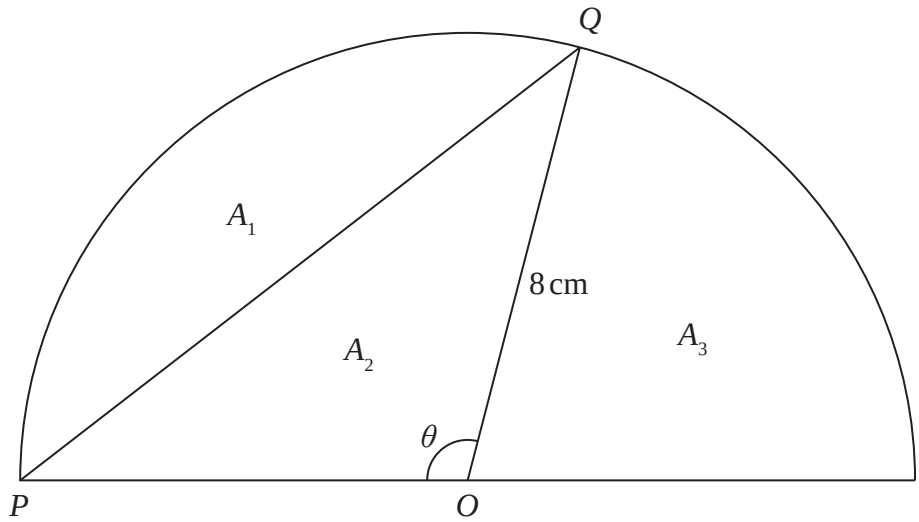

Figure 1

Figure 1 shows a semicircle with centre O and radius 8 cm.
The chord PQ and the radius OQ divide the semicircle into three regions.
The regions have areas A_1, A_2 and A_3 as shown in Figure 1.

Given that angle $POQ = \theta$ radians,

(a) show that

$$A_1 = k(\theta - \sin\theta)$$

where k is a positive constant to be found.

(2)

Given also that $A_3 = 2A_1$

(b) show that

$$\sin\theta = \frac{3\theta}{2} - \frac{\pi}{2}$$

(3)