

## Section 2: Circular measure

### Solutions to Exercise level 3

1. (i) For the 2 m pond, the angle subtended is given by

$$\sin \frac{1}{2} \alpha = \frac{0.5}{2} = 0.25 \approx \sin 0.2526$$

$$\Rightarrow \alpha \approx 0.5052$$

For the 4 m pond, the angle subtended is given by

$$\sin \frac{1}{2} \beta = \frac{0.5}{4} = 0.125 \approx \sin 0.1253$$

$$\Rightarrow \beta \approx 0.2506$$

For the 3 m pond, the angle subtended is given by

$$\sin \frac{1}{2} \gamma = \frac{0.5}{3} = 0.1666... \approx \sin 0.1674$$

$$\Rightarrow \gamma \approx 0.3348$$

- (ii) For 2 m pond, perimeter =  $2\pi(2) - 2\alpha \approx 11.56$

For 3 m pond, perimeter =  $2\pi(3) - 3\gamma \approx 17.85$

For 4 m pond, perimeter =  $2\pi(4) - 2(4\beta) \approx 23.13$

so the total perimeter  $\approx 52.54$  m.

- (iii) For 2 m pond, area =  $\frac{1}{2}(2^2)(2\pi - \alpha) + \frac{1}{2}(2^2)\sin \alpha \approx 12.52$

For 3 m pond, area =  $\frac{1}{2}(3^2)(2\pi - \gamma) + \frac{1}{2}(3^2)\sin \gamma \approx 28.25$

For 4 m pond, area =  $\frac{1}{2}(4^2)(2\pi - 2\beta) + 2\left(\frac{1}{2}(4^2)\sin \beta\right) \approx 50.22$

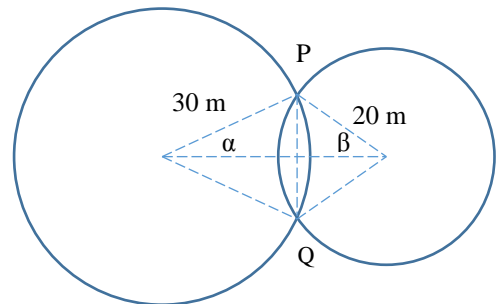
so the total area  $\approx 91\text{m}^2$ .

2. (i)  $\sin \alpha = \frac{4}{30} \Rightarrow \alpha \approx 0.1337$

so the angle in 30 m dome is  $\theta \approx 0.2674$

$$\sin \beta = \frac{4}{20} \Rightarrow \beta \approx 0.2014$$

so the angle in 20 m dome is  $\phi \approx 0.4028$



- (ii) Area in 30 m dome =  $\frac{1}{2}(30^2)(2\pi - \theta) + \frac{1}{2}(30^2)\sin \theta$   
 $\approx 2826.00$

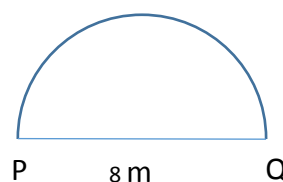
Area in 20 m dome =  $\frac{1}{2}(20^2)(2\pi - \phi) + \frac{1}{2}(20^2)\sin \phi$   
 $\approx 1254.47$

so floor area of domes  $\approx 4080\text{m}^2$ .

- (iii) Wall is a semicircle, radius 4 m

$$\text{Area} \approx \frac{1}{2}\pi(4^2)$$

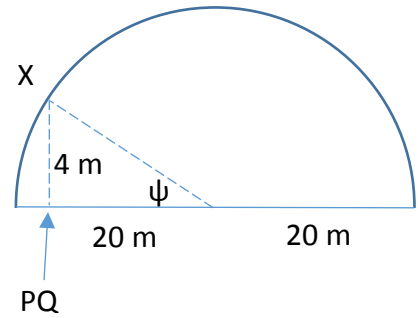
$$\approx 25.1\text{m}^2$$



## Edexcel A level Maths Trigonometry 2 Exercise solns

(iv) Power cable length =  $\frac{1}{2}(2)\pi(4)$   
 $\approx 12.57$  m

(v) height of wall above PQ as in diagram = 4 m  
 $\psi = \beta$   
(since the point X is on the circumference  
of the wall in (iii))  
so area =  $\frac{1}{2}(20^2)(\pi - \psi) + \frac{1}{2}(20 \cos \psi)(4)$   
 $\approx 627$  m<sup>2</sup>



(vi) perimeter of domes =  $30(2\pi - \theta) + 20(2\pi - \phi)$   
 $\approx 180.47 + 117.61$   
 $\approx 298$  m