

1.7 Answers

A-Level Pure Mathematics : Year 2 Applications of Trigonometry

1.7.1 Solution to 1.5 Example (Teaching Video)

$$(i) \quad \text{Area } \Delta = \frac{1}{2} a b \sin C$$

$$12 = \frac{1}{2} \times 5 \times 5 \times \sin \theta$$

$$\sin \theta = \frac{12 \times 2}{5 \times 5}$$

$$= 0.9600$$

$$\theta = \arcsin 0.9600$$

$$= 1.287^\circ$$

$$(ii) \quad \text{Area Segment Shaded} = \text{Area Sector } ABC - \text{Area } \Delta ABC$$

$$= \frac{1}{2} r^2 \theta - 12$$

$$= \frac{1}{2} \times 5^2 \times 1.287 - 12$$

$$= 4.088 \text{ cm}^2$$

$$(iii) \quad \text{Perimeter Segment Shaded} = \text{Arc Length } AB + \text{Length } AB$$

To get Length AB use The Cosine Rule,

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$= 5^2 + 5^2 - 2 \times 5 \times 5 \times \cos 1.287$$

$$= 25 + 25 - 14.000$$

$$= 36$$

$$\therefore c = 6 \text{ cm}$$

$$\text{Arc Length} = r\theta$$

$$= 5 \times 1.287$$

$$= 6.435 \text{ cm}$$

$$\text{Perimeter} = 12.435 \text{ cm}$$

[7 marks]

1.7.2 Solutions to 1.6 Exercise

Answer 1

$$(i) \quad 0.9975 \qquad (ii) \quad 0.6967$$

[2 marks]

Answer 2

$$\begin{aligned}(i) \quad Area \Delta &= \frac{1}{2} a b \sin C \\&= \frac{1}{2} \times 6 \times 8 \times \sin 0.4 \\&= 9.35 \text{ cm}^2\end{aligned}$$

[2 marks]

$$\begin{aligned}(ii) \quad c^2 &= a^2 + b^2 - 2 a b \cos C \\&= 6^2 + 8^2 - 2 \times 6 \times 8 \times \cos 0.4 \\&= 36 + 64 - 88.422 \\&= 11.578 \\c &= 3.40 \text{ cm}\end{aligned}$$

[2 marks]

Answer 3

$$\begin{aligned}(i) \quad Arc Length &= r \theta \\8 &= 5\theta \\ \theta &= 1.6^\circ\end{aligned}$$

[2 marks]

$$\begin{aligned}(ii) \quad Area Sector &= \frac{1}{2} r^2 \theta \\&= \frac{1}{2} \times 5^2 \times 1.6 \\&= 20 \text{ cm}^2\end{aligned}$$

[2 marks]

$$\begin{aligned}(iii) \quad Area \Delta &= \frac{1}{2} a b \sin C \\&= \frac{1}{2} \times 5 \times 5 \times \sin 1.6 \\&= 12.49 \text{ cm}^2\end{aligned}$$

[2 marks]

$$(iv) \quad Area Minor Segment = 20 - 12.49 = 7.51 \text{ cm}^2$$

[2 marks]

$$(v) \quad Area Major Segment = Area O - 7.51 = 5^2 \pi - 7.51 = 71.03 \text{ cm}^2$$

[2 marks]

Answer 4

(i) 0.451^{c}

(ii) 1.168^{c}

[2 marks]**Answer 5**

(i) $\frac{\pi}{6}$

(ii) $\frac{\pi}{4}$

(iii) $\frac{\pi}{2}$

[3 marks]**Answer 6**

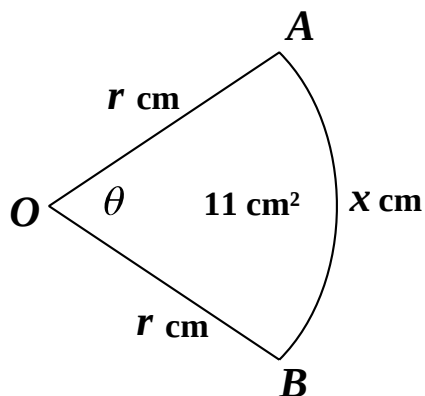
$$\begin{aligned}
 \textbf{(i)} \qquad \cos A &= \frac{b^2 + c^2 - a^2}{2 b c} \\
 &= \frac{15^2 + 7^2 - 12^2}{2 \times 15 \times 7} \\
 &= \frac{130}{210} \\
 &= 0.6190 \\
 A &= \arccos 0.6190 \\
 &= 0.9033^{\text{c}}
 \end{aligned}$$

[3 marks]

$$\begin{aligned}
 \textbf{(ii)} \qquad \text{Area } \Delta &= \frac{1}{2} b c \sin A^{\text{c}} \\
 &= \frac{1}{2} \times 15 \times 7 \times \sin 0.9033 \\
 &= 41.2 \text{ cm}^2
 \end{aligned}$$

[2 marks]

Answer 7



$$x + 2r = 4x \Rightarrow r = 1.5x$$

$$\text{Arc Length, } x = r\theta \Rightarrow r = \frac{x}{\theta}$$

$$\text{Combining these two results, } 1.5x = \frac{x}{\theta} \Rightarrow \theta = \frac{2}{3}$$

$$\text{Area Sector, } 11 = \frac{1}{2} r^2 \times \frac{2}{3} \Rightarrow r = \sqrt{33} \text{ cm}$$

[4 marks]