

Area of a Segment Worksheet

Calculating the Area of Circular Segments

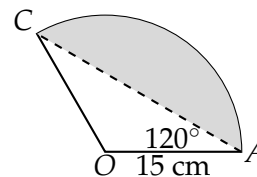
I Do

The diagram shows a sector OAC of a circle with centre O and radius 15 cm.

The central angle $\angle AOC = 120^\circ$.

Calculate the area of the shaded segment.

Give your answer correct to 3 significant figures.



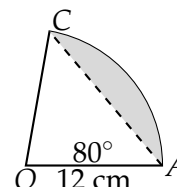
We Do

The diagram shows a sector OAC of a circle with centre O and radius 12 cm.

The central angle $\angle AOC = 80^\circ$.

Calculate the area of the shaded segment.

Give your answer correct to 3 significant figures.



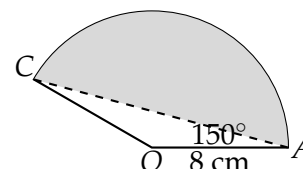
You Do

The diagram shows a sector OAC of a circle with centre O and radius 8 cm.

The central angle $\angle AOC = 150^\circ$.

Calculate the area of the shaded segment.

Give your answer correct to 3 significant figures.



Challenge

The area of a sector of a circle with radius r and angle 60° is $24\pi \text{ cm}^2$.

Calculate the area of the segment enclosed by the sector's chord and arc.

Give your answer correct to 3 significant figures.

Answers & Worked Solutions

• I Do:

$$\text{Area of sector} = \frac{120}{360} \times \pi \times 15^2 = \frac{1}{3} \times 225\pi = 75\pi \approx 235.619 \text{ cm}^2$$

$$\text{Area of triangle} = \frac{1}{2} \times 15 \times 15 \times \sin(120^\circ) = 112.5 \times \frac{\sqrt{3}}{2} \approx 97.428 \text{ cm}^2$$

$$\text{Area of segment} = 235.619 - 97.428 = 138.191... \quad \text{Answer: } 138 \text{ cm}^2$$

• We Do:

$$\text{Area of sector} = \frac{80}{360} \times \pi \times 12^2 = \frac{2}{9} \times 144\pi = 32\pi \approx 100.531 \text{ cm}^2$$

$$\text{Area of triangle} = \frac{1}{2} \times 12 \times 12 \times \sin(80^\circ) = 72 \sin(80^\circ) \approx 70.906 \text{ cm}^2$$

$$\text{Area of segment} = 100.531 - 70.906 = 29.625... \quad \text{Answer: } 29.6 \text{ cm}^2$$

• You Do:

$$\text{Area of sector} = \frac{150}{360} \times \pi \times 8^2 = \frac{5}{12} \times 64\pi = \frac{80\pi}{3} \approx 83.776 \text{ cm}^2$$

$$\text{Area of triangle} = \frac{1}{2} \times 8 \times 8 \times \sin(150^\circ) = 32 \times 0.5 = 16 \text{ cm}^2$$

$$\text{Area of segment} = 83.776 - 16 = 67.776... \quad \text{Answer: } 67.8 \text{ cm}^2$$

• Challenge:

$$\text{Area of sector} = \frac{60}{360} \times \pi \times r^2 = 24\pi \implies \frac{1}{6}r^2 = 24 \implies r^2 = 144 \implies r = 12 \text{ cm}$$

$$\text{Area of triangle} = \frac{1}{2} \times 12 \times 12 \times \sin(60^\circ) = 72 \times \frac{\sqrt{3}}{2} = 36\sqrt{3} \approx 62.354 \text{ cm}^2$$

$$\text{Area of segment} = 24\pi - 36\sqrt{3} \approx 75.398 - 62.354 = 13.044... \quad \text{Answer: } 13.0 \text{ cm}^2$$