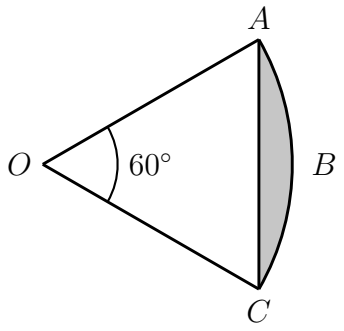
Mensuration: Circular Segments & Perimeters

Practice Worksheet (Jun 2024 Paper 1H Style)

I Do

The diagram shows a sector $OABC$ of a circle centre O.

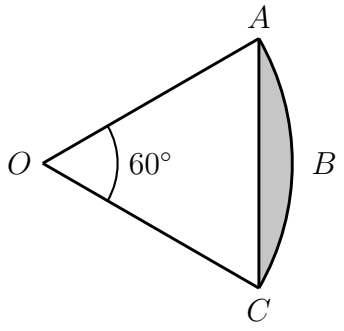


Angle $AOC = 60°$
The area of the shaded segment ABC is 38 cm^2

Work out the perimeter of the shaded segment ABC.
Give your answer correct to 1 decimal place.

We Do

The diagram shows a sector $OABC$ of a circle centre O.

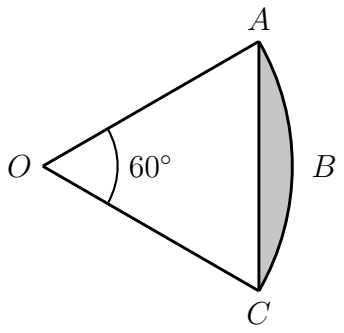


Angle $AOC = 60°$
The area of the shaded segment ABC is 25 cm^2

Work out the perimeter of the shaded segment ABC.
Give your answer correct to 1 decimal place.

You Do

The diagram shows a sector $OABC$ of a circle centre O.

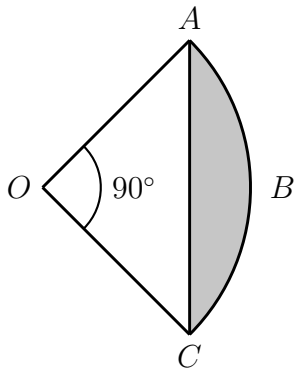


Angle $AOC = 60°$
The area of the shaded segment ABC is 50 cm^2

Work out the perimeter of the shaded segment ABC.
Give your answer correct to 1 decimal place.

Challenge

The diagram shows a sector $OABC$ of a circle centre O.



Angle $AOC = 90°$
The area of the shaded segment ABC is 45 cm^2

Work out the perimeter of the shaded segment ABC.
Give your answer correct to 1 decimal place.

Answers & Worked Solutions

- **I Do:**
  1. Let radius be r.
  2. Area of sector $OABC = \frac{60}{360}\pi r^2 = \frac{\pi}{6}r^2$.
  3. Area of triangle $OAC = \frac{1}{2}r^2\sin(60°) = \frac{\sqrt{3}}{4}r^2$.
  4. Segment Area $= r^2\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right) = 38 \implies r^2 = \frac{38}{\frac{\pi}{6} - \frac{\sqrt{3}}{4}} \approx 419.491 \implies r \approx 20.481$ cm.
  5. Arc $ABC = \frac{60}{360} \times 2\pi r = \frac{\pi}{3}r$.
  6. Since $\triangle OAC$ is equilateral ($OA = OC = r$ and $\angle AOC = 60°$), chord $AC = r$.
  7. Perimeter = Arc ABC + Chord $AC = \left(\frac{\pi}{3} + 1\right)r = \left(\frac{\pi}{3} + 1\right)(20.481) \approx 41.929. \implies$ **41.9** cm (1 dp).

- **We Do:**
  1. $r^2 = \frac{25}{\frac{\pi}{6} - \frac{\sqrt{3}}{4}} \approx 275.981 \implies r \approx 16.613$ cm.
  2. Perimeter $= \left(\frac{\pi}{3} + 1\right)(16.613) \approx 34.009 \implies$ **34.0** cm (1 dp).

- **You Do:**
  1. $r^2 = \frac{50}{\frac{\pi}{6} - \frac{\sqrt{3}}{4}} \approx 551.962 \implies r \approx 23.494$ cm.
  2. Perimeter $= \left(\frac{\pi}{3} + 1\right)(23.494) \approx 48.097 \implies$ **48.1** cm (1 dp).

- **Challenge:**
  1. Segment Area $= \frac{90}{360}\pi r^2 - \frac{1}{2}r^2\sin(90°) = r^2\left(\frac{\pi}{4} - \frac{1}{2}\right) = 45 \implies r \approx 12.557$ cm.
  2. Arc $ABC = \frac{\pi}{2}r$, Chord $AC = \sqrt{r^2 + r^2} = r\sqrt{2}$.
  3. Perimeter $= \left(\frac{\pi}{2} + \sqrt{2}\right)r = \left(\frac{\pi}{2} + \sqrt{2}\right)(12.557) \approx 37.482 \implies$ **37.5** cm (1 dp).