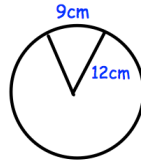


April 12th

Shown below is a sector with radii 12cm and arc 9cm.

Find the area and perimeter of the sector.
There is another sector that has the same area and perimeter.

Find the length of its radii and arc length.



This problem is solved more efficiently if we work in radians not degrees.

Arc length = radius \times θ

Area of sector = $\frac{1}{2} r^2 \theta$

Therefore

$$\text{Perimeter} = 9 + 12 + 12 = \mathbf{33\text{cm}}$$

$$\text{Area} = \frac{1}{2} \times r \times r \theta = \frac{1}{2} \times 12 \times 9 = \mathbf{54\text{cm}^2}$$

Now we need another value of r and of θ that will yield the same values:

Perimeter:

$$33 = 2r + r\theta \quad \therefore \theta = \frac{33-2r}{r}$$

Area:

$$54 = \frac{1}{2} r^2 \theta \quad \therefore r^2 \times \frac{33-2r}{r} = 108$$

$$2r^2 - 33r + 108 = 0$$

$$(2r - 9)(r - 12) = 0 \quad \therefore r = 4\frac{1}{2} \quad (\text{or } 12, \text{ which we already have})$$

$$\mathbf{r = 4\frac{1}{2} \text{ cm} \quad \text{arc length } r\theta = 24\text{cm}}$$