



Name: Wan Rm Hm (27)

Class: 3E1

Date: 5th Aug

MA304.1.2 – Area of a Sector

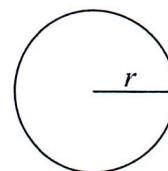
At the end of this unit, you should be able to

- find area of a sector of a circle

With the knowledge of the radian in measuring angles, it can be used to derive the area of sectors.

E1. Given a complete circle with radius r , state its area in terms of r .

$$\text{Area} = \pi r^2 \text{ units}^2$$



(a) What fraction of the area would be occupied by a sector of angle 30° ?

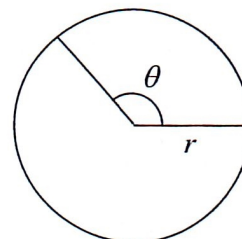
$$\frac{30^\circ}{360^\circ} = \frac{1}{12}$$

(b) What fraction of the area would be occupied by a sector of angle $\frac{7\pi}{6}$?

$$\frac{7\pi}{6} \div 2\pi = \frac{7}{12}$$

(c) Let the angle subtended by the arc be θ radians. Determine the area, A occupied by the sector in terms of r and θ .

$$\begin{aligned} A &= \frac{\theta}{2\pi} \pi r^2 \\ &= \frac{\theta}{2} r^2 \\ &= \frac{1}{2} r^2 \theta \end{aligned}$$



- (d) Now let the arc subtended by the angle be of length s . Determine the area, A occupied by the sector in terms of r and s .

$$\begin{aligned}\frac{\theta r^2}{2} &= \frac{\frac{s}{r} r^2}{2} \\ &= \frac{1}{2} rs\end{aligned}$$

Given r , the radius of the sector/circle and θ , the angle subtended by the arc, the area of the sector is given by $\frac{1}{2} r^2 \theta$ or $\frac{1}{2} rs$.

E2. The chord of a circle of radius 8 cm is 12 cm long.

- (a) Find the angle subtended by the chord at the centre of the circle.

$$\begin{aligned}m^2 + 6^2 &= 64 \\ m &= \sqrt{28} \\ \theta &= 2 \tan^{-1} \left(\frac{6}{\sqrt{28}} \right) \\ &= 97.2^\circ \text{ (d.p.)}\end{aligned}$$

- (b) Find the area of the minor segment of the circle.

$$\begin{aligned}\text{Area} &= \left(\frac{1}{2} \times 8^2 \times 97.2 \times \frac{\pi}{180} - \frac{1}{2} \times \sqrt{28} \times 12 \right) \text{ cm}^2 \\ &= 22.5 \text{ cm}^2\end{aligned}$$

P1. A prism container A , whose base is shaped of that of a sector of a circle with radius 12 cm with an arc length of 8 cm, has a depth of 5 cm. Fluid X is then poured into the container, filling to the brim. This fluid is then poured into another container B which has the same shape as A , but has a depth of 4 cm, an angle of 45° subtended by the arc, and a radius of 10 cm. Determine the depth of which the fluid will take up in container B .

$$\begin{aligned}\text{Vol. of container } A &= \frac{1}{2} \times 12 \times 8 \times 5 \text{ cm}^3 \\ &= 240 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}45^\circ &= \frac{45}{360} \times 2\pi \\ &= \frac{1}{4} \pi\end{aligned}$$

Let depth of B be d cm.

$$240 = \frac{1}{2} \times 10^2 \times \frac{1}{4} \pi \times d$$

$$d = 6.11 \text{ (3 s.f.)} > 4$$

The depth will be 4 cm as water overflows.