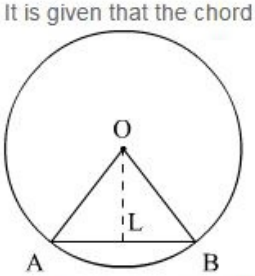
Areas Related to Circles Ex 15.3 Q1

Answer :

We know that the area of minor segment of angle θ in a circle of radius r is,

$$A=\left\{\frac{\pi\theta}{360^\circ}-\sin\frac{\theta}{2}\cos\frac{\theta}{2}\right\}r^2$$

It is given that the chord AB divides the circle in two segments.



We have $OA=4\text{ cm}$ and $AB=4\text{ cm}$. So,

$$AL=\frac{AB}{2}\text{ cm}$$
$$=\frac{4}{2}\text{ cm}$$
$$=2\text{ cm}$$

Let $\angle AOB=2\theta$. Then,

$$\angle AOL=\angle BOL$$
$$=\theta$$

In ΔOLA, we have

$$\sin\theta=\frac{AL}{OA}$$
$$=\frac{2}{4}$$
$$=\frac{1}{2}$$
$$\theta=\sin^{-1}\frac{1}{2}$$
$$=30^\circ$$

Hence, $\angle AOB=60^\circ$

Now using the value of r and θ, we will find the area of minor segment

$$A=\left\{\frac{\pi\times60^\circ}{360^\circ}-\sin\frac{60^\circ}{2}\cos\frac{60^\circ}{2}\right\}\times4\times4$$
$$=\left\{\frac{\pi}{6}-\sin30^\circ\cos30^\circ\right\}\times16$$
$$=\left\{\frac{16\times\pi}{6}-\frac{1}{2}\times\frac{\sqrt{3}}{2}\times16\right\}$$
$$=\boxed{\left\{\frac{8\pi}{3}-4\sqrt{3}\right\}\text{ cm}^2}$$

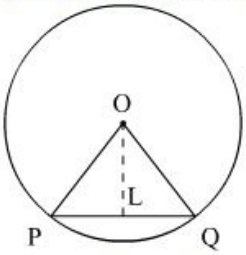
Areas Related to Circles Ex 15.3 Q2

Answer :

We know that the area of minor segment of angle θ in a circle of radius r is,

$$A=\left\{\frac{\pi\theta}{360^\circ}-\sin\frac{\theta}{2}\cos\frac{\theta}{2}\right\}r^2$$

It is given that the chord PQ divides the circle in two segments.



We have $\angle POQ=120^\circ$ and $PQ=12\text{ cm}$. So,

$$\begin{aligned}PL&=\frac{PQ}{2}\text{ cm}\\&=\frac{12}{2}\text{ cm}\\&=6\text{ cm}\end{aligned}$$

Since $\angle POQ=120^\circ$,

$$\begin{aligned}\angle POL&=\angle QOL\\&=60^\circ\end{aligned}$$

Since $\angle POQ=120^\circ$,

$$\begin{aligned}\angle POL&=\angle QOL\\&=60^\circ\end{aligned}$$

In ΔOPQ, we have

$$\sin\theta=\frac{PL}{OA}$$

$$\sin 60^\circ=\frac{6}{OA}$$

$$\frac{\sqrt{3}}{2}=\frac{6}{OA}$$

$$OA=\frac{12}{\sqrt{3}}$$

Thus the radius of circle is $\boxed{OA=4\sqrt{3}\text{ cm}}$.

Now using the value of radius r and angle θ we will find the area of minor segment

$$\begin{aligned}A&=\left\{\frac{120^\circ\pi}{360^\circ}-\sin\frac{120^\circ}{2}\cos\frac{120^\circ}{2}\right\}\left(4\sqrt{3}\right)^2\\&=\left\{\frac{\pi}{3}-\frac{\sqrt{3}}{2}\times\frac{1}{2}\right\}\times 48\\&=\boxed{4\left\{4\pi-3\sqrt{3}\right\}\text{ cm}^2}\end{aligned}$$

********** END **********