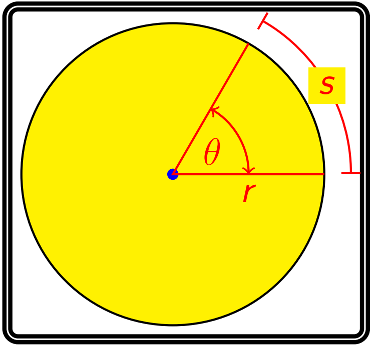
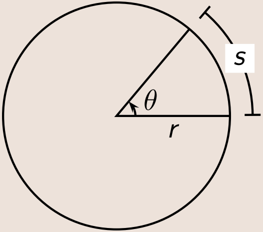
Trigonometry DLA Series



Central Angle & Arc Length

In this DLA, we are are going to look at sector, central angle and arc length..

Sector is the portion of a circle when two radii of the circle meet at both ends of the portion of the circumference of the circle.



Central Angle is labeled by θ and the **arc length** is labeled with s for the sector of the circle with **radius** r.

The chart below shows the **Area of Sector** and the **Arc Length**.

Type	Formula
Area of Sector	$A = \frac{1}{2} \cdot r^2 \cdot \theta$
Arc Length	$s = r \cdot \theta$

Where the **Central Angle** θ must be measured in **Radians** where

$$1^\circ = \frac{\pi}{180} \text{ radian and } \frac{180^\circ}{\pi} = 1 \text{ radian}$$

Example:

Convert 30° to radian.

Solution:

$$\begin{aligned} 30^\circ &= 30 \cdot 1^\circ \\ &= 30 \cdot \frac{\pi}{180} = \frac{\pi}{6} \end{aligned}$$

Example:

Convert $\frac{\pi}{2}$ radians to degrees.

Solution:

$$\begin{aligned} \frac{\pi}{2} \ \textbf{radians} &= \frac{\pi}{2} \cdot 1 \ \textbf{radian} \\ &= \frac{\pi}{2} \cdot \frac{180}{\pi} = 90^\circ \end{aligned}$$

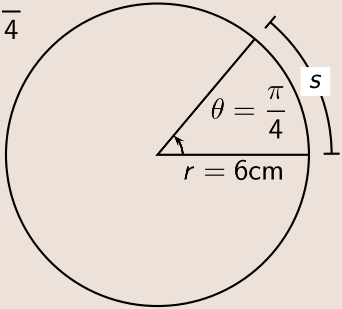
Example:

Find the area of a sector and arc length for the sector with central angle 45° and radius of $6cm$.

Solution:

We first need to convert the central angle to radian.

$$\begin{aligned} 45^\circ &= 45 \cdot 1^\circ \\ &= 45 \cdot \frac{\pi}{180} = \frac{\pi}{4} \end{aligned}$$



Solution(continued):

Using the formula for the area of sector.

$$\begin{aligned} A &= \frac{1}{2} \cdot r^2 \cdot \theta \\ &= \frac{1}{2} \cdot 6^2 \cdot \frac{\pi}{4} = \boxed{\frac{9\pi}{2} cm^2} \end{aligned}$$

Using the formula for the arc length.

$$\begin{aligned} s &= r \cdot \theta \\ &= 6 \cdot \frac{\pi}{4} = \boxed{\frac{3\pi}{2} cm} \end{aligned}$$

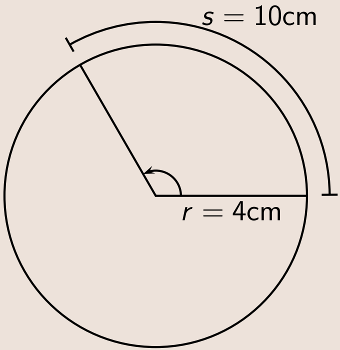
Example:

Find the area of a sector with arc length for the sector of $10cm$ and radius of $6cm$.

Solution:

Using the formula for the area,

$$\begin{aligned} A &= \frac{1}{2} \cdot r^2 \cdot \theta \\ &= \frac{1}{2} \cdot r \cdot r \cdot \theta \\ &= \frac{1}{2} \cdot r \cdot s \\ &= \frac{1}{2} \cdot 6 \cdot 10 \\ &= \boxed{30cm^2} \end{aligned}$$



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