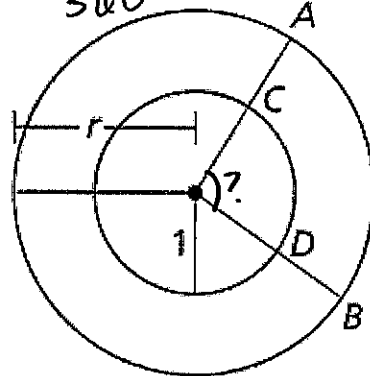


Measuring Angles in Radians

Recall that in a circle, the ratio of the length of a given arc to the circumference is equal to the ratio of the measure of the arc to 360° . To see why, consider the diagram at right.

$$\frac{\text{arc}}{2\pi r} = \frac{\text{central } \angle}{360}$$



A circle of radius 1 has circumference 2π , so the arc length of $\widehat{CD}$ is $\frac{\text{central } \angle}{360} \cdot 2\pi$.

Recall that all circles are similar and corresponding lengths of similar figures are proportional.

Because $m\widehat{AB} = m\widehat{CD}$, $\widehat{AB}$ and $\widehat{CD}$ are corresponding arcs. So, you can write the following proportion:

$$\frac{\text{arc length } \widehat{AB}}{\text{arc length } \widehat{CD}} = \frac{r}{1}$$

$$\text{arc length } \widehat{AB} = r \cdot (\text{arc length } \widehat{CD})$$

$$\text{arc length } \widehat{AB} = r \left(\frac{\text{central } \angle}{360} \cdot 2\pi \right)$$

This form of the equation shows that the arc length associated with a central angle is *proportional to the radius* of a circle.

constant of proportionality, $\frac{\text{central } \angle}{360} \cdot 2\pi$, is defined to be the radian measure of the central angle associated with the arc.

In a circle of radius 1, the radian measure of a given central angle can be thought of as the length of the arc associated with the angle.

The degree measure of a complete circle is 360° , and radian measure of a complete circle is 2π radians, because the circumference of a circle with radius 1 is exactly 2π .

You can use this fact to convert from degree measure to radian measure and vice versa.

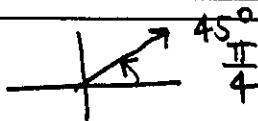
Converting between Degrees and Radians

<i>Degrees to Radians</i>	<i>Radians to Degrees</i>
Multiply degree measure by...	Multiply radian measure by...
$\frac{2\pi \text{ rad}}{360^\circ}$ (OR $\frac{\pi \text{ rad}}{180^\circ}$)	$\frac{360^\circ}{2\pi \text{ rad}}$ (OR $\frac{180^\circ}{\pi \text{ rad}}$)

Example:

8. Convert 45° to radians.

$$45^\circ \times \frac{2\pi}{360} = \frac{2\pi}{8} = \boxed{\frac{\pi}{4}}$$



9. Convert $\frac{3\pi}{2}$ radians to degrees

$$\frac{3\pi}{2} \times \frac{180}{\pi} = 270^\circ$$