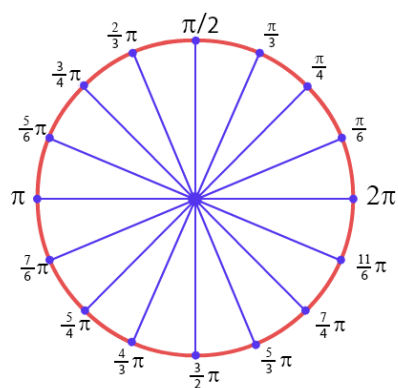


Lesson 6.01 - Radian Measure



Learning Goals:

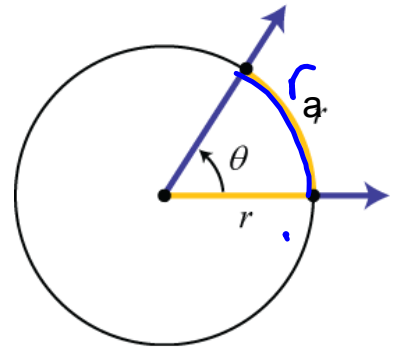
- I know what a radian is
- I can convert from radians to degrees and vice versa
- I can solve problems involving radians



What is a radian?**"Math Speak"**

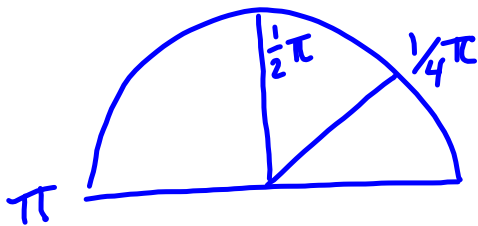
A measurement expressed as the ratio of the arclength, a , that subtends the centre of the circle, over the radius, r , of the circle.

i.e. $\theta = \frac{a}{r}$



1 radian is when the arclength is equal to the radius

$$180^\circ = \pi \text{ radians}$$

How do you convert between degrees and radian?

degrees \rightarrow radians

$$\text{rad} = \frac{\theta}{180} \pi$$

$$\theta = \frac{\text{rads} (180)}{\pi}$$

Example 1: Convert the following to radians

40°

$$\begin{aligned} \text{rad} &= \frac{40}{180} \pi \\ &= \frac{2\pi}{9} \end{aligned}$$

315°

$$\begin{aligned} \text{rad} &= \frac{315}{180} \pi \\ &= \frac{7\pi}{4} \end{aligned}$$

Example 2: Convert the following to degrees

$\frac{2\pi}{3}$

$$\begin{aligned} &= \frac{2}{3}(180) \\ &= 120^\circ \end{aligned}$$

$\frac{-3\pi}{4}$

$$\begin{aligned} \theta &= \frac{\text{rad}}{\pi} 180 \\ &= \frac{-3\pi}{4} (180) \\ &= \frac{-3\pi}{4} \times \frac{1}{\pi} (180) \\ &= -\frac{3}{4}(180) \\ &= -135^\circ \end{aligned}$$

θ°	radians
0	0
30	$\pi/6$
45	$\pi/4$
60	$\pi/3$
90	$\pi/2$

Example 3:

A wind turbine with three blades rotates five times per minute.

a) What is the angular velocity in radians per second?

$$\begin{aligned}
 \text{angular velocity} &= \frac{\text{rotation}}{\Delta t} \\
 &= \frac{5 \times 2\pi}{\text{min}} \\
 &= \frac{10\pi}{1 \text{ min}} \\
 &= \frac{10\pi}{60\text{s}} \\
 &= \frac{\pi}{6} / \text{second}
 \end{aligned}$$

b) The radius of the turbine is 15 m. How far does the tip of the blade travel after 3 minutes?

$$\begin{aligned}
 C &= 2\pi(15) \\
 &= 30\pi \text{ m}
 \end{aligned}$$

\therefore one rotation, the blade travels 30π m

$$3 \text{ min} \times \frac{5 \text{ rotations}}{\text{min}} = 15 \text{ rotations}$$

$$\begin{aligned}
 \therefore \text{blade travel} & \quad 15 \times 30\pi = 450\pi \text{ m} \\
 \text{in 3 min} &
 \end{aligned}$$

Homework:

pg. 320-322 #1aceg, 2aceg, 3bc, 4bc, 5, 7ab, 8ab, 9ac, 11, 12, 13.

Challenge: #10, 16*

*the answer for 16 should be about 86.81 radians per second.

