

4.1 Radian Measure Lesson

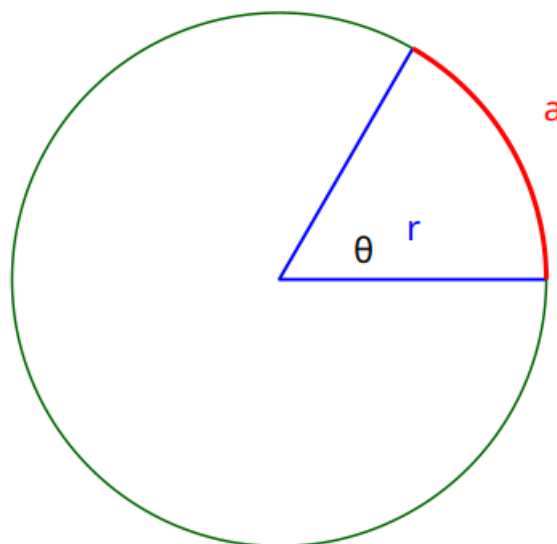
This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

Part 1: What is a Radian?

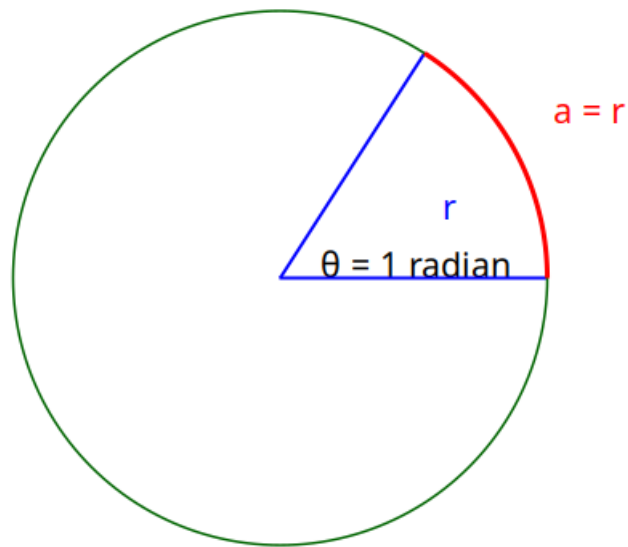
Angles are commonly measured in _____. However, in mathematics and physics, there are many applications in which expressing an angle as a pure number, without units, is more convenient than using degrees.

When measuring in _____, the size of an angle is expressed in terms of the length of an arc, a , that subtends the angle, θ , where $\theta = \frac{a}{r}$.



1 Radian is defined as the size of an angle that is subtended by an arc with a length _____ of the circle.

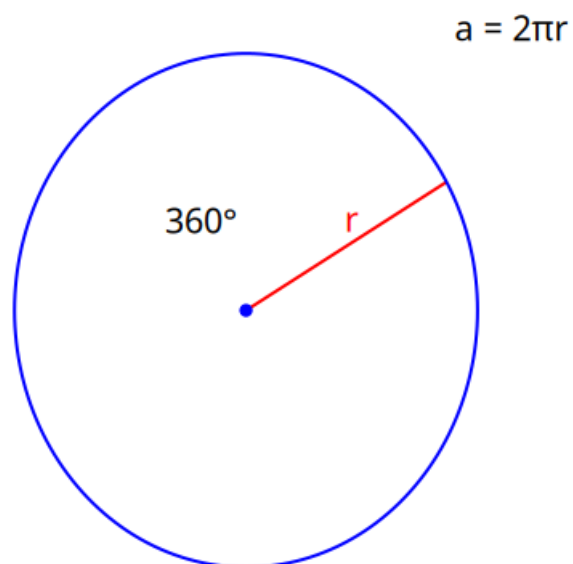
Therefore, when the arc length and radius are equal, $\theta = \frac{a}{r} = \underline{\hspace{2cm}}$



How many radians are in a full circle? Or in other words, how many times can an arc length equal to the radius fit around the circumference of a circle?

Remember: $C = 2\pi r$

So if we use the full circumference of the circle for the arc length, $\theta = \frac{a}{r} = \underline{\hspace{2cm}}$



Part 2: Switching Between Degrees and Radians

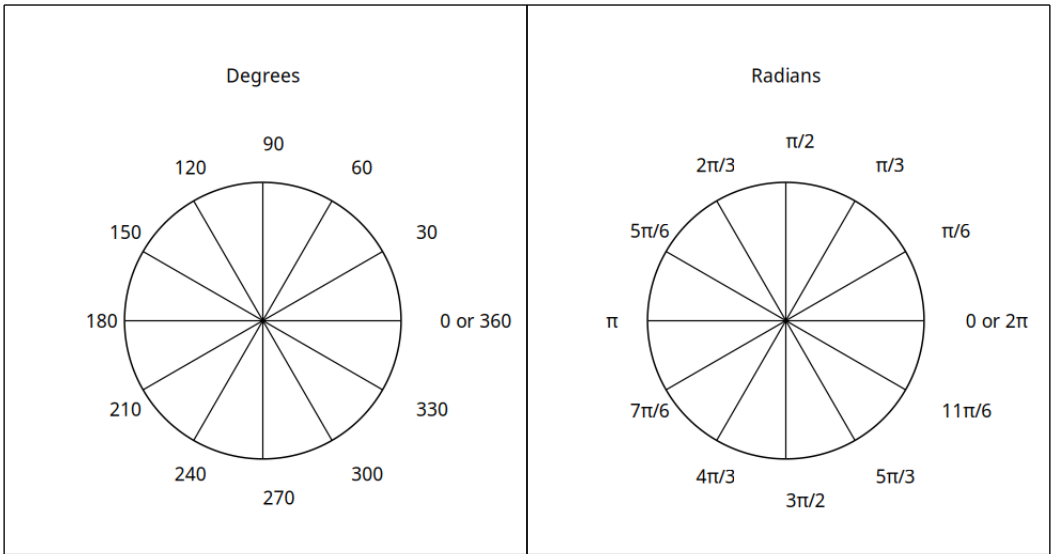
The key relationship you need to know in order to switch between degrees and radians is:

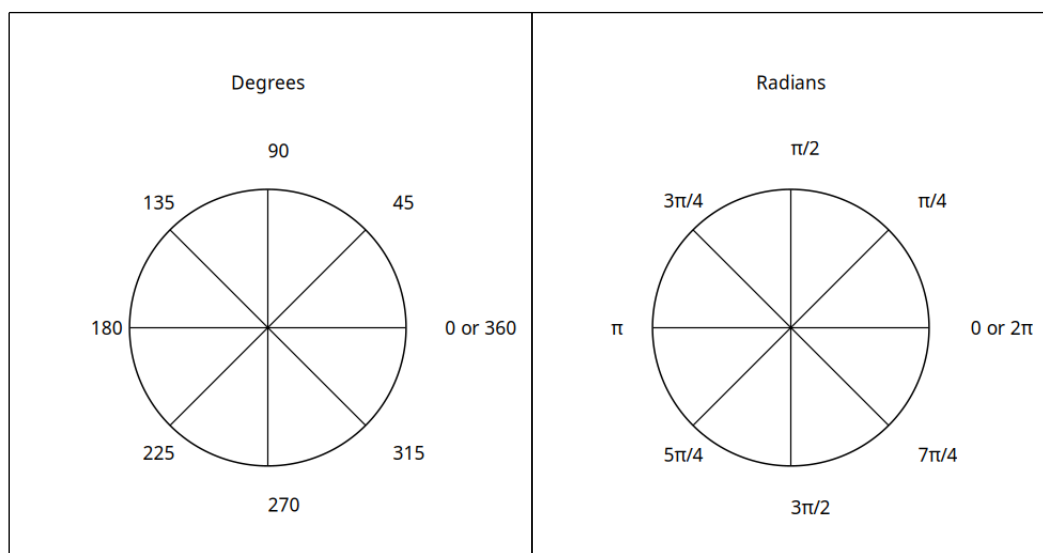
$360^\circ = 2\pi$ radians

1 degree = _____ radians To switch from degrees to radians, multiply by _____	1 radian = _____ degrees To switch from radians to degrees, multiply by _____
--	--

Example 1: Start by converting the following common degree measures to radians

- a) 180°
- b) 90°
- c) 60°
- d) 45°
- e) 30°
- f) 1°





Example 2: Convert each of the following degree measures to radian measures

a) 225°

b) 80°

c) 450°

Example 3: Convert each of the following radian measures to degree measures

a) $\frac{2\pi}{3}$ radians

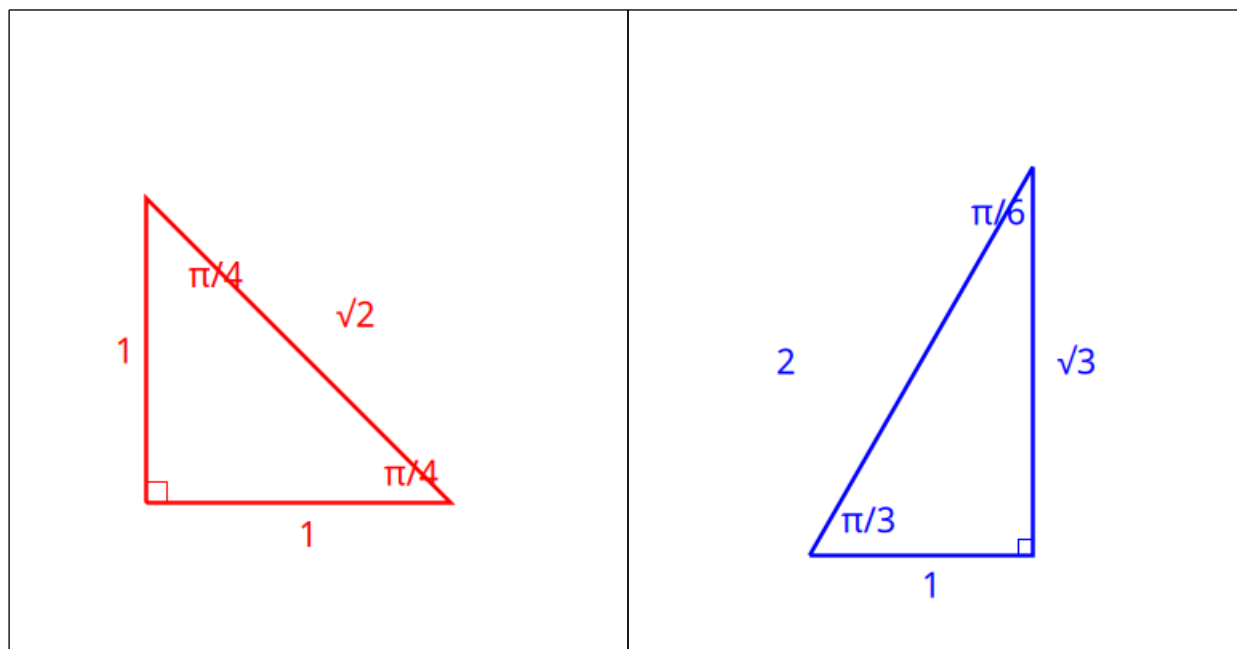
b) $\frac{9\pi}{4}$ radians

c) 1 radian

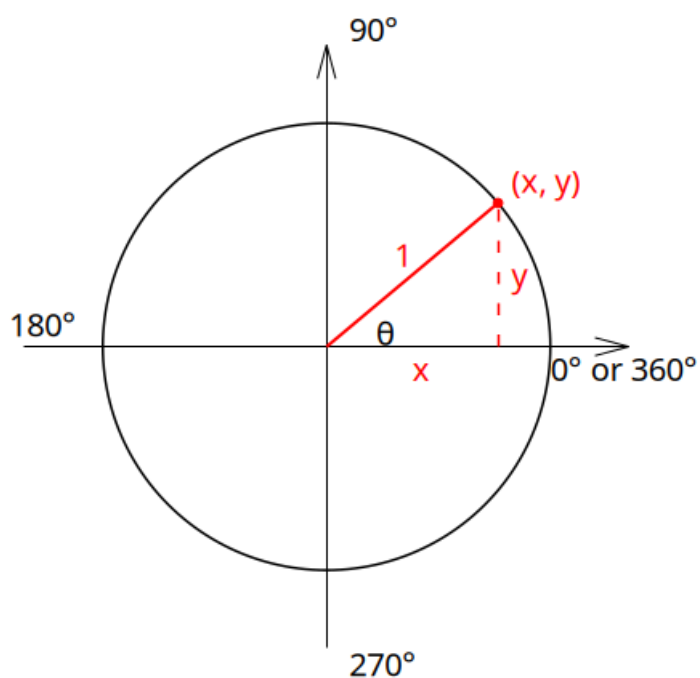
Part 3: Application

Example 4: Suzette chooses a camel to ride on a carousel. The camel is located 9 m from the center of the carousel. If the carousel turns through an angle of $\frac{5\pi}{6}$, determine the length of the arc travelled by the camel, to the nearest tenth of a meter.

Part 4: Special Triangles Using Radian Measures



Also, you will need to remember the UNIT CIRCLE, which is a circle that has a radius of 1. Use the unit circle to write expressions for $\sin \theta$, $\cos \theta$, and $\tan \theta$ in terms of x , y , and r .



On the unit circle, the sine and cosine functions take a simple form:

$$\sin \theta = \underline{\hspace{2cm}}$$

$$\cos \theta = \underline{\hspace{2cm}}$$

The value of $\sin \theta$ is the _____ of each point on the unit circle

The value of $\cos \theta$ is the _____ of each point on the unit circle

4.1 Radian Measure Lesson

Therefore, we can use the points where the terminal arm intersects the unit circle to get the sine and cosine ratios just by looking at the x and y co-ordinates of the points.

$\sin \theta =$ _____

$\cos \theta =$ _____

$\tan \theta =$ _____

Example 5: Fill out chart of ratios using special triangles and the unit circle

	$0, 2\pi$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$
$\sin x$							
$\cos x$							
$\tan x$							