

## Unit 6: Trigonometric Functions

### 6.1 Radian Measure

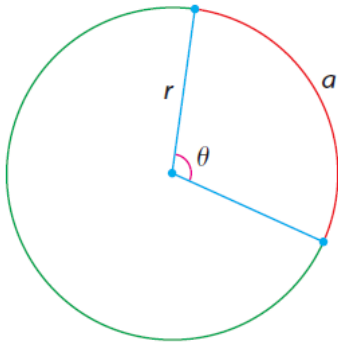


#### Math Learning Target:

"I understand how to calculate a radian measure.

Also, I can convert an angle in degrees to the same angle expressed in radians.

Finally, I can solve problems involving angular velocity."



The size of the angle is expressed in terms of the arc length,  $a$ , that subtends the angle  $\theta$  at the centre of a circle with radius,  $r$ .

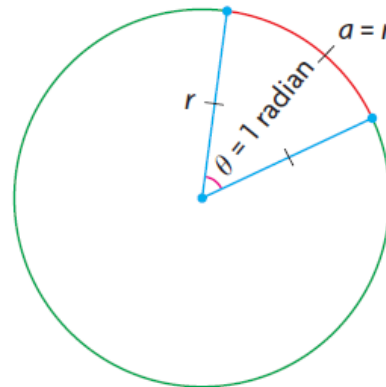
In this situation,  $a$  is proportional to both  $r$  and  $\theta$ .

Hence,

$$\theta = \frac{a}{r}$$

This unit of measure,  $\theta$  is the **radian**.

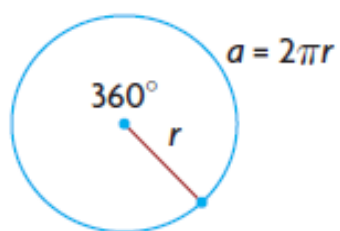
1 radian is defined when  $a = r$ .



As you see in the picture,

it appears as though 1 radian should be a little less than  $60^\circ$ , since the sector of the circle formed *resembles* an equilateral triangle (but with one side that is curved).

How does one convert between radians and degrees?



Ex.1: Convert to radians.

a)  $40^\circ$

b)  $315^\circ$

Ex. 2: Convert from radians to degrees.

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

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

Ex. 3: A wind turbine with three blades rotates five times per minute.

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

b) The radius of the turbine is 15 *m*.

How far does the tip of the blade travel after 3 minutes?

Entertainment:

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

Challenge Yourself! #10, 16\* the answer for 16 should be about 86.81 radians per second.