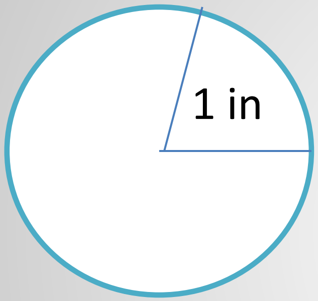
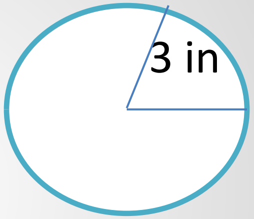
Notes – Arc Length

A)

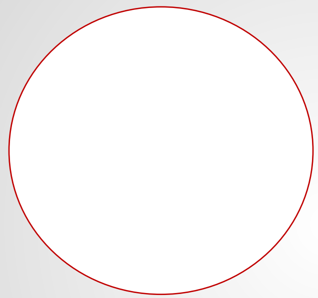


B)



If θ is 45° for each circle , which circle is larger? Why?

- What is arc length? – The distance along the curved line making up the arc. We usually label arc length as a radian measure.



- Arc length can be found using the formula $s = r\theta$

  * s = arc length

  * r = radius

  * θ = angle measure (in radians)

Let’s practice finding arc length. It’s formula is
$s = r\theta$.

For unit circles, the formula is $s = \theta$, ***since the value of r is 1.***

When r is a value other than one, then $s = r\theta$ is used.

As you recall, arc length is a radian measure.

Therefore, when solving for any arc length of any circle, we must be sure θ is a radian.

- Find the arc length of the two given circles at the beginning of our PPT.

- A) B)

More practice…..(note: all answers must be in ***radian*** measure)

1) Find the arc length of the following:

b) r = 4 inches, $\theta = 240°$

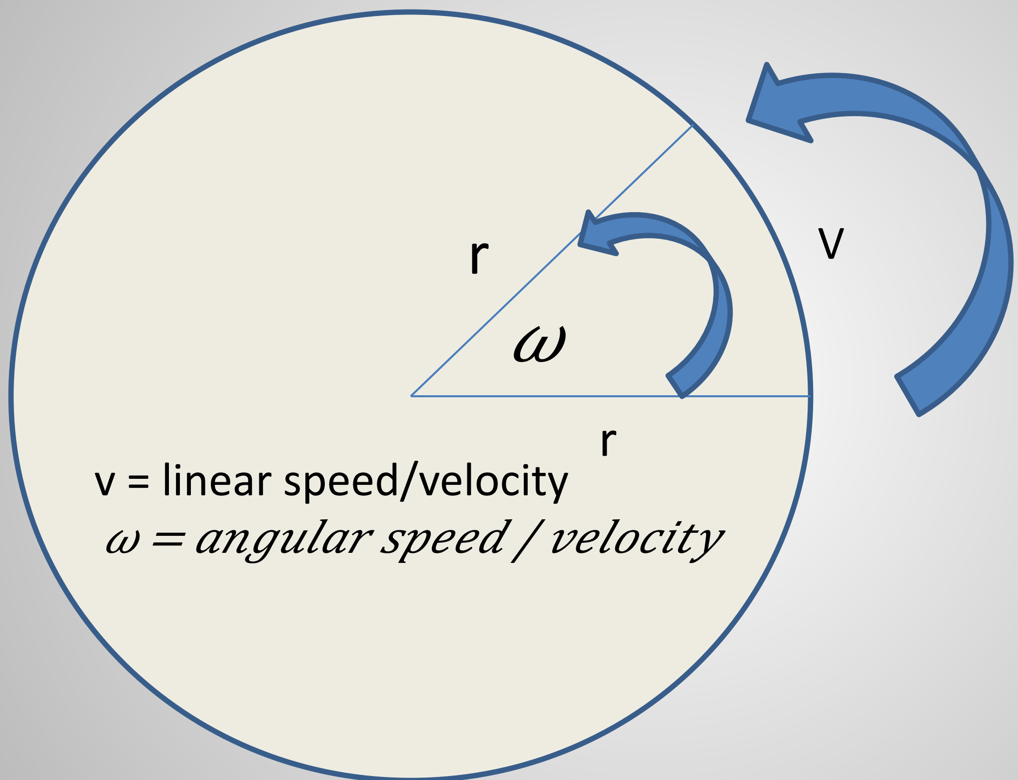
c) r = 27 inches, θ = 160 °

2) What is r using the following arc length and θ?

a) 39.26 inches, θ = 135 °

b) 94.24 inches, θ = 720 °

Given an object with a fixed speed that is moving in a circle with a fixed radius, we can define the



angular velocity ω of the object. That is, we can determine ***how fast the radian measure of the angle is changing*** as the object moves on its circular path.

Next, We use *radians* as a unit of measure when working with angular velocity.

Angular velocity is the formula:

$$\omega = \frac{\theta}{t}$$

ω = angular velocity

θ = central angle (in radians)

t = time

Now let's practice using the formula

$$\omega = \frac{\theta}{t}$$

ω = angular velocity

θ = central angle (in radians)

t = time

With the following:

3) A Ferris wheel with a 50 – foot radius makes 1.5 revolutions per minute.

(***Caution: How do we convert 1.5 revolutions to radians?***)

A) Find the angular velocity of the Ferris wheel in radians per minute.

B) Find the angular velocity of the Ferris wheel in radians per ***hour.***

4) The circular blade on a saw rotates at 2400 revolutions per minute.
(***Caution: How do we convert 2400 revolutions to radians?***)

A) Find the angular speed in radians per minute.

B) Find the angular speed in radians per ***second***.

AMIII HW

Do pg. 292 (83 – 90 all)

Linear Velocity

- *Linear velocity* – Speed at which a particle is moving along a circular path.

- Formula is…. $v = \frac{s}{t}$

v = linear velocity

s = arc length (remember: $r\theta$)

t = time

- *Remember a few key things:*
- θ is a central angle.
- For angular velocity, remember θ is measured in radians.
- We must also remember that

$$\theta = (\text{revolutions})(2\pi)$$

Let’s practice:

Ex: A typical vinyl record has a diameter of 30 cm. When played on a turn table, the record spins at 33 and 1/3 revolutions per minute.

A) Find angular speed. Round to the nearest tenth.

B) Find linear speed in cm/*sec*.

* Note: Answer should be in ***<u>cm/sec</u>***

Now you try:

A) During one delivery, the tires rotate at a rate of 140 revolutions per minute. Find the angular speed of the tire in radians per minute.

B) On part of the trip to the next delivery, the tire turns at a constant rate of 2.5 revolutions per second. If the diameter of the tire is 30 in, find the linear speed of the tire in miles per hour.

Be able to go in reverse as well.

Find the rotation in revolutions per minute given the angular speed (for # 1 and # 2) and the radius given the linear speed and the rate of rotation (for # 3 and # 4).

1) $\omega = 2.7\ rad/sec$

2) $\omega = \frac{4}{3}\pi$ rad/hour

3) v = 24.8 m/s, 120 rev/min

4) v = 118 ft/min, 3.6 rev/s.

Homework AM3 pg. 292-293

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