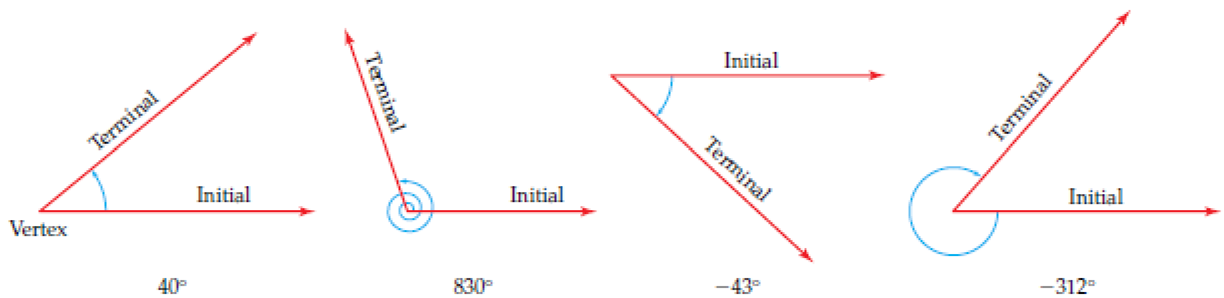
# Off-Site Learning Packet Day 4

**6-3 Day 1** **Angles and Radian Measure**

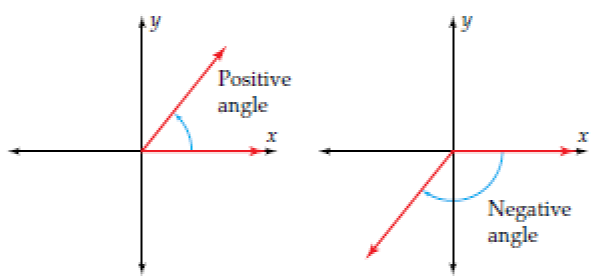
## Extending Angle Measure

In geometry and triangle trigonometry, an angle is a static figure consisting of two rays that meet at a point. But in modern trigonometry, an angle is thought of as being formed dynamically by *rotating* a ray around its endpoint, the ___*vertex*_____. The starting position of the ray is called the ____*initial side*________ and its final position after rotation is called the ____*terminal side*_______.

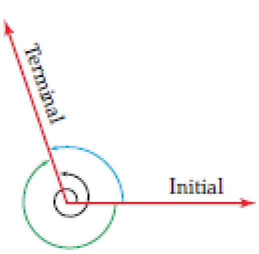
The amount the ray is rotated is the measure of the angle. Counterclockwise rotations have __*positive*_______ measure and clockwise rotations have ___*negative*_____ measure.




An angle in the coordinate plane is said to be in ____*standard position*_________ if its vertex is at the origin and its initial side is on the positive x-axis.




Angles formed by different rotations that have the same initial and terminal side are called ____*coterminal*_________.



Example 1: **Coterminal Angles**

Find three angles coterminal with an angle of 60° in standard position.

$$60 + 360 = 420°$$

$$420 + 360 = 780°$$

$$60 - 360 = -300°$$

**Arc Length**

**Arc** – *unbroken part of a circle*

**Central Angle** – *an angle whose vertex is at the center of a circle*

Arc length can be calculated by considering an arc as a fraction of the entire circle. Suppose an arc in a circle of radius $r$ has a central angle measure of $\theta$.

*An arc of a circle is* $\frac{\theta}{360}$ *Circumference =* $2\pi r$

*Length of arc:* $l = \frac{\theta}{360} \cdot 2\pi r = \frac{\theta \pi r}{180}$

Example 2: **Finding an Angle Given an Arc Length**

An arc in a circle has an arc length $l$ which is equal to the radius $r$. Find the measure of the central angle that the arc intercepts.

$$r = l$$

$$r = \frac{\theta \pi r}{180} \qquad 180r = \theta \pi r \qquad 180 = \theta \pi$$

$$\theta = \frac{180}{\pi} = 57.3°$$

**Radian Measure**

The angle found in Example 2 leads to another unit used in finding angle measure called *radian*.

Angle measurement in radians can be described in terms of the ____*Unit Circle*____________, which is the circle of radius 1 centered at the origin, whose equation is $x^2 + y^2 = 1$.

$$360° = 2\pi \; radians$$

1 radian = ____$\left(\frac{180}{\pi}\right)° = 57.3°$________

| Converting Angle Measures | |
|---|---|
| **DEGREES TO RADIANS** | **RADIANS TO DEGREES** |
| Multiply the number of degrees by $\frac{\pi}{180}$ | Multiply the number of radians by $\frac{180}{\pi}$ |

Example 3: **Converting From Radians to Degrees**

Convert the following radian measurements to degrees.

a) $\frac{\pi}{5}$

$\frac{\pi}{5} \cdot \frac{180}{\pi} = \frac{180}{5} = 36°$

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

$\frac{4\pi}{9} \cdot \frac{180}{\pi} = \frac{720}{9} = 80°$

c) $6\pi$

$6\pi \cdot \frac{180}{\pi} = 1080°$

Example 4: **Converting from Degrees to Radians**

Convert the following degree measurements to radians.

a) $75°$

$75° \cdot \frac{\pi}{180} = \frac{5\pi}{180}$

b) $220°$

$220° \cdot \frac{\pi}{180} = \frac{11\pi}{9}$

c) $400°$

$400° \cdot \frac{\pi}{180} = \frac{20\pi}{9}$

<u>Assessment:</u>

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