ANGLES AND RADIAN MEASURE – SECTION 4.1

***1) Definition of an angle*: ( ) ( )**

An angle is formed by _____ with a common _____.

Drawing:

2) Definition of an Angle in Standard Position (SP):

An angle is in standard position if:

- Its vertex is at _____
- Its initial side lies along _____
- The terminal side:_____

Positive angles are generated by _____ rotations of the terminal side.

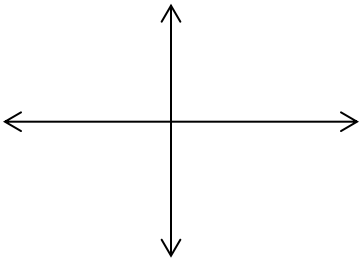
Negative angles are generated by _____ rotations of the terminal side.

3) Definition of Quadrantal Angle:

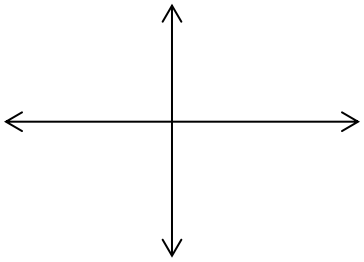
An angle in Standard Position with the terminal side lying on an axis.

Ex: Draw an angle in **SP** with the following measures: All drawings must include an *initial side,* a *terminal side*, and *the direction*. In BLUE ink write the quadrant < lies in. In RED in draw & find <'s **Reference angle**.

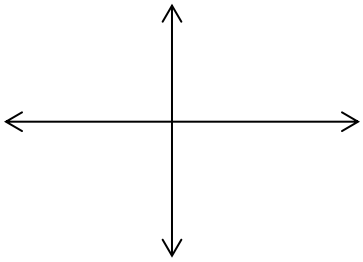
1) 190°



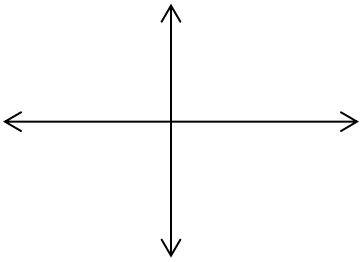
2) – 375°



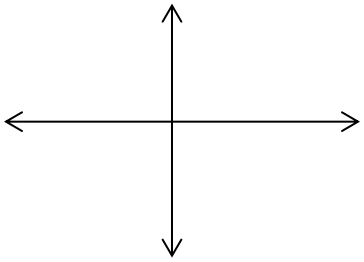
3) –1440°



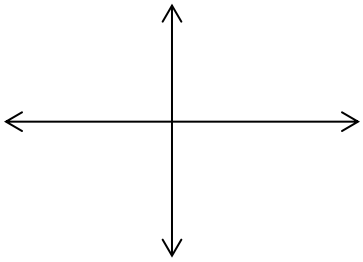
4) 420°



5) 270°



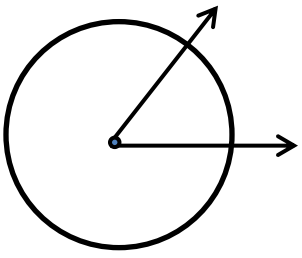
6) – 220°



Measuring Angles Using Radians:

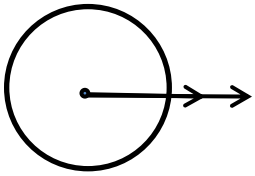
One radian measure is the measure of the central angle of a circle that intercepts an arc equal in length to the radius. $\boldsymbol{\theta^R = \frac{s}{r}}$, where θ^R is the angle in radian measurement, s is the arc length, and r is the radius.

Examples of angles measuring one (1) radian measure:



Relationship between Degrees and Radians

Let's find the radian measure of the angle below. Notice, the terminal side has completed ***one full rotation*** which is equivalent to the **circumference of the circle**.
(Manually **draw** the **direction** as a positive angle). **Label** the radius as "**r**".



The intercepted arc (s)= _____ radius = _____.
Using the formula for radian measure $\boldsymbol{\theta^R = \frac{s}{r}}$, we get $\boldsymbol{\theta^R} =$ ——— =
Therefore, one full revolution in radian measure = and in degree measure =
Based on this discovery, then fill out the following table:

Rotations	Radian measure	Degree measure
1		
$1/2$		
$1/4$		
$3/2$		
$-3/4$		
-1		

Can you find a pattern to make conversions from radians to degrees and from degrees to radian?

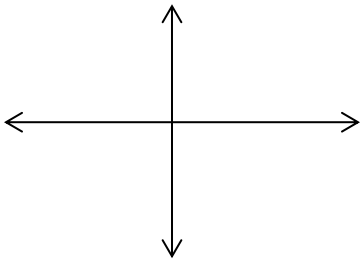
Ex – convert to radians
a) $30°$ $b)$ $90°$ $c)$ $-135°$

Ex – convert to degrees
a) $\frac{2\pi}{3}$ $b) -\frac{5\pi}{3}$ $c)$ $1\ radian$

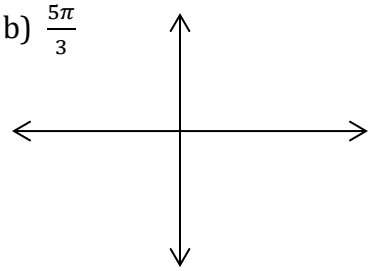
Drawing Angles in Standard Position with Radian Measures: Note: Must include initial and terminal sides, direction, and angle.

Ex.

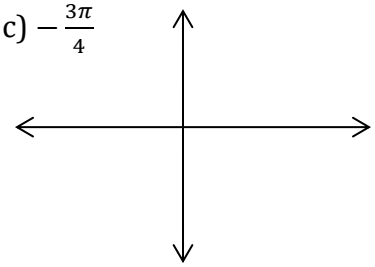
a) $\frac{7\pi}{6}$



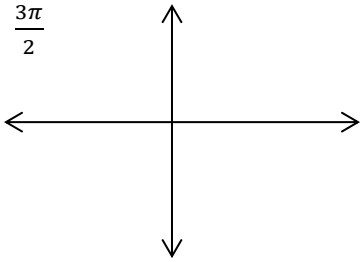
b) $\frac{5\pi}{3}$



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



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



4) Definition of Coterminal Angles:

Two angles are coterminal if they are in standard position but have possibly different rotations.

Ex.: Find one positive and one negative coterminal angle for each problem:

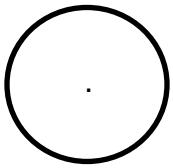
a) 60 degrees

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

The Length [s] of a Circular Arc:

Ex. Find "s" if the central angle of a circle measures 120° and the radius "r" = 10 inches. **Label the circle below**

Formula:



By the end of 4.1, you need to have LEARNED the definitions for:

- **Angle**
- **Angle in Standard Position**
- **Quadrantal Angle**
- **Coterminal Angles**
- **Reference Angles**