**13-2/13-3 Angles, Reference Angles & Radians Notes**



Remember: When sketching an angle, always start at the positive *x*-axis.

 The positive *x*-axis represents \_\_\_\_\_\_\_\_o or \_\_\_\_\_\_\_o.





A **reference angle** is the acute angle formed by the terminal side and the *x*-axis. (denoted by $θ')$

Examples: Sketch each angle. Then find its reference angle.

1. 290° 2. 135° 3. -40°





$$θ'$$

$θ'$=70o



**Radians**

The definition of a radian is based on the unit circle,

a circle of radius 1 which centers at the origin.

One radian is the measure of angle in standard

position whose rays intercept and arc of length 1 unit.



**Circle Review:** The circumference of any circle

is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, where r is the radius.

The circumference of the unit circle would

be \_\_\_\_\_\_\_\_\_\_\_\_\_\_, so 360° = \_\_\_\_\_\_\_\_\_ Radians 180° = \_\_\_\_\_\_\_\_\_\_Radians.

**Conversions**Converting degrees to radians: Converting radians to degrees:

R=D($\frac{π }{180°}$) D=R$(\frac{180}{π})$

Examples:

Rewrite the degree measures in radians and the radian measure in degrees.

**1. 60°**  **2. 45°**

 $R=60°∙\frac{π}{180°}=\frac{60π}{180}$ = $\frac{π}{3}$

**3.** $-\frac{7π}{4}$ **4.** $\frac{5π}{3}$

$$D=-\frac{7π}{4}∙\frac{180}{π}=-\frac{1260}{4}=-315°$$

**Coterminal Angles:** The graph shows a 405° angle and a 45° angle. They both share the same terminal side. When two angles in standard position have the same terminal sides, they are called co terminal angles.



**405°- 360°=45° In degrees, you add/subtract 360**

**In radians, you would add/subtract 2**

***Examples:*** *Find one angle with positive measure and one angle with negative measure coterminal with each angle.*

1. 240° 2. $\frac{9π}{4}$

3. 15° 4. $-\frac{π}{4}$

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_

**13-2/13-3 Angles, Reference Angles & Radians Hwk:**

1. On the circle below, draw and label all of the following degrees:

0, 30, 45, 60, 90, 120, 135, 150, 180, 210, 225, 240, 270, 300, 315, 330, and 360.

Then find and label all radians of each degree.



(1,0)

**2. Without looking on the front, sketch each angle and find its reference angle.**

a). 315o  b). $\frac{7π}{4}$ c). -240o



d). $-\frac{2π}{3}$ e). 750o  f). $\frac{5π}{6}$



