Reference Angles & Unit Circle

Section 4.2

Precalculus PreAP/Dual, Revised ©2017

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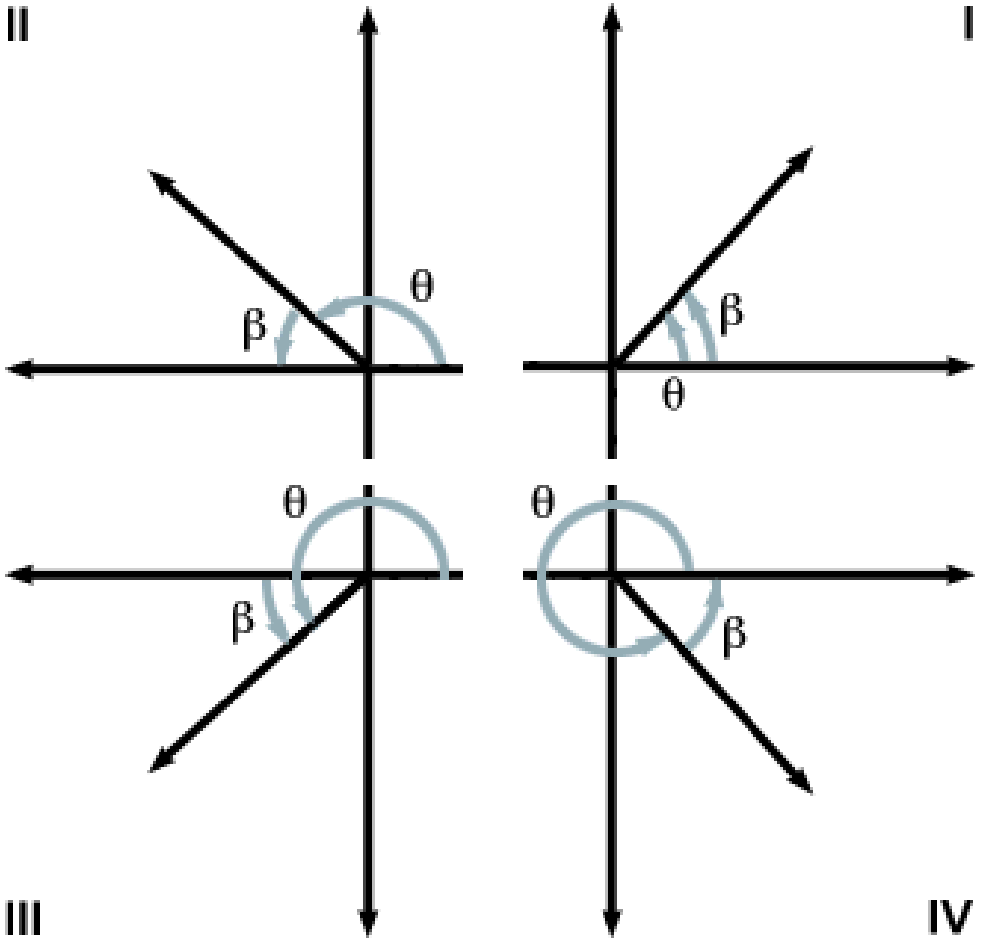
Reference Angles

A. Reference angle is a positive acute angle formed by the terminal side of θ and the x-axis. They are viewed as linear pairs. (Think: REFER's back to the x-axis)
B. The main angle should be within 0 and 360 degrees.
C. No reference trigonometric values of measure are greater than $90°$ or less than to $0°$
    1. Quadrant I: θ
    2. Quadrant II: $180° - \theta$
    3. Quadrant III: $\theta - 180°$
    4. Quadrant IV: $360° - \theta$

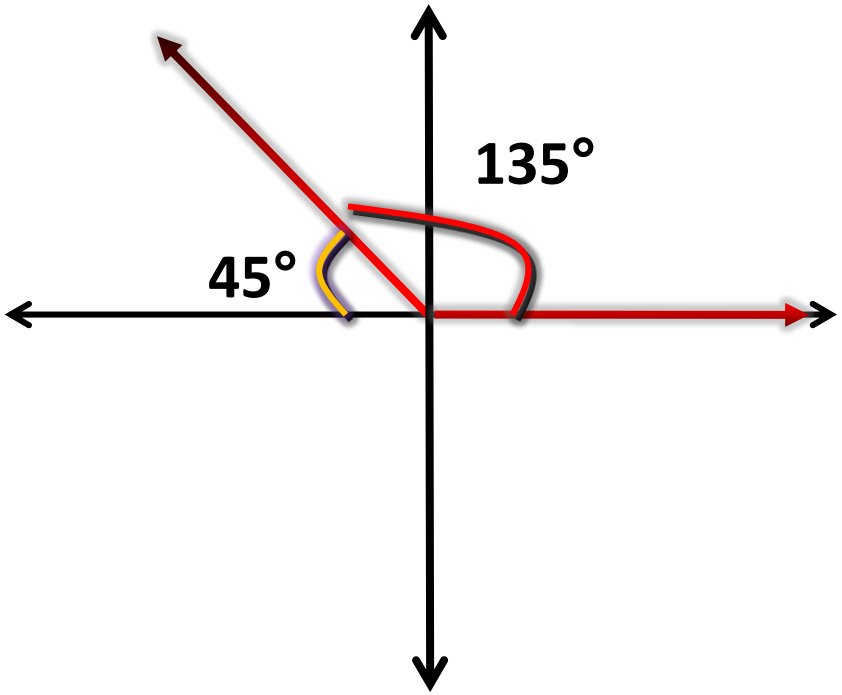
Reference Angle Quadrants



quadrant	β (reference angle)
I	$\beta = \theta$
II	$\beta = 180 - \theta$
III	$\beta = \theta - 180$
IV	$\beta = 360 - \theta$

EXAMPLE 1

Determine the reference angle for $\theta = 135°$



$$\theta = 45°$$

EXAMPLE 2

Determine the reference angle for $\theta = -\frac{11\pi}{6}$

$$\theta = \frac{\pi}{6}$$

EXAMPLE 3

Determine the reference angle for $\theta = 3\ Radians$

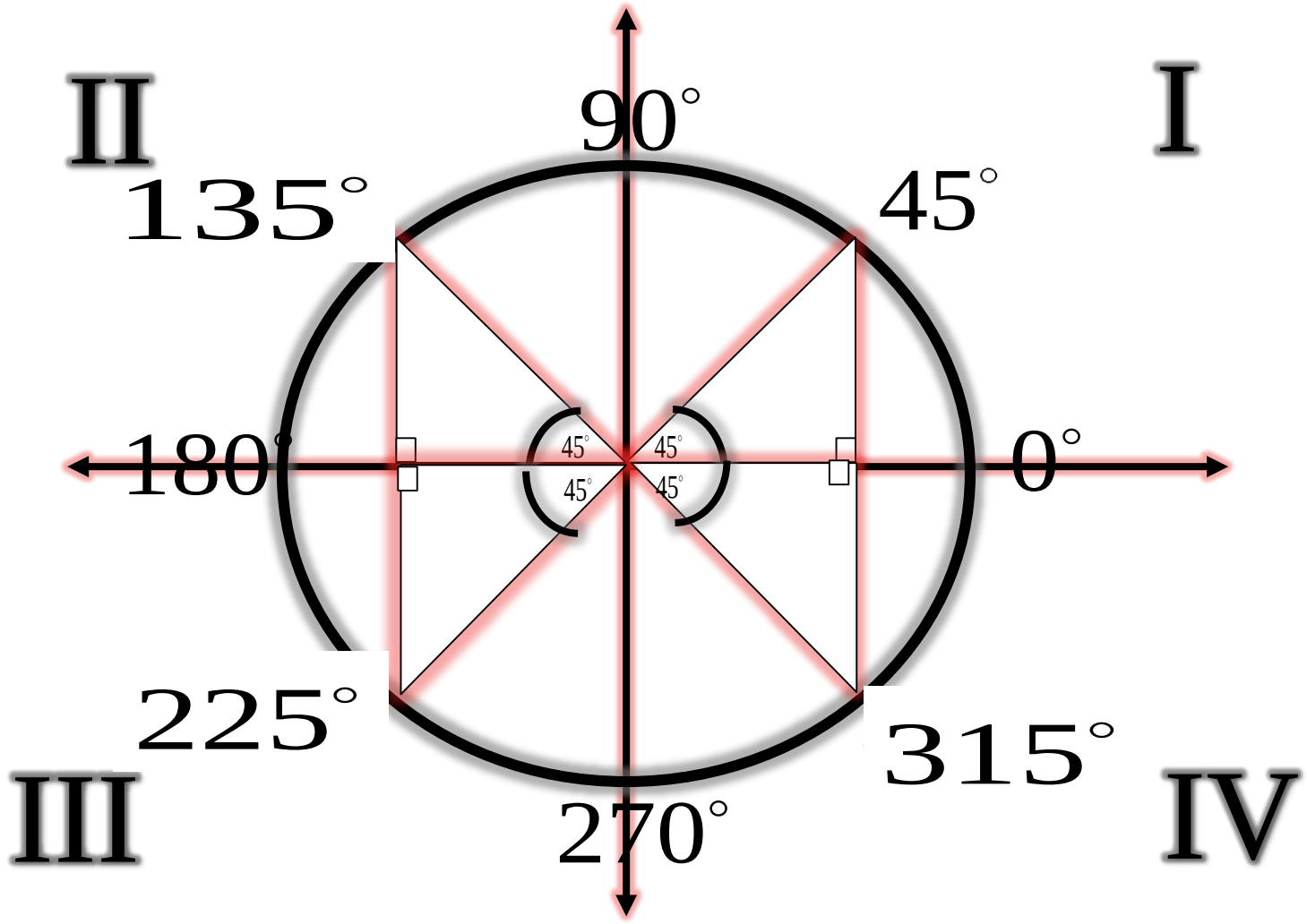
$$\approx 0.1416\ Rad$$

YOUR TURN

Determine the reference angle for $\theta = -\frac{\pi}{7}$

$$\theta = \frac{\pi}{7}$$

Degrees in the Unit Circle – 45°, 45°, 90°

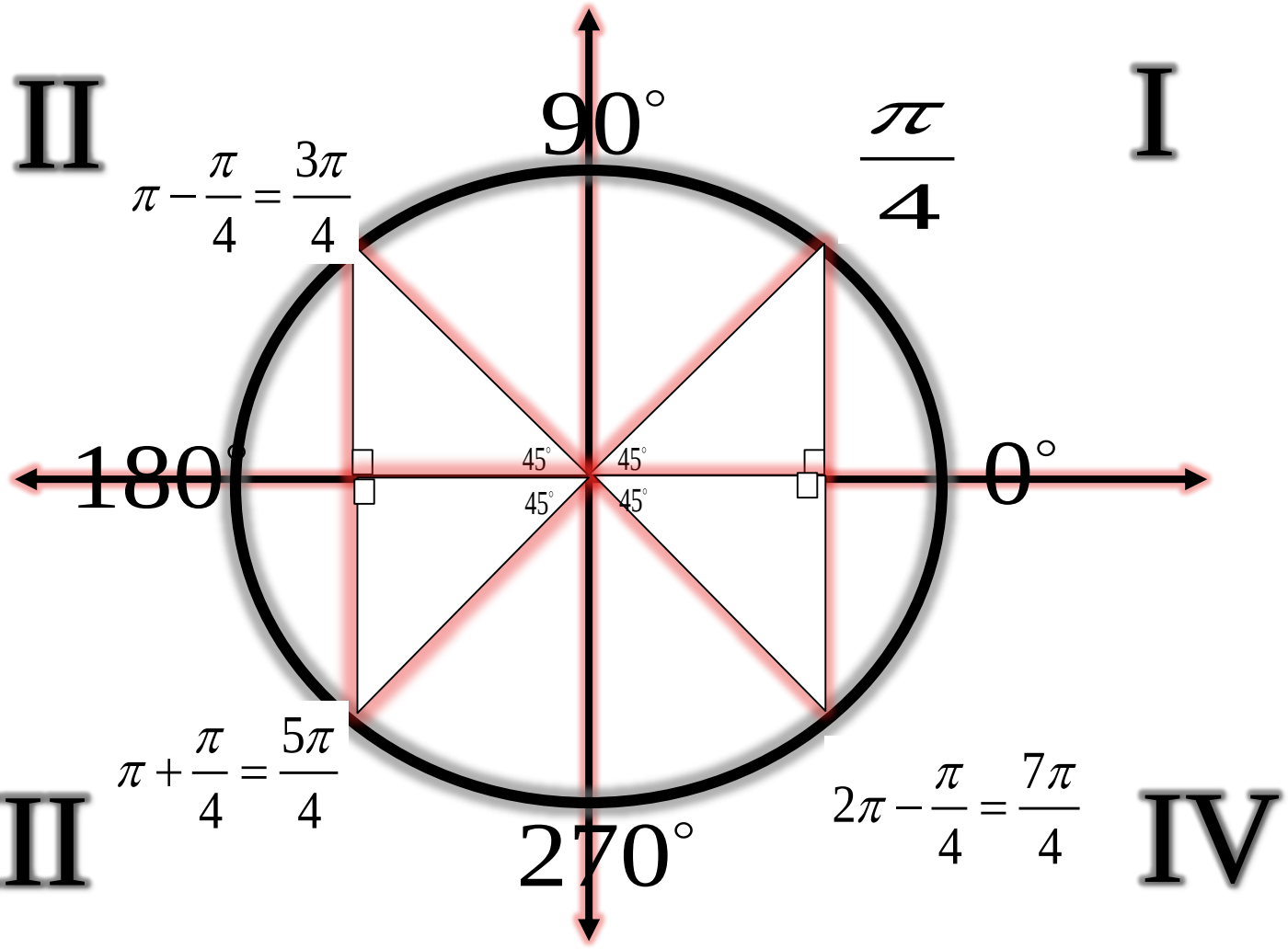


Conversions

Convert $45°$ to Radian Mode

$$45° \cdot \frac{\pi}{180°} = \frac{\pi}{4}$$

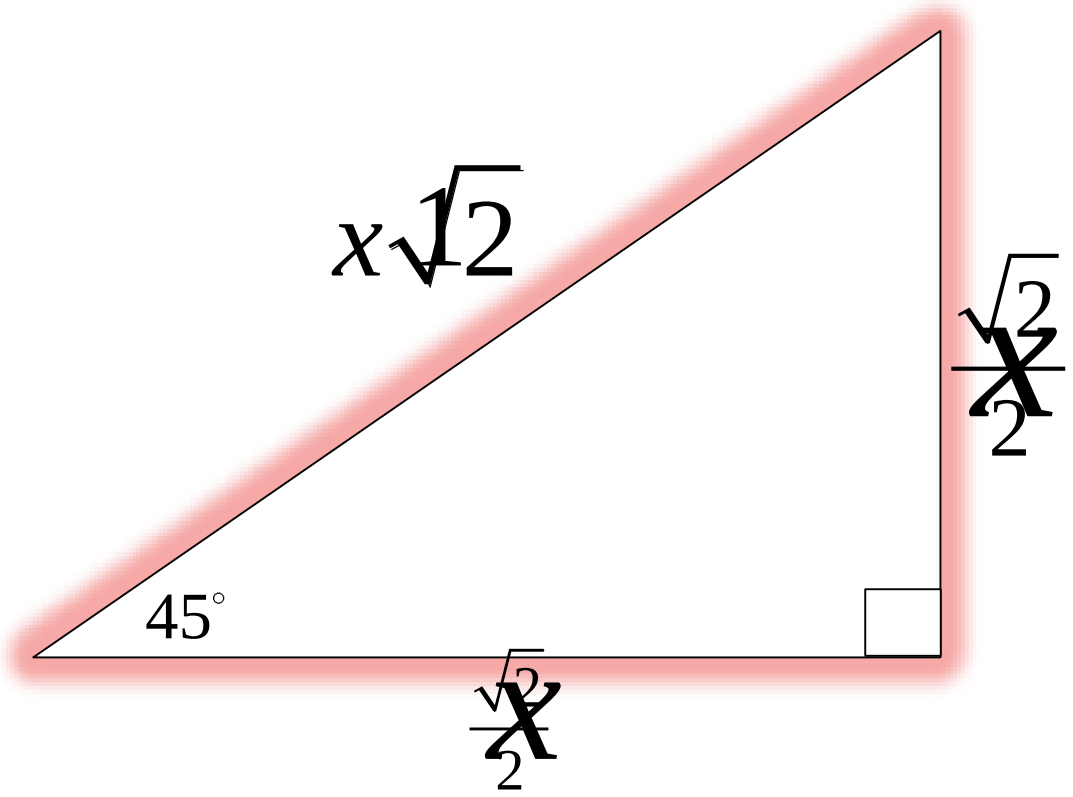
Radians in the Unit Circle – 45°, 45°, 90°



RIGHT TRIANGLES – 45°, 45°, 90°

45-45-90 triangles

(Drawing not to scale) Radius = 1

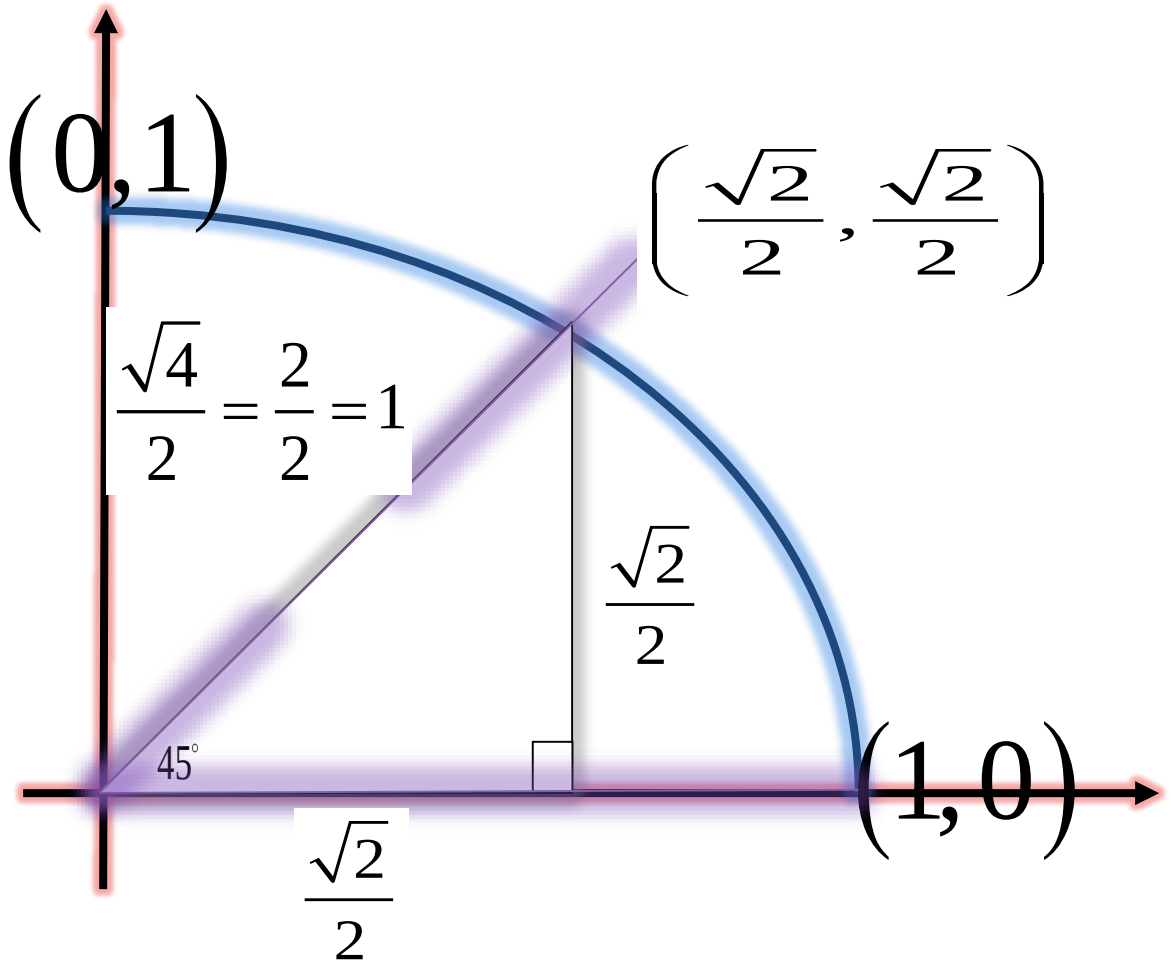


REMINDER

$$\cos\theta = \frac{x}{r} \qquad \sin\theta = \frac{y}{r}$$

$$(\cos\theta, \sin\theta)$$

Creating the Unit Circle – 45°, 45°, 90°

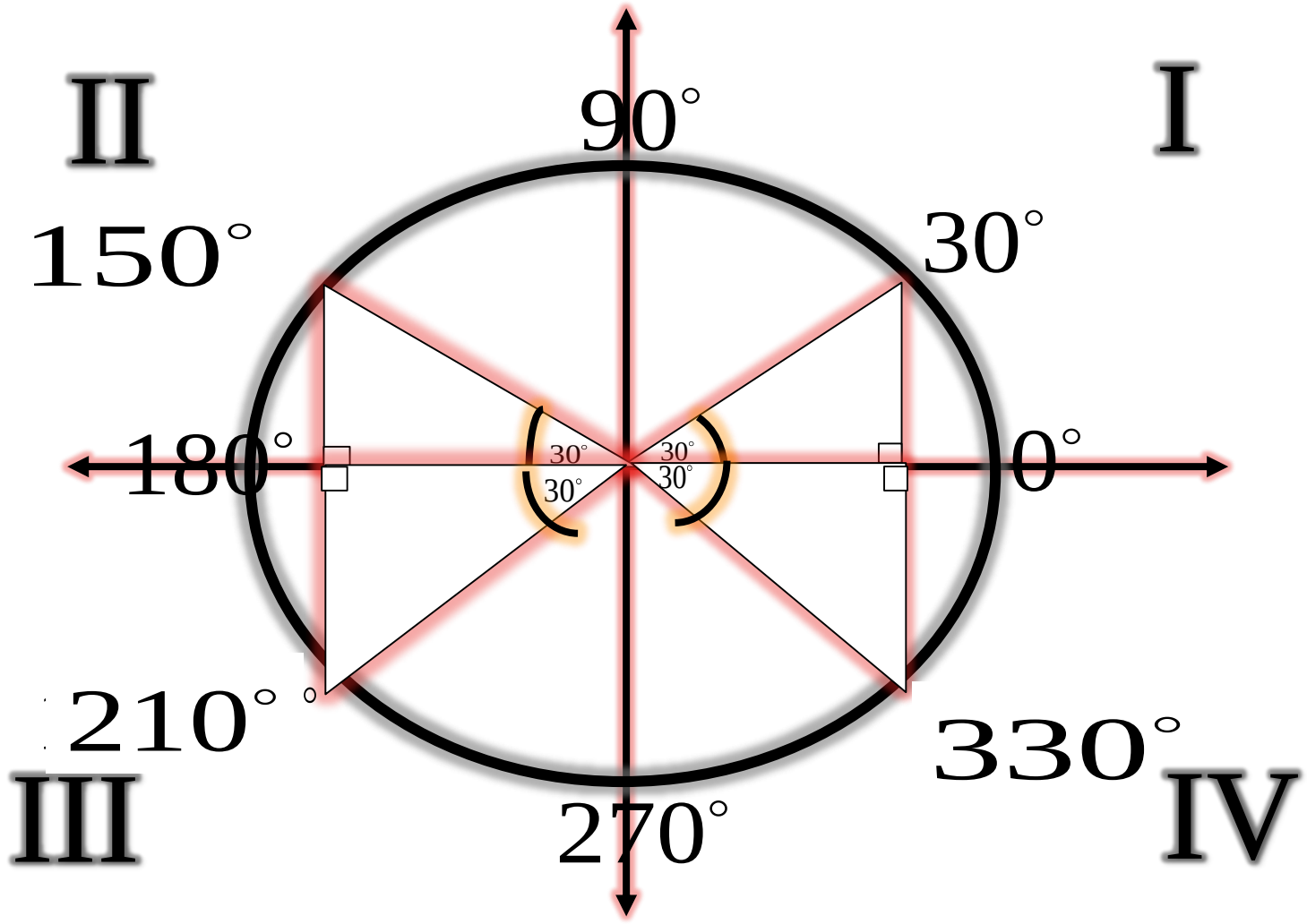


$$x\sqrt{2}=1$$

$$\frac{x\sqrt{2}}{\sqrt{2}}=\frac{1}{\sqrt{2}}$$

$$x=\frac{\sqrt{2}}{2}$$

Degrees in the Unit Circle – 30°, 60°, 90°

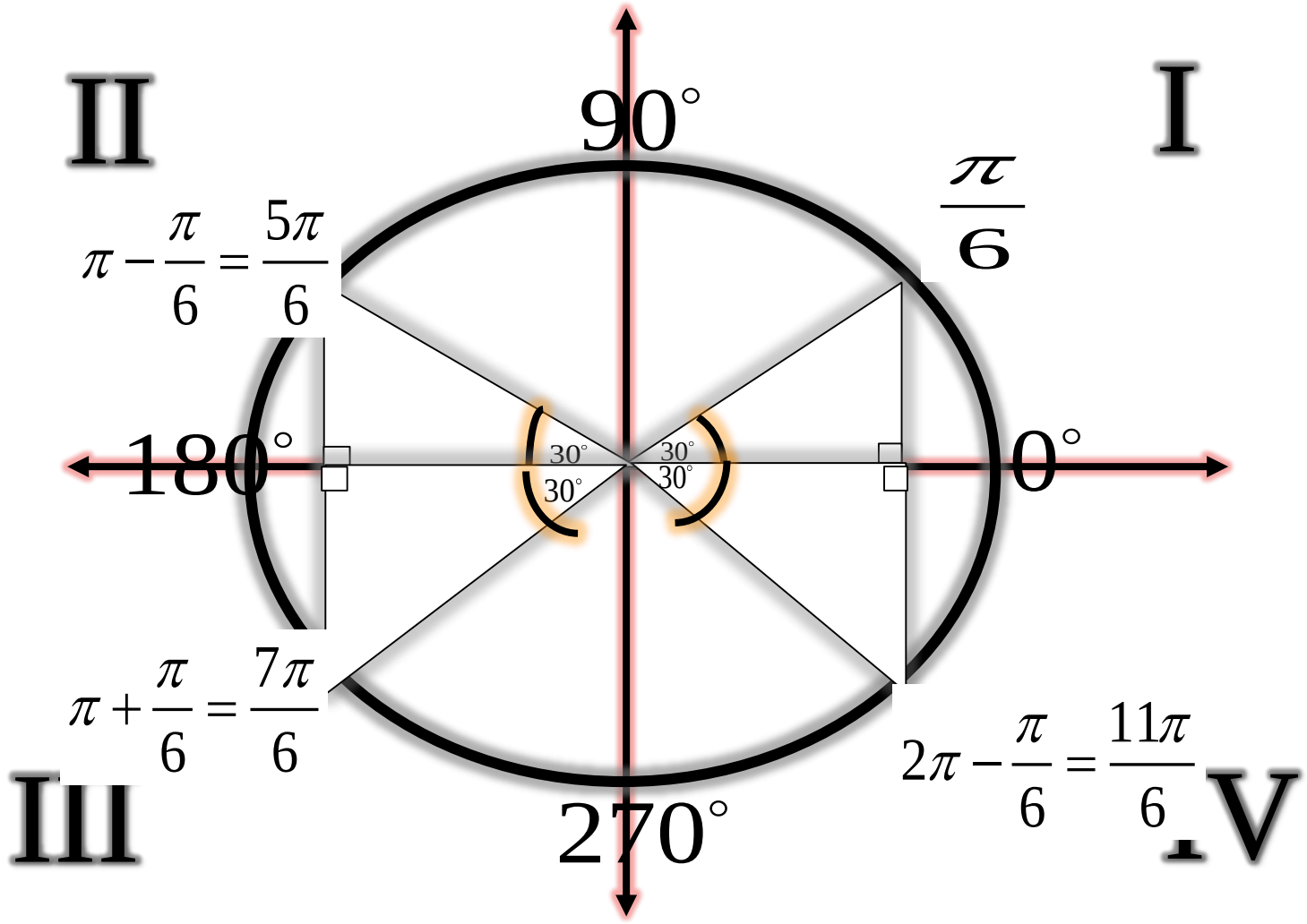


CONVERSIONS

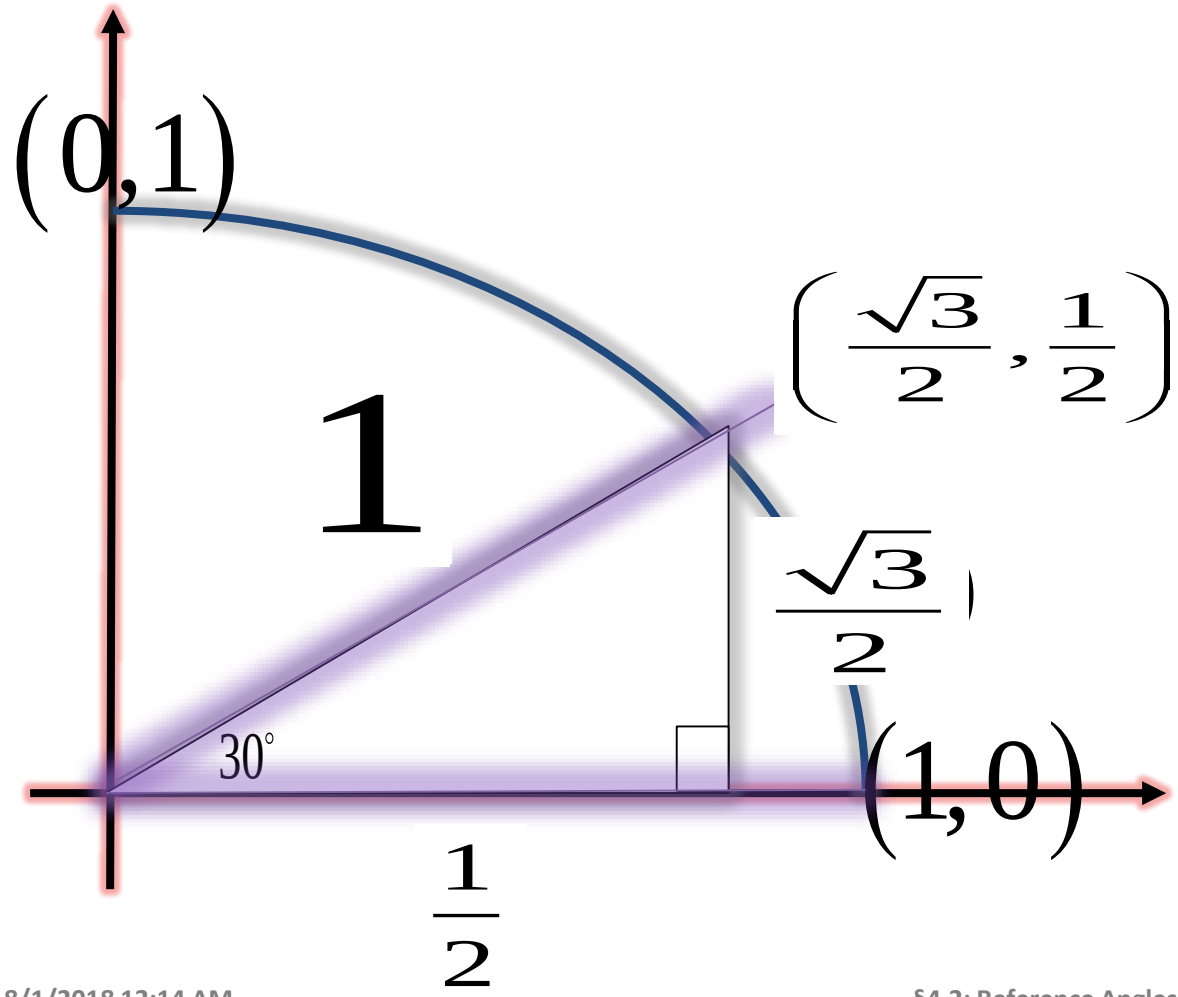
Convert $30°$ to Radian Mode

$$30° \cdot \frac{\pi}{180°} = \frac{\pi}{6}$$

Radians in the Unit Circle – 30°, 60°, 90°



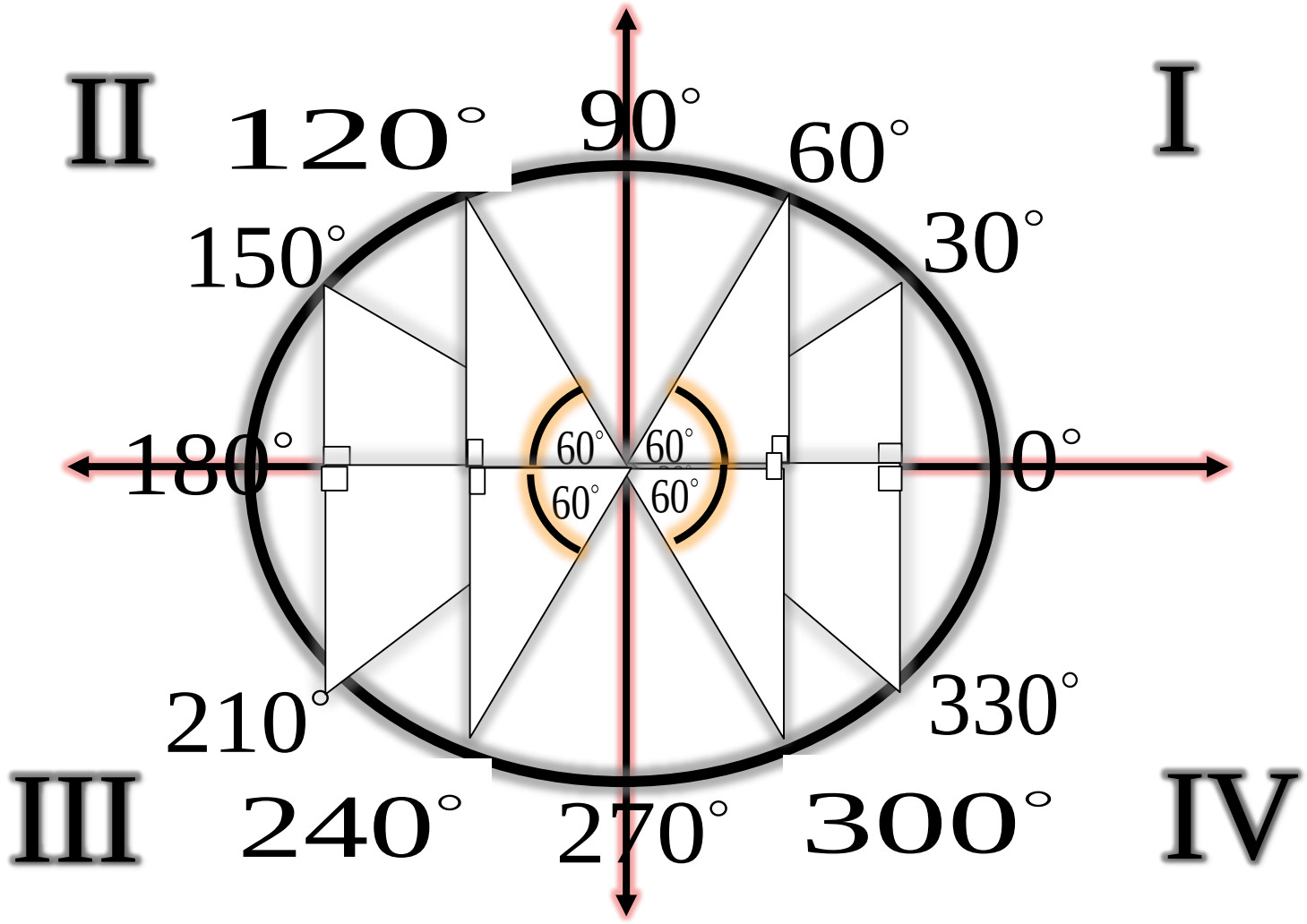
Creating the Unit Circle – 30°, 60°, 90°



$$2x = 1$$

$$x = \frac{1}{2}$$

Degrees in the Unit Circle – 30°, 60°, 90°

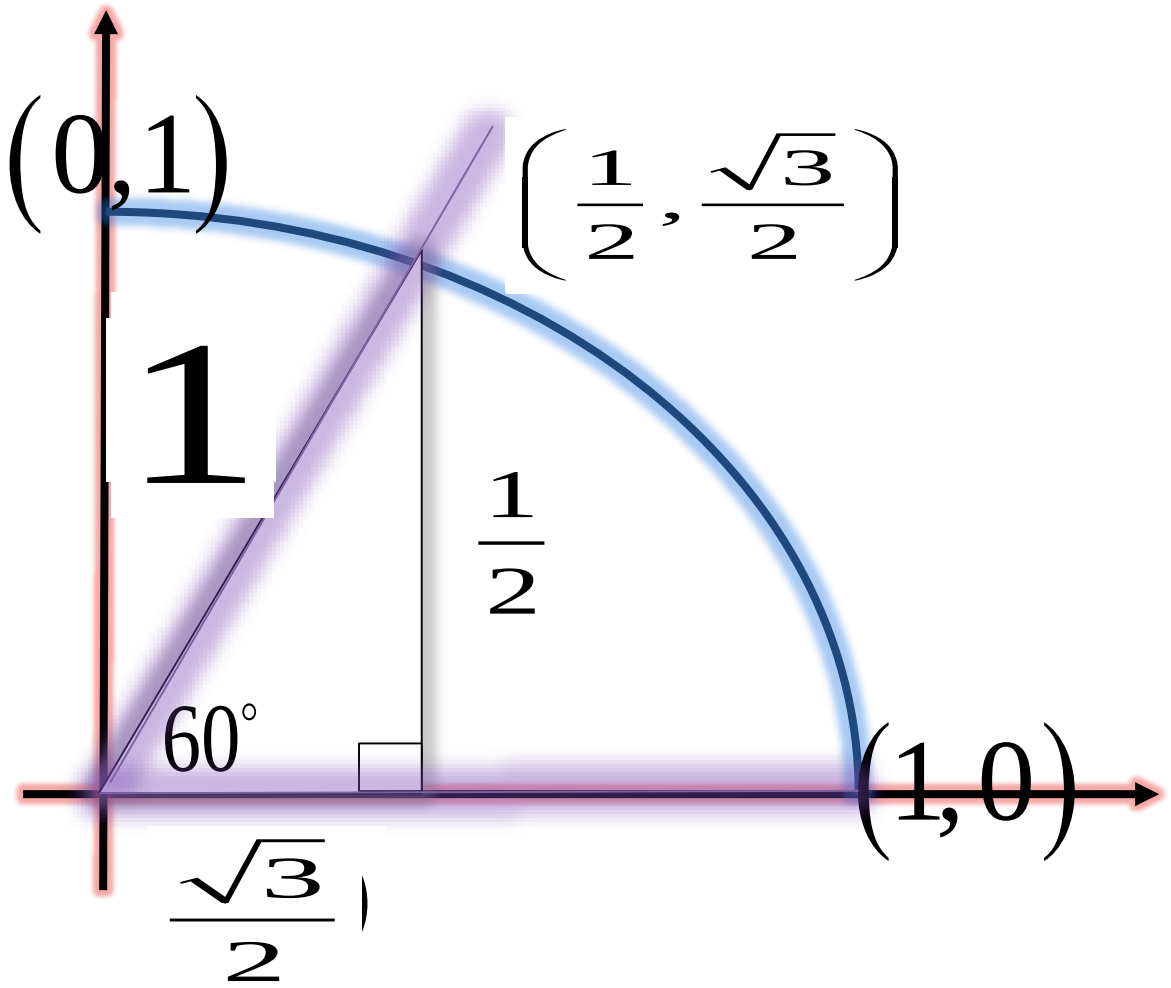


Conversions

Convert 60° to Radian Mode

$$60^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{3}$$

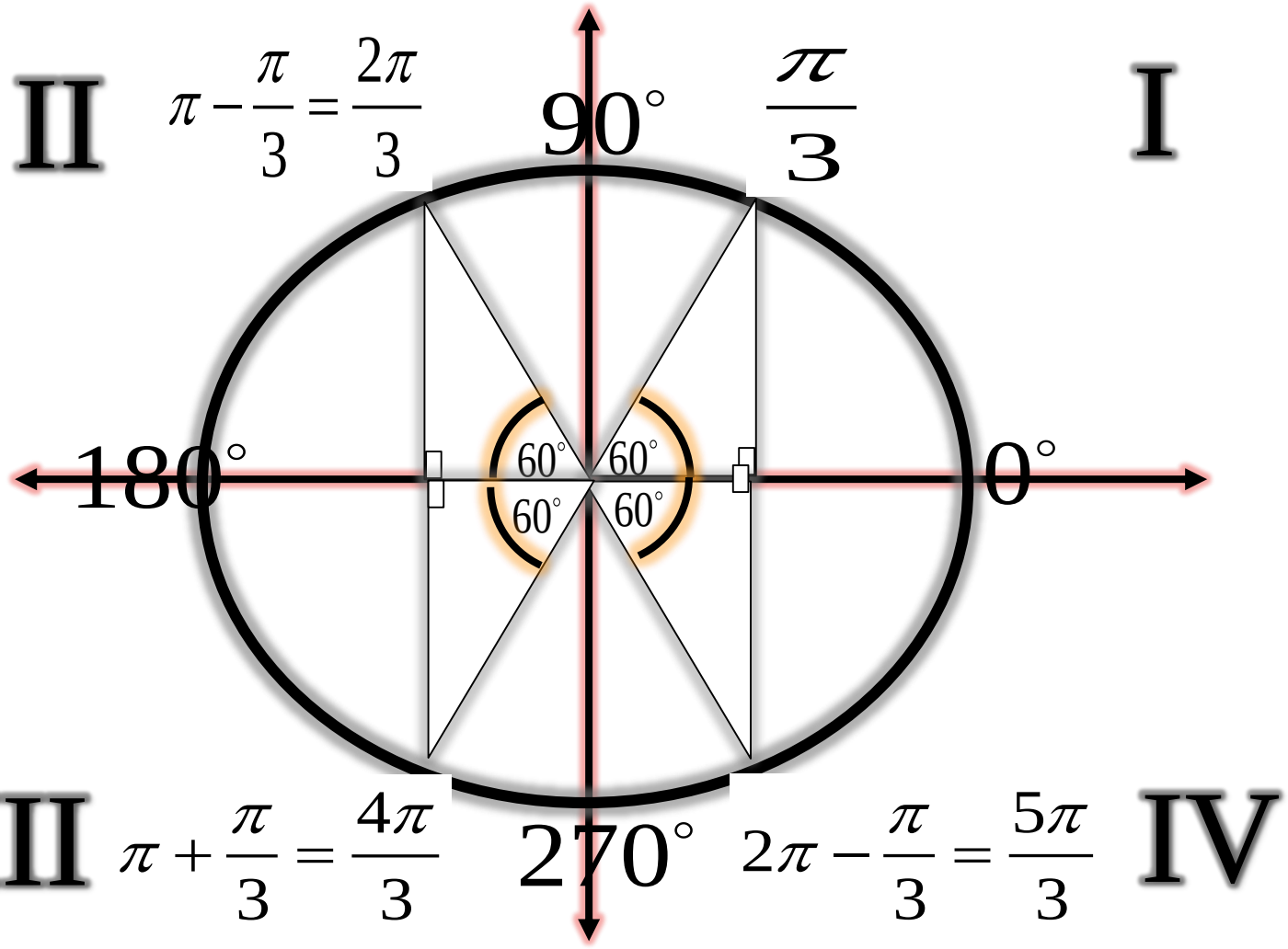
Creating the Unit Circle – 30°, 60°, 90°



$$2x = 1$$

$$x = \frac{1}{2}$$

Degrees in the Unit Circle – 30°, 60°, 90°



ASSIGNMENT

Complete the Unit Circle and Worksheet 1