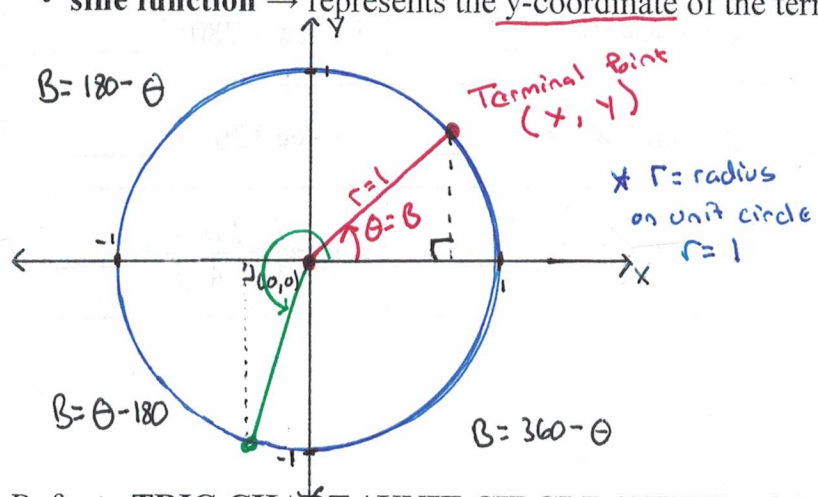


## 8.2 – The Unit Circle and Finding Exact Value

- **unit circle** → a circle with a radius of 1 and centered at  $(0, 0)$  and has equation of  $x^2 + y^2 = 1$
- **reference angle** → an acute angle formed between a drawn angle  $\theta$  and the x-axis.
- **terminal point** → a point  $(x, y)$  that falls on the Unit Circle.  $(\underset{x}{\cos \theta}, \underset{y}{\sin \theta})$
- **cosine function** → represents the x-coordinate of the terminal point of an angle on the Unit Circle.
- **sine function** → represents the y-coordinate of the terminal point of an angle on the Unit Circle.

Egn of Circle:  $(x-h)^2 + (y-k)^2 = r^2 \rightarrow (x-0)^2 + (y-0)^2 = (1)^2 \rightarrow x^2 + y^2 = 1$



Rt Δ	UC	Ref Δ
$\sin \theta = \frac{O}{H}$	$= \frac{Y}{1}$	$= \frac{Y}{h}$
$\csc \theta = \frac{H}{O}$	$= \frac{1}{Y}$	$= \frac{h}{y}$
$\cos \theta = \frac{A}{H}$	$= \frac{X}{1}$	$= \frac{X}{h}$
$\sec \theta = \frac{H}{A}$	$= \frac{1}{X}$	$= \frac{h}{x}$
$\tan \theta = \frac{O}{A}$	$= \frac{Y}{X}$	$= \frac{Y}{X}$
$\cot \theta = \frac{A}{O}$	$= \frac{X}{Y}$	$= \frac{X}{Y}$

\* NO RADICALS IN DENOMINATOR! \*

Refer to **TRIG CHART / UNIT CIRCLE SHEET** to label parts of the Unit Circle:

- 1.) Complete the TRIG CHART → Use the 45 – 45 – right Δ and the 30 – 60 – right Δ  
For quadrant angles ( $0^\circ$  and  $90^\circ$ ), use your calculator
- 2.) Label the degree measure ABOVE each pt on the Unit Circle (only use increments of  $30^\circ, 45^\circ, 60^\circ$ )
- 3.) Label the radian measure BELOW each pt on the Unit Circle (convert degree measure to radians)
- 4.) Draw diagonal lines through pairs of points that have the same reference number (angle):
 

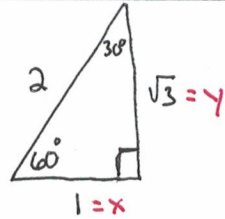
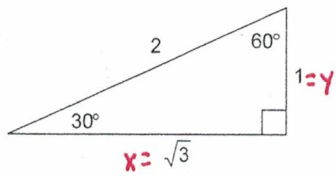
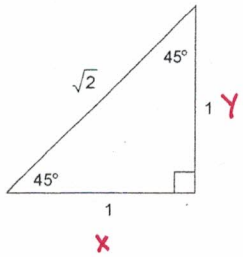
a.) $30^\circ$ and $210^\circ$	b.) $45^\circ$ and $225^\circ$	c.) $60^\circ$ and $240^\circ$
$150^\circ$ and $330^\circ$	$135^\circ$ and $315^\circ$	$120^\circ$ and $300^\circ$
} Ref Angle = $30^\circ$	} Ref Angle = $45^\circ$	} Ref Angle = $60^\circ$
- 5.) Label the terminal point  $(x, y)$  of each degree/radian measure →  $(x = \cos \theta, y = \sin \theta)$
- 6.) Write in Quadrant #'s and where trig functions are positive (ALL SENIORS TAKE CANDY)

**Example 1: Using your TC/UC Sheet, answer each question.**

a.) What is the reference angle for the angle of $240^\circ$ ?	b.) What is the reference angle for the angle of $\frac{3\pi}{4}$ ?	c.) What is the reference angle for the angle of $-750^\circ$ ?
d.) What is the terminal point for the angle of $510^\circ$ ?	e.) What is the terminal point for the angle of $-\frac{9\pi}{4}$ ?	f.) If you are at terminal pt $(0, 1)$ and move $300^\circ$ CCW, what angle did you stop at that is on the UC?

AFM – Trig Chart / Unit Circle Sheet

$\theta$	$\sin \theta$ (y)	$\cos \theta$ (x)	$\tan \theta$ (y / x)	$\csc \theta$ (1 / y)	$\sec \theta$ (1 / x)	$\cot \theta$ (x / y)
$0^\circ$ <i>Quadrant I</i>	$\frac{0}{1} = 0$	$\frac{1}{1} = 1$	$\frac{0}{1} = 0$	$\frac{1}{0} = \text{Undef.}$	$\frac{1}{1} = 1$	$\frac{1}{0} = \text{Undef.}$
$30^\circ$	$\frac{1/2}{1} = 1/2$	$\frac{\sqrt{3}/2}{1} = \sqrt{3}/2$	$\frac{1/2}{\sqrt{3}/2} = \sqrt{3}/3$	$\frac{1}{1/2} = 2$	$\frac{1}{\sqrt{3}/2} = 2\sqrt{3}/3$	$\frac{\sqrt{3}/2}{1/2} = \sqrt{3}$
$45^\circ$						
$60^\circ$						
$90^\circ$ <i>Quadrant II</i>	$\frac{1}{1} = 1$	$\frac{0}{1} = 0$	$\frac{1}{0} = \text{Undef.}$	$\frac{1}{1} = 1$	$\frac{1}{0} = \text{Undef.}$	$\frac{0}{1} = 0$



Reference Angle Color Coding Key

- [red] – reference angles =  $30^\circ$
- [blue] – reference angles =  $45^\circ$
- [green] – reference angles =  $60^\circ$

