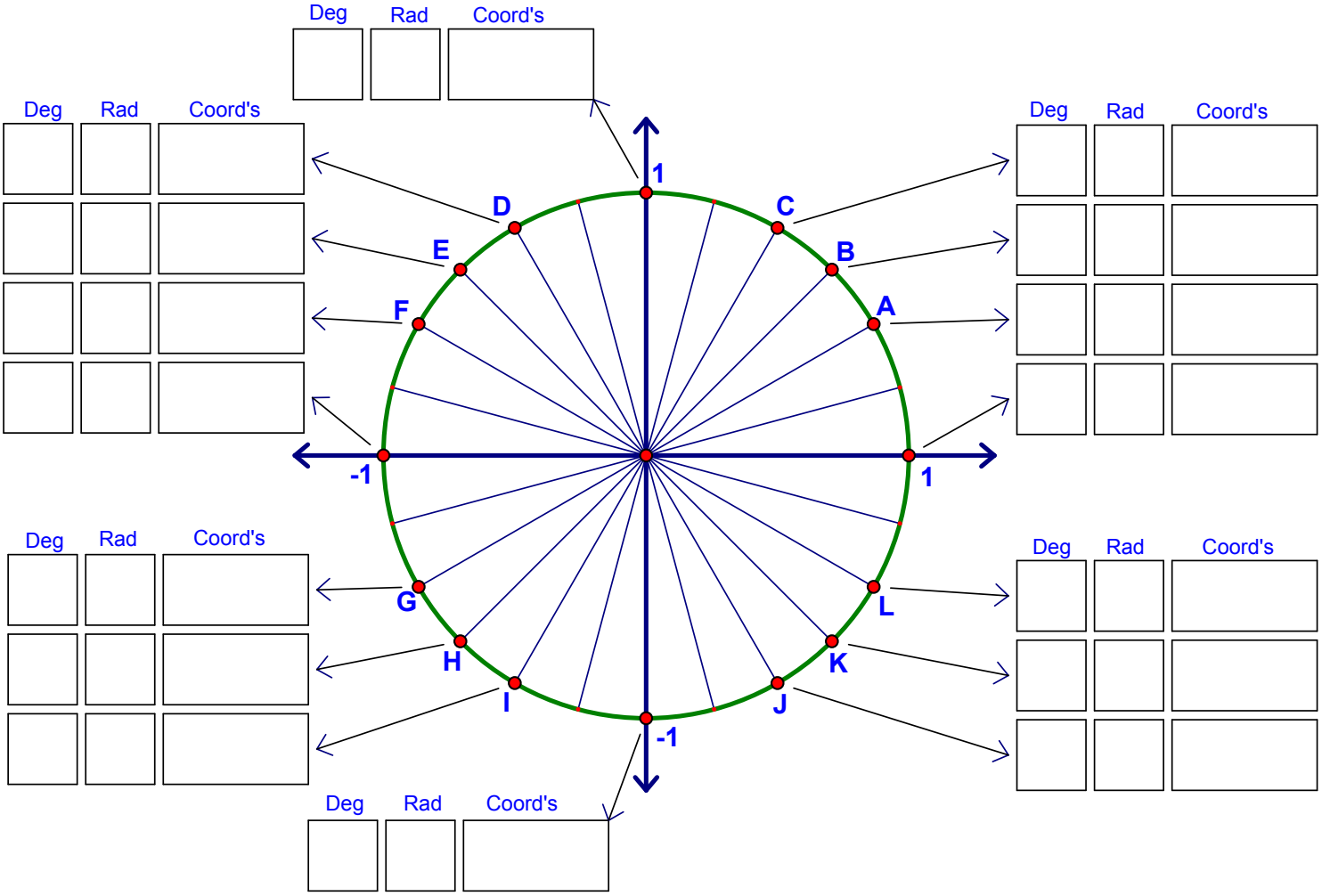
Sections 4.2 & 4.4 – Trig Functions of Any Angle

Using your calculator, find the sine and cosine of the following angles:

θ	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$
$\sin\theta$				
$\cos\theta$				

Now, fill in the coordinates of these quadrantal angles in the chart below.



Is there some sort of relationship between sine and cosine and the x and y coordinates of these four angles?

$$(x, y) = (\quad , \quad)$$

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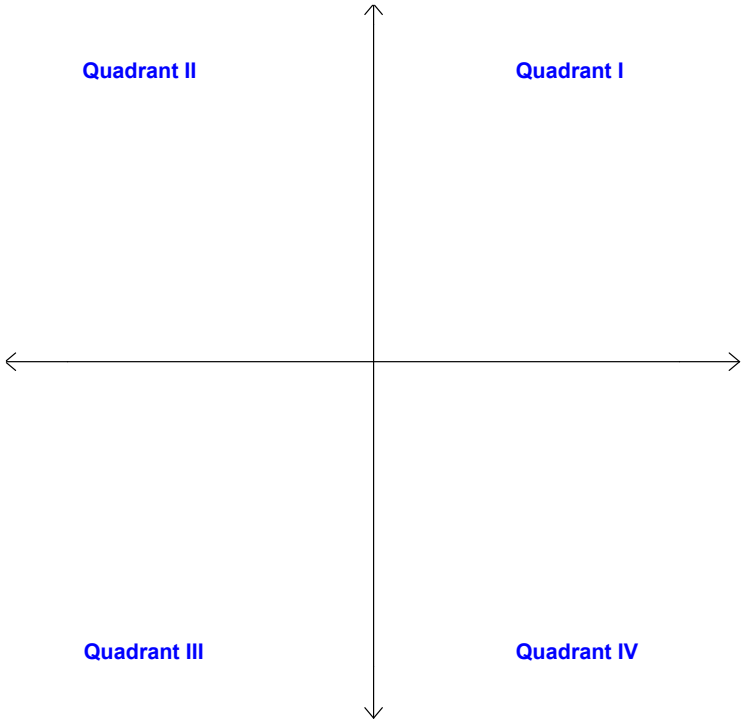
Signs of Trig Functions



Remember it by…..

Examples:

1) State the quadrant in which θ lies:

a. $\sin\theta > 0$ and $\tan\theta < 0$

b. $\sec\theta > 0$ and $\cot\theta < 0$

2) If $\sin\theta = 0.5358$, find two values for θ ($0° \le \theta < 360°$). Round to the nearest tenth of a degree.

3) If $\cos\theta = 0.8164$, find two values for θ ($0° \le \theta < 360°$). Round to the nearest tenth of a degree.

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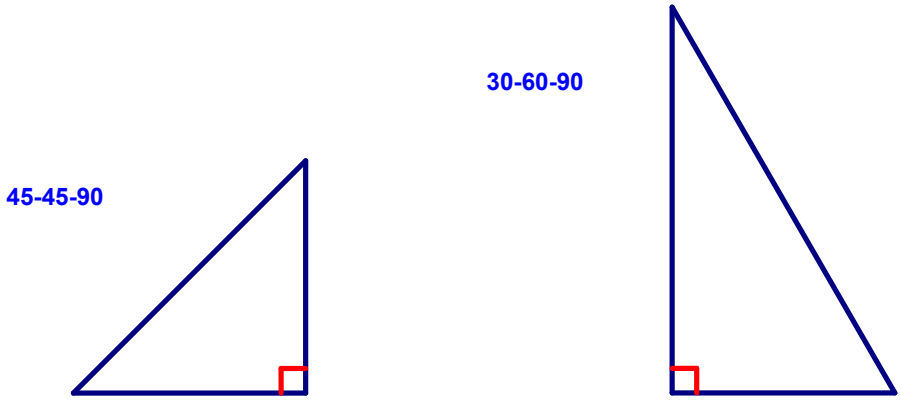
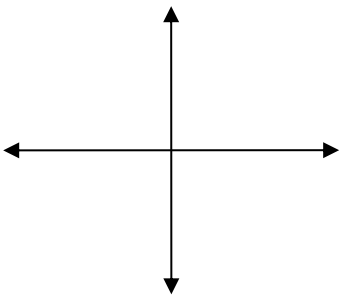
Reference Angles

RECALL: Special Right Triangles:

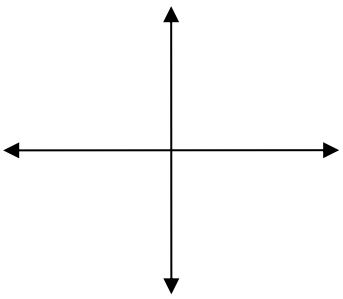


Reference Angle – θ' - an angle made with the x-axis that is used to create an acute right triangle we can use to analyze trig functions

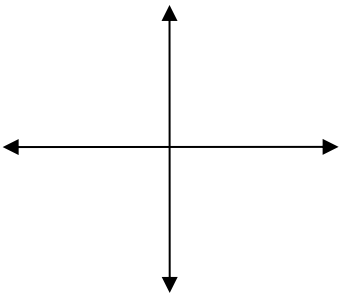
If $\theta = 100°$



If $\theta = 220°$



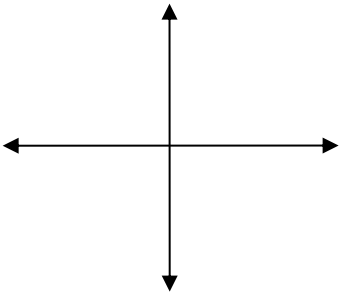
If $\theta = 350°$



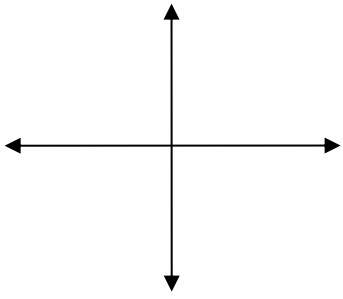
Examples:

Find the reference angle θ'. Draw a diagram to help you.

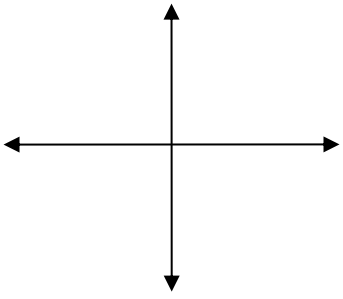
a) $\theta = 300°$



b) $\theta = \frac{5\pi}{6}$



c) $\theta = -135°$



Reference angles are useful because they enable us to evaluate the trig functions of many different "special" angles.

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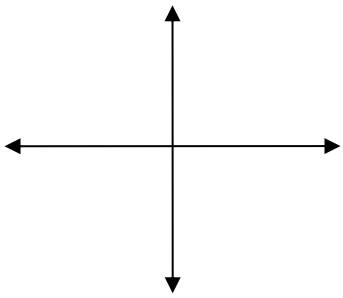
Trig Functions of Real Numbers

To find the value of a trig function of any "special" angle follow the following steps:

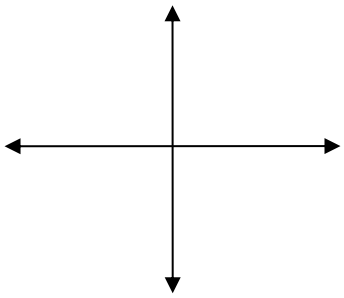
1. Draw the angle in standard position
2. Determine the reference angle θ' (always made with the x-axis)
3. Find the function value based on the sides of the appropriate special right triangle
4. Depending on the Quadrant in which θ lies, affix the appropriate sign (positive or negative) to the function value

Examples:

Evaluate $\cos\frac{2\pi}{3}$



Evaluate $\tan\frac{7\pi}{4}$



More Examples:

1) If θ is in Quadrant II and $\cos\theta = \frac{-7}{25}$, what is $\sin\theta$?

2) If $\cos\theta = \frac{-\sqrt{3}}{2}$ and θ is in Quadrant III, what is $\sin\theta$?

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3) If θ is in standard position and the point (-3, -6) is on the terminal side, find the six trigonometric functions of θ.

4) If θ is in standard position and the point $\left(\frac{-8}{17}, \frac{15}{17}\right)$ is on the terminal side, find the six trigonometric functions of θ.

5) Evaluate the following trig functions:

   a) $\sin 5\pi$

   b) $\cos\left(\frac{-9\pi}{4}\right)$

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6) If θ is in quadrant III and $\cos\theta = -\frac{1}{2}$, find:

a) sin θ

b) tan θ

c) csc θ

Homework:

4.4 day 1: p. 318 #11-14, 30, 33, 39, 42, 45, 48, 51, 54
4.4 day 2: p. 318 #1, 6, 7, 17, 21, 59, 61, 81, 83, 92, 93