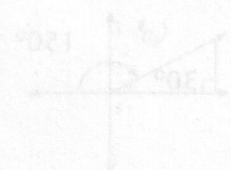


**Practice Problems 1**

Draw the angle and tell in what quadrant the terminal side lies.

- |                 |                 |
|-----------------|-----------------|
| 1. $-60^\circ$  | 2. $-135^\circ$ |
| 3. $420^\circ$  | 4. $560^\circ$  |
| 5. $210^\circ$  | 6. $-250^\circ$ |
| 7. $-315^\circ$ | 8. $-330^\circ$ |

**REFERENCE ANGLES**



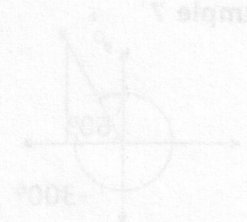
Example 2



Example 6



Example 7



The reference angle makes it possible to have a sin, cos, or tan and thus a ratio. The quadrant in which the terminal side of the angle ends up determines whether the ratio will be positive or negative. Technically, the angles  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$ , and  $360^\circ$  (or  $0^\circ$ ) lie on the x- and y-axes and not in a specific quadrant, but I am going to assign them to quadrants to keep it simple. We will consider  $90^\circ$  to be in the first quadrant,  $180^\circ$  in the second,  $270^\circ$  in the third, and  $360^\circ$  in the fourth.

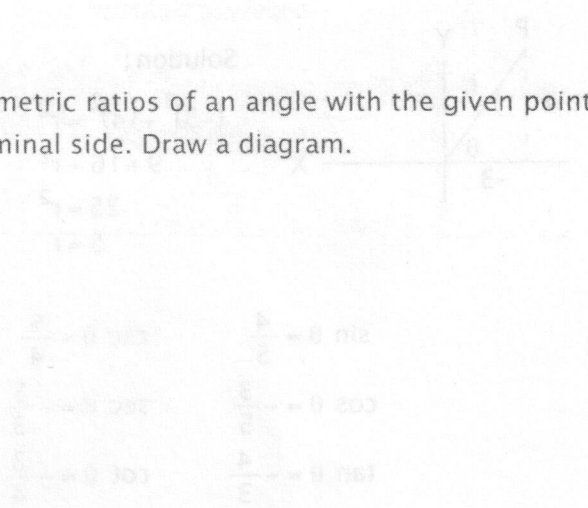
### Practice Problems 2

For each angle, name the quadrant in which it lies and the reference angle to be used.

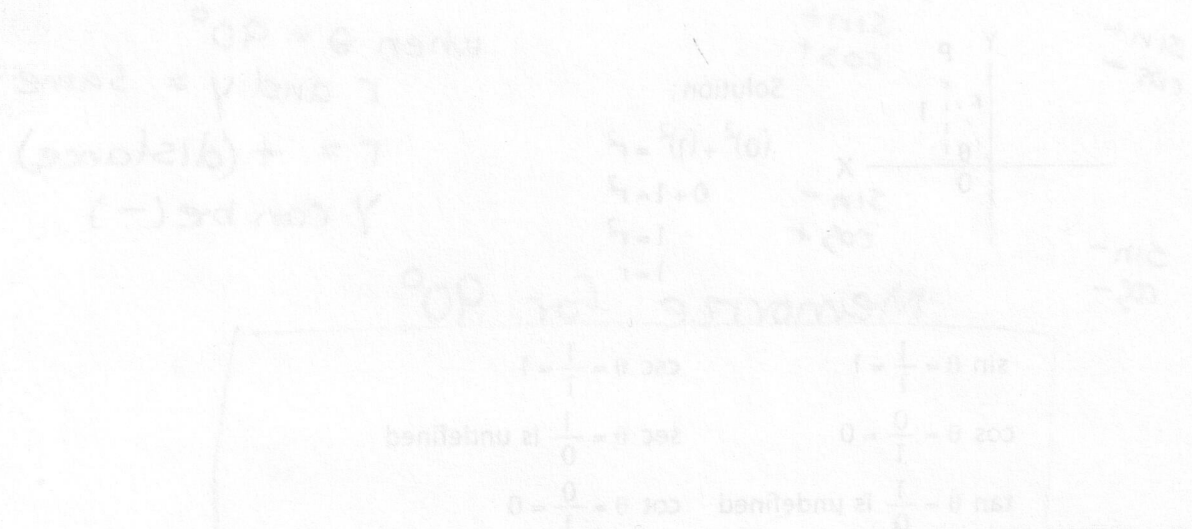
- |                  |                  |
|------------------|------------------|
| 1. $-30^\circ$   | 2. $820^\circ$   |
| 3. $-240^\circ$  | 4. $720^\circ$   |
| 5. $630^\circ$   | 6. $-98^\circ$   |
| 7. $443^\circ$   | 8. $-320^\circ$  |
| 9. $542^\circ$   | 10. $-190^\circ$ |
| 11. $-400^\circ$ | 12. $618^\circ$  |

**Practice Problems 3**

1. Find the six trigonometric ratios of an angle with the given point  $(5, -12)$  on the terminal side. Draw a diagram.
2. Find the six trigonometric ratios of an angle with the given point  $(-15, -8)$  on the terminal side. Draw a diagram.



*Example 8 - Inverse*  
 This is a  $90^\circ$  angle. Because it is hard to visualize the trig functions, we will draw an imaginary reference angle with an x value of zero. This method will help you find the trig functions for other angles that have their terminal sides on the x- or y-axis. If the denominator is zero, the answer is "undefined" because we cannot divide by zero.



#### Practice Problems 4

Sketch the angle, find the reference angle, and note in which quadrant it lies. Then fill in the table. Some values are undefined because the denominator of the ratio is zero. Use your knowledge of special triangles to write the ratios as fractions. Numbers 3 and 6 are worked out as examples.

	hypotenuse	$\theta$	quadrant	$\sin \theta$	$\cos \theta$	$\tan \theta$	$\csc \theta$	$\sec \theta$	$\cot \theta$
1.	8	$30^\circ$	I						
2.	$8\sqrt{2}$	$45^\circ$	I						
3.	8	$60^\circ$	I	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$
4.	4	$90^\circ$	I						
5.	4	$120^\circ$	II						
6.	$4\sqrt{2}$	$135^\circ$	II	$\frac{\sqrt{2}}{2}$	$\frac{-\sqrt{2}}{2}$	-1	$\sqrt{2}$	$-\sqrt{2}$	-1
7.	4	$150^\circ$	II						
8.	7	$180^\circ$	II						