Trigonometry Lesson 2: Radian Measure and the Unit Circle
Includes material from textbook sections 7.1 and 7.3

1. What does it mean for an angle to be measured in radians?

2. Use the above definition to find the radian measure of 360°.

3. Fill in the following table:

Degrees	Radians
360°	
180°	
90°	
60°	
45°	
30°	
1°	
	1

4. Use the above information to explain how to convert from:

   Degrees to radians

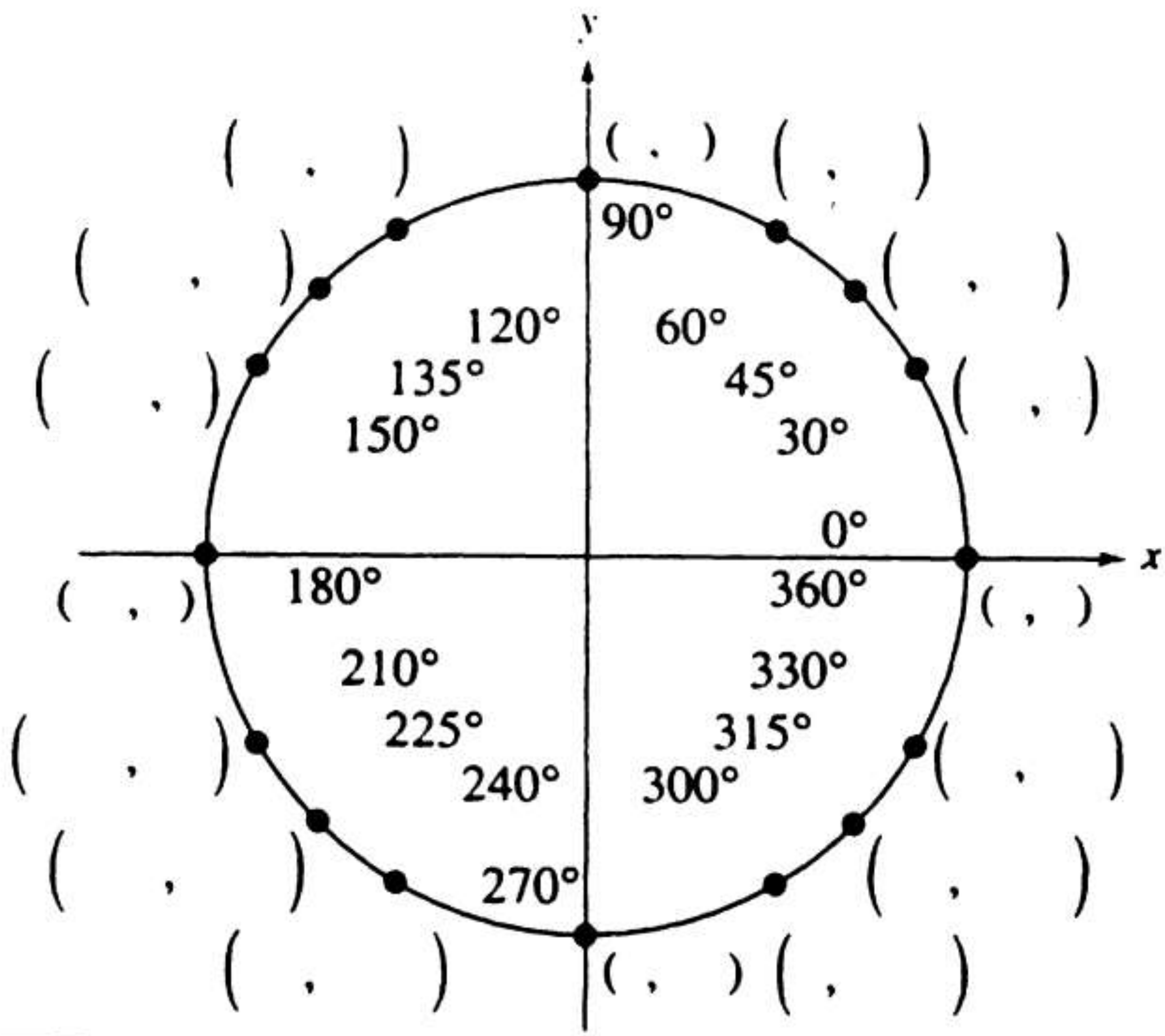
   Radians to degrees

5. Convert between degrees and radians:

150°	$\frac{13\pi}{6}$
390°	$-\frac{7\pi}{3}$
-210°	10

Parts 6-8 involve filling in the blank unit circle below.

6. Since the notion of radians is closely tied to that of the unit circle, let us examine the “basic” angles (i.e. angles that are multiples of 30° and 45°) on it. Include the radian measure of each angle.

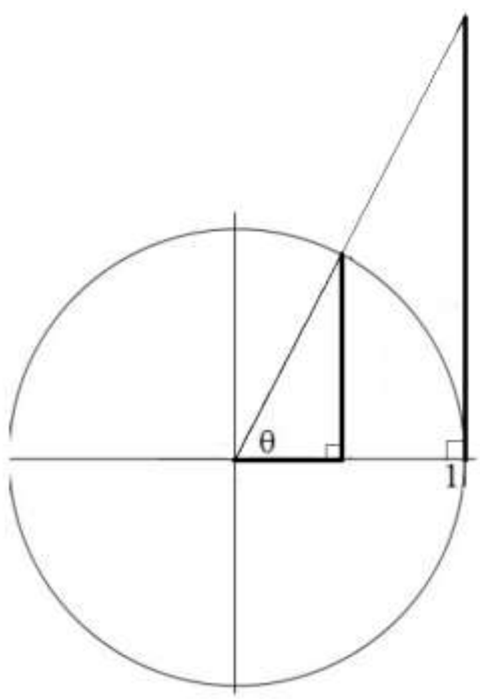


7. Using what you know about the sine and cosine of 30°, 45°, and 60°, fill out the coordinates for all angles in the first quadrant.

8. How might we be able to use this to find the coordinates of all of these "special" angles on the unit circle?

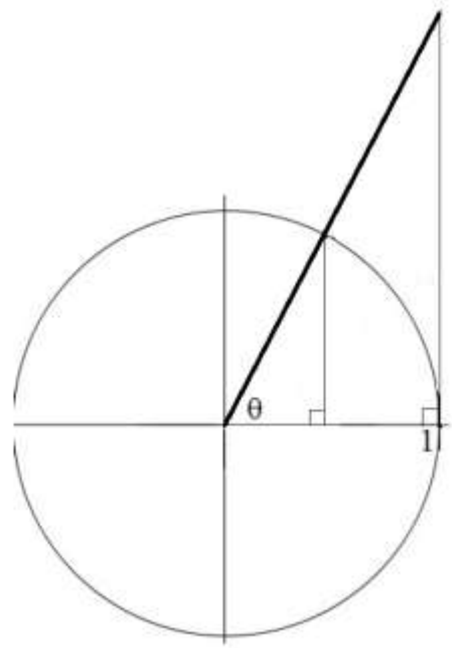
9. Review of properties of similar triangles (textbook pg. 452):

10. We have noticed above that cosine and sine correspond to the *x* and *y* coordinates, respectively, of an angle in standard position on the unit circle. Find an expression for the indicated (bolded) lengths.



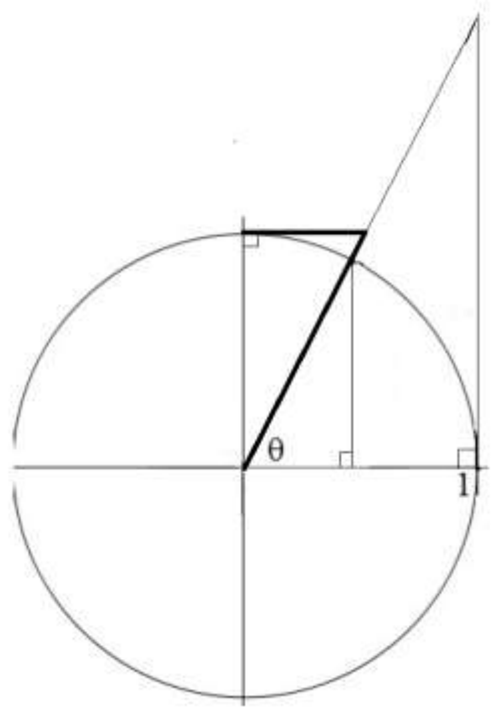
To which trigonometric function do each of these correspond?

11. Again using similar triangles, find an expression in terms of sine and cosine for the indicated length:



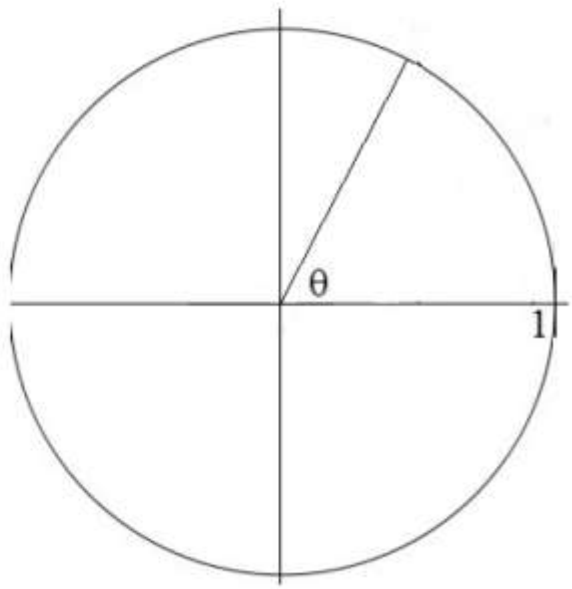
To which trigonometric function does this correspond?

12. Find expressions in terms of sine and cosine for the indicated lengths:



To which trigonometric functions do these correspond?

13. You have just proved that each of the six basic trigonometric functions correspond to lengths that can be constructed on the unit circle (and written in terms of sine and cosine). Consolidate this information by labeling each of the six basic trigonometric functions for the given angle on the unit circle below:



14. Of course, we are not limited to evaluating the trigonometric functions of points on the unit circle. For example, if we are given the coordinates (5, 12) of an angle in standard position, what are the trigonometric functions of that angle?[1]

[1] Because the trigonometric functions are inextricably linked to circles, they are sometimes called the *circular functions*; additionally, because we don't need to know the angle in questions like this one, some textbooks use the term the trigonometric functions of a point.

15. **Application: arclength.** Find the length of an arc with a central angle of $\frac{\pi}{5}$ radians on a circle of radius 6 inches.

Homework Assignment: Section 7.1: 5-17 odd, 21-29 odd, 67, 69