

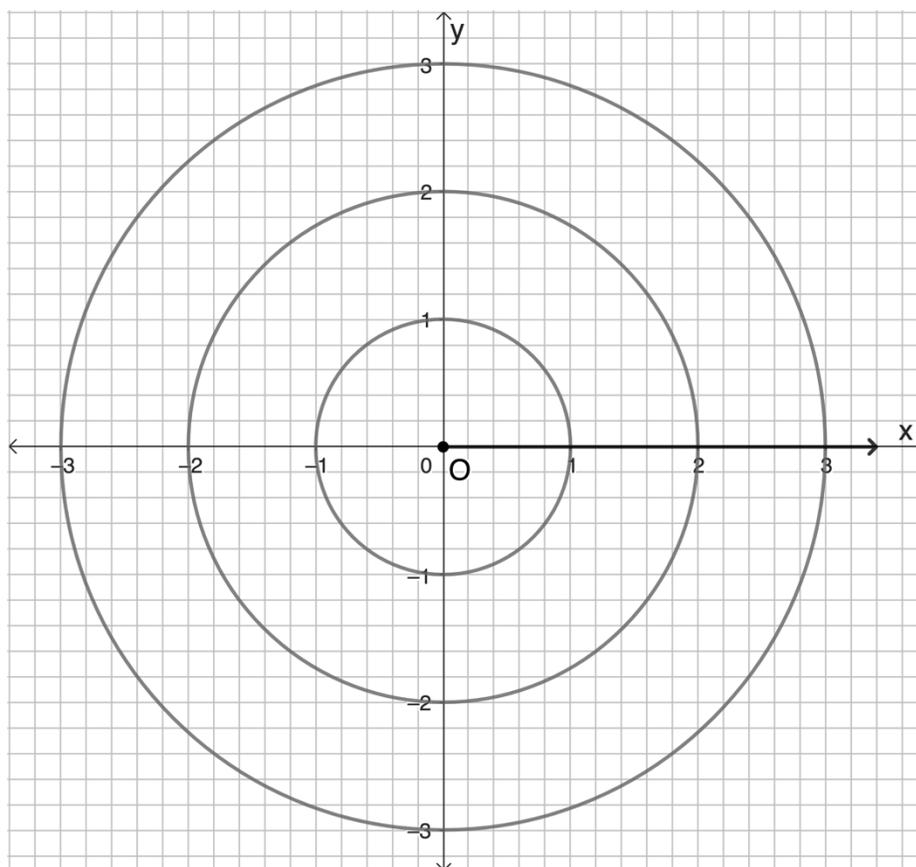


## Trig Ratios in the Wild



In Geometry, you learned how to determine the sine, cosine, and tangent ratios for acute angles contained in a right triangle. Today we're going to extend this idea to *all* angles on the coordinate plane.

1. An angle in standard position has its initial ray on the positive x-axis, as shown. Use a protractor to measure a  $40^\circ$  angle and sketch the terminal ray.

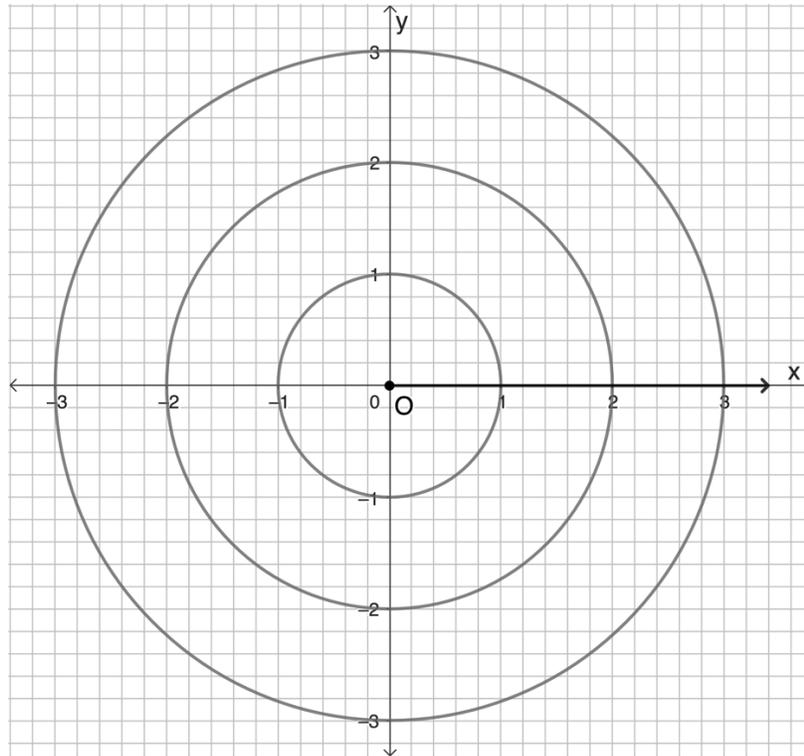


2. Label the points where the terminal ray intersects the circles as A, B, and C, where A is on the smallest circle, B is on the medium circle, and C is on the largest circle.
3. For each of these points, estimate the horizontal distance from the y-axis, the vertical distance from the x-axis, and the true distance from the origin.

	Horizontal distance	Vertical distance	Distance from origin
Point A			
Point B			
Point C			

4. How could you use the information in the table to estimate  $\sin(40^\circ)$ ?
5. How could you use the information in the table to estimate  $\cos(40^\circ)$ ?

6. Now use your protractor to measure a  $150^\circ$  angle. Label the points where the terminal ray intersects the three circles as A, B, and C, respectively.



7. What quadrant is this angle in? What is the measure of this angle in radians?
8. Complete the table with the horizontal and vertical displacements from the x and y axis. (Note: while distances are always positive, displacement represents a *change* in position and can be positive or negative).

	Horizontal displacement	Vertical displacement	Distance from origin
Point A			
Point B			
Point C			

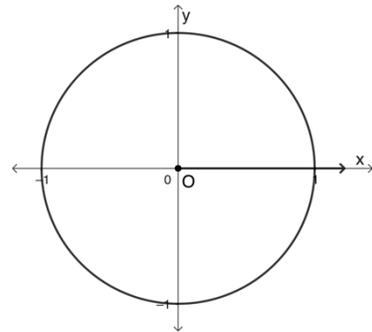
9. Estimate  $\sin(150^\circ)$  and  $\cos(150^\circ)$ .
10. Which set of measurements did you use to determine your answer? Why?
11. Estimate  $\tan(150^\circ)$ .
12. A point on the terminal ray of an angle has the same horizontal displacement as Point B but the opposite vertical displacement. What is the measure of the angle?

## Lesson 6.3 – Defining Sine, Cosine, and Tangent for Any Angle

QuickNotes

### Check Your Understanding

1. For  $\theta = \frac{\pi}{3}$ ,  $\cos \theta = \frac{1}{2}$ . For which other value(s) of  $\theta$  is  $\cos \theta = \frac{1}{2}$ ?
2. For an angle  $\theta$  in the second quadrant,  $\sin \theta = 0.3$ . Find  $\cos \theta$  and  $\tan \theta$ . Sketch a picture.



3. a. For which angle(s),  $0 \leq \theta \leq 2\pi$ , is  $\sin \theta = -1$ ?
- b. For which angle(s),  $0 \leq \theta \leq 2\pi$ , is  $\cos \theta = -1$ ?
- c. For which angle(s),  $0 \leq \theta \leq 2\pi$ , is  $\tan \theta = -1$ ?
4. If  $\cos 280^\circ \approx 0.174$ , estimate  $\cos(260^\circ)$ .