

## 10.1.2 EXERCISES

For a link to all of the additional resources available for this section, click [OSttS Chapter 10 materials](#).

In Exercises 1 - 4, convert the angles into the DMS system. Round each of your answers to the nearest second.

- |                  |                    |                    |                    |
|------------------|--------------------|--------------------|--------------------|
| 1. $63.75^\circ$ | 2. $200.325^\circ$ | 3. $-317.06^\circ$ | 4. $179.999^\circ$ |
|------------------|--------------------|--------------------|--------------------|

In Exercises 5 - 8, convert the angles into decimal degrees. Round each of your answers to three decimal places.

- |                    |                         |                    |                         |
|--------------------|-------------------------|--------------------|-------------------------|
| 5. $125^\circ 50'$ | 6. $-32^\circ 10' 12''$ | 7. $502^\circ 35'$ | 8. $237^\circ 58' 43''$ |
|--------------------|-------------------------|--------------------|-------------------------|

In Exercises 9 - 28, graph the oriented angle in standard position. Classify each angle according to where its terminal side lies and then give two coterminal angles, one of which is positive and the other negative.

For help with these exercises, click one or more of the resources below:

- [Graphing oriented angles in standard position](#)
- [Finding coterminal angles \(in degree measure\)](#)
- [Finding coterminal angles \(in radian measure\)](#)

- |                      |                      |                        |                        |
|----------------------|----------------------|------------------------|------------------------|
| 9. $330^\circ$       | 10. $-135^\circ$     | 11. $120^\circ$        | 12. $405^\circ$        |
| 13. $-270^\circ$     | 14. $\frac{5\pi}{6}$ | 15. $-\frac{11\pi}{3}$ | 16. $\frac{5\pi}{4}$   |
| 17. $\frac{3\pi}{4}$ | 18. $-\frac{\pi}{3}$ | 19. $\frac{7\pi}{2}$   | 20. $\frac{\pi}{4}$    |
| 21. $-\frac{\pi}{2}$ | 22. $\frac{7\pi}{6}$ | 23. $-\frac{5\pi}{3}$  | 24. $3\pi$             |
| 25. $-2\pi$          | 26. $-\frac{\pi}{4}$ | 27. $\frac{15\pi}{4}$  | 28. $-\frac{13\pi}{6}$ |

In Exercises 29 - 36, convert the angle from degree measure into radian measure, giving the exact value in terms of  $\pi$ .

For help with these exercises, click the resource below:

- [Understanding radian measure and converting between degree and radian measure](#)

- |               |                 |                 |                  |
|---------------|-----------------|-----------------|------------------|
| 29. $0^\circ$ | 30. $240^\circ$ | 31. $135^\circ$ | 32. $-270^\circ$ |
|---------------|-----------------|-----------------|------------------|

33.  $-315^\circ$

34.  $150^\circ$

35.  $45^\circ$

36.  $-225^\circ$

In Exercises 37 - 44, convert the angle from radian measure into degree measure.

For help with these exercises, click the resource below:

- [Understanding radian measure and converting between degree and radian measure](#)

37.  $\pi$

38.  $-\frac{2\pi}{3}$

39.  $\frac{7\pi}{6}$

40.  $\frac{11\pi}{6}$

41.  $\frac{\pi}{3}$

42.  $\frac{5\pi}{3}$

43.  $-\frac{\pi}{6}$

44.  $\frac{\pi}{2}$

In Exercises 45 - 49, sketch the oriented arc on the Unit Circle which corresponds to the given real number.

45.  $t = \frac{5\pi}{6}$

46.  $t = -\pi$

47.  $t = 6$

48.  $t = -2$

49.  $t = 12$

For help with Exercises 50 - 55, click the resource below:

- [Linear and angular velocity](#)

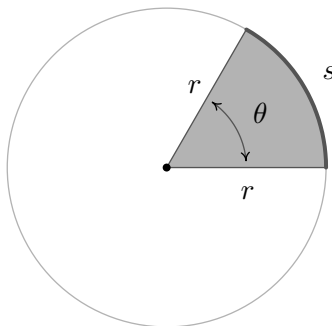
50. A yo-yo which is 2.25 inches in diameter spins at a rate of 4500 revolutions per minute. How fast is the edge of the yo-yo spinning in miles per hour? Round your answer to two decimal places.
51. How many revolutions per minute would the yo-yo in exercise 50 have to complete if the edge of the yo-yo is to be spinning at a rate of 42 miles per hour? Round your answer to two decimal places.
52. In the yo-yo trick 'Around the World,' the performer throws the yo-yo so it sweeps out a vertical circle whose radius is the yo-yo string. If the yo-yo string is 28 inches long and the yo-yo takes 3 seconds to complete one revolution of the circle, compute the speed of the yo-yo in miles per hour. Round your answer to two decimal places.
53. A computer hard drive contains a circular disk with diameter 2.5 inches and spins at a rate of 7200 RPM (revolutions per minute). Find the linear speed of a point on the edge of the disk in miles per hour.
54. A rock got stuck in the tread of my tire and when I was driving 70 miles per hour, the rock came loose and hit the inside of the wheel well of the car. How fast, in miles per hour, was the rock traveling when it came out of the tread? (The tire has a diameter of 23 inches.)
55. The Giant Wheel at Cedar Point is a circle with diameter 128 feet which sits on an 8 foot tall platform making its overall height is 136 feet. (Remember this from Exercise 17 in Section 7.2?) It completes two revolutions in 2 minutes and 7 seconds.<sup>20</sup> Assuming the riders are at the edge of the circle, how fast are they traveling in miles per hour?

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<sup>20</sup>Source: [Cedar Point's webpage](#).

56. Consider the circle of radius  $r$  pictured below with central angle  $\theta$ , measured in radians, and subtended arc of length  $s$ . Prove that the area of the shaded sector is  $A = \frac{1}{2}r^2\theta$ .

(Hint: Use the proportion  $\frac{A}{\text{area of the circle}} = \frac{s}{\text{circumference of the circle}}$ .)



In Exercises 57 - 62, use the result of Exercise 56 to compute the areas of the circular sectors with the given central angles and radii.

For help with these exercises, click the resource below:

- [Arc length and area of a circular sector](#)

57.  $\theta = \frac{\pi}{6}$ ,  $r = 12$

58.  $\theta = \frac{5\pi}{4}$ ,  $r = 100$

59.  $\theta = 330^\circ$ ,  $r = 9.3$

60.  $\theta = \pi$ ,  $r = 1$

61.  $\theta = 240^\circ$ ,  $r = 5$

62.  $\theta = 1^\circ$ ,  $r = 117$

63. Imagine a rope tied around the Earth at the equator. Show that you need to add only  $2\pi$  feet of length to the rope in order to lift it one foot above the ground around the entire equator. (You do NOT need to know the radius of the Earth to show this.)
64. With the help of your classmates, look for a proof that  $\pi$  is indeed a constant.

**Checkpoint Quiz 10.1**

1. Convert to decimal degrees:  $42^{\circ}3'11''$ . Round your answer to three decimal places.
2. Convert to the DMS system:  $-13.621^{\circ}$ . Round your answers to the nearest second.
3. Graph each oriented angle in standard position. Classify each angle according to where its terminal side lies and give two coterminal angles, one positive and one negative.  

(a)  $\theta = -240^{\circ}$ (b)  $\theta = \frac{11\pi}{6}$ (c)  $\theta = 750^{\circ}$ (d)  $\theta = -\frac{5\pi}{2}$
4. A 3 inch diameter yo-yo spins at an estimated 4000 revolutions per minute. What is the speed of a point on the outer edge of the yo-yo in miles per hour?

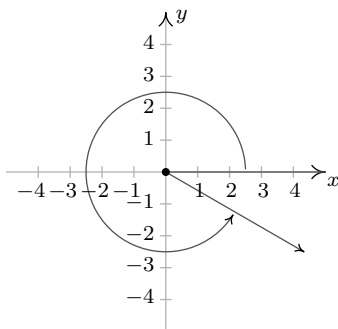
For worked out solutions to this quiz, click the links below:

- [Quiz Solution Part 1](#)
- [Quiz Solution Part 2](#)

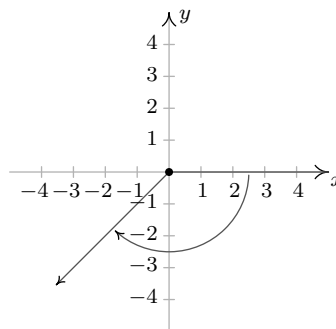
## 10.1.3 ANSWERS

1.  $63^\circ 45'$                       2.  $200^\circ 19' 30''$                       3.  $-317^\circ 3' 36''$                       4.  $179^\circ 59' 56''$   
 5.  $125.833^\circ$                       6.  $-32.17^\circ$                       7.  $502.583^\circ$                       8.  $237.979^\circ$

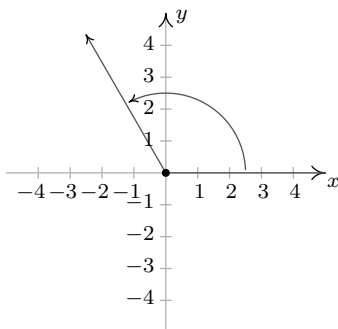
9.  $330^\circ$  is a Quadrant IV angle  
coterminal with  $690^\circ$  and  $-30^\circ$



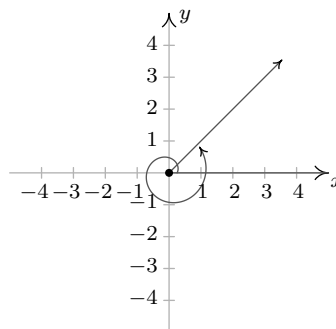
10.  $-135^\circ$  is a Quadrant III angle  
coterminal with  $225^\circ$  and  $-495^\circ$



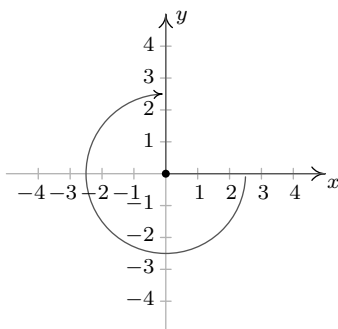
11.  $120^\circ$  is a Quadrant II angle  
coterminal with  $480^\circ$  and  $-240^\circ$



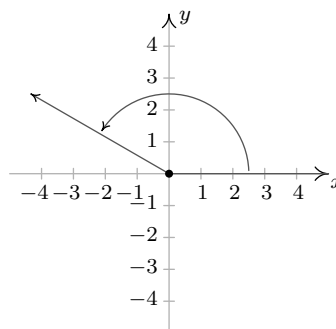
12.  $405^\circ$  is a Quadrant I angle  
coterminal with  $45^\circ$  and  $-315^\circ$



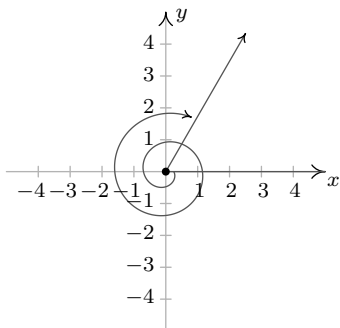
13.  $-270^\circ$  lies on the positive  $y$ -axis  
coterminal with  $90^\circ$  and  $-630^\circ$



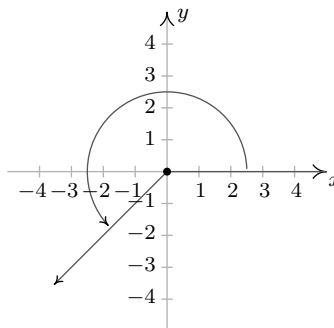
14.  $\frac{5\pi}{6}$  is a Quadrant II angle  
coterminal with  $\frac{17\pi}{6}$  and  $-\frac{7\pi}{6}$



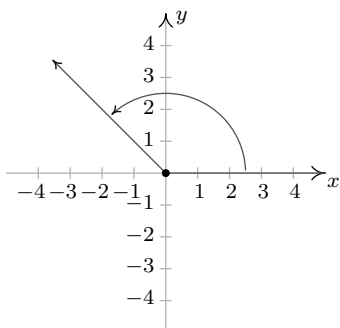
15.  $-\frac{11\pi}{3}$  is a Quadrant I angle  
coterminal with  $\frac{\pi}{3}$  and  $-\frac{5\pi}{3}$



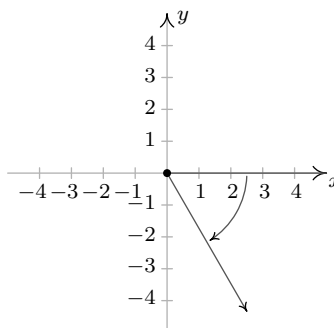
16.  $\frac{5\pi}{4}$  is a Quadrant III angle  
coterminal with  $\frac{13\pi}{4}$  and  $-\frac{3\pi}{4}$



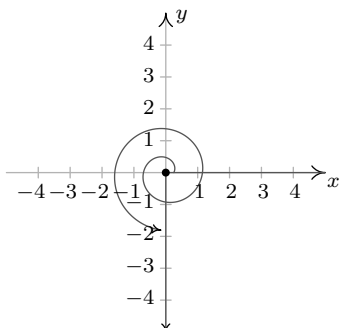
17.  $\frac{3\pi}{4}$  is a Quadrant II angle  
coterminal with  $\frac{11\pi}{4}$  and  $-\frac{5\pi}{4}$



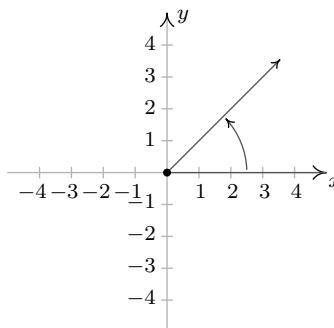
18.  $-\frac{\pi}{3}$  is a Quadrant IV angle  
coterminal with  $\frac{5\pi}{3}$  and  $-\frac{7\pi}{3}$



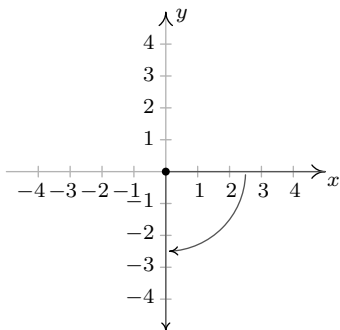
19.  $\frac{7\pi}{2}$  lies on the negative  $y$ -axis  
coterminal with  $\frac{3\pi}{2}$  and  $-\frac{\pi}{2}$



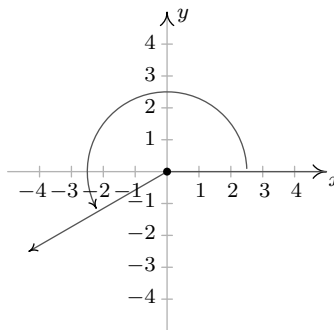
20.  $\frac{\pi}{4}$  is a Quadrant I angle  
coterminal with  $\frac{9\pi}{4}$  and  $-\frac{7\pi}{4}$



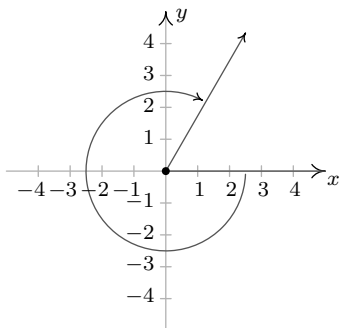
21.  $-\frac{\pi}{2}$  lies on the negative  $y$ -axis  
coterminal with  $\frac{3\pi}{2}$  and  $-\frac{5\pi}{2}$



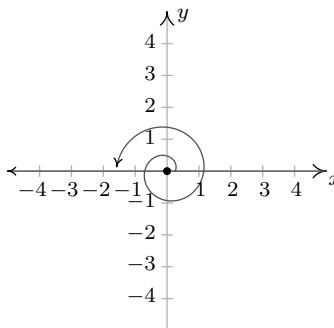
22.  $\frac{7\pi}{6}$  is a Quadrant III angle  
coterminal with  $\frac{19\pi}{6}$  and  $-\frac{5\pi}{6}$



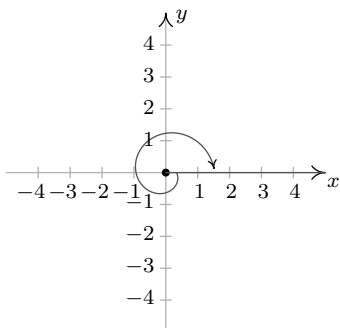
23.  $-\frac{5\pi}{3}$  is a Quadrant I angle  
coterminal with  $\frac{\pi}{3}$  and  $-\frac{11\pi}{3}$



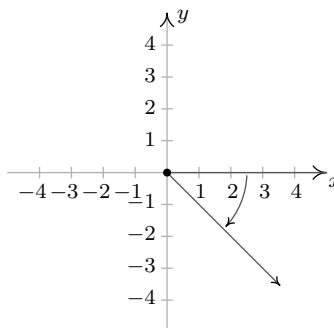
24.  $3\pi$  lies on the negative  $x$ -axis  
coterminal with  $\pi$  and  $-\pi$



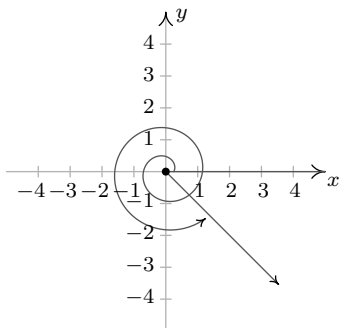
25.  $-2\pi$  lies on the positive  $x$ -axis  
coterminal with  $2\pi$  and  $-4\pi$



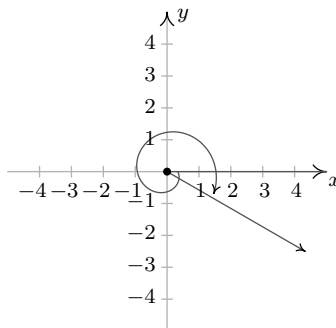
26.  $-\frac{\pi}{4}$  is a Quadrant IV angle  
coterminal with  $\frac{7\pi}{4}$  and  $-\frac{9\pi}{4}$



27.  $\frac{15\pi}{4}$  is a Quadrant IV angle  
coterminal with  $\frac{7\pi}{4}$  and  $-\frac{\pi}{4}$



28.  $-\frac{13\pi}{6}$  is a Quadrant IV angle  
coterminal with  $\frac{11\pi}{6}$  and  $-\frac{\pi}{6}$



29. 0

30.  $\frac{4\pi}{3}$

31.  $\frac{3\pi}{4}$

32.  $-\frac{3\pi}{2}$

33.  $-\frac{7\pi}{4}$

34.  $\frac{5\pi}{6}$

35.  $\frac{\pi}{4}$

36.  $-\frac{5\pi}{4}$

37.  $180^\circ$

38.  $-120^\circ$

39.  $210^\circ$

40.  $330^\circ$

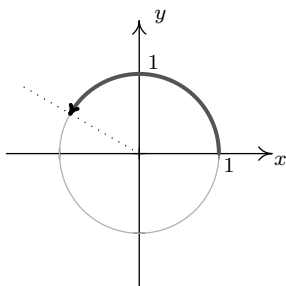
41.  $60^\circ$

42.  $300^\circ$

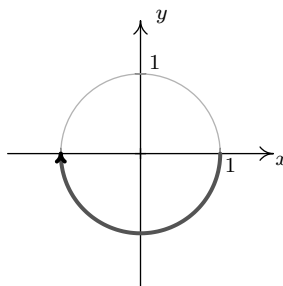
43.  $-30^\circ$

44.  $90^\circ$

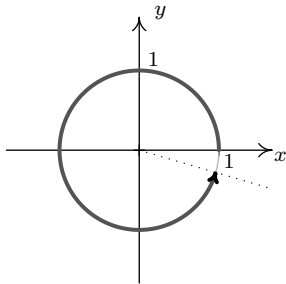
45.  $t = \frac{5\pi}{6}$



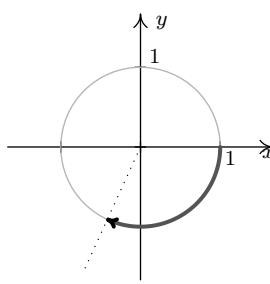
46.  $t = -\pi$



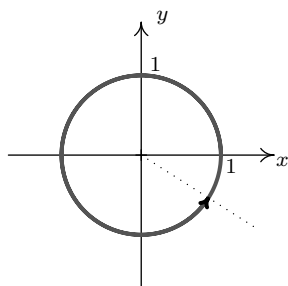
47.  $t = 6$



48.  $t = -2$



49.  $t = 12$  (between 1 and 2 revolutions)



- |  |   |
|--|---|
| 50. About 30.12 miles per hour               | 51. About 6274.52 revolutions per minute    |
| 52. About 3.33 miles per hour                | 53. About 53.55 miles per hour              |
| 54. 70 miles per hour                        | 55. About 4.32 miles per hour               |
| 57. $12\pi$ square units                     | 58. $6250\pi$ square units                  |
| 59. $79.2825\pi \approx 249.07$ square units | 60. $\frac{\pi}{2}$ square units            |
| 61. $\frac{50\pi}{3}$ square units           | 62. $38.025\pi \approx 119.46$ square units |