NAME ____________ DATE ________ PERIOD ______

6-2 Practice

Linear and Angular Velocity

Determine each angular displacement in radians. Round to the nearest tenth.

1. 6 revolutions
   37.7 radians
2. 4.3 revolutions
   27.0 radians
3. 85 revolutions
   534.1 radians
4. 11.5 revolutions
   72.3 radians
5. 7.7 revolutions
   48.4 radians
6. 17.8 revolutions
   111.8 radians

Determine each angular velocity. Round to the nearest tenth.

7. 2.6 revolutions in 6 seconds
   2.7 radians/s
8. 7.9 revolutions in 11 seconds
   4.5 radians/s
9. 118.3 revolutions in 19 minutes
   39.1 radians/min
10. 5.5 revolutions in 4 minutes
    8.6 radians/min
11. 22.4 revolutions in 15 seconds
    9.4 radians/s
12. 14 revolutions in 2 minutes
    44.0 radians/min

Determine the linear velocity of a point rotating at the given angular velocity at a distance r from the center of the rotating object. Round to the nearest tenth.

13. $\omega = 14.3$ radians per second, $r = 7$ centimeters
    100.1 cm/s
14. $\omega = 28$ radians per second, $r = 2$ feet
    56.0 ft/s
15. $\omega = 5.4\pi$ radians per minute, $r = 1.3$ meters
    22.1 m/min
16. $\omega = 41.7\pi$ radians per second, $r = 18$ inches
    2358.1 in./s
17. $\omega = 234$ radians per minute, $r = 31$ inches
    7254.0 in./min
18. ***Clocks*** Suppose the second hand on a clock is 3 inches long. Find the linear velocity of the tip of the second hand.
    0.3 in./s

NAME ____________ DATE ________ PERIOD ______

6-1 Practice

Angles and Radian Measure

Change each degree measure to radian measure in terms of π.

1. $-250°$
   $-\frac{25\pi}{18}$
2. $6°$
   $\frac{\pi}{30}$
3. $-145°$
   $-\frac{29\pi}{36}$
4. $870°$
   $\frac{29\pi}{6}$
5. $18°$
   $\frac{\pi}{10}$
6. $-820°$
   $-\frac{41\pi}{9}$

Change each radian measure to degree measure. Round to the nearest tenth, if necessary.

7. 4π
   $720°$
8. $\frac{13\pi}{30}$
   $78°$
9. -1
   $-57.3°$
10. $\frac{3\pi}{16}$
    $33.8°$
11. -2.56
    $-146.7°$
12. $-\frac{7\pi}{9}$
    $-140°$

Evaluate each expression.

13. $\tan \frac{\pi}{4}$
    1
14. $\cos \frac{3\pi}{2}$
    0
15. $\sin \frac{3\pi}{2}$
    -1
16. $\tan \frac{11\pi}{6}$
    $-\frac{\sqrt{3}}{3}$
17. $\cos \frac{3\pi}{4}$
    $-\frac{\sqrt{2}}{2}$
18. $\sin \frac{5\pi}{3}$
    $-\frac{\sqrt{3}}{2}$

Given the measurement of a central angle, find the length of its intercepted arc in a circle of radius 10 centimeters. Round to the nearest tenth.

19. $\frac{\pi}{6}$
    5.2 cm
20. $\frac{3\pi}{5}$
    18.8 cm
21. $\frac{\pi}{2}$
    15.7 cm

Find the area of each sector, given its central angle θ and the radius of the circle. Round to the nearest tenth.

22. $\theta = \frac{\pi}{6}, r = 14$
    51.3 units^2
23. $\theta = \frac{7\pi}{4}, r = 4$
    44.0 units^2

NAME ______________ DATE ________ PERIOD ____

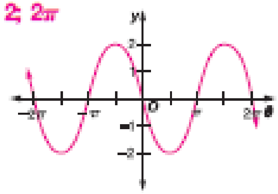
6-4 Practice

Amplitude and Period of Sine and Cosine Functions

State the amplitude and period for each function. Then graph each function.

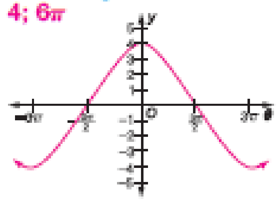
1. $y = -2 \sin \theta$

$2; 2\pi$



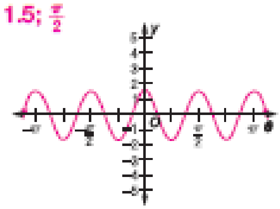
2. $y = 4 \cos \frac{\theta}{3}$

$4; 6\pi$



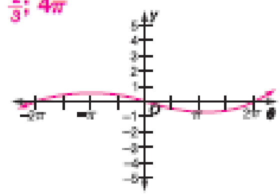
3. $y = 1.5 \cos 4\theta$

$1.5; \frac{\pi}{2}$



4. $y = -\frac{2}{3} \sin \frac{\theta}{2}$

$\frac{2}{3}; 4\pi$



Write an equation of the sine function with each amplitude and period.

5. amplitude = 3, period = 2π

$y = \pm 3 \sin \theta$

6. amplitude = 8.5, period = 6π

$y = \pm 8.5 \sin \frac{\theta}{3}$

Write an equation of the cosine function with each amplitude and period.

7. amplitude = 0.5, period = 0.2π

$y = \pm 0.5 \cos 10\theta$

8. amplitude = $\frac{1}{5}$, period = $\frac{2}{5}\pi$

$y = \pm \frac{1}{5} \cos 5\theta$

9. ***Music*** A piano tuner strikes a tuning fork for note A above middle C and sets in motion vibrations that can be modeled by the equation $y = 0.001 \sin 880\pi t$. Find the amplitude and period for the function.

$0.001; \frac{1}{440}$

NAME ______________ DATE ________ PERIOD ____

6-3 Practice

Graphing Sine and Cosine Functions

Find each value by referring to the graph of the sine or the cosine function.

1. $\cos \pi$

-1

2. $\sin \frac{3\pi}{2}$

-1

3. $\sin\left(-\frac{7\pi}{2}\right)$

1

Find the values of θ for which each equation is true.

4. $\sin \theta = 0$

πn, where n is any integer

5. $\cos \theta = 1$

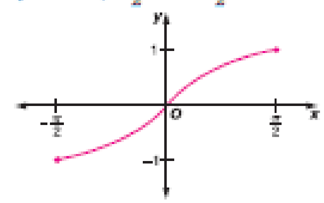
πn, where n is an even integer

6. $\cos \theta = -1$

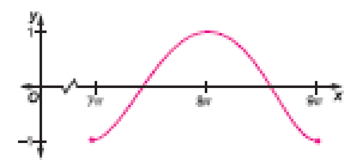
πn, where n is an odd integer

Graph each function for the given interval.

7. $y = \sin x$; $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$

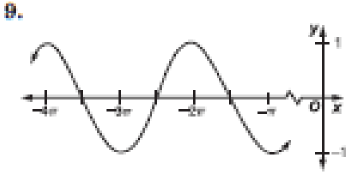


8. $y = \cos x$; $7\pi \le x \le 9\pi$



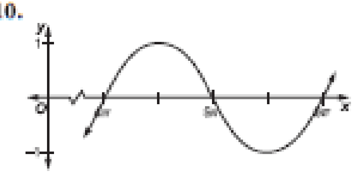
Determine whether each graph is y = sin x, y = cos x, or neither.

9.



$y = \cos x$

10.



$y = \sin x$

11. ***Meteorology*** The equation $y = 70.5 + 19.5 \sin\left[\frac{\pi}{6}(t - 4)\right]$ models the average monthly temperature for Phoenix, Arizona, in degrees Fahrenheit. In this equation, t denotes the number of months, with $t = 1$ representing January. What is the average monthly temperature for July? 90°F

6-6

NAME ______________ DATE ______________ PERIOD ________

Practice

Modeling Real-World Data with Sinusoidal Functions

1. ***Meteorology*** The average monthly temperatures in degrees Fahrenheit (°F) for Baltimore, Maryland, are given below.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
32°	35°	44°	53°	63°	73°	77°	76°	69°	57°	47°	37°

a. Find the amplitude of a sinusoidal function that models the monthly temperatures.
22.5°

b. Find the vertical shift of a sinusoidal function that models the monthly temperatures.
54.5°

c. What is the period of a sinusoidal function that models the monthly temperatures?
12 months

d. Write a sinusoidal function that models the monthly temperatures, using $t = 1$ to represent January.
Sample answer: $y = 22.5 \cos\left(\frac{\pi}{6}t + 2.62\right) + 54.5$

e. According to your model, what is the average temperature in July? How does this compare with the actual average?
Sample answer: 77°; the average temperature and the model are the same.

f. According to your model, what is the average temperature in December? How does this compare with the actual average?
Sample answer: 35°; the average temperature is 37°; the model is 2° less.

2. ***Boating*** A buoy, bobbing up and down in the water as waves move past it, moves from its highest point to its lowest point and back to its highest point every 10 seconds. The distance between its highest and lowest points is 3 feet.

a. What is the amplitude of a sinusoidal function that models the bobbing buoy? 1.5

b. What is the period of a sinusoidal function that models the bobbing buoy? 10 s

c. Write a sinusoidal function that models the bobbing buoy, using $t = 0$ at its highest point. Sample answer: $1.5 \cos\left(\frac{\pi}{5}t\right)$

d. According to your model, what is the height of the buoy at $t = 2$ seconds? about 0.46 ft

e. According to your model, what is the height of the buoy at $t = 6$ seconds? about −1.21 ft

6-5

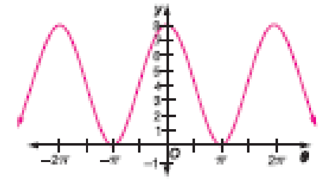
NAME ______________ DATE ______________ PERIOD ________

Practice

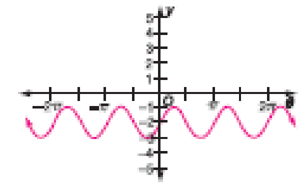
Translations of Sine and Cosine Functions

State the vertical shift and the equation of the midline for each function. Then graph each function.

1. $y = 4 \cos \theta + 4$
4 units up; $y = 4$

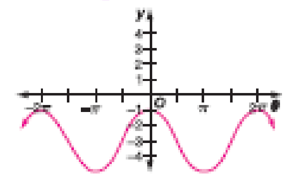


2. $y = \sin 2\theta - 2$
2 units down; $y = -2$

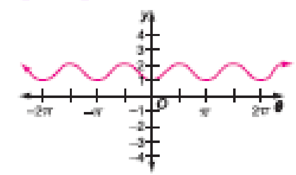


State the amplitude, period, phase shift, and vertical shift for each function. Then graph the function.

3. $y = 2 \sin\left(\theta + \frac{\pi}{2}\right) - 3$
2; 2π; $-\frac{\pi}{2}$; −3



4. $y = \frac{1}{2} \cos(2\theta - \pi) + 2$
$\frac{1}{2}$; π; $\frac{\pi}{2}$; 2



Write an equation of the specified function with each amplitude, period, phase shift, and vertical shift.

5. sine function: amplitude = 15, period = 4π, phase shift = $\frac{\pi}{2}$, vertical shift = −10
$y = \pm 15 \sin\left(\frac{\theta}{2} - \frac{\pi}{4}\right) - 10$

6. cosine function: amplitude = $\frac{2}{3}$, period = $\frac{\pi}{3}$, phase shift = $-\frac{\pi}{3}$, vertical shift = 5
$y = \pm \frac{2}{3} \cos(6\theta + 2\pi) + 5$

7. sine function: amplitude = 6, period = π, phase shift = 0, vertical shift = $-\frac{3}{2}$
$y = \pm 6 \sin 2\theta - \frac{3}{2}$