CHAPTER 6 TEST

For further assessment items, please use Nelson's Computerized Assessment Bank.

1. The table of values has been created for the function $y = \cos x$ after it has undergone a transformation. State what transformation has occurred to the graph of $y = \cos x$.

x	$-360°$	$-270°$	$-180°$	$0°$	$180°$	$270°$	$360°$
y	-0.5	0	0.5	1	0.5	0	-0.5

2. Determine the equation of the sine function whose graph has each of the following features.

a) An amplitude of 3.5, a period of 10°, an equation of the axis of $y = 4.5$, and a horizontal translation of 66°.

b) An amplitude of 8, a period of 1440°, an equation of the axis of $y = -9$, and a horizontal translation of $-270°$.

3. A hypnotist is swinging a pocket watch back and forth in front of a motion detector that has just been activated. The distance of the pocket watch from the detector in terms of time is described by the function $d(t) = 8 \sin(180t + 60°) + 20$, where t is the time in seconds and $d(t)$ is the distance in cm.

a) What is the closest distance that the pocket watch gets to the motion detector?

b) How long does it take the pocket watch to complete one full cycle of swinging back and forth?

c) What is the distance of the pocket watch from the motion detector at $t = 10.5$ s?

4. Determine each of the following rotations in degrees about the point (0, 0). Each rotation is greater than or equal to 0° and less than or equal to 90°.

a) The point (9.5, 0) is rotated about the point (0, 0), and the resulting point has an x-coordinate of 3.

b) The point $\left(\frac{2}{5}, 0\right)$ is rotated about the point (0, 0), and the resulting point has a y-coordinate of $\frac{1}{5}$.

c) At $t = 147.85$ min, what is the height above the ground of the tip of the second hand?

5. A clock is hanging on a wall. The length of the second hand is 22 cm, and the lowest that the tip of the second hand ever reaches above the ground is 304 cm.

a) What are the equation of the axis, amplitude, and period in minutes of the function that represents the tip of the second hand's height above the ground?

b) Determine the equation of the sinusoidal function that represents the tip of the second hand's height above the ground. Assume that at $t = 0$ min, the time is 5 p.m.

6. a) If a sinusoidal function has a period of 3°, how many cycles does it go through in 450°?

b) If a sinusoidal function goes through 15 cycles in 1080°, what is its period?

c) How many cycles does a sinusoidal function with a period of 20° go through between $x = -90°$ and $x = 90°$?

7. Each of the following sinusoidal functions has had its period, amplitude, or equation of the axis changed by a transformation. Determine which characteristic has been changed and state its value.

a) $y = \sin\left(\frac{4}{5}x\right)$ **b)** $y = 77\cos$ **c)** $y = \sin x - 2.75$

8. A TV camera is directly east of a circular race track. When a stock car is at its farthest point south, it is 3014 m west of the TV camera, and the closest it comes to the TV camera is 50 m. The time it takes the stock car to go from its farthest point south to its farthest point north is 20 s. Once the stock car reaches full speed, its distance west of the TV camera can be represented by a sinusoidal function.

a) What is the amplitude of the function, and what does it represent in this situation?

b) What is the period of the function, and what does it represent in this situation?

c) If at $t = 0$, the stock car is at its farthest point north, would it be easier to use the sine function or the cosine function to model this situation? Explain.

CHAPTER 6 TEST ANSWERS

1. The function $y = \cos x$ has been horizontally stretched by a factor of 3.

2. a) $f(x) = 3.5 \sin(36x - 66°) + 4.5$

b) $f(x) = 8 \sin(\frac{1}{4}x + 270°) - 9$

3. a) 12 cm

b) 2 s

c) 24 cm

4. a) 71.59°

b) 30°

5. a) equation of the axis: $d = 326$ cm; amplitude: 22 cm; period: 1 min

b) $d(t) = 22 \cos(360t) + 326$ or $d(t) = 22 \sin(360t + 90°) + 326$

c) 338.93 cm

6. a) 150

b) 72°

c) 9

7. a) period: 450°

b) amplitude: 77

c) equation of the axis: $y = -2.75$

8. a) 2964 m; the radius of the race track

b) 40 s; the amount of time it takes the stock car to complete 1 lap of the race track

c) the sine function; the sine function is halfway between its maximum and its minimum at $t = 0$, and the stock car is halfway between its maximum and minimum distance west of the TV camera when it's at its farthest point north