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**

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