

**Exercise 181**

Suppose that  $T = 50 + 10 \sin \left[ \frac{\pi}{12}(t - 8) \right]$  is a mathematical model of the temperature (in degrees Fahrenheit) at  $t$  hours after midnight on a certain day of the week.

- Determine the amplitude and period.
  - Find the temperature 7 hours after midnight.
  - At what time does  $T = 60^\circ$ ?
  - Sketch the graph of  $T$  over  $0 \leq T \leq 24$ .
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**Solution****Part (a)**

The amplitude is 10, the (positive) coefficient of the sine function. The period is

$$\frac{2\pi}{\frac{\pi}{12}} = 24,$$

the number of hours in a day.

**Part (b)**

Plug  $t = 7$  into the formula to find the temperature 7 hours after midnight.

$$T(7) = 50 + 10 \sin \left[ \frac{\pi}{12}(7 - 8) \right] \approx 47.4 \text{ }^\circ\text{F},$$

**Part (c)**

$T = 60^\circ$  when the sine function is  $+1$ , which occurs at

$$\frac{\pi}{12}(t - 8) = \frac{\pi}{2}$$

$$t - 8 = 6$$

$$t = 14$$

2 PM.

**Part (d)**

Below is a graph of  $T(t)$  versus  $t$ .

