1. A boat leaves the entrance to a harbor and travels 25 miles on a bearing of N 42° E. Then, the captain turns the boat 120° clockwise and travels 18 miles. How far is the boat from the harbor?

![Diagram of boat's journey]

2. Sarah walks due North for 2.3 miles, then turns 37° clockwise and walks for 3.5 miles. Afterwards, she turns 143° counterclockwise, and walks 1.5 miles. How far is she from where she started?
3. Consider the following function:

\[ y = 3 \sin(2x) - 1 \]

(a) Sketch the graph of this function:

(b) What is the amplitude?

(c) What is the period?

(d) What is the frequency?
4. The following circle has radius 1 and is centered at the origin:

What is \( \tan \theta \)?

5. The following circle has radius 1 and is centered at the origin:

If the \( y \)-coordinate of the point \( P \) is 0.5, what is \( \cos \theta \)?

6. If \( \cos \theta = 0.3 \), what are the possible values for \( \sin \theta \)?

7. If \( \sin \theta = 0.5 \), what are the possible values for \( \theta \)?
8. Suppose that the following function is used to model the outside temperature on a certain
day of the week:

\[ T(t) = 50 + 10 \sin \left( \frac{\pi}{12} t - \frac{2\pi}{3} \right) \]

where \( t \) is the number of hours past midnight, the temperature is measured in Fahrenheit,
and radians are used to evaluate sine.

(a) What is the temperature at 8am?

(b) At what time(s) does the temperature equal 45 °F?

(c) Find the minimum temperature. At what time(s) does it occur?

(d) Find the maximum temperature. At what time(s) does it occur?
9. Little Joey is riding a ferris wheel at an amusement park:

The wheel has a radius of 40 feet, and the center of the wheel sits 45 feet off the ground. Let \( h \) represent Joey’s height above the ground, and let \( \theta \) be the measure of the angle shown in the picture.

(a) Determine the values for \( h \) for \( \theta = 0^\circ, \theta = 90^\circ, \theta = 180^\circ, \) and \( \theta = 270^\circ \).

(b) Sketch a graph of \( h \) as a function of \( \theta \).

(c) Find a formula for \( h \) as a function of \( \theta \). Make sure your formula agrees with your answers to parts (a) and (b).
In problems 10 through 12, use the following trig identities:

\[
\begin{align*}
\cos^2 \theta + \sin^2 \theta &= 1 \\
\sin^2 \theta &= \frac{1}{2} - \frac{1}{2} \cos 2\theta \\
\sec^2 \theta - \tan^2 \theta &= 1 \\
\cos^2 \theta &= \frac{1}{2} + \frac{1}{2} \cos 2\theta \\
\csc^2 \theta - \cot^2 \theta &= 1 \\
\sin 2\theta &= 2 \sin \theta \cos \theta
\end{align*}
\]

10. Show that \((\sin x + \cos x)^2 = 1 + \sin 2x\).

11. Show that \(\sin^2 x + \cos 2x = \cos^2 x\).

12. Show that \(\tan x + \cot x = (\sec x)(\csc x)\).