1. John and Sally begin at the same location. John walks 5 miles at a bearing of N $47^\circ$ E. Sally walks $x$ miles East followed by $y$ miles North, and ends at the same place as John. Determine the values of $x$ and $y$. 

2. Ben walks due North for 2.3 miles. Then, he turns $54^\circ$ degrees clockwise and walks for 1.8 miles. How far is he from where he started? (*Hint:* First determine how far North and East he has traveled; then use the Pythagorean theorem.)
3. Consider the following function:
\[ y = 2 \cos(3x) \]

(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:

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

5. If $\sin \theta = -0.4$, what are the possible values for $\cos \theta$?

6. If $\cos \theta = -0.8$, what are the possible values for $\theta$?

7. If $\tan \theta = 0.6$, what are the possible values for $\theta$?
8. For a triangle

\[ \begin{array}{c}
\[c\] \quad B \\
\[a\] \\
\[A\] \quad B \\
\[a\] \\
\[b\] \\
\[C\] \quad C
\end{array} \]

with sides \(a\), \(b\), and \(c\) and angles opposite those sides \(A\), \(B\), and \(C\), the Law of Sines states that:

\[
\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}
\]

And the Law of Cosines states that:

\[
a^2 = b^2 + c^2 - 2bc \cos A
\]

Use these laws to answer the following questions:

(a) In the above triangle, if \(B = 54^\circ\), \(C = 82^\circ\), and \(a = 16\), what is \(b\)?

(b) In the above triangle, if \(A = 22^\circ\), \(b = 6\), and \(c = 15\), what is \(a\)?
9. A triangular piece of land in a park is to be made into a flower bed. Stakes have previously been driven into the ground at the vertices of the triangle, which we will call A, B, and C. However, the gardener can only locate two of the stakes, A and B. The distance from A to B is 6.2 meters and the gardener recalls that the angle at A is 60° and that the side opposite the 60° angle was supposed to be 5.5 meters long. The gardener uses the law of sines and determines that there is more than one possibility for the distance from A to the third stake. What are the possibilities for the distance between stakes A and C?

10. Two people come to a fork in a road. One walks down one straight branch at 3 mph, and the other walks down the other straight branch at 3.5 mph. If the angle between the two roads is 30°, find the distance between the two people after one hour.
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 \( \frac{\cos \theta \sec \theta}{\cot \theta} = \tan \theta \).

11. Show that \( \frac{\sin \theta}{\csc \theta} + \frac{\cos \theta}{\sec \theta} = 1 \).

12. Show that \( \sin 2\theta = \frac{2 \cot \theta}{1 + \cot^2 \theta} \).