Goals:
1. To find the length of a missing side of a right triangle.
2. To find the supplement and complement of a given angle.
3. To find a coterminal angle.
4. To set up a function involving the Pythagorean Theorem.
Ex. A TV has an aspect ratio of 16 inches by 9 inches and a 52 inch diagonal. Find the dimensions.

\[ 16^2 + 9^2 = 52^2 \]

\[ \frac{16}{9} x = \frac{16}{9} y \]

\[ \frac{256}{81} y^2 + y^2 = 52^2 \]

\[ \frac{256}{81} y^2 + \frac{81}{81} y^2 = 52^2 \]

\[ \frac{337}{81} y^2 = 2704 \]

\[ y^2 = \frac{2704 \cdot 81}{337} \]

\[ y \approx 25.5 \text{ inches} \]

\[ x = \frac{16}{9} y \]

\[ x = \frac{16}{9} (25.5) = 45.3 \text{ inches} \]
Ex. A bridge that is 5000 feet long expands 1 foot in the summer heat. For simplicity, assume the bridge bows up in the middle. Use the Pythagorean Theorem to estimate the height of the bridge midway across it.

![Diagram showing the bridge expansion and the use of the Pythagorean Theorem to calculate the height.]

\[ h^2 + x^2 = (2500.5)^2 \]

\[ h^2 = (2500.5^2 - x^2) \]

\[ h \approx 50 \text{ ft} \]

**Definition:** An angle is formed by rotating a ray about its endpoint.

- **Initial Side:** The original ray before rotation.
- **Terminal Side:** The ray after rotation.

1. 1 degree is \( \frac{1}{360} \) of a full rotation.
2. Coterminal angles share the same \( 20^\circ, 120^\circ, -200^\circ \).
(3) Coterminel angles share the same terminal side.

Ex. Find a coterminel angle for \(790^\circ\) that is between \(0^\circ\) and \(360^\circ\).

\[
790^\circ - 360^\circ - 360^\circ = 70^\circ
\]

Ex. Find the exact length of the missing side. (in terms of \(a\)).

\[
h^2 + a^2 = (2a)^2
\]
\[
h^2 + a^2 = 4a^2
\]
\[
\sqrt{h^2} = \sqrt{3a^2}
\]
\[
h = \sqrt{3a^2}
\]
\[
= a\sqrt{3}
\]

Note: In a \(30^\circ - 60^\circ - 90^\circ\) Triangle, the sides are...

\[
\begin{align*}
a \sqrt{3} & \quad 2a \\
a & \quad a \sqrt{3}
\end{align*}
\]
Two ships leave the same port at the same time, one is traveling north at 10 mph, and the other goes east at 12 mph. Write a function that gives the distance between the ships after \( t \) hours.

\[
D = Rt
\]

\[
f(x) = \sqrt{10^2 + 12^2} \times x
\]

\[
f(x) = 2x \sqrt{61} \text{ (in miles)}
\]
complementary add to 90°
supplementary " " 180°