Objective: In this lesson, you will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Right Triangles and the Pythagorean Theorem

Watch the video to see the Pythagorean Theorem applied to a real-world context involving a right triangle.

How long was the rope in the video? ____________________________

Example

Bryan has a square parcel of land that is 120 yards long and 120 yards wide. The land is planted with Bermuda grass and surrounded by a fence. So that his cattle will not ruin the grass, Bryan decides to split the field into two halves and rotate his cattle on the land every 30 days. He plans to build a fence diagonally across the field. How many feet of fencing will Bryan need to split the parcel of land in half? Round your answer to the nearest yard.

___________________________
**Inverse Trigonometric Functions**

In a right triangle, when you know any two sides, you can use the inverse trig functions to find all the angles. In the figure below we are given the three sides. We can find the angles $A, B, C$

Using $\text{acrsin or } \sin^{-1}$

\[
\sin C = \frac{6}{10} \text{ or } 0.6 \\
C = \sin^{-1}(0.6) \\
\text{On the calculator type } 0.6, \text{ } 2^{\text{nd}}, \text{ } \sin = \text{__________________________}
\]
Using \text{acrcos or cos}^{-1} \\
\cos C = \frac{8}{10} \text{ or } 0.8 \\
C = \cos^{-1}(0.8) \\
On the calculator type 0.8, \text{ 2}^{\text{nd}}, \cos = \underline{\quad} \\

Using \text{acrtan or tan}^{-1} \\
\tan C = \frac{6}{8} \text{ or } 0.75 \\
C = \tan^{-1}(0.75) \\
On the calculator type 0.75, \text{ 2}^{\text{nd}}, \tan = \underline{\quad} \\

Suppose that \( m \angle B \) is not given, but you do know the side lengths of the triangle.

\[
\sin B = \frac{64.28}{100} = .6428 \\
\sin^{-1} (0.6428) = \underline{\quad}
\]
Example

If $\cos A = \frac{342}{1000}$, then what is $m \angle A$ to the nearest degree?

Example

Jeremy finds a set of plans to build a model airplane. Most, but not all, of the lengths given in the plans are direct measurements. According to the plans, each horizontal stabilizer of the tail wing is made from a right triangle. The length of the leg of the triangle that touches the plane is $AB = 8$ inches, and $\cos A = \frac{8}{17}$. To find the number of inches each horizontal stabilizer extends from the plane, find $BC$. 

![Diagram of a right triangle with labels and measurements for example problems.]
Example

Marilyn is having shelves installed to create a corner pantry. The length of one wall is 21 inches and the length of the other wall is 25 inches. The contractor who is making the shelves, which are shaped like right triangles, needs to know the measure of the angle opposite the short side of the pantry, \( \angle A \). What is the measure of that angle? Round your answer to the nearest degree.

\[
\sin 50.19 = \frac{12}{AB} \\
AB \times \sin 50.19 = \frac{12}{AB} \times AB \\
AB \times \sin 50.19 = 12 \\
AB = \frac{12}{\sin 50.19} \\
AB = \frac{12}{0.7682} \\
AB = \text{___________}
\]

\[m \angle A = \text{______________}\]
Find the missing side. Round to the nearest tenth.

1) \[ \sqrt{6^2 + x^2} = x \]

2) \[ \sqrt{6^2 + x^2} = x \]

3) \[ \sqrt{12^2 + x^2} = x \]

4) \[ \sqrt{12^2 + x^2} = x \]

5) \[ \sqrt{14^2 + x^2} = x \]

6) \[ \sqrt{x^2 + 14^2} = x \]

7) \[ \sqrt{x^2 + 16^2} = x \]

8) \[ \sqrt{x^2 + 16^2} = x \]
Critical thinking question:

17) Write a new problem that is similar to the others on this worksheet. Solve the question you wrote.
Solving Right Triangles

Find the missing side. Round to the nearest tenth.

1) $\tan 72^\circ \times = 19.4$

2) $\tan 73^\circ \times = 1.8$

3) $\tan 24^\circ \times = 5.3$

4) $\tan 37^\circ \times = 9.0$

5) $\tan 49^\circ \times = 12.2$

6) $\tan 51^\circ \times = 18.0$

7) $\tan 83^\circ \times = 18.0$

8) $\tan 15^\circ \times = 61.8$
Critical thinking question:

17) Write a new problem that is similar to the others on this worksheet. Solve the question you wrote.

Many answers.