LESSON 12.2

Solving Right Triangles

LEARNING GOALS:

1) Solve right triangles using inverse trigonometric functions.

2) Solve real-world problems using trigonometry.

Common Core State Standards
HSG-SRT.D.9, HSG-SRT.D.10, HSG-SRT.D.11

LESSON 12.2 - Solving Right Triangles

- Every right triangle has one right angle, two acute angles, one hypotenuse, and two legs.
- To **SOLVE A RIGHT TRIANGLE** means to determine the measures of all six parts.
- You can solve a right triangle if you know either of the following:
  1) One side length and one acute angle measure
  2) Two side lengths.

- We learned yesterday that we can use the side lengths of a right triangle to find trigonometric ratios for the acute angles of the triangle.
- Today we will learn that once you know the sine, cosine, or tangent of an acute angle, you can use a calculator to find the measure of the angle.

In general, for the acute angle A:

- **if $\sin A = x$, then $\sin^{-1} x = m\angle A$**
- **if $\cos A = y$, then $\cos^{-1} y = m\angle A$**
- **if $\tan A = z$, then $\tan^{-1} z = m\angle A$**

A is an acute angle. Use a calculator to approximate the measure of A to the nearest tenth.

A) $\sin A = 0.35$, so... $m\angle A = 20.5^\circ$

B) $\cos A = 0.64$, so... $m\angle A = 50.2^\circ$

C) $\tan A = 2.07$, so... $m\angle A = 64.2^\circ$

Solve the right triangle. Round decimals to the nearest tenth.

$\tan A = \frac{3}{2}$

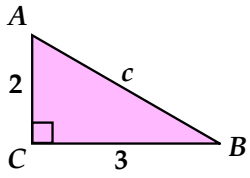
$\tan A = 1.5$

$m\angle A = \tan^{-1}(1.5)$

$m\angle A = 56.3^\circ$

$m\angle B = 90 - 56.3^\circ$

$m\angle B = 33.7^\circ$



$2^2 + 3^2 = c^2$

$4 + 9 = c^2$

$13 = c^2$

$c = 3.6$

Solve the right triangle. Round decimals to the nearest tenth.

$\cos A = \frac{8}{9.2}$

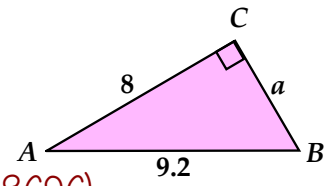
$\cos A = 0.8696$

$m\angle A = \cos^{-1}(0.8696)$

$m\angle A = 29.6^\circ$

$m\angle B = 90 - 29.6^\circ$

$m\angle B = 60.4^\circ$



$a^2 + 8^2 = 9.2^2$

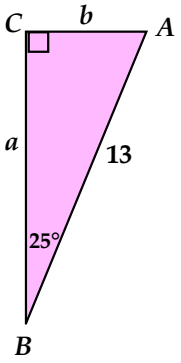
$a^2 + 64 = 84.64$

$a^2 = 20.64$

$a = 4.5$

12.2 NOTES - Solving Right Triangles

Solve the right triangle. Round decimals to the nearest tenth.



$\cos 25° = \frac{a}{13}$

$a = 11.8$

$\sin 25° = \frac{b}{13}$

$b = 5.5$

$m\angle A = 90 - 25°$

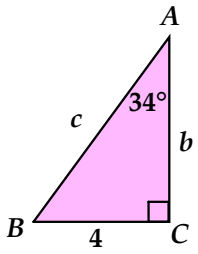
$m\angle A = 65°$

Solve the right triangle. Round decimals to the nearest tenth.

$\tan 34° = \frac{4}{b}$

$b \cdot \tan 34° = 4$

$b = 5.9$



$4^2 + 5.9^2 = c^2$

$16 + 35.2 = c^2$

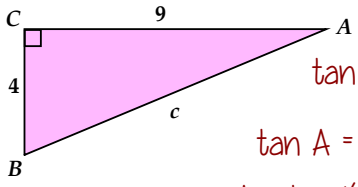
$51.2 = c^2$

$c = 7.2$

$m\angle B = 90 - 34°$

$m\angle B = 56°$

Solve the right triangle. Round decimals to the nearest tenth.



$\tan A = \frac{4}{9}$

$\tan A = 0.4444$

$m\angle A = \tan^{-1}(0.4444)$

$m\angle A = 24.0°$

$m\angle B = 90 - 24°$

$m\angle B = 66°$

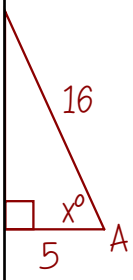
$4^2 + 9^2 = c^2$

$16 + 81 = c^2$

$97 = c^2$

$c = 9.8$

You lean a 16 foot ladder against a wall so that the base of the ladder is 5 feet away from the wall. What is the angle created by the floor and the ladder?



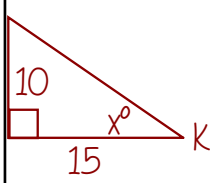
$\cos A = \frac{5}{16}$

$\cos A = 0.3125$

$m\angle A = \cos^{-1}(0.3125)$

$m\angle A = 71.8°$

Kobe is standing at the free throw line, which is 15 feet in front of the backboard of the basketball hoop. The hoop is 10 feet off the ground. Help Kobe figure out what the angle of elevation is from the floor to the backboard.



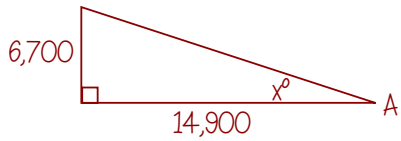
$\tan K = \frac{10}{15}$

$\tan K = 0.6667$

$m\angle K = \tan^{-1}(0.6667)$

$m\angle K = 33.7°$

Joe is hiking up a mountain. He starts at a trail head whose elevation is 5,600 feet. The trail ends near the summit of the mountain at 12,300 ft. The horizontal distance Joe covers on his hike is about 14,900 feet. What is the angle of elevation from the trail head to the summit? Draw a sketch and solve.



$\tan A = \frac{6,700}{14,900}$

$\tan A = 0.4497$

$m\angle A = \tan^{-1}(0.4497)$

$m\angle A = 24.2°$

HOMEWORK:

12.2 Worksheet - Solving Right Triangles