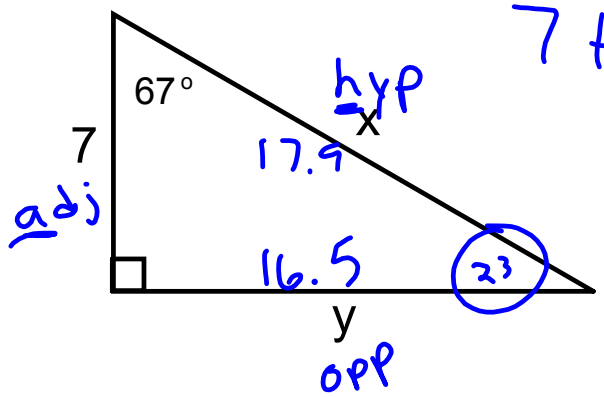
Warm-Up

Find x and y.



$\tan 67 = \frac{y}{7}$

$7 \tan 67 = y$

$16.5 \approx y$

$\cos 67 = \frac{7}{x}$

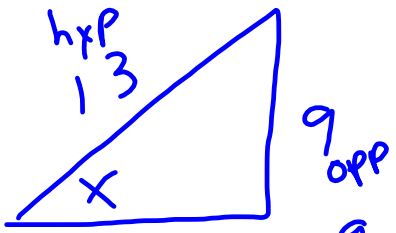
$x \cos 67 = 7$

$x = \frac{7}{\cos 67}$

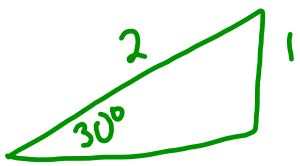
$x \approx 17.9$

12.1 Trigonometric Ratios Day 2 - Inverse Trigonometric Functions

a. Given a right triangle, I can define the sine, cosine, and tangent ratios from an unknown angle.
b. I can use Trigonometric Ratios to solve for unknown sides and angles in a right triangle.



$\sin x = \frac{9}{13}$



You can use your calculator to find acute angle measurements in right triangles when you know the measure of at least two of its sides. The operations you will use are called **inverse trigonometric functions**. They are designated by $\sin^{-1}$, $\cos^{-1}$, and $\tan^{-1}$. To access them, press the 2nd key on your calculator, then the trig function you want to use.

Examples:

1. $X = \sin^{-1}.3256$ $X \approx 19.0°$

2. $U = \cos^{-1}\frac{4}{9}$ $U \approx 63.6°$

3. $S = \tan^{-1}\frac{8}{6}$ $S \approx 53.1°$

You try! Solve for the angle using the inverse trigonometric functions.

4. sin X = .9231

$\sin^{-1}(\sin X) = \sin^{-1}.9231$

$X = \sin^{-1}.9231$

$X \approx 67.4°$

5. $\cos X = \frac{3}{8}$

$X = \cos^{-1}\left(\frac{3}{8}\right)$

$X \approx 68.0°$

6. $\tan X = \frac{8}{5}$

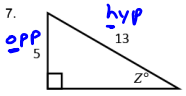
$X = \tan^{-1}\left(\frac{8}{5}\right)$

$X \approx 58.0°$

Solve for each variable.

SOH-CAH-TOA

7.



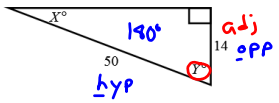
$\sin Z = \frac{5}{13}$

$Z = \sin^{-1}\left(\frac{5}{13}\right)$

$Z \approx 22.6$

Solve for each variable.

8.



$\sin X = \frac{14}{50}$

$X = \sin^{-1}\left(\frac{14}{50}\right)$

$X \approx 16.3$

$X + Y = 90$

$Y = 90 - 16.3$

$Y = 73.7$

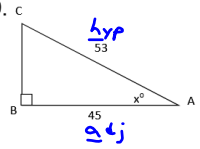
$\cos Y = \frac{14}{50}$

$Y = \cos^{-1}\left(\frac{14}{50}\right)$

$Y \approx 73.7$

You Try! Find the value of x in each right triangle. If necessary, round to the nearest tenth.

9.

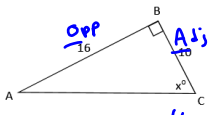


$\cos X = \frac{45}{53}$

$X = \cos^{-1}\left(\frac{45}{53}\right)$

$X \approx 31.9$

10.



$\tan X = \frac{16}{10}$

$X = \tan^{-1}\left(\frac{16}{10}\right)$

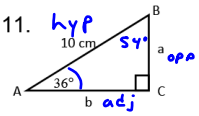
$X \approx 58.0$

Solving Right Triangles

"Solve the right triangle" means to find all missing parts on the right triangle, be it sides or angles. You will use a combination of trigonometric functions and inverse trigonometric functions. Don't forget that the **two acute angles** of a right triangle must be **complementary**.

Solve the right triangle by finding all the missing angles and side lengths.

11.



$m\angle B = 90 - 36 = \boxed{54^\circ}$

$\sin 36 = \frac{a}{10}$

$10 \cdot \sin 36 = a$

$\boxed{5.9 \approx a}$

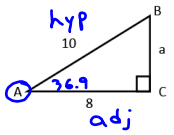
$\cos 36 = \frac{b}{10}$

$10 \cdot \cos 36 = b$

$\boxed{8.1 \approx b}$

Solve the right triangle by finding all the missing angles and side lengths.

12.



$m\angle B = 90 - 36.9 = \boxed{53.1°}$

$\cos A = \frac{8}{10}$

$A = \cos^{-1}\left(\frac{8}{10}\right)$

$\boxed{A \approx 36.9°}$

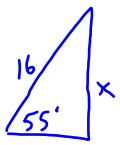
$a^2 + 8^2 = 10^2$

$a^2 + 64 = 100$

$a^2 = 36$

$\boxed{a = 6}$

13. A 16-foot ladder is propped against the side of a building. The angle it forms with the ground measures 55°. How far up the side of the building does the ladder reach?

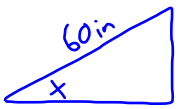


$\sin 55 = \frac{x}{16}$

$16 \sin 55 = x$ $\boxed{13.1 \text{ ft}}$

$13.1 \approx x$

14. The walking surface of a treadmill is 5 feet long. A trainer raises the end of the treadmill 6 inches to create an incline. Approximately what angle does the incline of the treadmill form with the ground? *convert to inches



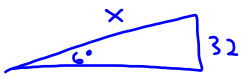
$\sin x = \frac{6}{60}$

$x = \sin^{-1}\left(\frac{6}{60}\right)$

$x \approx 5.7$

5.7°

15. A wheelchair ramp has an incline which forms a $6°$ angle with the ground and has a height of 32 centimeters. Find the length of the ramp to the nearest tenth centimeter.



$\sin 6 = \frac{32}{x}$

$x \sin 6 = 32$

$x = \frac{32}{\sin 6}$

$x \approx 306.1$

306.1cm

Assignment: 12.1 Day 3 Inverse Trigonometric Functions Practice Sheet