

Geometry CC - Unit 8
Lesson 7: Missing Angle w/ Trig
M2 L27

Homework: HW Handout 8.7

HW Answers 8.6

2) In right triangle ABC, Angle B is the right angle, BC = 22, $\angle C = 11^\circ$. Find the length of AB to the nearest tenth.

$\tan 11 = \frac{x}{22}$
 $x = 22 \tan 11$
 $x \approx 5.13$

4) While flying a kite, Kim lets out 322 feet of string. When the string is secured to the ground, it makes an angle of 38° with the ground. To the nearest tenth of a foot, what is the height of the kite above the ground?

$\sin 38 = \frac{x}{322}$
 $x = 322 \sin 38$
 $x \approx 198.2$

6) A ladder is leaning against a structure. The ladder reaches 12 feet up the structure. The angle the ladder makes with the ground is 38° . Find the length of the ladder to the nearest tenth.

$\sin 38 = \frac{12}{x}$
 $12 = x \sin 38$
 $x = \frac{12}{\sin 38}$
 $x \approx 19.5$

8) A wire reaches from the top of a pole to a stake in the ground. The wire is 23 feet long. The wire makes an angle of 54° with the ground. Find to the nearest tenth of a foot the length from the stake in the ground to the foot of the pole.

$\cos 54 = \frac{x}{23}$
 $x = 23 \cos 54$
 $x \approx 13.5$

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Inverse Trig Ratios **FINDING MISSING ANGLES**

If you know the sin, cosine, or tangent ratio of an angle, you can use the inverse function (\sin^{-1} , \cos^{-1} , \tan^{-1}) to find the measure of the angle.

- 1) Label the triangle with the given information
- 2) Label the side you are looking for with x
- 3) Circle the angle
- 4) Label the sides: Hypotenuse, Opposite, and Adjacent
- 5) Write S, O, A, C, T
- 6) Identify the side that is not labeled - cross it out on S, O, A, C, T
- 7) Set up your proportion using the trig function that has not been crossed out.
- 8) Use the \sin^{-1} , \cos^{-1} , and \tan^{-1} functions on the calculator.

Examples: Find the value of x. Round to the nearest tenth.

1. $\sin x = \frac{15}{24}$
 $\sin^{-1}\left(\frac{15}{24}\right) \approx 38.7^\circ$

2. $\cos x = \frac{8}{11}$
 $\cos^{-1}\left(\frac{8}{11}\right) \approx 43.3^\circ$

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3. $\tan x = \frac{20}{37}$
 $\tan^{-1}\left(\frac{20}{37}\right) \approx 28.4^\circ$

4. $\cos x = \frac{18}{23}$
 $\cos^{-1}\left(\frac{18}{23}\right) \approx 38.5^\circ$

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Practice Questions

1) If the length of a rectangle is 8 and its width is 6, find, correct to the nearest degree, the measure of the angle a diagonal makes with the longer side.

$\tan x = \frac{6}{8}$
 $\tan^{-1}\left(\frac{6}{8}\right) \approx 37^\circ$

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2) A 22-foot ladder that is leaning against a wall reaches a point that is 18 feet above the ground. Find to the nearest degree the measure of the angle that the ladder makes with the ground.

$\sin x = \frac{18}{22}$
 $\sin^{-1}\left(\frac{18}{22}\right) \approx 55^\circ$

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3) When using our calculator to solve a trigonometric proportion, what is the difference between solving for a missing side and solving for a missing angle?

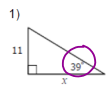
For both we set up a trig equation. To find a side, the unknown is the ratio. To solve, set up a proportion and use the sin, cos or tan keys.

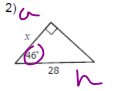
To find an angle, the unknown is written with sin, cos or tan. To solve use \sin^{-1} , \cos^{-1} or \tan^{-1} .

For both be sure to label the sides in relation to the given \angle (opp, adj & hyp)


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
Review: Finding Sides & Angles
 Directions: Find the value of x . Round to the nearest tenth.

1)  $\tan 39 = \frac{11}{x}$
 $x \tan 39 = 11$
 $x = \frac{11}{\tan 39}$
 $x \approx 13.6$


2)  $\cos 46 = \frac{28}{x}$
 $x \cos 46 = 28$
 $x = \frac{28}{\cos 46}$
 $x \approx 19.5$

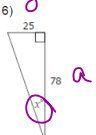
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3)  $\sin 51 = \frac{8}{x}$
 $x \sin 51 = 8$
 $x = \frac{8}{\sin 51}$
 $x \approx 10.1$


4)  $\sin 24 = \frac{x}{31}$
 $x = 31 \sin 24$
 $x \approx 12.6$


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5)  $\cos x = \frac{14}{22}$
 $x = \cos^{-1}\left(\frac{14}{22}\right) \approx 50.5^\circ$

6)  $\tan x = \frac{25}{78}$
 $x = \tan^{-1}\left(\frac{25}{78}\right) \approx 17.9^\circ$

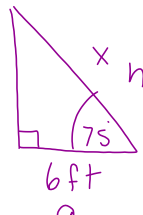
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7)  $\cos x = \frac{31}{36}$
 $x = \cos^{-1}\left(\frac{31}{36}\right) \approx 31.1^\circ$

8)  $\tan x = \frac{10}{19}$
 $x = \tan^{-1}\left(\frac{10}{19}\right) \approx 27.1^\circ$

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9) A ladder leaning against a wall makes an angle of 75° with the ground. If the foot of the ladder is 6 feet from the base of the wall, what is the length of the ladder?



$\cos 75 = \frac{6}{x}$
 $x \cos 75 = 6$
 $x = \frac{6}{\cos 75}$
 $x \approx 23.2 \text{ ft}$

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10) Jaden is flying a kite and lets ^{out} 275 feet of string. If the kite is 150 feet above ground and assuming the string is straight, what angle does the string make with the ground?



$\sin x = \frac{150}{275}$
 $x = \sin^{-1}\left(\frac{150}{275}\right) \approx 33.1^\circ$

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