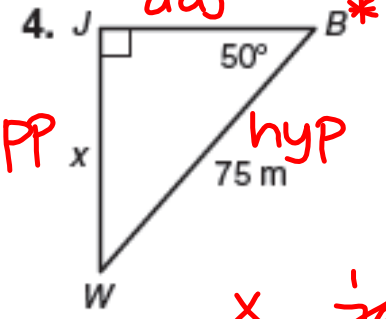
Starter

Use the sine ratio or the inverse sine to solve for x in both right triangles below - this will help you get ready for your quiz on the sine ratio.

Sine - missing side length

Inverse Sine - missing angle measure

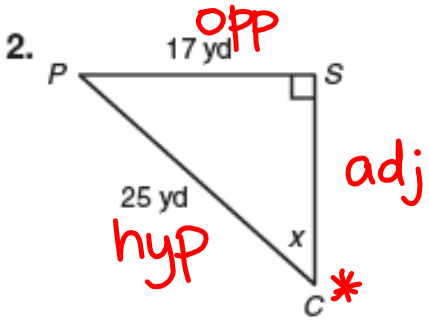
4. 

adj, opp, hyp, *

$75 \cdot \sin 50 = \frac{x}{75} \cdot 75$

$75 \cdot \sin 50 = x$

$57.45 = x$ m

2. 

opp, adj, hyp, *

$\sin x = \frac{17}{25}$

$\sin^{-1}(\sin x) = \sin^{-1}\left(\frac{17}{25}\right)$

$x = \sin^{-1}\left(\frac{17}{25}\right)$

8.4 The Cosine Ratio

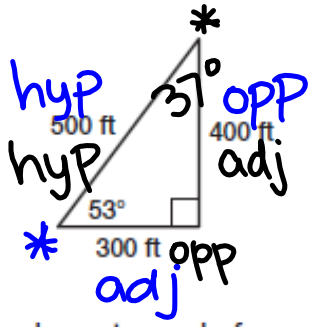
Cosine Ratio, Secant Ratio, and Inverse Cosine

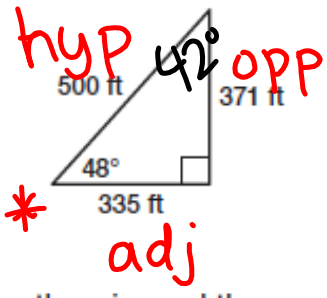
PG.605-606 IN YOUR BOOK

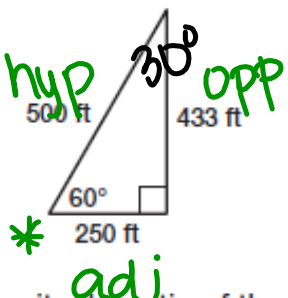
A "guy wire" is used to provide stability to tall structures like radio towers. Guy wires are attached near the top of a tower and are attached to the ground.

A guy wire and its tower form a right triangle. It is important that all guy wires form congruent triangles so that the tension on each wire is the same.

1. Each triangle shown represents the triangle formed by a tower and guy wire. The angle formed by the wire and the ground is given in each triangle.







For each acute angle formed by the wire and the ground, write the ratio of the length of the side adjacent to the angle to the length of the hypotenuse. Write your answers as decimals rounded to the nearest hundredth if necessary.

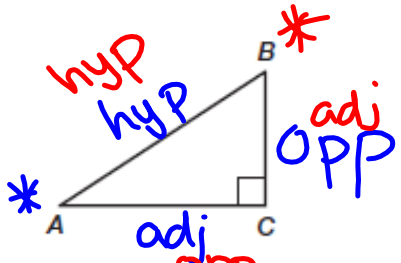
$\cos 53 = \frac{300}{500} \approx 0.6$ $\cos 60 = \frac{250}{500} \approx 0.5$

$\cos 48 = \frac{335}{500} \approx 0.67$

Sep 14-9:16 AM

PG.606 IN YOUR BOOK

The **cosine (cos)** of an acute angle in a right triangle is the ratio of the length of the side that is adjacent to the angle to the length of the hypotenuse. The expression "cos A" means "the cosine of $\angle A$."



2. Complete the ratio to represent the cosine of $\angle A$.

$$\cos A = \frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}} = \frac{AC}{AB}$$

$\cos B = \frac{BC}{AB}$

PG.607 IN YOUR BOOK

3. For each triangle in Question 1, calculate the cosine value of the angle made by the guy wire and the ground. Then calculate the cosine value of the other acute angle. Round your answers to the nearest hundredth if necessary.

$\cos 53 \approx 0.6$

$\cos 48 \approx 0.67$

$\cos 60 = 0.5$

$\cos 37 = \frac{400}{500} = 0.8$

$\cos 42 = \frac{371}{500} \approx 0.7$

$\cos 30 = \frac{433}{500} \approx 0.87$

4. What do the cosine values of the angles in Question 3 all have in common?

All are less than 1.

5. Is the cosine value of every acute angle less than 1? Explain your reasoning.

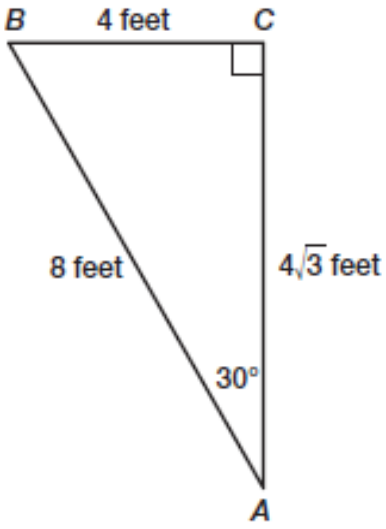
Since the hypotenuse is the denominator of the cosine ratio, and the hypotenuse is the longest side in a right triangle, the cosine ratio will always be less than 1.

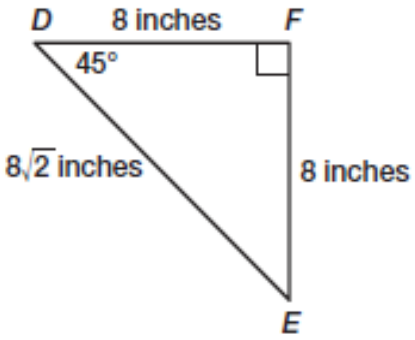
6. What happens to the cosine value of an angle as the measure of the angle increases?

The cosine value gets smaller as the angle measure increases

PG.607 IN YOUR BOOK

7. Use the right triangles shown to calculate the values of cos 30°, cos 45°, and cos 60°. Show all your work.





PG.608 IN YOUR BOOK

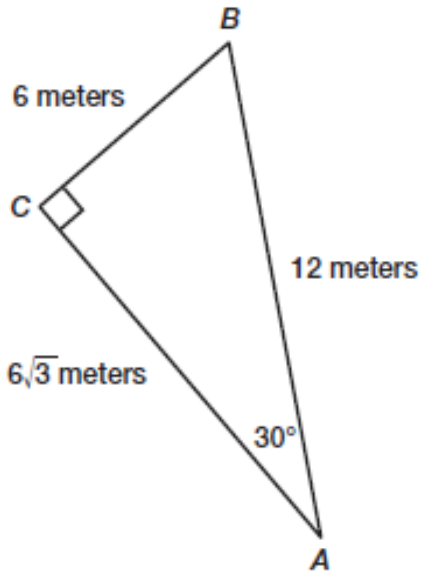
8. A guy wire is 600 feet long and forms a 55° angle with the ground. First, draw a diagram of this situation. Then, calculate the number of feet from the tower's base to where the wire is attached to the ground.

Finish #9 on pg.608 for **homework**

Nov 18-8:54 AM

PG.609 IN YOUR BOOK

10. For the triangle shown, calculate the values of sin 30°, cos 30°, and tan 30°.



11. Calculate the value of $\frac{\sin 30^\circ}{\cos 30^\circ}$.

12. What do you notice about the value of $\frac{\sin 30^\circ}{\cos 30^\circ}$?

13. Do you think that the relationship between the sine, cosine, and tangent values of an angle is true for any angle? Explain your reasoning.

Dec 1-8:48 AM

SKIP problem 2 on pg.610-611
The below is on pg.612

The **inverse cosine** (or arc cosine) of x is defined as the measure of an acute angle whose cosine is x. If you know the length of any two sides of a right triangle, it is possible to compute the measure of either acute angle by using the inverse cosine, or $\cos^{-1}$ button on a graphing calculator.

$\cos^{-1}$

In right triangle ABC, if $\cos A = x$, then $\cos^{-1} x = m\angle A$.

1. In right triangle ABC, if $\cos A = \frac{2}{7}$, calculate $\cos^{-1}\left(\frac{2}{7}\right)$ to determine $m\angle A$.

$\cos A = \frac{2}{7}$

$\cos^{-1}(\cos A) = \cos^{-1}\left(\frac{2}{7}\right)$

$A = \cos^{-1}(2/7) \approx 73.4°$

$m\angle A = 73.4°$

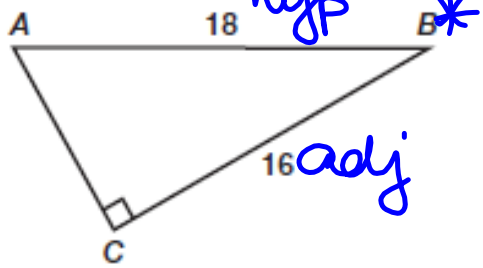
2. Determine the ratio for $\cos B$, and then use $\cos^{-1}(\cos B)$ to calculate $m\angle B$.

$\cos B = \frac{16}{18}$

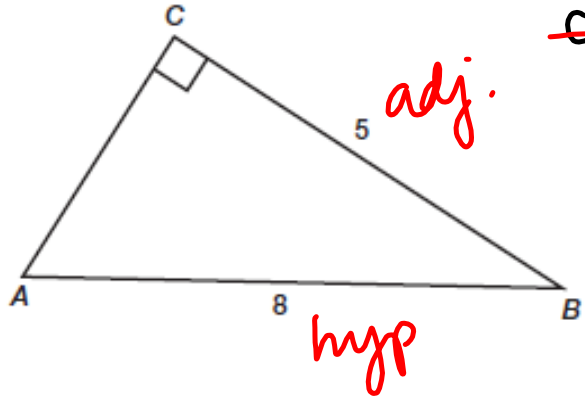
$\cos^{-1}(\cos B) = \cos^{-1}\left(\frac{16}{18}\right)$

$B = \cos^{-1}\left(\frac{16}{18}\right)$

$B \approx 27.3°$



3. Calculate $m\angle B$.



$\cos B = \frac{5}{8}$

$\cos^{-1}(\cos B) = \cos^{-1}\left(\frac{5}{8}\right)$

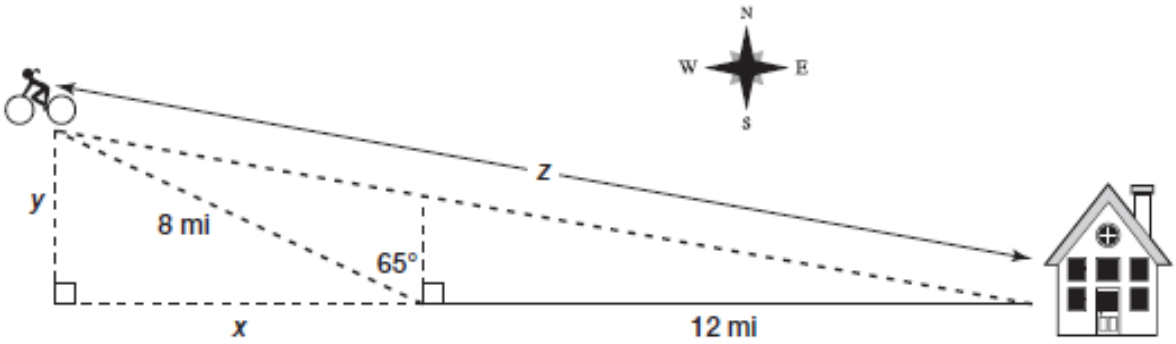
$B = \cos^{-1}(5/8)$

$B \approx 51.3°$

* $\cos^{-1}(5/8) \approx 51.3°$

Finish pg.613 for **homework**.
Below is on pg.614

5. Diane is training for a charity bicycle marathon. She leaves her house at noon and heads due west, biking at an average rate of 4 miles per hour. At 3 PM she changes course to N 65°W as shown. Determine the bike's distance from Diane's home at 5 PM.



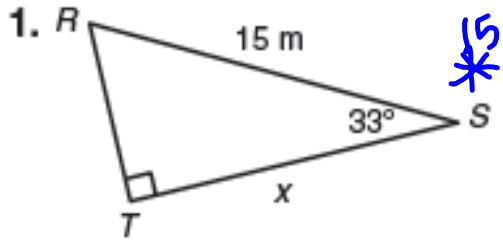
Nov 19-2:51 PM

Not in your book, copy the following into your notes!

Use the cosine ratio, ~~the secant ratio~~, or the inverse cosine to solve for x. Round each answer to the nearest tenth.

$15 \cdot \cos 33 = \frac{x}{15} \cdot 15$

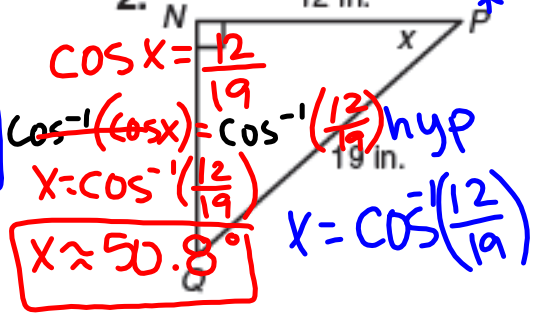
1.



$15 \cdot \cos 33 = x$

$12.6 = x$ m

2.



adj

$\cos x = \frac{12}{19}$

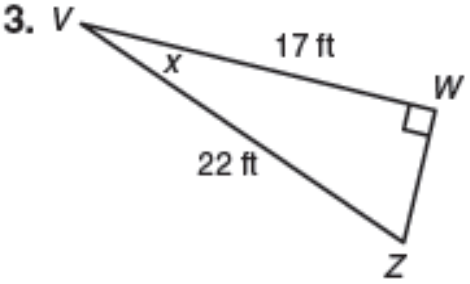
$\cos^{-1}(\cos x) = \cos^{-1}\left(\frac{12}{19}\right)$ hyp

$x = \cos^{-1}\left(\frac{12}{19}\right)$

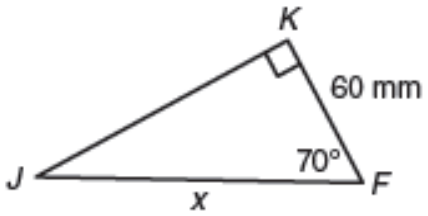
$x \approx 50.8°$

$x = \cos^{-1}\left(\frac{12}{19}\right)$

3.

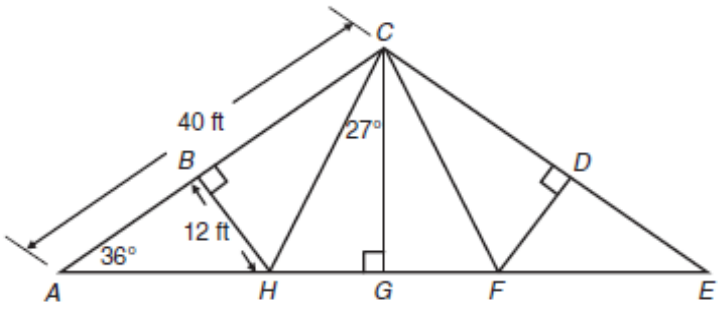


4.



not in your book

5. A bridge is shown in the following figure. Use the figure and the fact that $\triangle AGC$ is congruent to $\triangle EGC$ to complete parts (a) through (e). Round each answer to the nearest tenth.



a. Determine the width AE of the bridge.

b. Determine the height CG of the bridge.

c. Determine CH.

d. Determine the measure of $\angle BHC$.

e. Does $\overline{CH}$ bisect $\angle ACG$? Explain your reasoning.

Homework

Finish Lesson 8.4

HW: pg 607-609
pg 613-614

Aug 24-2:00 PM