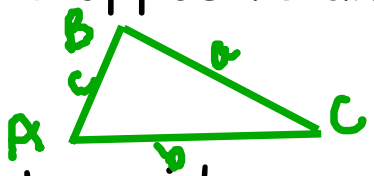
10.5 The Law of Cosines

Warm-Up

1. Draw any non-right triangle. Label the vertices A, B, and C. Use a, b, and c to label the sides with side a opposite angle A, side b opposite angle B and side c opposite angle C.



2. List all possible ways to name two sides and the included angle for the triangle you drew.

a b ∠C

b c ∠A

a c ∠B

You can use the law of cosines to solve a triangle if you are given the measure of

1.two sides and the included angle or

2.three sides.

The Law of Cosines

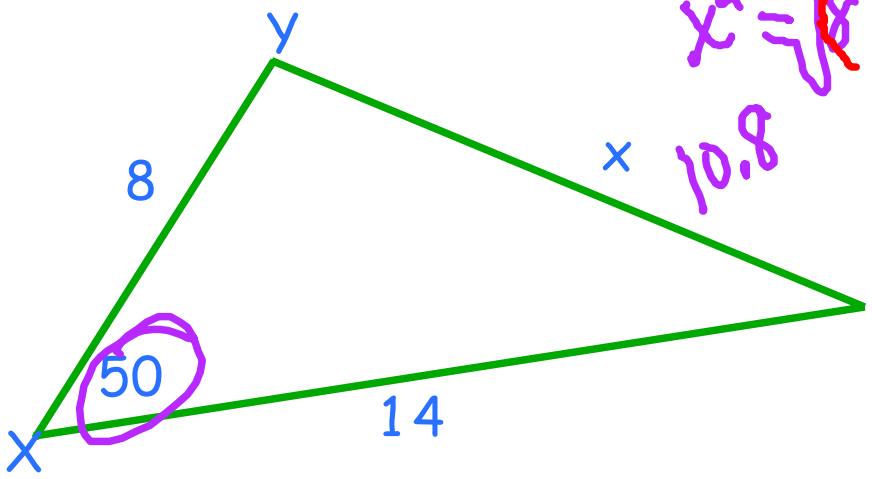
For any triangle ABC with sides a, b, and c:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Find x in the ΔXYZ below.



$x = \sqrt{8^2 + 14^2 - 2(8)(14)\cos(50)}$

$64 + 196 - 224\cos(50)$

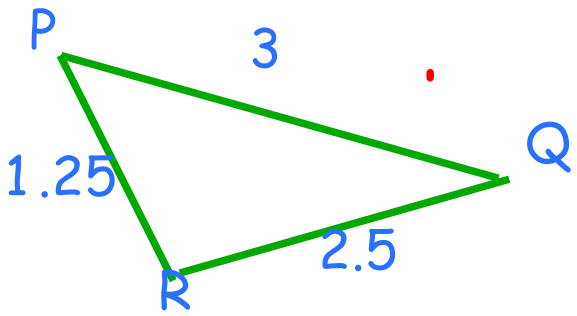
$260 - 224\cos 50$

$\sqrt{116.0155}$

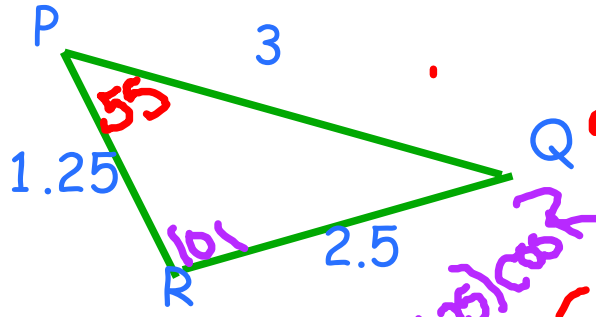
10.8

10.8

Given the triangle, find b.



Given the triangle, find b.



$2.5^2 = 3^2 + 1.25^2 - 2(3)(1.25)\cos P$

$6.25 = 9 + 1.5625 - 7.5\cos P$

$6.25 = 10.5625 - 7.5\cos P$

$-10.5625 \quad -10.5625$

$\frac{-4.3125}{-7.5} = \frac{-7.5\cos P}{-7.5}$

$.5875 = \cos P$

$9 = 6.25 + 1.5625 - 2(2.5)(1.25)\cos R$

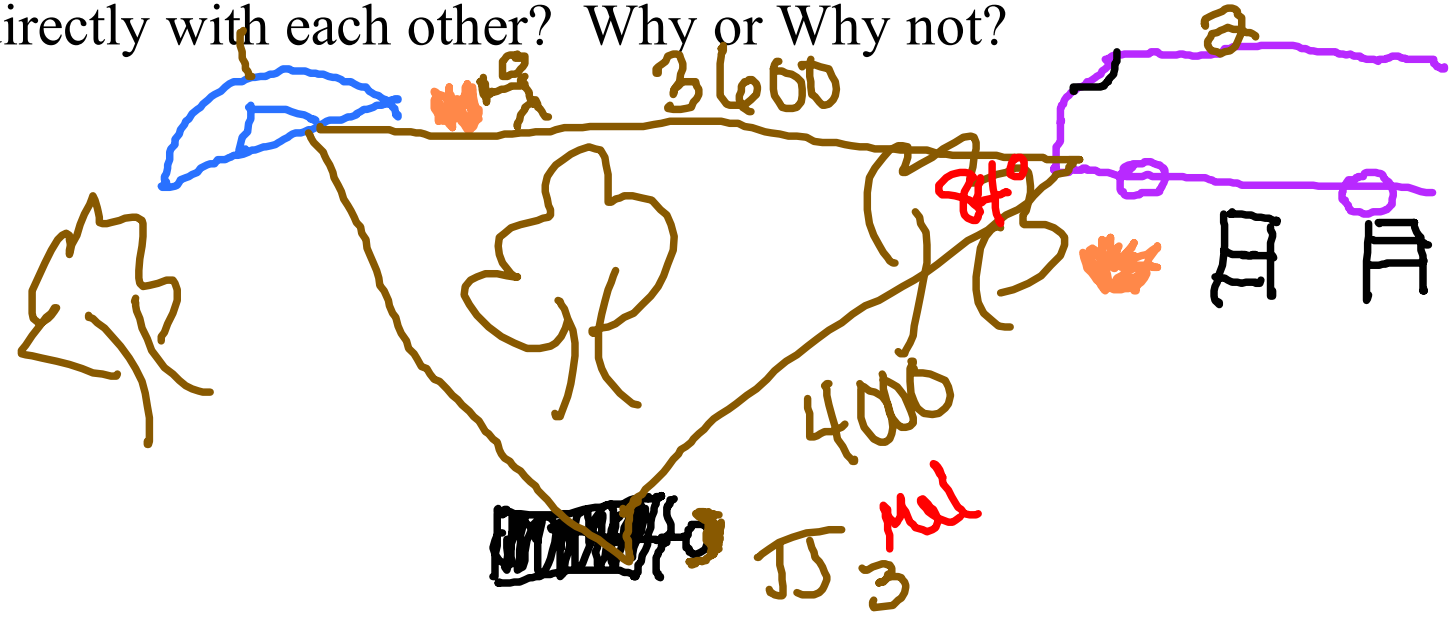
$9 = 7.8125 - 6.25\cos R$

$\frac{1.18775}{-6.25} = \frac{-6.25\cos R}{-6.25}$

$-.19 = \cos R$

At a campground there are three groups of campers at three different campsites. The campers carry two way radios with a range of about 1 mile.

If the distance from site 1 to site 2 is 3600Ft, the distance from site 2 to site 3 is 4000 ft, and m∠B = 84° , will the campers at sites 1 and 3 be able to communicate directly with each other? Why or Why not?



Points A and B are on opposite sides of Gene's Pond. From a third point, C, the angle between the lines of site to points A and B measures 46°. If the distance from A to C is 350 meters and the distance from B to C is 286 meters, what is the distance from A to B?

$c^2 = 350^2 + 286^2 - 2(350)(286)\cos 46$