

**Section 9.4**  
**Law of Cosines**

\*Used for SAS

If finding a side length...  $c^2 = a^2 + b^2 - 2(a)(b) \cos(C)$

What if you need to find an angle?

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

\*Used for SSS

If finding an angle...

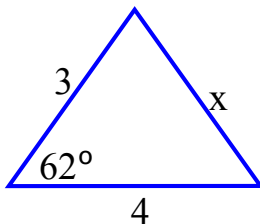
$$\cos C = \frac{c^2 - a^2 - b^2}{-2(a)(b)}$$

The angle must correspond to the side that starts off the formula

- Step 1) calculate the numerator
- Step 2) calculate the denominator
- Step 3) divide
- Step 4) cosine inverse =  $\cos^{-1}(\#)$

Find x in the following problems.

**Example 1**



$$x^2 = 3^2 + 4^2 - 2(3)(4)\cos(62^\circ)$$

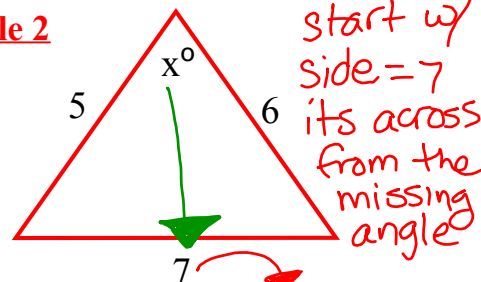
$$x^2 = 13.7326$$

$$x = \sqrt{13.7326}$$

$$x \approx 3.71 \text{ units}$$

plug all into calculator at one time

**Example 2**



$$\cos X = \frac{7^2 - 5^2 - 6^2}{-2(5)(6)}$$

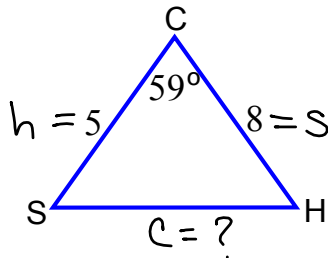
$$\cos X = \frac{-12}{60} = 0.2$$

$$X = \cos^{-1}(0.2)$$

$$X = 78.46^\circ$$

**Example 3**

A triangle has sides of 5cm and 8cm and an included angle of  $59^\circ$ .  
Find the missing side and angles.



$$c^2 = 5^2 + 8^2 - 2(5)(8)\cos(59^\circ)$$

$$c^2 = 47.796$$

$$c = \sqrt{47.796} \approx 6.91$$

$$c = \underline{6.91 \text{ cm}}$$

$$\angle S = \underline{82.7^\circ}$$

$$\angle H = \underline{38.3^\circ}$$

$$\cos H = \frac{5^2 - 8^2 - 6.91^2}{-2(8)(6.91)} = \frac{-86.748}{-110.56} = .7846$$

$$m\angle H = \cos^{-1}(.7846) \approx 38.3^\circ$$

$$\text{sum of } \Delta = 180^\circ$$

$$m\angle S = 180 - \angle C - \angle H = 180 - 59 - 38.3 = 82.7^\circ$$

# Homework

## p352 #1-6, 15

\*If you have a choice...

Always use Law of Cosines  
over Law of Sines