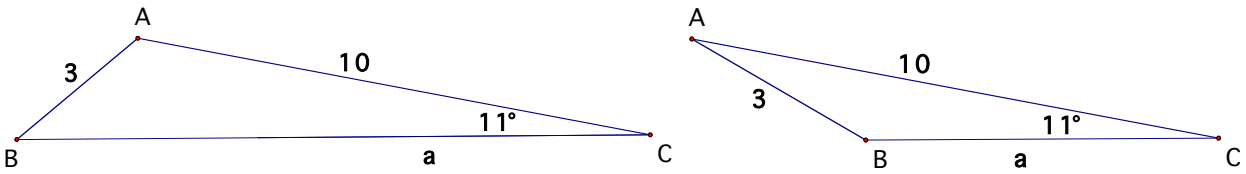
After watching the video, *Law of Sines*, complete the following problems.

1. Draw, as best you can, a triangle with side b=10, side c = 3, and angle C = 11°. Compute measures of angles A and B and length of side a. (NOTE: There are actually TWO such triangles!)



$A = 129.5°$, $B = 39.5°$, $a = 25.779$
First find angle B:

$$\sin B = \frac{10 \cdot \sin 11}{3}$$

$$B = \sin^{-1} \frac{10 \cdot \sin 11}{3}$$

$$B \approx 39.5^{\circ}$$

So angle A must be: 129.5°

Then, find side a:

$$\frac{3}{\sin 11} = \frac{a}{\sin 129.5}$$

$$a = \frac{3 \cdot \sin 129.5}{\sin 11}$$

$$a \approx 12.13$$

OR

B=140.5° which is the supplement to 39.5°. So, A must be: 28.5°.

$$\frac{3}{\sin 11} = \frac{a}{\sin 28.5}$$

$$a = \frac{3 \cdot \sin 28.5}{\sin 11}$$

$$a \approx 7.5$$

2. We have a triangle with side a = 100, and angle A = 50°. Find a value of b for which there are two triangles (as in example 1). Find a value of b for which there are *no* possible triangles.

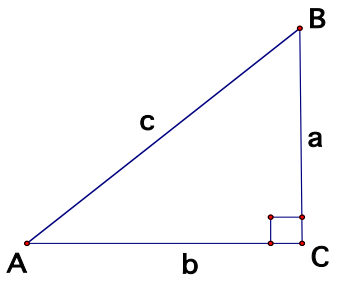
   There are many answers to this question. If $b < 100/\sin 50^\circ$, there will be two possible triangles. If $b > 100/\sin 50^\circ$, there are no possible triangles.

3. The Law of Cosines is used to find missing angle measures and lengths of sides in any triangle. The Law of Cosines states: $c^2 = a^2 + b^2 - 2ac\cos C$

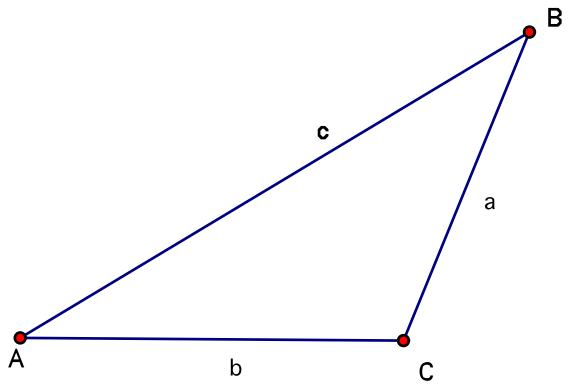
   a. What happens to the Law of Cosines in the case of a right triangle, if angle C is the right angle?

      The result is the Pythagorean Theorem.

      $$c^2 = a^2 + b^2 - 2ac\cos 90$$
      $$c^2 = a^2 + b^2 - 2ac(0)$$
      $$c^2 = a^2 + b^2$$

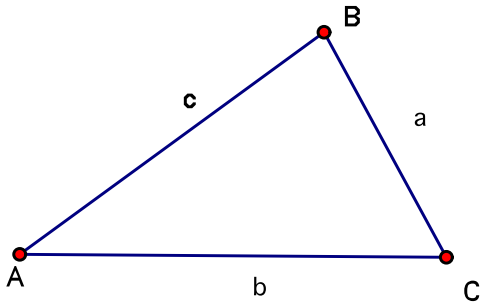


   b. -2ab cos C can be thought of an "adjustment" to the Pythagorean Theorem. If angle C is obtuse, how does the length of side c compare to the length of side c in a right triangle?



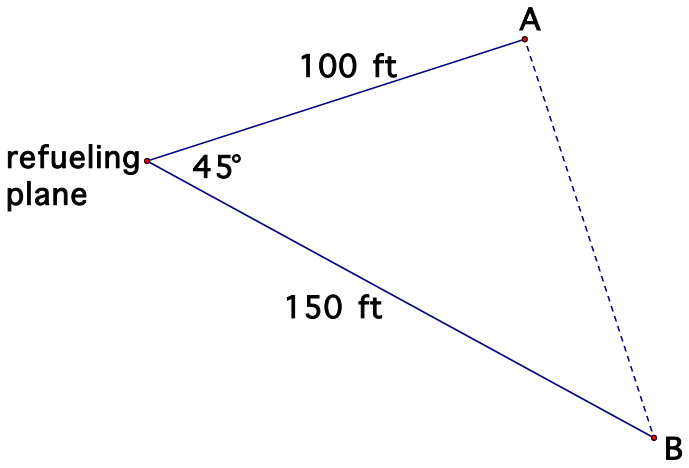
      If angle C is obtuse, then the cosine of the angle will be negative. This means that negative 2ab is multiplied by a negative value giving a positive value. Side c will then be the length of $a^2 + b^2$ plus some additional length.

c. If angle C is acute, how does the length of side c compare to the length of side c in a right triangle?



If angle C is acute, then the cosine of the angle will be positive. This means that negative 2ab is multiplied by a positive value resulting in a negative value. Side c will then be the length of $a^2 + b^2$ minus some length.

4. Two planes are refueling at the same time. The distance from plane A to the refueling plane is 100 ft. The distance from plane B to the refueling plane is 150ft. The angle that the separates the two planes receiving fuel is approximately 45°. How far apart are plane A and plane B?



$\text{distance} = \sqrt{100^2 + 150^2 - 2(100)(150)\cos 45^\circ}$

$\text{distance} \approx 106.24\text{ft}$