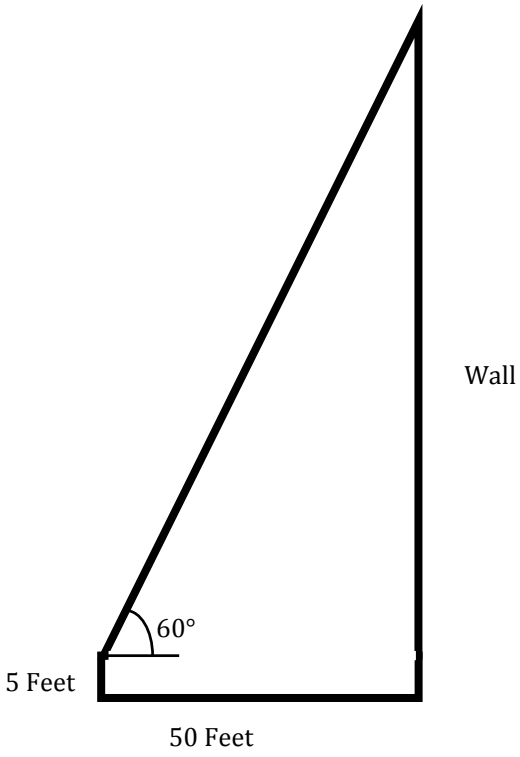
Law of Sines

Use What You've Learned
Answers and Explanations

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

1. We wish to determine the height of a wall. If a five-foot tall person paces off 50 feet from the wall, we can measure the angle of inclination to the top of the wall to be 60°. The angle of inclination is the angle the person's head has to tilt from the horizontal to look at the top of the wall. How high is the wall?



105 feet;

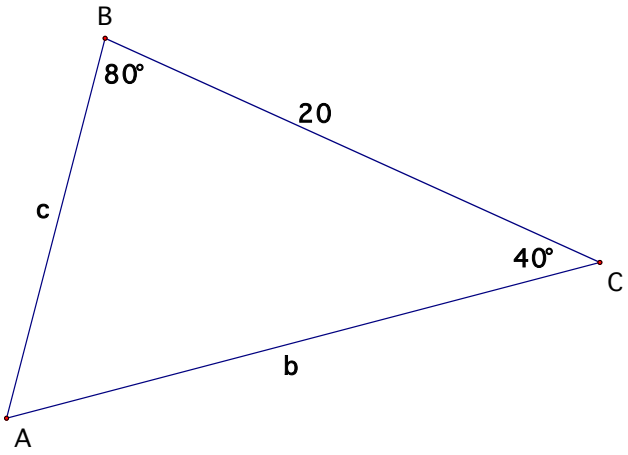
$$\tan 60 = \frac{wall - 5}{50}$$

$$(\tan 60) \cdot 50 = wall - 5$$

$$(\tan 60) \cdot 50 + 5 = wall$$

$$91.6ft \approx wall$$

2. Assume a triangle has side lengths a, b, and c, with opposite angles A, B, and C. Draw, as best you can, a triangle with a = 20, B = 80°, and C = 40°. Compute A, b, and c.



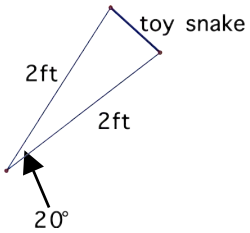
Since there are 180° in a triangle, A = 60°. Using the Law of Sines:

$$\frac{20}{\sin 60} = \frac{b}{\sin 80} \qquad \frac{20}{\sin 60} = \frac{c}{\sin 40}$$

$$b = \frac{20 \cdot \sin 80}{\sin 60} \qquad c = \frac{20 \cdot \sin 40}{\sin 60}$$

$$b \approx 22.743 \qquad c \approx 14.845$$

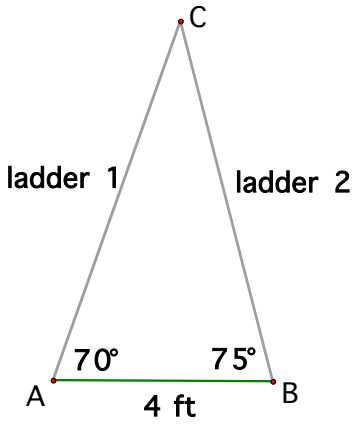
3. A child has a toy snake. He holds one end in each hand and extends his arms to stretch the snake out to its maximum length. If the angle formed by his arms is 20° and if each arm is 2 feet long, how long is the toy snake?



Since this is an isosceles triangle, the remaining two angles can be found by $\frac{180 - 20}{2}$. They are both 80 degrees. Now, set up a proportion using the Law of Sines and the known information and solve for the missing length.

$$\frac{2}{\sin 80} = \frac{length}{\sin 20}$$
$$length = \frac{2 \cdot \sin 20}{\sin 80}$$
$$length \approx 0.695 ft$$

4. Two ladders lean against each other. If the first makes an angle of 70° with the ground, and the second makes an angle of 75° with the ground and they are four feet apart, how tall are the ladders?



First find the remaining angle by subtracting 70° and 75° from 180°. The remaining angle in the triangle is 35°. Then, solve for the ladder lengths by using the Law of Sines.

$$\frac{4}{\sin 35} = \frac{ladder1}{\sin 75}$$
$$ladder1 = \frac{4 \cdot \sin 75}{\sin 35}$$
$$ladder1 \approx 6.736 \text{ feet}$$

$$\frac{4}{\sin 35} = \frac{ladder2}{\sin 70}$$
$$ladder2 = \frac{4 \cdot \sin 70}{\sin 35}$$
$$ladder2 \approx 6.553 \text{ feet}$$