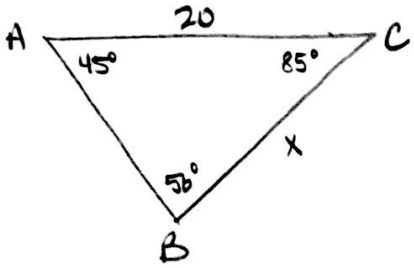
PreCalculus
Law of Sines/Law of Cosines Word Problems

Key

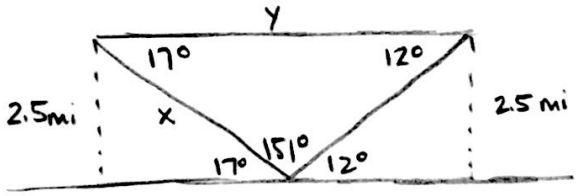
1. Airplane A is flying directly toward the airport, which is 20 miles away. The pilot notices airplane B 45 degrees to her right. Airplane B is also flying directly toward the airport. Airplane A is 50 degrees to the left of airplane B. How far is airplane B from the airport?



$\frac{\sin 50^\circ}{20} = \frac{\sin 45^\circ}{x}$

$x \approx 18.5$ miles

2. Flights 104 and 217 are both approaching Hartsfield-Jackson Airport from opposite directions and at an altitude of 2.5 miles. The pilot of 104 reports an angle of depression of 17 degrees to the tower, and the pilot of 217 reports an angle of depression of 12 degrees to the tower. Calculate the distance between the planes.



Find x first: $\sin 17 = \frac{2.5}{x}$

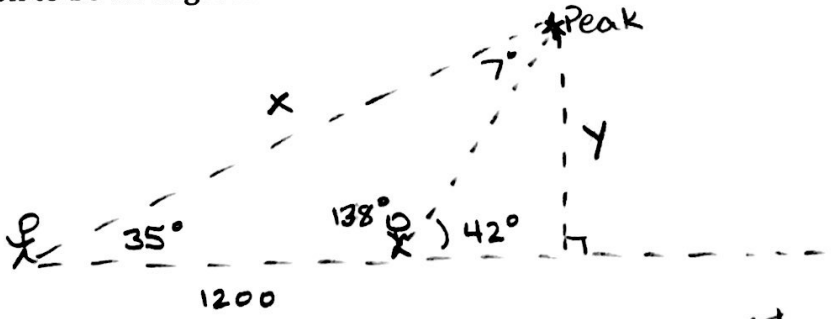
$x = \frac{2.5}{\sin 17}$

$x = 8.55$

$\frac{\sin 12}{8.55} = \frac{\sin 151}{y}$

$y = 19.9$ mi

3. Surveyor 1 measures the angle of elevation of the peak of a mountain to be 35 degrees. Surveyor 2 who is 1200 feet closer on a straight path measures the angle of elevation to be 42 degrees. How tall is the mountain?



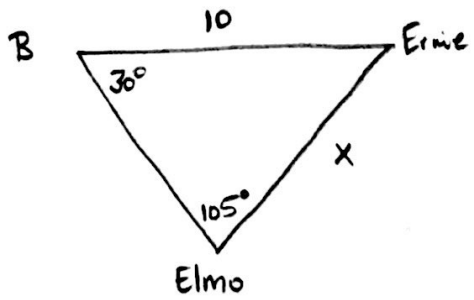
$\frac{\sin 138^\circ}{x} = \frac{\sin 7^\circ}{1200}$

$x = 6589$ ft

$\sin 35^\circ = \frac{y}{6589}$

$y = 3779$ ft

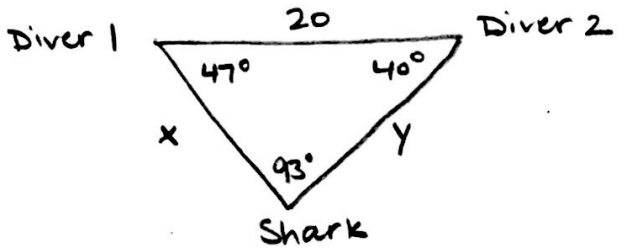
4. Three friends are camping in the woods, Bert, Ernie and Elmo. They each have their own tents and the tents are set up in a triangle. Bert and Ernie are 10m apart. The angle formed at Bert is 30 degrees. The angle formed at Elmo is 105 degrees. How far apart are Ernie and Elmo?



$$\frac{\sin 105}{10} = \frac{\sin 30}{x}$$

$x = 5.18\text{m}$

5. Two scuba divers are 20m apart below the surface of the water. They both spot a shark that is below them. The angle of depression from diver 1 to the shark is 47 degrees and the angle of depression from diver 2 to the shark is 40 degrees. How far is each diver from the shark?



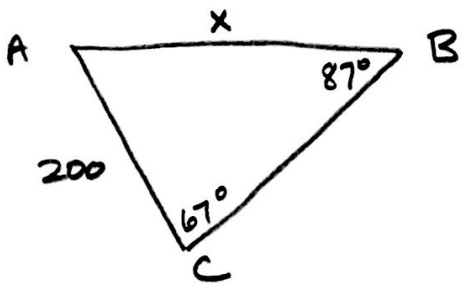
$$\frac{\sin 93}{20} = \frac{\sin 40}{x}$$

$x = 12.87\text{m}$

$$\frac{\sin 93}{20} = \frac{\sin 47}{y}$$

$y = 14.65\text{m}$

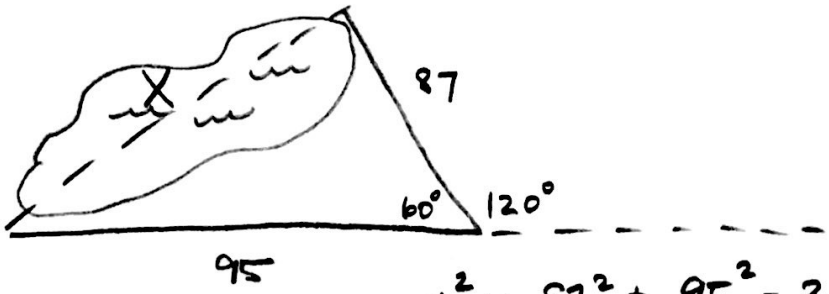
6. Points A and B are on opposite sides of the Grand Canyon. Point C is 200 yds. from A. Angle B measures 87 degrees and angle C measures 67 degrees. What is the distance between A and B?



$$\frac{\sin 67}{x} = \frac{\sin 87}{200}$$

$x = 184.35\text{ yds}$

7. To estimate the length of a lake, Caleb starts at one end of the lake and walks 95m. He then turns and walks on a new path, which is 120 degrees to the direction he was first walking, and walks 87m more until he arrives at the other end of the lake. Approximately how long is the lake?



$$x^2 = 87^2 + 95^2 - 2(87)(95)\cos 60^\circ$$

$$x^2 = 8329$$

$x = 91.3\text{ m}$