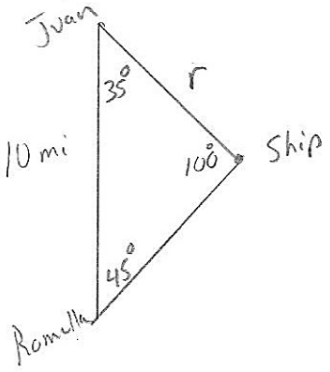
Pre-Calculus
Chapter 9
Law of Sines and Cosines WS

Name _____
Period _____
A# _____

Directions: Use the Law of Sines and/or the Law of Cosines to solve the problems.

1. Juan and Romella are standing at the seashore 10 miles apart. The coastline is a straight line between them. Both can see the same ship in the water. The angle between the coastline and the line between the ship and Juan is 35 degrees. The angle between the coastline and the line between the ship and Romella is 45 degrees. How far is the ship from Juan?



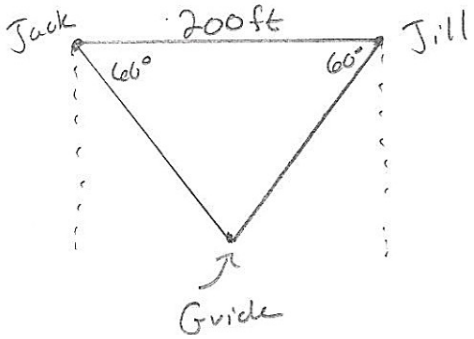

$\frac{\sin 100^\circ}{10} = \frac{\sin 45^\circ}{r}$

$r \sin 100^\circ = 10 \sin 45^\circ$

$r = \frac{10 \sin 45^\circ}{\sin 100^\circ}$

$r = 7.180$ miles is the distance from ship to Juan

2. Jack is on one side of a 200-foot-wide canyon and Jill is on the other. Jack and Jill can both see the trail guide at an angle of depression of 60 degrees. How far are they from the trail guide?




They are both 200 ft from the guide b/c it is an equilateral $\triangle$.

3. Tom, Dick, and Harry are camping in their tents. If the distance between Tom and Dick is 153 feet, the distance between Tom and Harry is 201 feet, and the distance between Dick and Harry is 175 feet, what is the angle between Dick, Harry, and Tom?

$t^2 = d^2 + h^2 - 2(d)(h)\cos T$ are

$175^2 = 201^2 + 153^2 - 2(201)(153)\cos T$

$30625 = 63810 - 61506 \cos T$

$-33185 = -61506 \cos T$

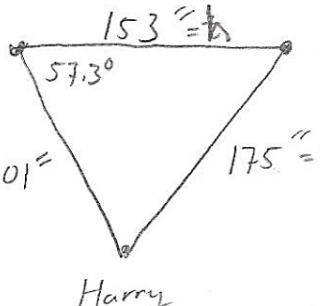
$\frac{-33185}{-61506} = \cos T$

$T = 57.3^\circ$

$\frac{\sin 57.3^\circ}{175} = \frac{\sin D}{201}$

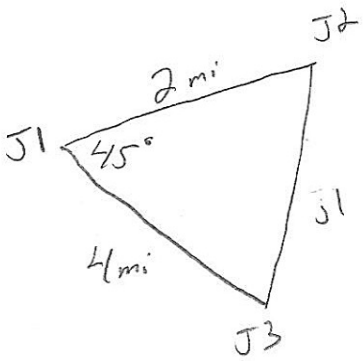
$\sin D = \frac{201(\sin 57.3)}{175}$

$\angle D = 75.1^\circ$




$\angle D = 75.1^\circ$, $\angle T = 57.3^\circ$, $\angle H = 47.6^\circ$

4. Three boats are at sea: Jenny one (J1), Jenny two (J2), and Jenny three (J3). The crew of J1 can see both J2 and J3. The angle between the line of sight to J2 and the line of sight to J3 is 45 degrees. If the distance between J1 and J2 is 2 miles and the distance between J1 and J3 is 4 miles, what is the distance between J2 and J3?

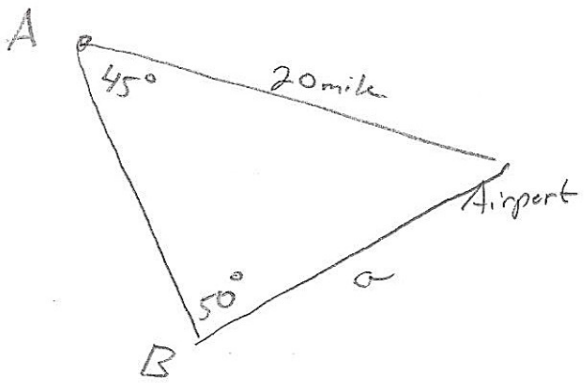



$(j1)^2 = 2^2 + 4^2 - 2(2)(4)\cos 45°$

$(j1)^2 = 8.686$

j1 = 2.947 miles between J2 and J3

5. 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. The pilot of airplane B calculates that airplane A is 50 degrees to his left. Based on that information, how far is airplane B from the airport?



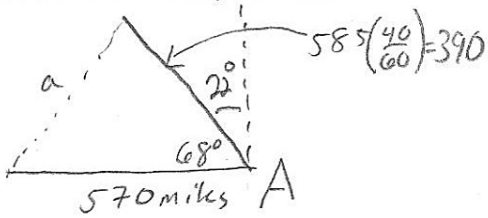

$\frac{\sin 45°}{a} = \frac{\sin 50°}{20 \text{ miles}}$

$a \sin 50° = 20 \sin 45°$

$a = \frac{20 \sin 45°}{\sin 50°}$

a = 18.461 miles from the airport

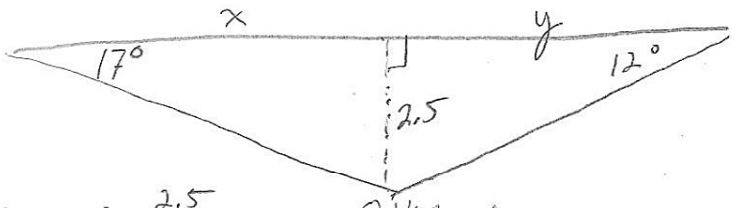
6. A plane leaves JFK International Airport and travels due west at 570 mi/hr. Another plane leaves 20 minutes later and travels 22º west of north at the rate of 585 mi/h. To the nearest ten miles, how far apart are they 40 minutes after the second plane leaves.




$a^2 = 570^2 + 390^2 - 2(570)(390)\cos 68°$

a = 557.18 miles

7. Flights 104 and 217 are both approaching O'Hare International Airport from directions directly opposite one another and at an altitude of 2.5 miles. The pilot on flight 104 reports an angle of depression of 17º to the tower, and the pilot on flight 217 reports an angle of depression of 12º to the tower. Calculate the distance between the planes.




$\tan 17° = \frac{2.5}{x}$

$\tan 17° = \frac{2.5}{x}$

$x = \frac{2.5}{\tan 17°} = 8.18$

$\tan 12° = \frac{2.5}{y}$

$y = \frac{2.5}{\tan 12°}$

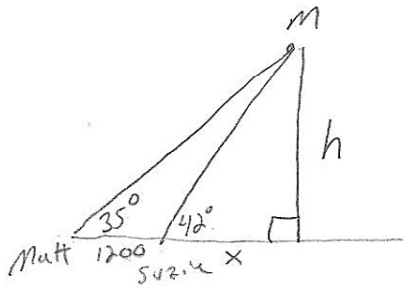
$y = 11.76$

$x + y$

$8.18 + 11.76$

19.94 miles between the airplanes

8. Matt measures the angle of elevation of the peak of a mountain as 35º. Susie, who is 1200 feet closer on a straight level path, measures the angle of elevation as 42º. How high is the mountain?




$\tan 35° = \frac{h}{1200+x}$ $\tan 45° = \frac{h}{x}$

$h = (1200+x)\tan 35°$ $h = x \tan 45°$

$(1200+x)\tan 35° = x \tan 45°$

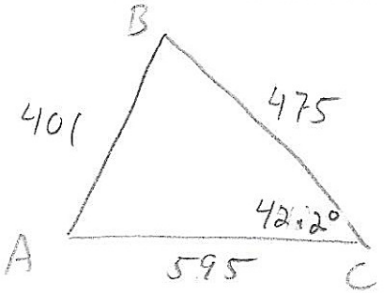
$(1200+x)0.7 = x$

$840 + 0.7x = x$

$840 = 0.3x$

2800 ft = x

9. A triangular playground has sides of lengths 475 feet, 595 feet, and 401 feet. What are the measures of the angles between the sides, to the nearest tenth of a degree?




$401^2 = 595^2 + 475^2 - 2(595)(475)\cos C$

$160801 = 354025 + 225625 - 565250\cos C$

$160801 = 579650 - 565250\cos C$

$-418849 = -565250\cos C$

$0.741 = \cos C$

$C = \cos^{-1}(0.741)$

$C \approx 42.2°$

$\frac{\sin 42.2°}{401} = \frac{\sin B}{595}$

$\sin B = \frac{595 \sin 42.2°}{401}$

$\angle B = 85.3°$

$\angle A = 52.5°, \angle B = 85.3°, \angle C = 42.2°$