KEY

USL Practice

Lesson #2 Law of Sines Practice
CP Pre-Calculus

For each of the following draw a diagram to represent the situation and solve. **Round to nearest tenth.**

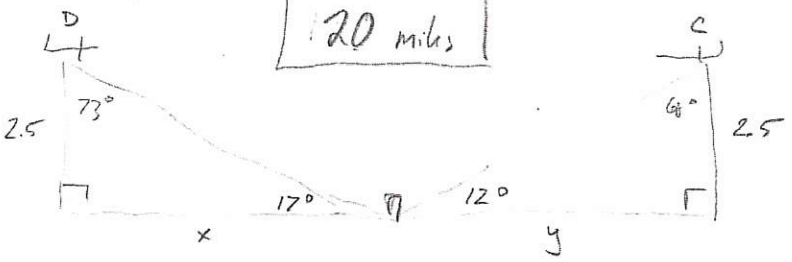
1. A Delta flight and a Continental flight are both approaching Bradley International Airport from directions directly opposite each other. Both planes are flying at an altitude of 2.5 miles. The Delta pilot reports an angle of depression of 17° to the tower, and the Continental pilot reports an angle of depression of 12° to the tower. How far apart are the planes?

20 miles

Use tangent

$\tan 17 = \frac{2.5}{x} = 8.2$

$\tan 12 \frac{2.5}{y} 11.8$



Law Sines

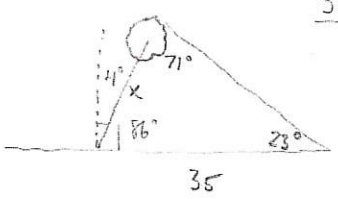
$\frac{\sin 17}{2.5} = \frac{\sin 73}{x}$

+

$\frac{\sin 12}{2.5} = \frac{\sin 68}{y}$

2. Because of prevailing winds, a tree grew so that it was leaning 4° from the vertical. At a point 35 meters from the tree, the angle of elevation to the top of the tree is 23°. Find the length of the tree.

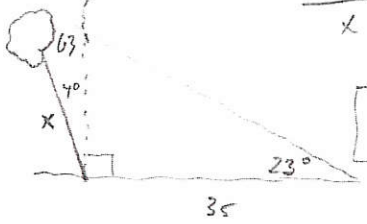
Option A



$\frac{\sin 23}{x} = \frac{\sin 71}{35}$

$x = 14.5\text{m}$

Option B

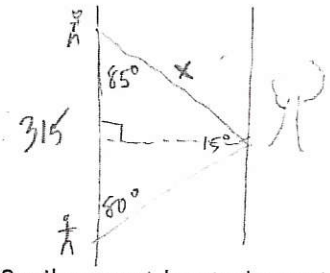


$\frac{\sin 23}{x} = \frac{\sin 63}{35}$

$x = 15.3\text{ m}$

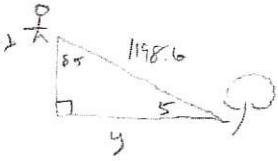
3. A surveyor has the job that requires that she measure the distance across the Rio Grande Gorge in northern New Mexico. Standing at one side of the ridge, she measures the angle formed by the edge of the ridge and the line of sight to a tree on the other side of the ridge. She then walks along the ridge (past the point directly opposite the tree) 315 feet and measured the angle formed by the edge of the ridge and the line of sight to the same tree. If the first angle is 80° and the second angle is 85°, find the distance across the gorge.

1,194 ft



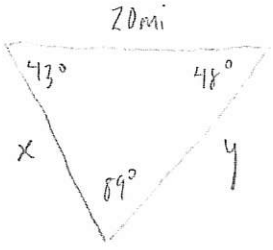
$\frac{\sin 15}{315} = \frac{\sin 80}{x}$

$x = 1198.6$



$\cos 5 = \frac{y}{1198.6}$

4. Two radar stations that are 20 miles apart located an unidentified plane that vanished from their screens at the same time. The first station indicated that the position of the plane made an angle of 43° with the line between the stations. The second station indicated that it made an angle of 48° with the same line. How far is each station from the point where they lost contact with the plane?



$\frac{\sin 89^\circ}{20} = \frac{\sin 48}{x}$

$x = 14.9$ miles

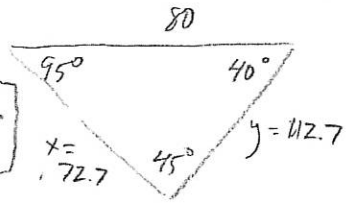
$\frac{\sin 89}{20} = \frac{\sin 43}{y}$

$y = 13.6$ miles

5. Mr. Riddle wants to plant begonias along the edges of a triangular plot of land in front of his house. Two of the angles of the triangle measure 95° and 40°. The side between these two angles is 80 feet long. Find the area and perimeter of this triangular plot of land.

Perimeter = 265.4 ft.

Area = 2,897 ft.^{2}

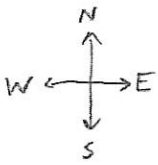


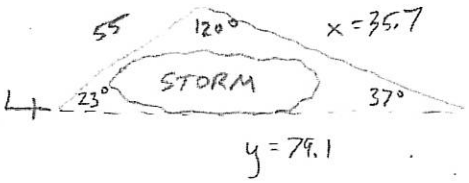
$\frac{\sin 45}{80} = \frac{\sin 95}{y}$ $\quad y = 112.7$

$\frac{\sin 45}{80} = \frac{\sin 40}{x}$ $\quad x = 72.7$

$A = \frac{1}{2}(80)(112.7)\sin 95°$

6. Amelia is flying an airplane due east. To avoid a severe thunderstorm, she finds it necessary to change her course. She turns her plane 23° towards the north and flies 55 miles. Then she makes another turn of 120° and heads back toward her original course. How far must Amelia fly after her second turn to return to her original course? How many miles did she add to her original flight course by taking the detour?



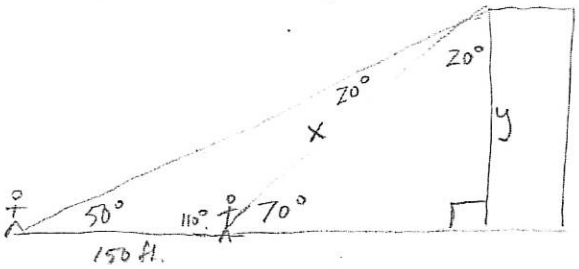


$\frac{\sin 37}{55} = \frac{\sin 23}{x}$ $\quad x = 35.7$ miles

$\frac{\sin 37}{55} = \frac{\sin 120}{y}$ $\quad y = 79.1$

$90.7 - 79.1 =$ 11.6 miles added to trip

7. A surveyor on the ground takes measures a 70° angle of elevation to the top of a building. Then she walks 150 feet farther away from the building and measures the angle elevation to the top of the building to be 50°. How tall is the building?

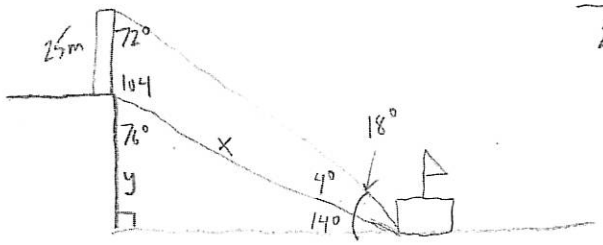


$\frac{\sin 20}{150} = \frac{\sin 50}{x}$ $\quad x = 336$

$\sin 70 = \frac{y}{336}$

$y = 315.7$ ft

8. A tower 25 meters high stands at the top of a cliff overlooking the ocean. From the top of the tower, the angle of depression to a ship approaching is 18°. From the base of the tower, the angle of depression to the ship is 14°. How high is the cliff?



$\frac{\sin 4}{25} = \frac{\sin 72}{x}$ $\quad x = 340.8$

$\sin 14 = \frac{y}{340.8}$

$y = 82.5$m

9. The adjacent sides of a parallelogram measure 8 cm and 12 cm, and the included angle measures 60°. Find the area of the parallelogram.

$A = \frac{1}{2}(8)(12)\sin 60$

$\times 2$

$A = 83.1\ cm^2$

88 ft Q_1

T2.911 $\frac{1}{2}a_2$

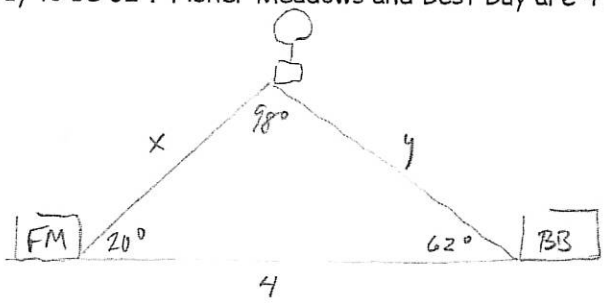
10. A regular pentagon is inscribed in a circle whose radius measures 7 cm. Find the area of the pentagon.

$A = \frac{1}{2}(7)(7)\sin 72$

$\times 5$

$A = 116.5\ cm^2$

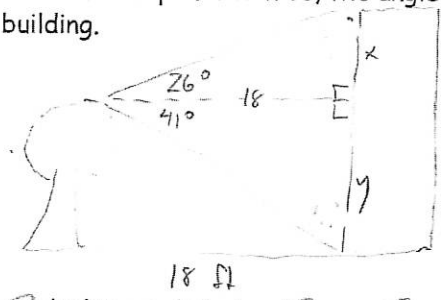
11. A hot air balloon is flying above Avon. To the left side of the balloon the balloonist measures the angle of depression to Fisher Meadows to be 20°. To the right side of the balloon, the balloonist measures the angle of depression to Best Buy to be 62°. Fisher Meadows and Best Buy are 4 miles apart. How far is the balloonist from each?



$\frac{\sin 62}{x} = \frac{\sin 98}{4}$ $\frac{\sin 20}{y} = \frac{\sin 98}{4}$

FM = 3.6 miles BB = 1.4 miles

12. A tree is 18 feet from a building. From the top of the tree, the angle of depression to the base of the building is 41°. From the top of the tree, the angle of elevation to the top of the building is 26°. Find the height of the building.

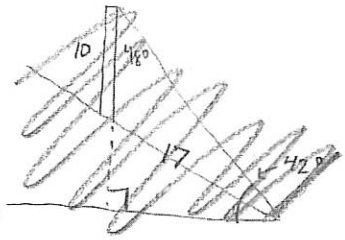


$\tan 26 = \frac{x}{18}$ $x = 8.8$

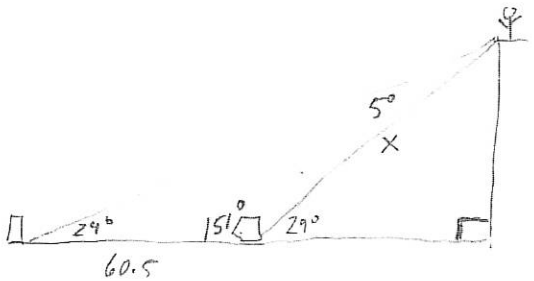
$\tan 41 = \frac{y}{18}$ $y = 15.6$

24.4 ft

13. A 10 meter telephone pole is located on a down-sloping hill, and casts a 17 meter shadow directly down the slope. The angle of elevation of the sun is 42 degrees. Find the angle of elevation of the ground.



13. ~~14~~. A baseball fan is sitting directly behind home plate in the last row of the upper deck. The angle of depression to home plate is 29°, and the angle of depression to the pitcher's mound is 24°. In major league baseball, the distance between home plate and the pitcher's mound is 60.5 feet. How far is the fan from home plate?



$\frac{\sin 5}{60.5} = \frac{\sin 24}{x}$

$x = 282.3$ ft.