

## Applications of Trig Laws - Group Work

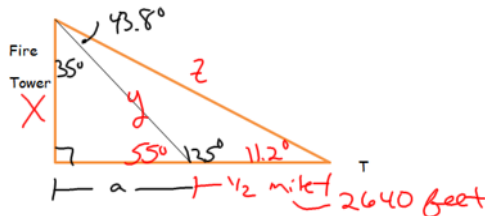
Unit 5 Day 8

$$\text{Law of Sines: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Law of Cosines: } c^2 = a^2 + b^2 - 2ab \cos C$$

1. Mike, Dave, Dylan, and Pat are hiking in the Catskill Mountains. As they hike, they take notice of their surroundings and are surprised to see a fire station high above the trees. At point T, Doug takes a reading and finds the angle of elevation to the top of the fire station to be  $11.2^\circ$ . They continue hiking for another half mile and decide to make camp. As they do, Mike takes a sighting on the fire station and finds the angle of elevation to the top of the tower is now  $55^\circ$ . (1 mile = 5280 feet)

- Find the height of the tower to the nearest foot.
- Find the distance from point T to the top of the fire tower to the nearest foot.



Find z

$$\textcircled{a} \frac{z}{\sin 125^\circ} = \frac{2640}{\sin 43.8^\circ}$$

$$z = \frac{2640 \sin 125^\circ}{\sin 43.8^\circ}$$

$$z = 3124.44$$


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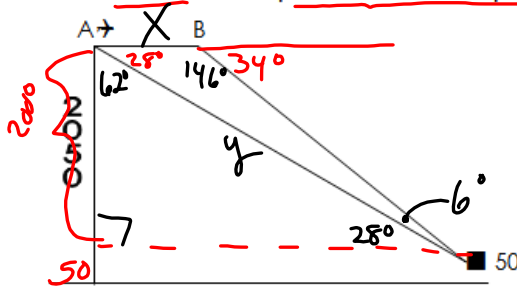

$$\frac{X}{\sin 11.2^\circ} = \frac{3124.44}{\sin 90^\circ}$$

$$X = \frac{3124.44 \sin 11.2^\circ}{\sin 90^\circ}$$

$$X = 606.8 \approx \textcircled{607'}$$

Dec 13-9:35 PM

An airplane flying at a level altitude of 2050 feet sights the top of a 50' tower at an angle of depression of  $28^\circ$  from point A. After continuing in level flight to point B, the angle of depression to the same tower is  $34^\circ$ . Find, to the nearest foot, the distance that the plane traveled from point A to point B.



$$\textcircled{1} \frac{y}{\sin 90^\circ} = \frac{2000}{\sin 28^\circ}$$

$$y = \frac{2000 \sin 90^\circ}{\sin 28^\circ} = 4260.108936$$

$$y \approx 4260.108$$

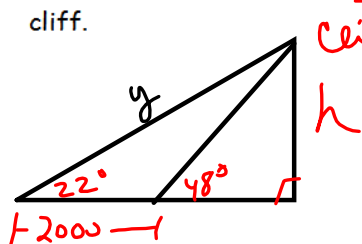
$$\textcircled{2} \frac{X}{\sin 6^\circ} = \frac{4260.108}{\sin 146^\circ}$$

$$X = \frac{4260.108 \sin 6^\circ}{\sin 146^\circ} \approx \textcircled{796 \text{ feet}}$$

Dec 13-9:33 PM

Draw a diagram for each question.

3. From a ship, the angle of elevation of point A at the top of a cliff measures  $22^\circ$ . After the ship has sailed 2000 feet directly toward the foot of the cliff, the angle of elevation of A measures  $48^\circ$ . Find, to the nearest ten feet, the height of the cliff.



①  $y$

$$\frac{y}{\sin 132^\circ} = \frac{2000}{\sin 26^\circ}$$

$$y = \frac{2000 \sin 132^\circ}{\sin 26^\circ}$$

$$y = 3390.48238$$

②  $h$

$$\frac{3390.482 \dots}{\sin 90^\circ} = \frac{h}{\sin 22^\circ}$$

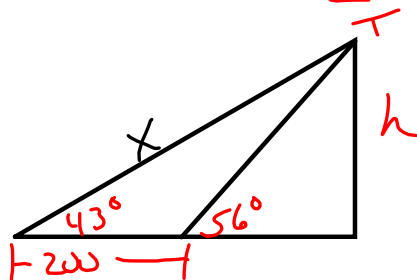
$$h = \frac{3390.482 \sin 22^\circ}{\sin 90^\circ}$$

$$h = 1270.097$$

$$h \approx 1270 \text{ feet}$$

Nov 30-3:49 PM

4. From point A on level ground, the angle of elevation of the top of a vertical control tower measure  $43^\circ$ . At point C, 200 feet closer to the foot of the tower, the angle of elevation measures  $56^\circ$ . Find, to the nearest foot, the height of the tower.



①  $x$

$$\frac{x}{\sin 124^\circ} = \frac{200}{\sin 13^\circ}$$

$$x = \frac{200 \sin 124^\circ}{\sin 13^\circ}$$

$$x = 737.0826 \dots$$

②  $h$

$$\frac{737.0826}{\sin 43^\circ} = \frac{h}{\sin 90^\circ}$$

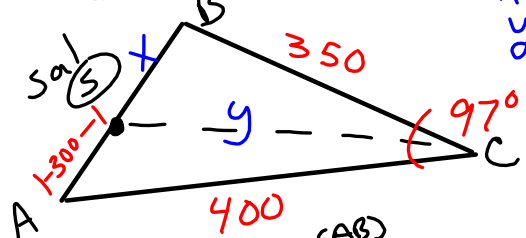
$$h = \frac{737.0826 \sin 43^\circ}{\sin 90^\circ}$$

$$h = 502.69 \dots \approx 503 \text{ feet}$$

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5. Sal is swimming across Lake Kern. After swimming 300m from dock A, he begins to tire. He can either swim back to dock A or swim to either dock B or dock C. Draw Triangle ABC, with S (Sal) on side AB. If AC = 400 m, BC = 350 m, and  $m\angle ACB = 97^\circ$ , determine which dock is closest to Sal and how far he must swim to reach that dock. Round to the nearest tenth.

$x = \text{distance to dock B}$   
 $y = \text{distance to dock C}$



①  $x = AB - 300$   
 $(AB)^2 = 350^2 + 400^2 - 2(350)(400)\cos 97^\circ$   
 $\sqrt{(AB)^2} = \sqrt{316623.4162\dots}$   
 $AB = 562.693\dots$   
 $x = 562.693\dots - 300 = 262.693\dots$  meters to Dock B

②  $\frac{\sin B}{400} = \frac{\sin 97^\circ}{562.693\dots}$   
 $\sin B = \frac{400 \sin 97^\circ}{562.693} = .7055\dots$   
 $B = \sin^{-1}(.7055\dots) = 44.8754$

③  $y^2 = (262.693)^2 + 350^2 - 2(262.693)(350)\cos(44.875)$   
 $y^2 = 61197.847$   
 $y = \sqrt{61197.847} = 247.3819$  meters to Dock C

Sal is closest to Dock C

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