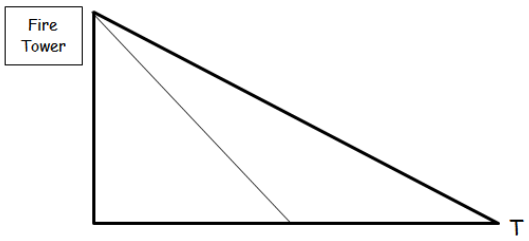
Applications of Trig Laws - Group Work Unit 5 Day 8

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ 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°. 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°. (1 mile = 5280 feet)
   a. Find the height of the tower to the nearest foot.
   b. Find the distance from point T to the top of the fire tower to the nearest foot.



Dec 13-9:35 PM

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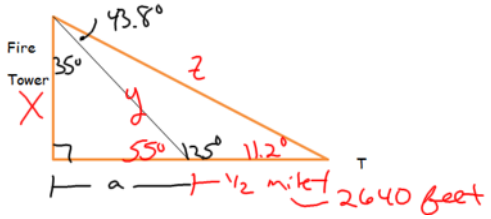

Find z

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

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

$z = 3124.44$

(b)

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

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

$X = 606.8 \approx 607'$

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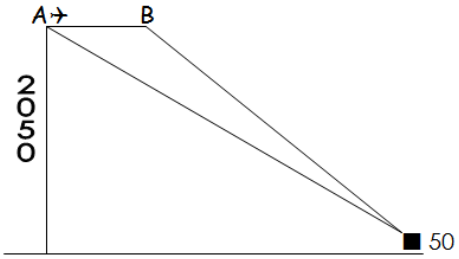
2. An airplane flying at a level altitude of 2050 feet sights the top of a 50' tower at an angle of depression of 28° from point A. After continuing in level flight to point B, the angle of depression to the same tower is 34°. Find, to the nearest foot, the distance that the plane traveled from point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



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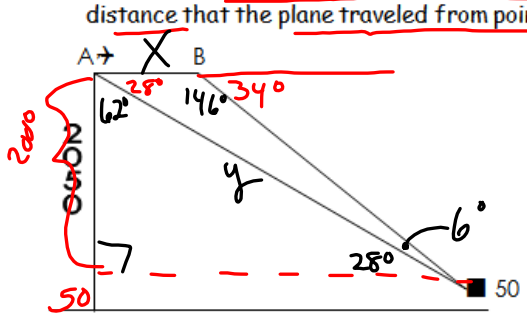

① $\frac{y}{\sin 90^\circ} = \frac{2000}{\sin 28^\circ}$

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

$y \approx 4260.108$

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

$X = \frac{4260.108 \sin 6^\circ}{\sin 146^\circ}$ ≈ 796 feet

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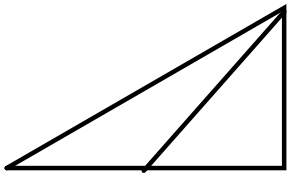
Draw a diagram for each question.

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



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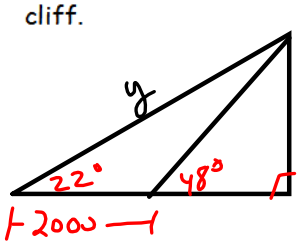

CliffB

h

(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

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

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

$h = 1270.097$

$h \approx 1270$ feet

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

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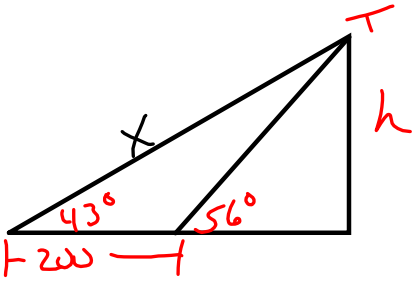
4. From point A on level ground, the angle of elevation of the top of a vertical control tower measure 43°. At point C, 200 feet closer to the foot of the tower, the angle of elevation measures 56°. Find, to the nearest foot, the height of the tower.



(1) $\frac{X}{\sin 124^\circ} = \frac{200}{\sin 13^\circ}$

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

$X = 737.0826..$

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

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

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

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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∠ACB = 97°, determine which dock is closest to Sal and how far he must swim to reach that dock. Round to the nearest tenth.

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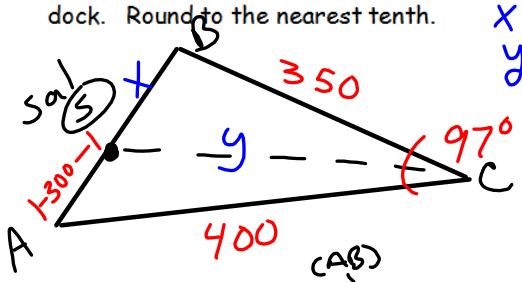
x = distance to dock B
y = " " " C



(1) $x = AB - 300$

$(AB)^2 = 350^2 + 400^2 - 2(350)(400)\cos 97°$

$\sqrt{(AB)^2} = \sqrt{316623.4162..}$

$AB = 562.693..$

$x = 562.693.. - 300 = 262.693..$ meters to dock B

(2) Angle B 400 (AB)

$\frac{400}{\sin B} = \frac{562.693..}{\sin 97°}$

$\sin B = \frac{400 \sin 97°}{562.693} = .7055...$

$B = \sin^{-1}(.7055..) = 44.875°$

(3) $y^2 = (262.693)^2 + 350^2 - 2(262.693)(350)\cos(44.875)$

$y^2 = 61197.847$

$y = 247.3819$ meters to dock C

Sal is closest to dock C

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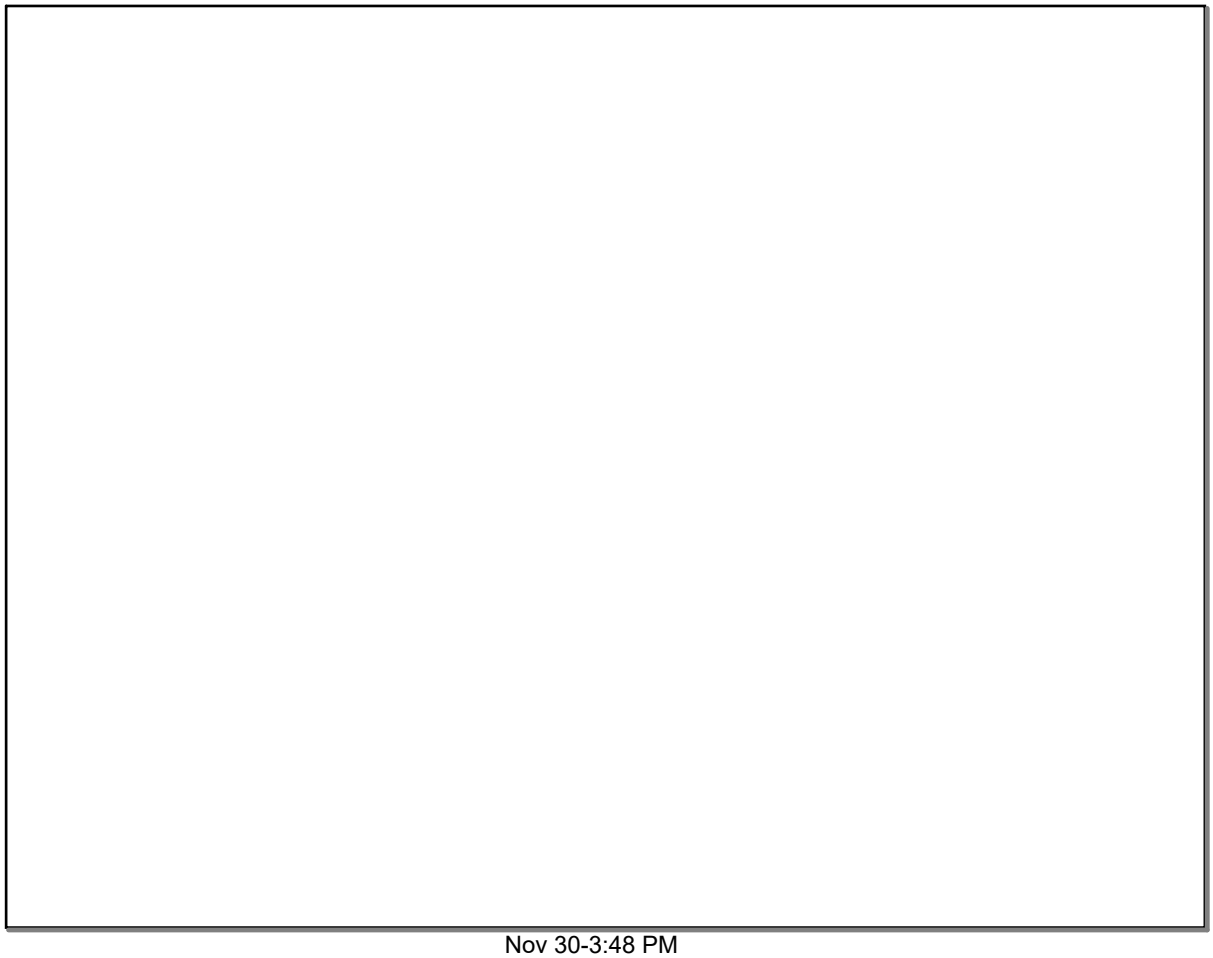

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