

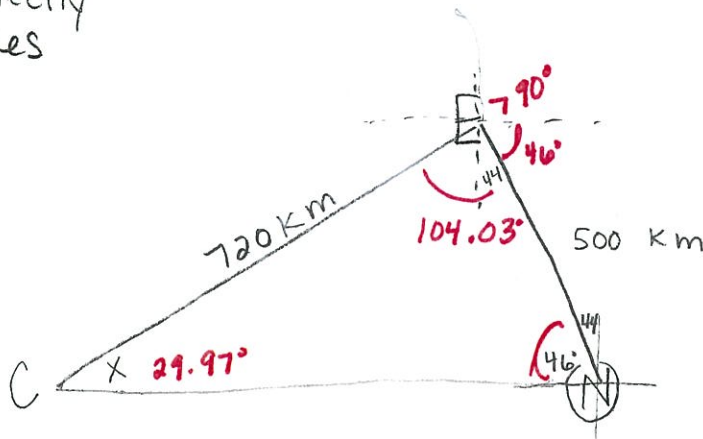
Pre-calculus Academic

Applications: Oblique Triangles/Bearings

Flight Path:

A plane flies 500 kilometers with a bearing of 316° from Naples to Elgin. The plane then flies 720 kilometers from Elgin to Canton. Determine the bearing of the flight from Elgin to Canton.

* Canton is directly West of Naples



SSA \rightarrow Law of Sines

$$90 + 46 + 104.03$$

$$\frac{500}{\sin C} = \frac{720}{\sin 46^\circ}$$

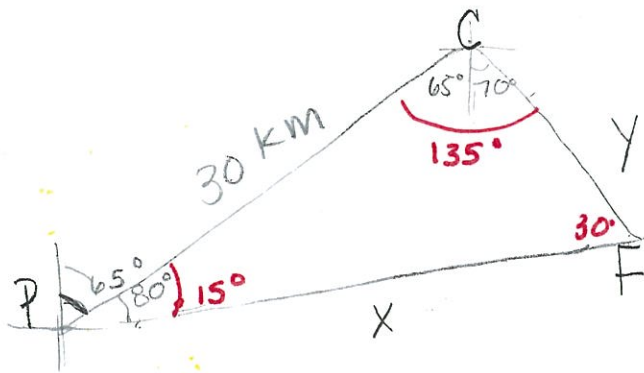
$$C \approx 29.97^\circ$$

240.03° or $S 60.03^\circ W$

Distance:

The bearing from Pine Knob fire tower to the Colt Station fire tower is $N 65^\circ E$. The two towers are 30 kilometers apart. A fire spotted by rangers in each tower has a bearing of $N 80^\circ E$ from Pine Knob and $S 70^\circ E$ from Colt Station. How far is the fire from each tower?

ASA \rightarrow Law of Sines



$$\frac{X}{\sin 135} = \frac{30 \text{ km}}{\sin 30^\circ}$$

$X = 42.43 \text{ km}$ from Pine Knob

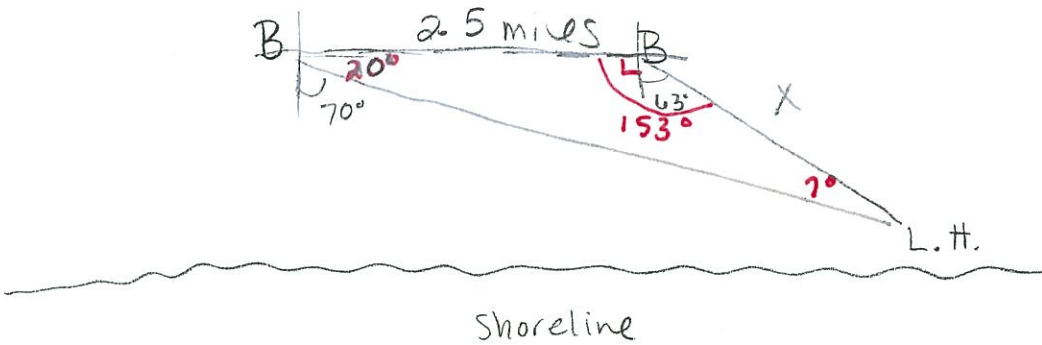
$$\frac{Y}{\sin 15} = \frac{30}{\sin 30}$$

$Y = 15.53 \text{ km}$ from Colt Sta

Distance:

$$\frac{15}{60} = \frac{1}{4} \text{ of an hour}$$

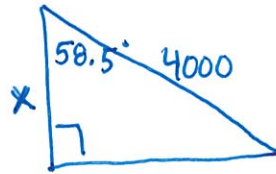
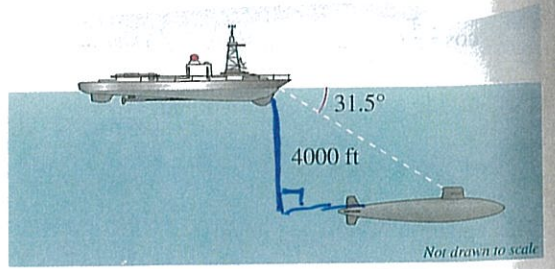
A boat is sailing due east parallel to the shoreline at a speed of 10 miles per hour. At a given time the bearing to the lighthouse is S 70° E. Fifteen minutes later, the bearing to the lighthouse is S 63° E. The lighthouse is located at the shoreline. Find the distance from the boat to the lighthouse.



$$\frac{X}{\sin 20^\circ} = \frac{2.5 \text{ miles}}{\sin 7^\circ}$$

$$X \approx 7.02 \text{ miles}$$

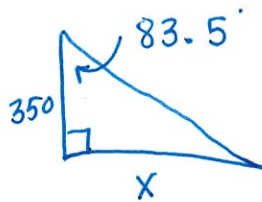
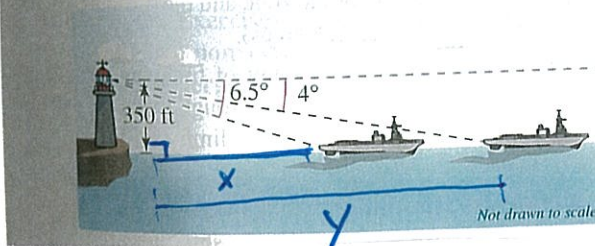
23. **Angle of Depression** The sonar of a navy cruiser detects a submarine that is 4000 feet from the cruiser. The angle between the water level and the submarine is 31.5° (see figure). How deep is the submarine?



$$\cos 58.5 = \frac{x}{4000}$$
$$4000 \cdot \cos 58.5 = x$$

$$x \approx 2,089.994 \text{ ft}$$

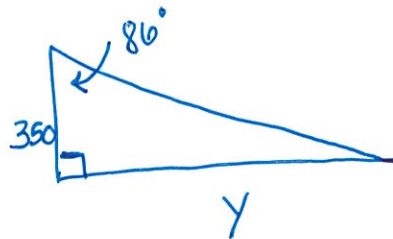
27. Marine Transportation An observer in a lighthouse 350 feet above sea level observes two ships in the same vertical plane as the lighthouse. The angles of depression to the ships are 4° and 6.5° (see figure). How far apart are the ships?



$$\tan 83.5 = \frac{x}{350}$$

$$350 \cdot \tan 83.5 = x$$

$$\underline{3,071.911 = x}$$



$$\tan 86^\circ = \frac{y}{350}$$

$$350 \cdot \tan 86^\circ = y$$

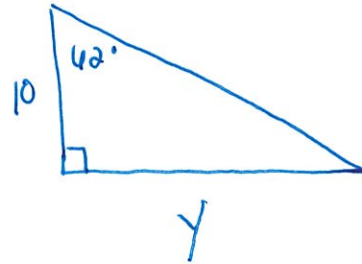
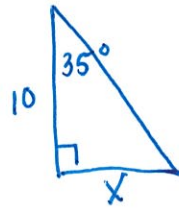
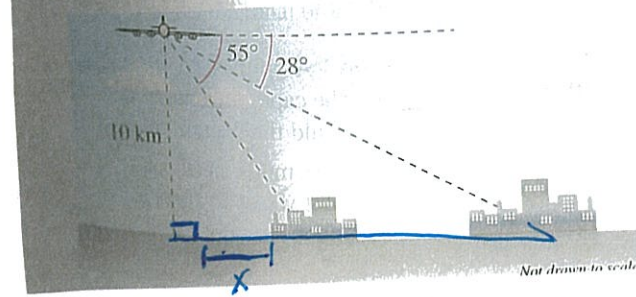
$$\underline{5,005.233 = y}$$

$$y - x$$

$$5,005.233 - 3,071.911$$

1,933.322 ft
apart

28. Aviation A passenger in an airplane flying at an altitude of 10 kilometers sees two towns due east of the plane. The angles of depression to the towns are 28° and 55° (see figure). How far apart are the towns?



$$\tan 35^\circ = \frac{x}{10}$$

$$10 \tan 35 = x$$

$$\underline{\underline{x \approx 7.002}}$$

$$\tan 62 = \frac{y}{10}$$

$$10 \cdot \tan 62 = y$$

$$\underline{\underline{y \approx 18.807}}$$

$$y - x$$

$$18.807 - 7.002$$

$$\boxed{11.805}$$