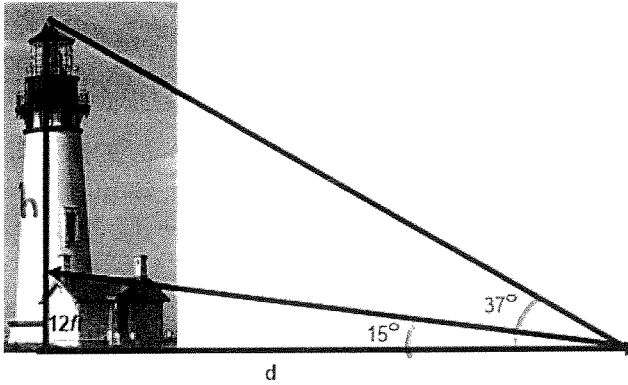


Math 112: #37 A/B/C/D

- A) Suppose that in the process of determining the height of a lighthouse, you stand at a spot level with the base and measure the angle of elevation to the top at 37° . The angle to the 12 ft house joined to the lighthouse is 15° . How high is the lighthouse to the nearest foot?



$$\tan 15^\circ = \frac{12}{d} \quad \tan 37^\circ = \frac{h}{d}$$

$$d = \frac{12}{\tan 15^\circ} \quad d = \frac{h}{\tan 37^\circ}$$

$$\frac{12}{\tan 15^\circ} = \frac{h}{\tan 37^\circ}$$

$$\frac{12 \cdot \tan 37^\circ}{\tan 15^\circ} = \frac{h \cdot \cancel{\tan 15^\circ}}{\cancel{\tan 15^\circ}}$$

$$33.7 = 34 \text{ ft} = h$$

- B) A passenger in a airplane flying at 30,000 ft sees two towns directly to the left of the plane. The angles of depression to the towns are 28° and 55° . How far apart are the towns? Show your work There are many different ways to do this

$$\tan 35^\circ = \frac{x}{30,000}$$

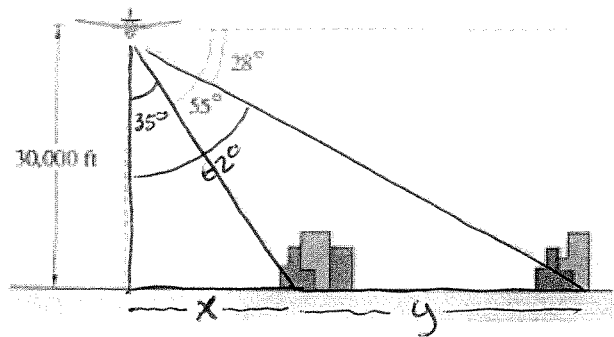
$$30,000 \tan 35^\circ = x = 21006.2$$

$$\tan 62^\circ = \frac{x+y}{30,000}$$

$$30,000 \tan 62^\circ = x+y = 56421.8$$

$$56421.8 - 21006.2 = y = 35415.6 \text{ or } 35,416 \text{ ft}$$

$$\text{or } 6.7 / 7 \text{ miles}$$



C) In order to find the height of a local landmark, you stand at a spot level with the base and measure the angle of elevation to the top at 65° . Then you move 8 meters back and measure the angle at 54° . How high is the landmark to the nearest meter?

$$\tan 65^\circ = \frac{h}{x} \quad \tan 54^\circ = \frac{h}{x+8}$$

$$x \tan 65^\circ = \underline{h} \quad (x+8) \tan 54^\circ = \underline{h}$$

$$x \tan 65^\circ = (x+8) \tan 54^\circ$$

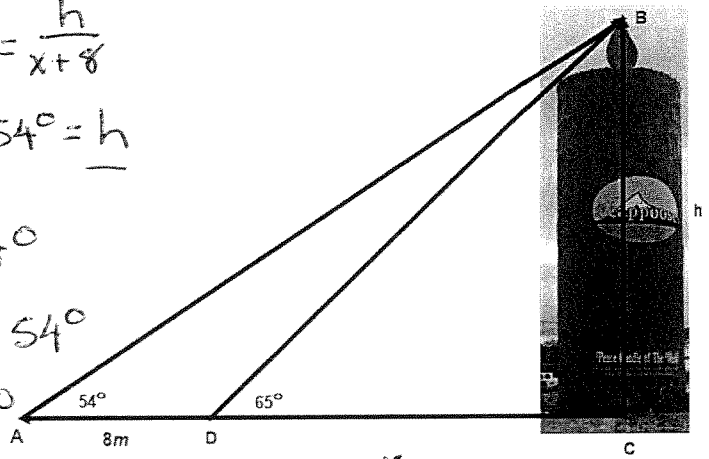
$$= x \tan 54^\circ + 8 \tan 54^\circ$$

$$x \tan 65^\circ - x \tan 54^\circ = 8 \tan 54^\circ$$

$$x (\tan 65^\circ - \tan 54^\circ) = 8 \tan 54^\circ$$

$$x = \frac{8 \tan 54^\circ}{\tan 65^\circ - \tan 54^\circ} = 14.3$$

$$14.3 \tan 65^\circ = h = 30.7 \text{ or } 31 \text{ m}$$



D) In Chicago, the John Hancock tower has an enormous pair of antennae. From 150 meters away the angle of elevation to the top of the tower is 72° . The angle to the top of the antennae is 85° . Find the height to the antennae to the nearest meter.

$$\tan 72^\circ = \frac{x}{150}$$

$$\tan 85^\circ = \frac{x+y}{150}$$

$$150 \tan 72^\circ = x$$

$$15 \tan 85^\circ = x+y$$

$$461.7 = x$$

$$1714.5 = x+y$$

$$1714.5 - 461.7 = y = 1252.9$$

$$\text{or } 1253 \text{ m}$$

