

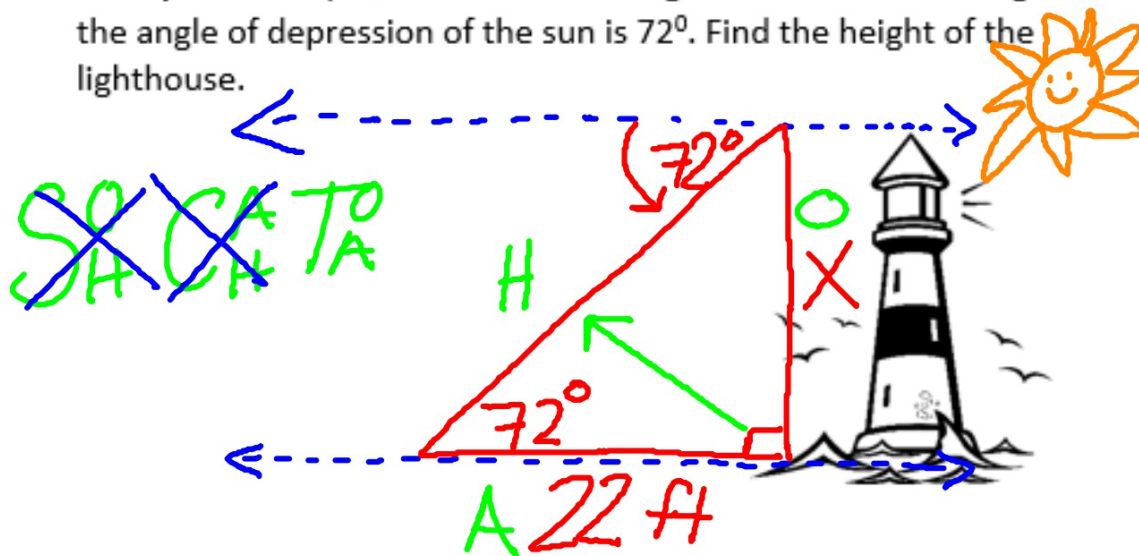
## **Angles of Elevation and Depression**

**Angle of Elevation** – angle formed by a horizontal line and a line of sight to a point above.

**Angle of Depression** – angle formed by a horizontal line and of sight to a point below.

Because the lines are parallel, the angle of elevation and the angle of depression are always Congruent.

**Example 1:** At 2 pm, the shadow of a lighthouse is 22 feet long and the angle of depression of the sun is  $72^\circ$ . Find the height of the lighthouse.



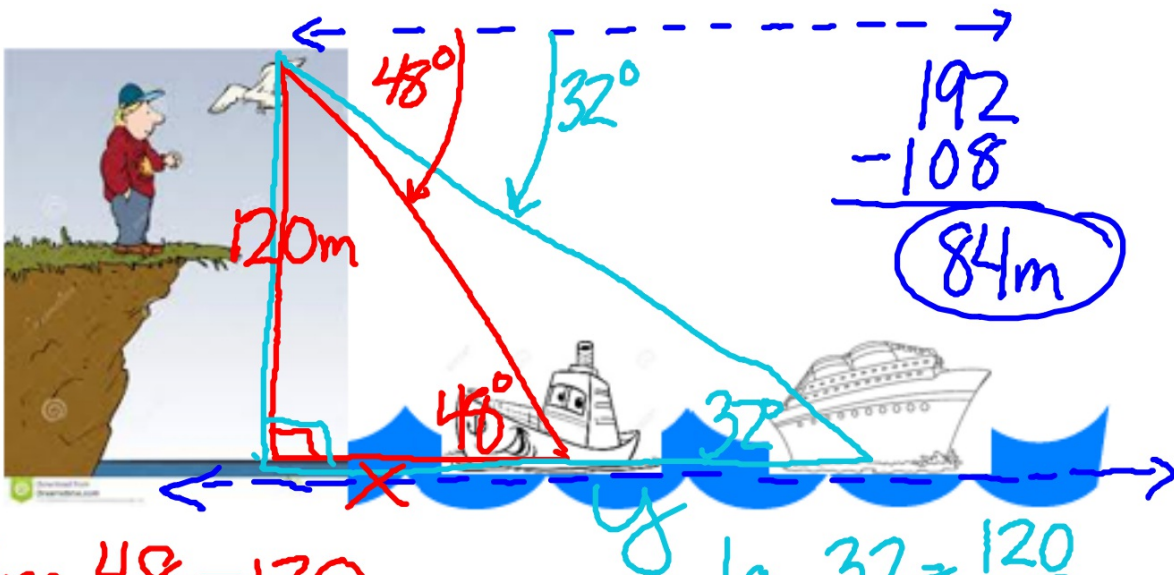
~~$$\frac{\tan 72}{1} = \frac{x}{22}$$~~

$$x = 22 \cdot \tan 72$$

$$= 67.71 \text{ ft}$$



**Example 3:** An observer on a cliff, 120 meters above sea level sights two ships due east. The angle of depression of the ships are  $48^\circ$  and  $32^\circ$ . Find, to the nearest meter, the distance between the ships.



$$\frac{\tan 48}{1} = \frac{120}{x}$$

$$x = 120 / \tan 48 = 108 \text{ m}$$

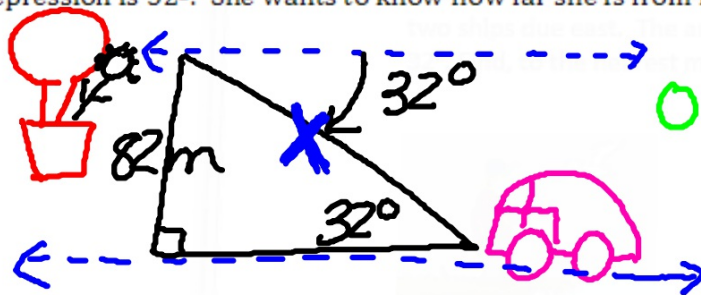
$$\frac{\tan 32}{1} = \frac{120}{y}$$

$$y = 120 / \tan 32 = 192 \text{ m}$$

## Extra Practice

$$X = 154.74 \text{ m}$$

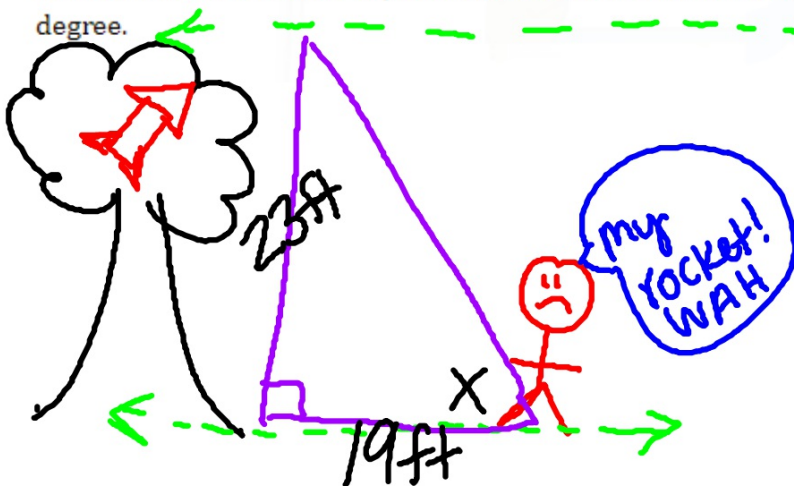
1. Rachel spotted her car from a weather balloon. She knows her altitude is 82 meters and her angle of depression is  $32^\circ$ . She wants to know how far she is from her car:



$$\sin 32 = \frac{82}{X}$$

$$X = \frac{82}{\sin 32}$$

2. Dillon spotted his model rocket from a launch stuck in a tree. HE knows the base of the tree is 19 feet from the launch site. The rocket is 23 feet from the ground. He needs to calculate the angle of elevation so he can make adjustments for future launches. Round the answer to the nearest degree.



$$\tan X = \frac{23}{19}$$

$$X = 50.44^\circ$$