

Problem 2 Using the Angle of Elevation

Wind Farm Suppose you stand 53 ft from a wind farm turbine. Your angle of elevation to the hub of the turbine is 56.5° . Your eye level is 5.5 ft above the ground. Approximately how tall is the turbine from the ground to its hub?

$\tan 56.5^\circ = \frac{x}{53}$ Use the tangent ratio.

$x = 53(\tan 56.5^\circ)$ Solve for x .

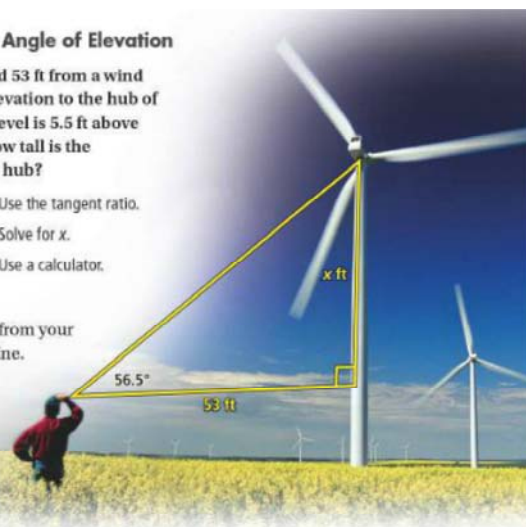
53 \tan 56.5 enter Use a calculator.

80.07426526

So $x \approx 80$, which is the height from your eye level to the hub of the turbine.

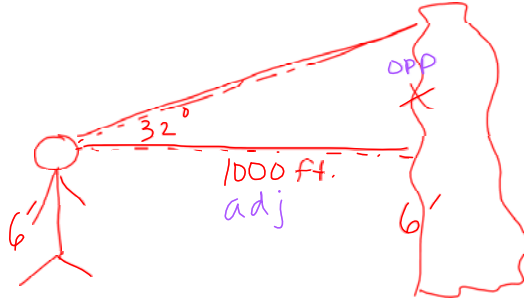
To find the total height of the turbine, add the height from the ground to your eyes.

Since $80 + 5.5 = 85.5$, the wind turbine is about 85.5 ft tall from the ground to its hub.



Example 1

You sight a rock climber on a cliff at a 32° angle of elevation. Your eye level is 6 ft above the ground and you are 1000 feet from the base of the cliff. What is the approximate height of the rock climber from the ground?

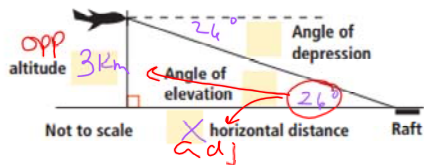


$$1000 \cdot \tan 32^\circ = \frac{x}{1000} \cdot 100$$

$$x = 1000 \tan 32^\circ \approx \frac{624.9}{+6} \\ \approx 630.9 \text{ ft}$$

Example 2

An airplane pilot sights a life raft at a 26° angle of depression. The airplane's altitude is 3 km. What is the airplane's horizontal distance from the raft?



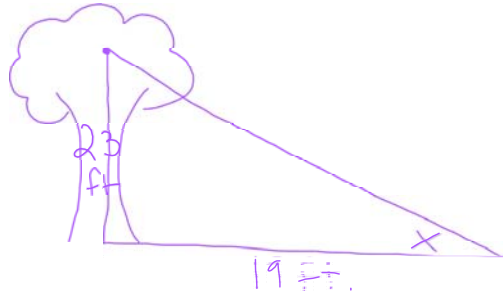
$$x \cdot \tan 26^\circ = \frac{3}{x} \cdot x$$

$$x \tan 26^\circ = 3$$

$$x = \frac{3}{\tan 26^\circ} \approx 6.2 \text{ km}$$

Example 3

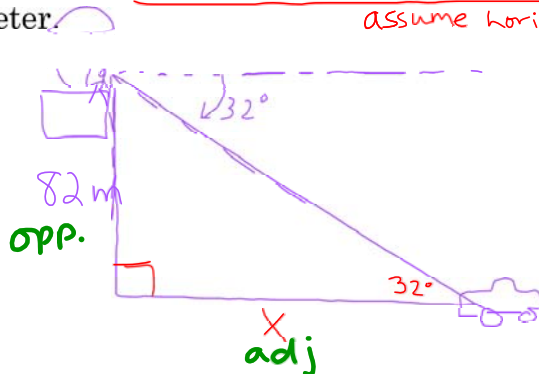
Dillon spotted his model rocket from a launch stuck in a tree. He knows the base of the tree is 19 ft from the launch site. The rocket is 23 feet up from the ground. He needs to calculate the angle of elevation so he can make adjustments for future launches. Round to the nearest degree.



$$\tan x = \frac{23}{19}$$
$$x = \tan^{-1}\left(\frac{23}{19}\right) \text{ or } x = \tan^{-1}(1.21\dots)$$
$$x \approx 50^\circ$$

Example 4

Rachel spotted her car from a weather balloon. She knows her altitude is 82 meters and her angle of depression is 32 degrees. She wants to know how far she is from her car. Round to the nearest meter.



$$x \cdot \tan 32^\circ = \frac{82}{x} \cdot x$$

$$x \tan 32^\circ = 82$$

$$x = \frac{82}{\tan 32^\circ} \approx 131 \text{ m}$$