

Investigating Trigonometry

Calculating the height of the Big Ben Clock using the tangent ratio

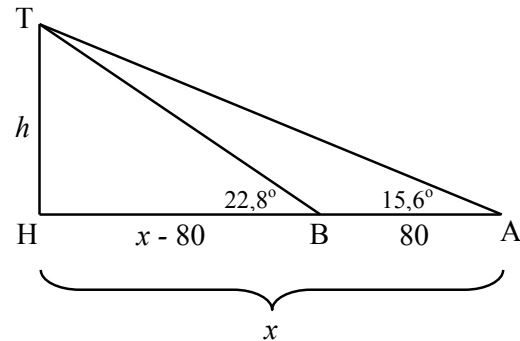
Scenario

A man stands at a certain distance from the tower and calculates the angle of elevation to be $15,6^\circ$. He walks 80m towards the tower and finds that the angle has changed to $22,8^\circ$. Calculate his initial distance from the base of the tower as well as the height of the clock.

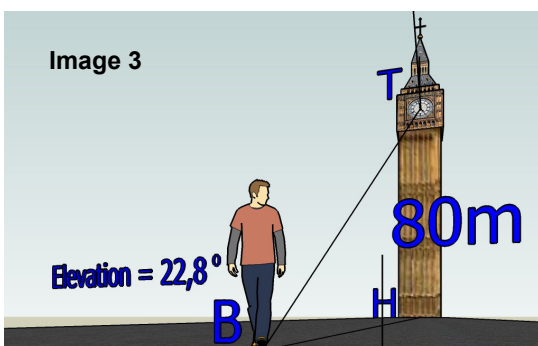
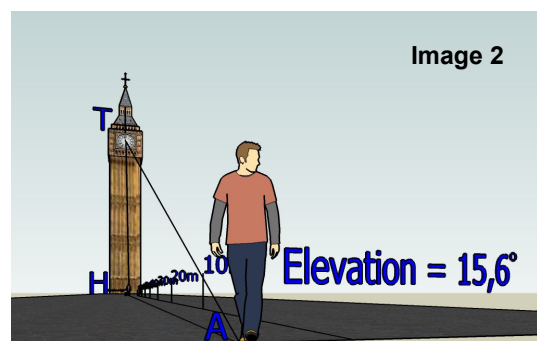
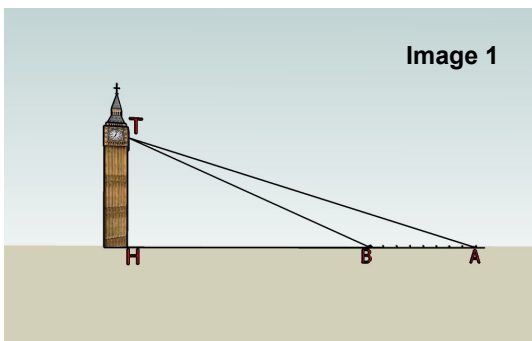
Solving the problem:

Let the initial distance and height be x meters and h meters respectively.

The sketch on the right illustrates the problem:



The Google SketchUp graphics below present a more realistic representation of the problem: Run the file; Height of Big Ben to get a dynamic sense of the problem. Start with the side view then click on the view 'far man' and then 'close man' found under the tool bar on the left of the screen. The views change from images 1, 2 and 3 shown below.



We can solve the problem by observing that:

$$\tan 15,6^\circ = \frac{TH}{AH} = \frac{h}{x} \quad \text{and} \quad \tan 22,8^\circ = \frac{TH}{BH} = \frac{h}{x - 80}$$

Now express h in terms of x from both equations and work out x . Once we have found x we substitute and find h .