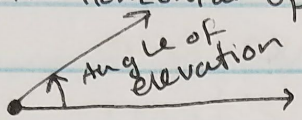
4.8 Solving Problems with Trigonometry

Angles and Line of Sight

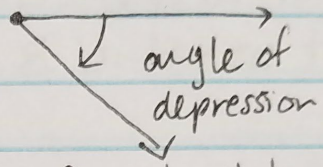
Elevation

From the horizontal up

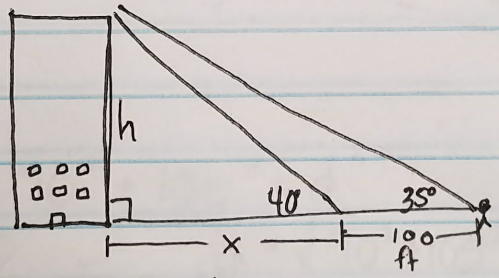


Depression

From the horizontal down



Ex #1 Joe sees the top of a building & finds the angle of elevation to be 35°. He moves 100 ft closer & finds the angle is now 40°. What is the height of the building?



$\tan 40° = \frac{h}{x}$ $\quad x = \frac{h}{\tan 40°}$

$\tan 35° = \frac{h}{x+100}$ $\quad x+100 = \frac{h}{\tan 35°}$

$x = \frac{h}{\tan 35°} - 100$

$\frac{h}{\tan 40°} = \frac{h}{\tan 35°} - 100$

$\frac{h}{\tan 40°} - \frac{h}{\tan 35°} = -100$

$\left[h\left(\frac{1}{\tan 40°} - \frac{1}{\tan 35°}\right) = -100\right] \tan 40° \tan 35°$

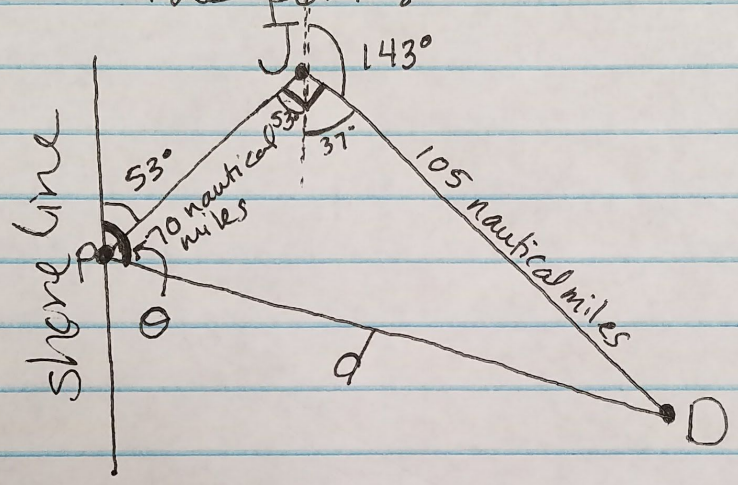
$h(\tan 35° - \tan 40°) = -100 \tan 40° \tan 35°$

$h = \frac{-100 \tan 40° \tan 35°}{\tan 35° - \tan 40°}$

$h \approx 423.022$ ft

The building is about 423.022 ft.

Ex #2 A boat leaves the port and averages 35 knots traveling for 2 hours on a course of 53° and then 3hrs on a course of 143°. What is the boat's bearing & distance from the port?



$70^2 + 105^2 = d^2$

$d = \sqrt{70^2 + 105^2}$

$d \approx 126.194$ nautical miles

$\theta = 53° + \tan^{-1}\left(\frac{105}{70}\right)$

$\theta \approx 109.310°$

The boat has a bearing of 109.310° & a distance of 126.194 nautical miles.