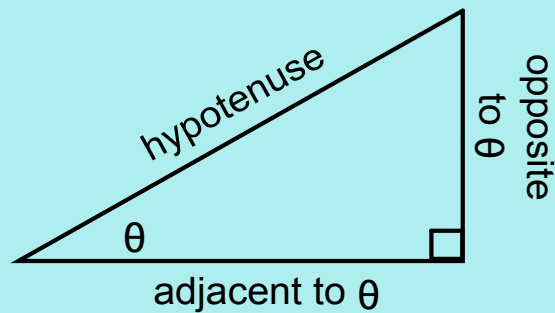


For any angle of interest, there are three (3) primary trigonometric ratios.

$$\text{sine of } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{cosine of } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{tangent of } \theta = \frac{\text{opposite}}{\text{adjacent}}$$



S o h C a h T o a

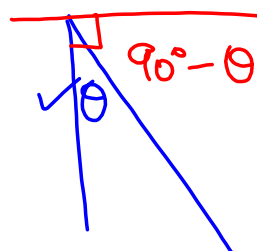
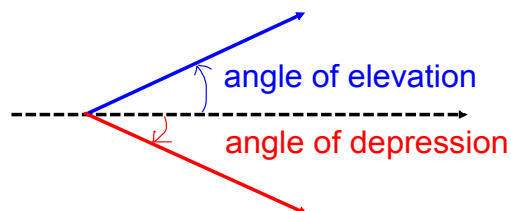
Dec 7-9:58 PM

Solving Problems with Trigonometric Ratios *May 13, 2016*

Terminology:

Angle of Elevation (or Inclination): the angle measured above the horizontal.

Angle of Depression (or Declination): the angle measured below the horizontal.



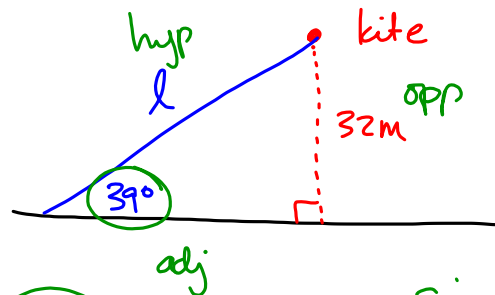
Dec 9-9:41 PM

Steps:

- 1) If possible, draw a good diagram of the situation.
- 2) Identify the unknown (what are you looking for?).
- 3) Label the sides of the triangle as opposite, hypotenuse, and adjacent with respect to the given angle (or the unknown if angle is what you are looking for).
- 4) Identify the trigonometric ratio that relates to the unknown and two of the unknowns OR Pythagorean Theorem OR the sum of the angles in a triangle.
- 5) Solve.

May 13-12:15 PM

Ex.1 A kite is 32 m above the ground. The string makes an angle of 39° with the ground. How long is the string?



Soh Cah Toa
 $\begin{matrix} \text{S} & \text{C} & \text{T} & \text{O} & \text{a} \\ \text{v} & \text{v} & \text{v} & \text{v} & \text{v} \\ \text{?} & \text{x} & \text{?} & \text{v} & \text{x} \end{matrix}$

$$\frac{\sin 39^\circ}{1} = \frac{32}{l}$$

$$\frac{l \sin 39^\circ}{\sin 39^\circ} = \frac{32}{\sin 39^\circ}$$

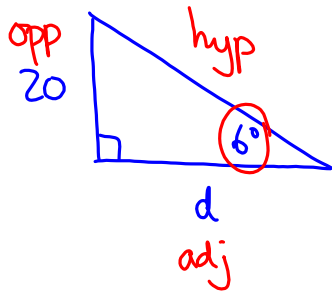
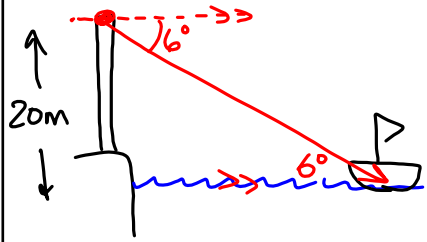
\therefore the length of string is 50.8 m

$$l = \frac{32}{\sin 39^\circ}$$

$$l = 50.8$$

Dec 10-10:22 PM

Ex.2 A lighthouse observation deck is about 20 m above sea level. A boat is viewed at an *angle of depression* of 6° . How far is the boat from the base of the lighthouse?



\therefore the ship is 190.3m away.

Soh Cah Toa
 $\checkmark \checkmark \times \checkmark ? \times \checkmark \checkmark ?$

$$\frac{\tan 6^\circ}{1} = \frac{20}{d}$$

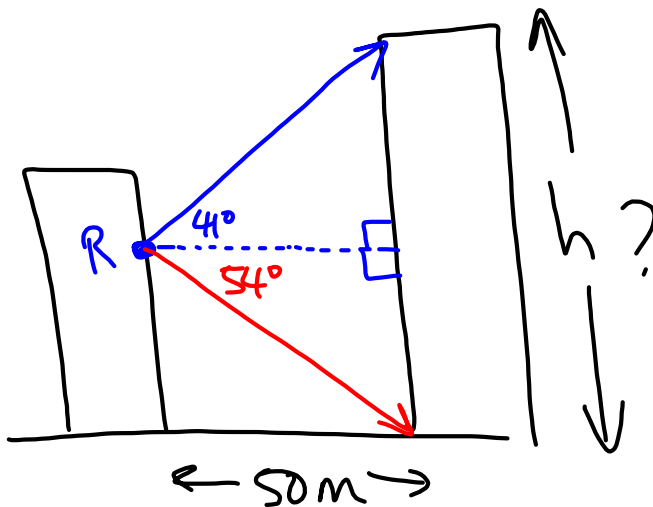
$$d \tan 6^\circ = 20$$

$$d = \frac{20}{\tan 6^\circ}$$

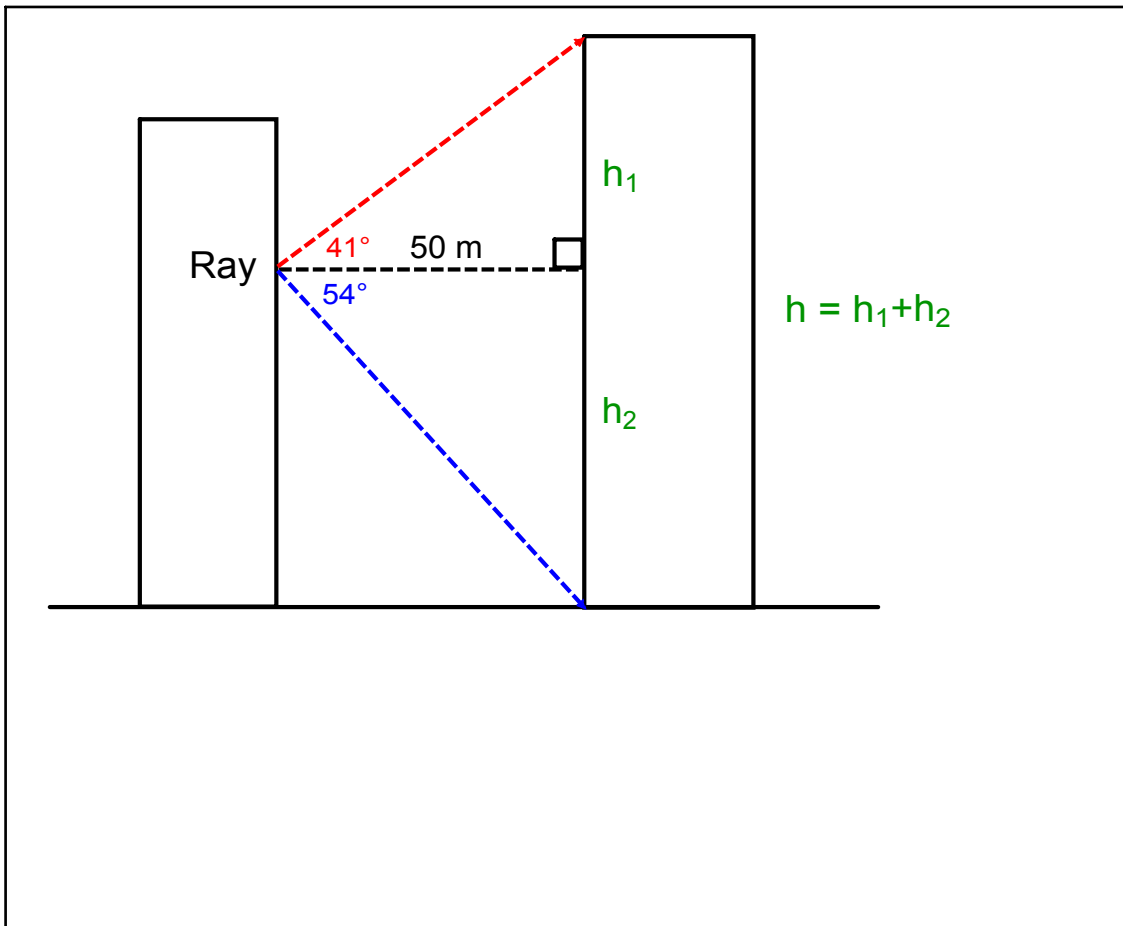
$$d = 190.3$$

Dec 10-10:23 PM

Ex.3 From the window of a building, Ray finds the angle of elevation to the top of a second building to be 41° . The angle of depression to the bottom is 54° . The buildings are 50 m apart. How tall is the second building?



Dec 10-10:25 PM



Dec 10-10:33 PM

Solve one triangle for h_1 and the other triangle for h_2

Triangle 1 (Top):
 hyp (red dashed), opp (red), adj (red), 41° , 50 m, h_1

Triangle 2 (Bottom):
 hyp (blue dashed), opp (blue), adj (blue), 54° , 50 m, h_2

Calculations:

For h_1 :
 Soh Cah Toa
 $\tan 41^\circ = \frac{h_1}{50}$
 $h_1 = 50 \tan 41^\circ$
 $h_1 = 43.4643$

For h_2 :
 Soh Cah Toa
 $\tan 54^\circ = \frac{h_2}{50}$
 $h_2 = 50 \tan 54^\circ$
 $h_2 = 68.8191$

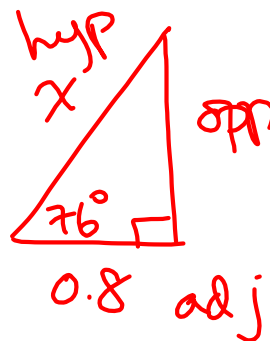
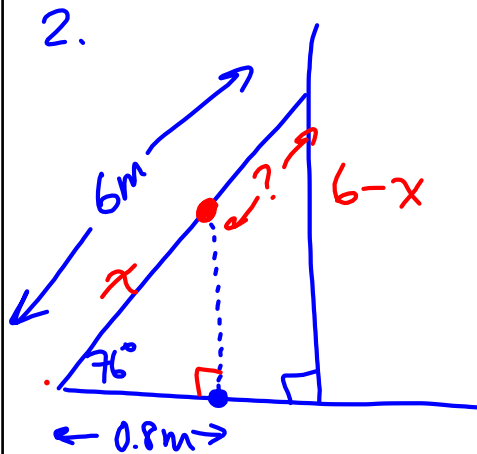
$h = h_1 + h_2$
 $h = 112.2$

\therefore the 2nd building is 112.2m tall.

Dec 10-10:33 PM

Assigned Work:

p.412 # 2, 3, 7, 10, 11

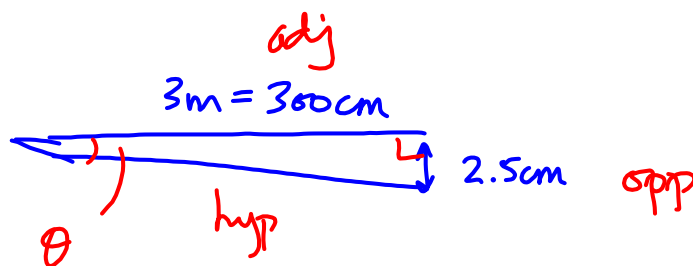


Soh Cah Toa

$$\cos 76^\circ = \frac{0.8}{x}$$

Dec 10-10:43 PM

7.



Soh Cah Toa

$$\tan \theta = \frac{2.5}{300}$$

$$\theta = \tan^{-1} \left(\frac{2.5}{300} \right)$$

$$\theta \doteq 0.5^\circ$$

May 16-12:50 PM

10.

48km
wind
actual 350km
plan
adj
hyp
 θ

SohCahToa

$$\sin \theta = \frac{48}{350}$$

$$\theta = \sin^{-1}\left(\frac{48}{350}\right)$$

$$\theta = \underline{\hspace{2cm}}$$

May 16-12:54 PM

11.

h hyp
opp h opp
35° adj x
65-x adj 30°
65m

SohCahToa
? ?
tan 35° = $\frac{h}{x}$
 $h = x \tan 35^\circ$ ①

SohCahToa
tan 30° = $\frac{h}{65-x}$
 $h = (65-x) \tan 30^\circ$ ②

$$x \tan 35^\circ = (65-x) \tan 30^\circ$$

$$\vdots$$

$$x = \underline{\hspace{2cm}}$$

May 16-12:59 PM