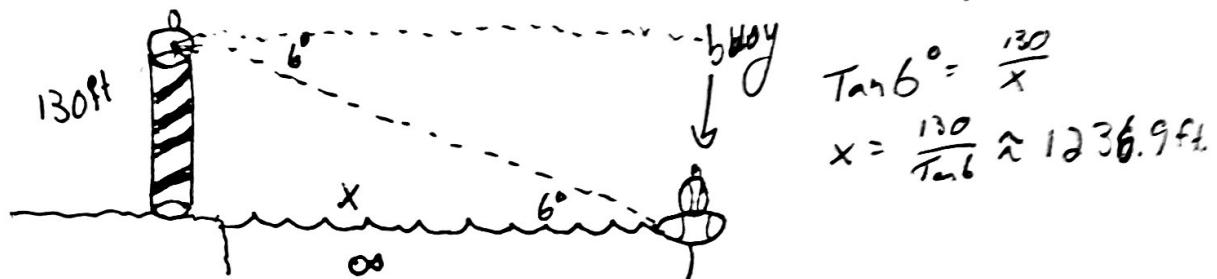


Example 4

The angle of depression of a buoy from the top of the Barnegat Bay lighthouse 130 feet above the surface of the water is 6° . Find the distance x from the base of the lighthouse to the buoy.

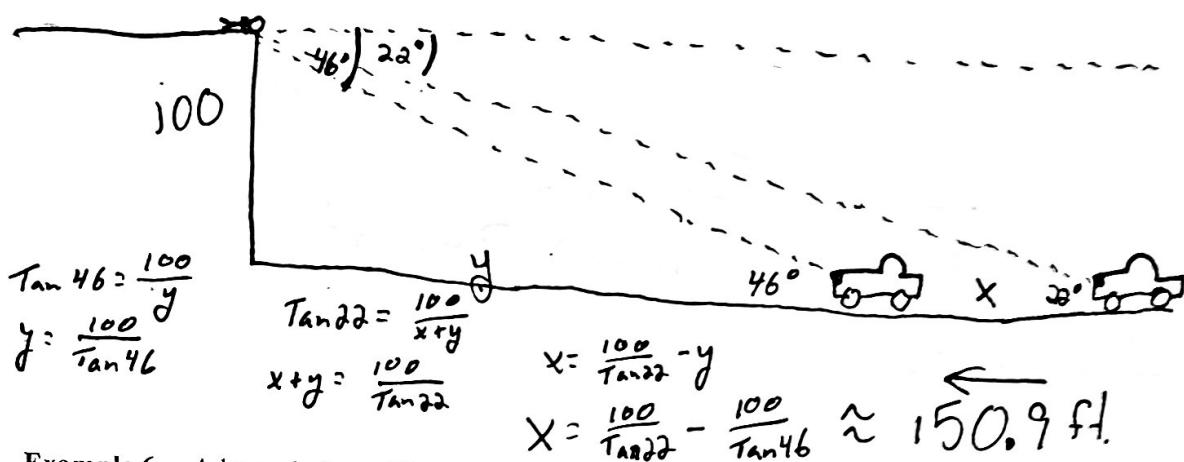


$$\tan 6^\circ = \frac{130}{x}$$

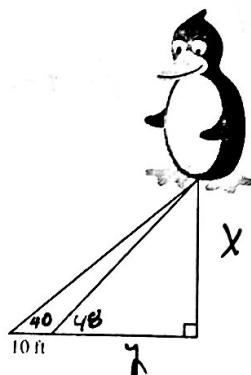
$$x = \frac{130}{\tan 6^\circ} \approx 1236.9 \text{ ft.}$$

Example 5

From the top of a 100-ft building a man observes a moving car. If the angle of depression of the car changes from 22° to 46° during the period of observation, how far does the car travel? Is the car moving to or from the building?



Example 6 A large, helium-filled penguin is awaiting the start of a parade. Two cables attached to the underside of the penguin make angles of 48° and 40° with the ground (see diagram). If the cables are attached to the ground 10 feet from each other, how high above the ground is the penguin?



$$\tan 48^\circ = \frac{x}{y} \quad \tan 40^\circ = \frac{x}{y+10}$$

$$y = \frac{x}{\tan 48^\circ} \quad y+10 = \frac{x}{\tan 40^\circ}$$

$$y = \frac{x}{\tan 40^\circ} - 10$$

$$\frac{x}{\tan 48^\circ} = \frac{x}{\tan 40^\circ} - 10$$

$$\frac{x}{\tan 48^\circ} - \frac{x}{\tan 40^\circ} = -10$$

$$x \left(\frac{1}{\tan 48^\circ} - \frac{1}{\tan 40^\circ} \right) = -10$$

$$x = \frac{-10}{\frac{1}{\tan 48^\circ} - \frac{1}{\tan 40^\circ}} \approx 34.3 \text{ ft.}$$

Unit 5 HW Pg 10

$$\textcircled{1} \quad \sin 38 = \frac{h}{15}$$

$$h = 15 \sin 38 \approx 9.2$$

$$\textcircled{2} \quad \sin 26 = \frac{h}{8}$$

$$h = 8 \sin 26 \\ h \approx 3.5$$

$$\textcircled{3} \quad \sin 52 = \frac{18}{z}$$

$$z = \frac{18}{\sin 52}$$

$$z \approx 22.8$$

$$\textcircled{4} \quad \cos 38 = \frac{w}{23}$$

$$w = \frac{23}{\cos 38}$$

$$w \approx 29.2$$

$$\textcircled{5} \quad \tan 15 = \frac{y}{38}$$

$$y = 38 \tan 15$$

$$y \approx 10.2$$

$$\textcircled{6} \quad \tan 55 = \frac{y}{43}$$

$$y = 43 \tan 55$$

$$y \approx 61.4$$

$$\textcircled{7} \quad \tan x = \frac{5}{7}$$

$$x = \tan^{-1}\left(\frac{5}{7}\right)$$

$$x \approx 35.5^\circ$$

$$\textcircled{8} \quad \tan u = \frac{7}{9}$$

$$u = \tan^{-1}\left(\frac{7}{9}\right)$$

$$u \approx 37.9^\circ$$

$$\textcircled{9} \quad \tan y = \frac{12}{18}$$

$$y = \tan^{-1}\left(\frac{12}{18}\right)$$

$$y \approx 33.7^\circ$$

$$\textcircled{10} \quad \sin 37 = \frac{h}{106}$$

$$h = 106 \sin 37$$

E

$$\textcircled{11} \quad \begin{array}{l} \text{Diagram of a right triangle with hypotenuse } 5.5, \text{ angle } 60^\circ \text{ at the top vertex, and vertical leg } y. \\ x \text{ is the horizontal leg.} \end{array}$$

A

$$\textcircled{12} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } 8, \text{ angle } 15^\circ \text{ at the top vertex, and hypotenuse } x. \\ \text{The angle at the bottom vertex is } 75^\circ. \end{array}$$

B

$$\sin 15 = \frac{8}{x}$$

$$x = \frac{8}{\sin 15}$$

C

$$\textcircled{13} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } x, \text{ angle } 50^\circ \text{ at the top vertex, and horizontal leg } 20. \\ \text{The angle at the bottom vertex is } 40^\circ. \end{array}$$

$$\tan 50 = \frac{x}{20}$$

$$x = 20 \tan 50$$

B

$$\textcircled{14} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } 9, \text{ angle } 45^\circ \text{ at the top vertex, and hypotenuse } 4.5\sqrt{2}. \\ \text{The angle at the bottom vertex is } 45^\circ. \end{array}$$

$$\textcircled{15} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } x, \text{ angle } 30^\circ \text{ at the top vertex, and horizontal leg } 40. \\ \text{The angle at the bottom vertex is } 60^\circ. \end{array}$$

$$\tan 30 = \frac{x}{40}$$

$$y = \frac{x}{\tan 30} - 40$$

$$\tan 60 = \frac{x}{y}$$

$$y = \frac{x}{\tan 60}$$

$$\frac{x}{\tan 30} - 40 = \frac{x}{\tan 60}$$

$$\frac{x}{\tan 30} - \frac{x}{\tan 60} = 40$$

$$x = \frac{40}{\frac{1}{\tan 30} - \frac{1}{\tan 60}}$$

$$\textcircled{16} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } 30 \text{ ft, angle } 30^\circ \text{ at the top vertex, and horizontal leg } 15. \\ \text{The angle at the bottom vertex is } 60^\circ. \end{array}$$

$$\textcircled{17} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } 200, \text{ angle } \theta \text{ at the top vertex, and horizontal leg } 400. \\ \text{The angle at the bottom vertex is } 90^\circ - \theta. \end{array}$$

$$\cos \theta = \frac{200}{400}$$

$$\theta = \cos^{-1}\left(\frac{200}{400}\right)$$

$$\theta \approx 60^\circ$$

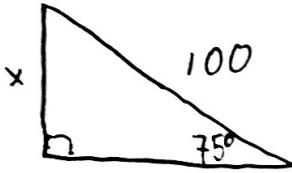
$$\textcircled{18} \quad \begin{array}{l} \text{Diagram of a right triangle with vertical leg } 12, \text{ angle } \theta \text{ at the top vertex, and horizontal leg } 9. \\ \text{The angle at the bottom vertex is } 90^\circ. \end{array}$$

$$\tan \theta = \frac{12}{9}$$

$$\theta = \tan^{-1}\left(\frac{12}{9}\right)$$

$$\theta \approx$$

(19)



$$\tan 75 = \frac{x}{100}$$

$$x = 100 \tan 75$$

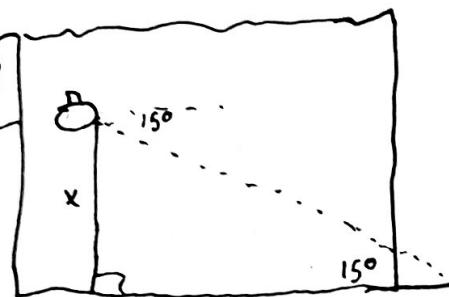
$$x \approx 373.2$$

$$\sin 75 = \frac{x}{100}$$

$$x = 100 \sin 75$$

$$x \approx 96.6$$

(20)



$$\tan 15 = \frac{x}{1500}$$

$$x = 1500 \tan 15$$

$$\text{Total: } 1500 \tan(15) + 250$$

$$\text{Total} \approx 651.9$$

(21)



~~$\tan \theta = \frac{100}{110}$~~

$$\sin \theta = \frac{100}{110}$$

$$\theta = \sin^{-1}\left(\frac{100}{110}\right)$$

$$\theta \approx 65.4^\circ$$

The Unit Circle

