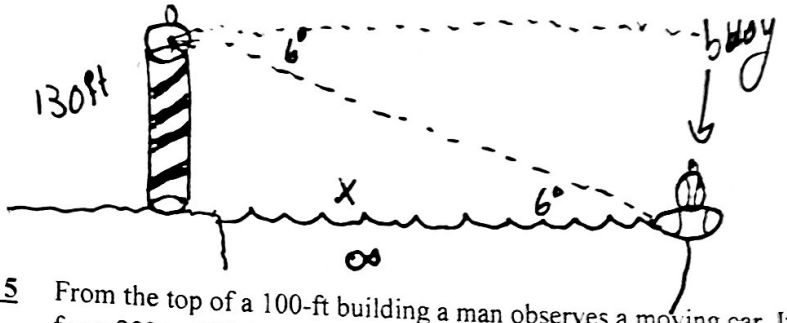
Example 4 The angle of depression of a buoy from the top of the Barnegat Bay lighthouse 130 feet above the surface of the water is 6°. Find the distance x from the base of the lighthouse to the buoy.



$\tan 6° = \frac{130}{x}$

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

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?

$\tan 46 = \frac{100}{y}$

$y = \frac{100}{\tan 46}$

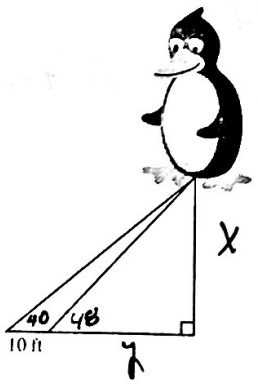
$\tan 22 = \frac{100}{x+y}$

$x+y = \frac{100}{\tan 22}$

$x = \frac{100}{\tan 22} - y$

$x = \frac{100}{\tan 22} - \frac{100}{\tan 46} \approx 150.9 \text{ ft}$

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?



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

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

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

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

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

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

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

Unit 5 HW Pg 10

(1) $\sin 38 = \frac{h}{15}$

$h = 15 \sin 38 \approx 9.2$

(2) $\sin 26 = \frac{h}{8}$

$h = 8 \sin 26$

$h \approx 3.5$

(3) $\sin 52 = \frac{18}{z}$

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

$z \approx 22.8$

(4) $\cos 38 = \frac{23}{w}$

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

$w \approx 29.2$

(5) $\tan 15 = \frac{y}{38}$

$y = 38 \tan 15$

$y \approx 10.2$

(6) $\tan 55 = \frac{y}{43}$

$y = 43 \tan 55$

$y \approx 61.4$

(7) $\tan x = \frac{5}{7}$

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

$x \approx 35.5°$

(8) $\tan u = \frac{7}{9}$

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

$u \approx 37.9°$

(9) $\tan y = \frac{12}{18}$

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

$y \approx 33.7°$

(10) $\sin 37 = \frac{h}{106}$

$h = 106 \sin 37$

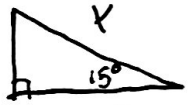
E

(11) 

$x = 2.75$ m

$y = 2.75\sqrt{3}$ m

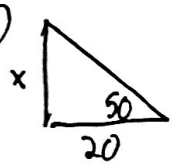
A

(12) 

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

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

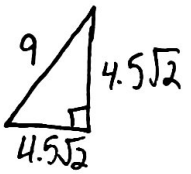
C

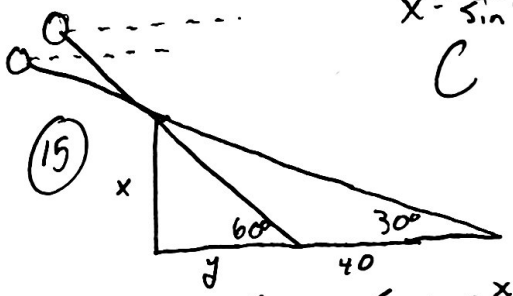
(13) 

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

$x = 20 \tan 50$

B

(14) 

(15) 

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

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

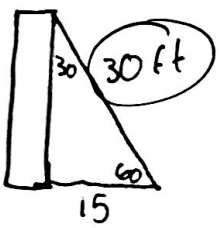
$\tan 60 = \frac{x}{y}$

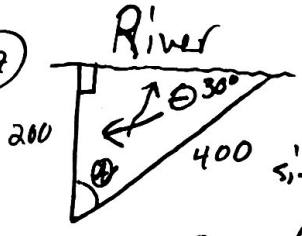
$y = \frac{x}{\tan 60}$

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

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

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

(16) 

(17) 

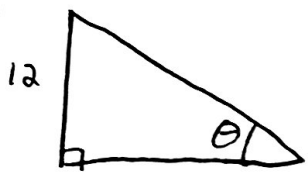
$\sin \theta = \frac{200}{400}$

$\theta = 30°$

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

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

$\theta \approx 60°$

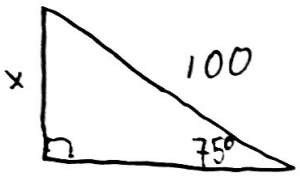
(18) 

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

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

$\theta \approx$

(19)



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

$x = 100 \tan 75$

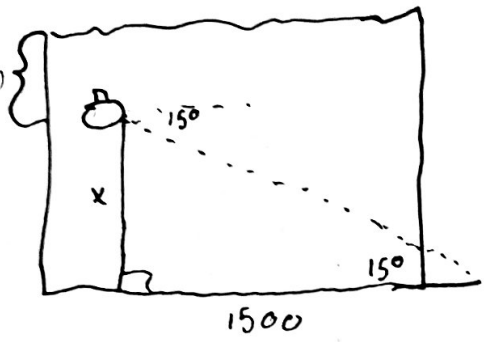
$x \approx 373.2$

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

$x = 100 \sin 75$

$x \approx 96.6$

(20)



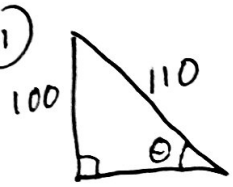
$\tan 15 = \frac{x}{1500}$

$x = 1500 \tan 15$

Total: $1500 \tan(15) + 250$

Total ≈ 651.9

(21)



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

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

$\theta \approx 65.4°$

The Unit Circle