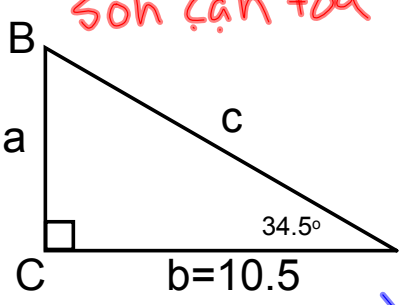
Chapter 4.8: Applications of Trig

Most applications involving trig require you to solve a right triangle using the pythagorean theorem and sine, cosine, tangent.

Solve the triangle:



SOH CAH TOA

180-90-34.5

m∠B = 55.5°

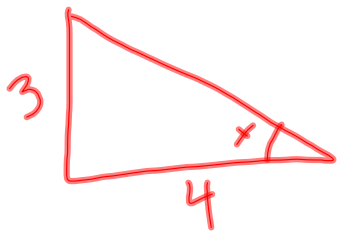
$\frac{a}{10.5} = \tan(34.5)$

$10.5\tan(34.5) = a$

$7.2 = a$

$\frac{10.5}{c} = \cos 34.5$

$c = 12.7$

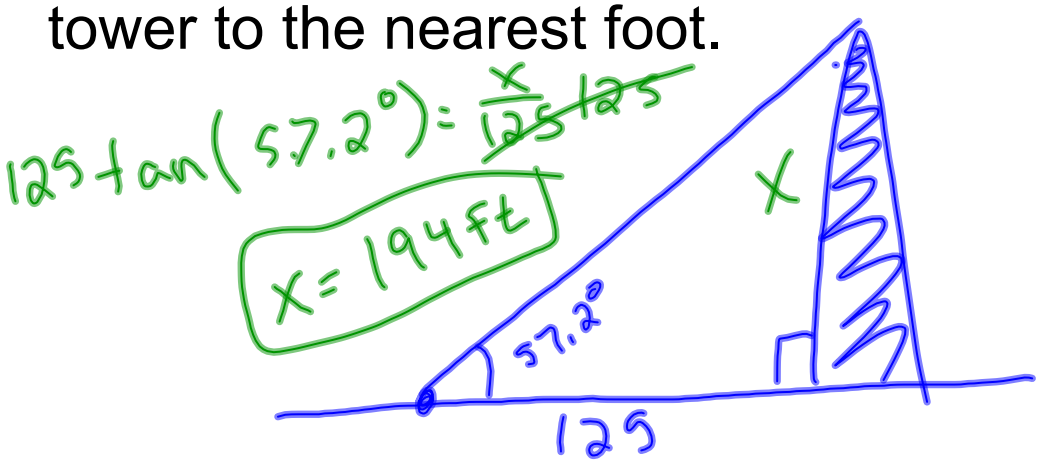


$\tan x = \frac{3}{4}$

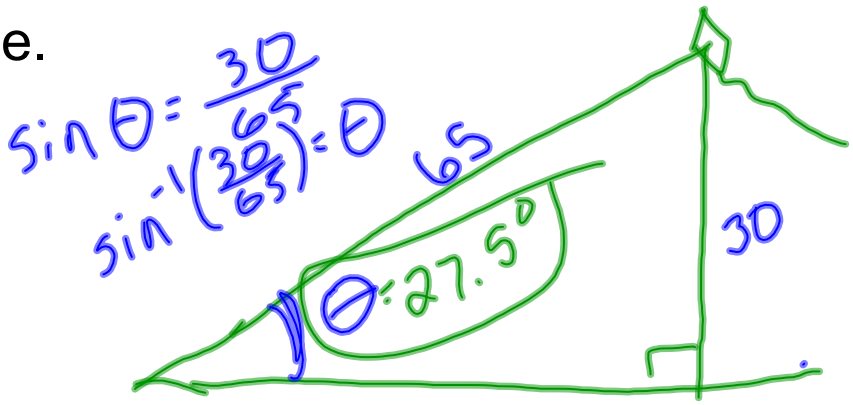
$\tan^{-1}$

$x = 36.9°$

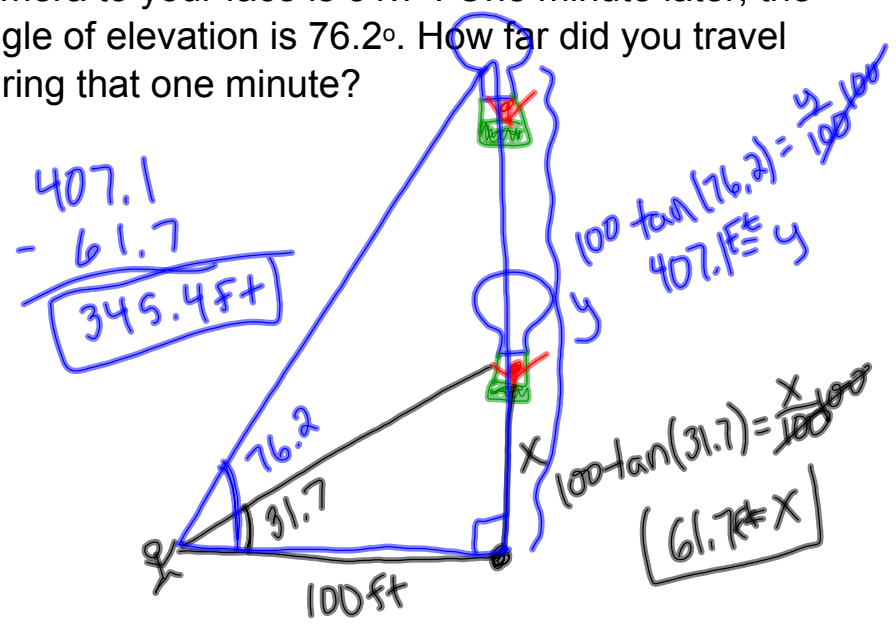
From a point on level ground 125 feet from the base of a tower, the angle of elevation is 57.2°. Approximate the height of the tower to the nearest foot.



A kite flies at a height of 30 feet when 65 feet of string is out. If the string is in a straight line, find the angle that it makes with the ground. Round to the nearest tenth of a degree.

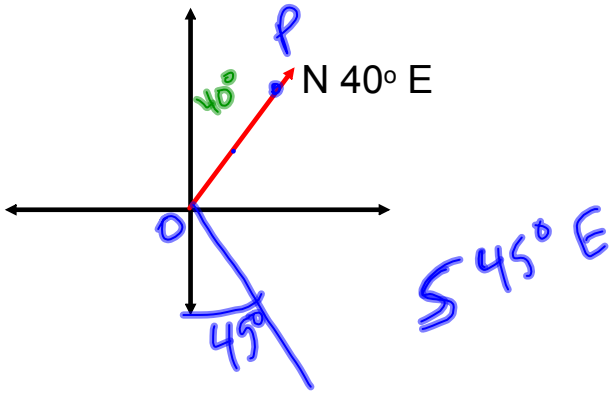


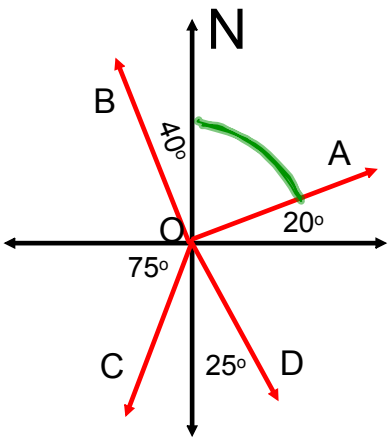
You are taking your first hot-air balloon ride. Your friend is standing on level ground, 100 ft away from your point of launch, making a video of the terrified look on your rapidly ascending face. How rapidly? At one instant, the angle of elevation from the video camera to your face is 31.7°. One minute later, the angle of elevation is 76.2°. How far did you travel during that one minute?



Bearings:

The bearing from point O to point P is the acute angle between ray OP and a north-south line.





Find the bearings:

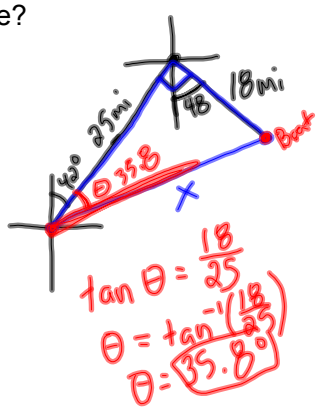
O to B N 40° W

O to A N 70° E

A boat leaves the entrance to a harbor and travels 25 miles on a bearing of N 42° E. The captain then turns the boat 90° clockwise and travels 18 miles on a bearing S 48° E. At that time:

How far is the boat from the harbor entrance?

What is the bearing of the boat from the harbor entrance?



$\tan\theta = \frac{18}{25}$

$\theta = \tan^{-1}\left(\frac{18}{25}\right)$

$\theta = 35.8°$

$25^2 + 18^2 = x^2$

$30.8\text{mi} = x$

N 77.8° E

Simple Harmonic Motion:

An object that moves on a coordinate axis is in simple harmonic motion is its distance from the origin, d, at time t is given by either

$$d = a\cos\omega t \qquad d = a\sin\omega t$$

the motion has amplitude $|a|$ and period $\frac{2\pi}{\omega}$

A ball on a spring is pulled 4 inched below its resting position and then released. The period of the motion is 6 seconds. Write the equation for the ball's simple harmonic motion.

$0 \le x \le 2\pi$ $y = -4\cos\omega t$

$y = -4\cos\left(\frac{\pi}{3}t\right)$

$\frac{2\pi}{\omega} = 6\omega$

$\frac{2\pi}{6} = \frac{6\omega}{6}$

$\omega = \frac{\pi}{3}$

$-5 \le y \le 5$

$$d = -4e^{-.1t}\cos 2t$$

Frequency of an Object in SHM

$$d = a\cos\omega t \qquad d = a\sin\omega t$$

$$f = \frac{\omega}{2\pi} \quad \text{or} \quad f = \frac{1}{period}$$

time for one cycle

A mass on a smooth table attached to a spring moves in a simple harmonic motion described by the equation. Find the max displacement, the frequency and the time required for one cycle.

$$d = 10\cos\frac{\pi}{6}t$$

ω

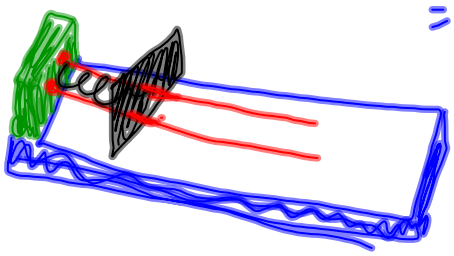
12 sec

$f = \frac{\omega}{2\pi}$

$= \frac{\frac{\pi}{6}}{2\pi}$

$\frac{\pi}{12}$

$f = \frac{1}{12}$ Hz



Problems: Ch 4.8 pg. 534 #'s
5,15,19,25,29,31,33,35,43,49,50