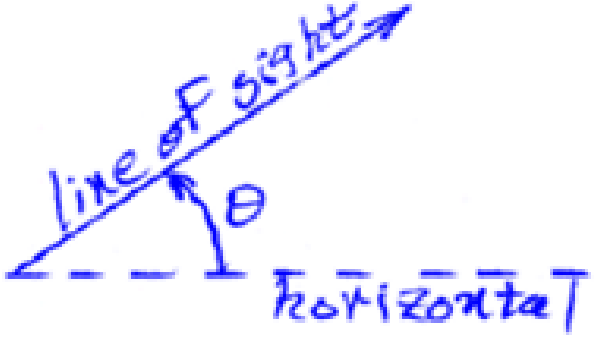
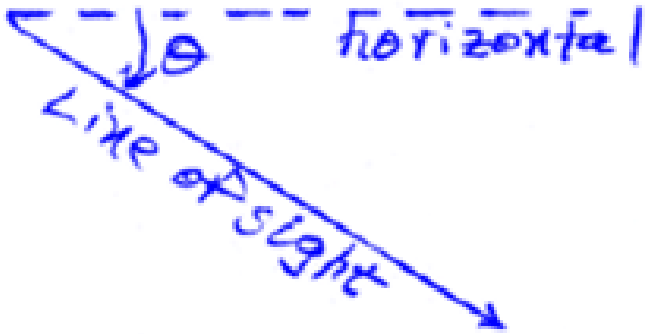
Solving Real World Problems with Right Triangles

Quite often in solving word problems we are confronted with angles that are not in "standard position."

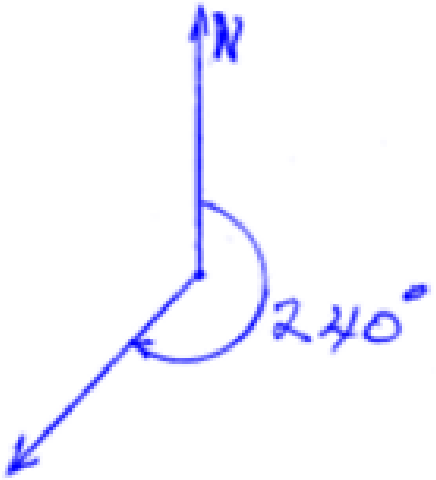
Angle of elevation (measure with respect to a horizontal line):



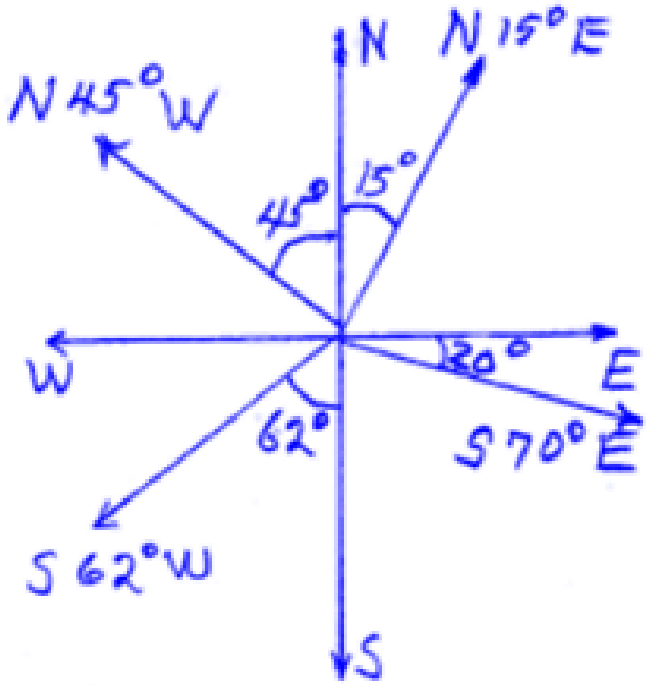
Angle of depression (measure with respect to a horizontal line):



Navigational angle (measure with respect to north, positive direction is clockwise):



Surveying, bearing angle (the acute angle at which the direction varies to the east or west from the north-south line):



You must ALWAYS be aware of the context of the problem, and provide units.

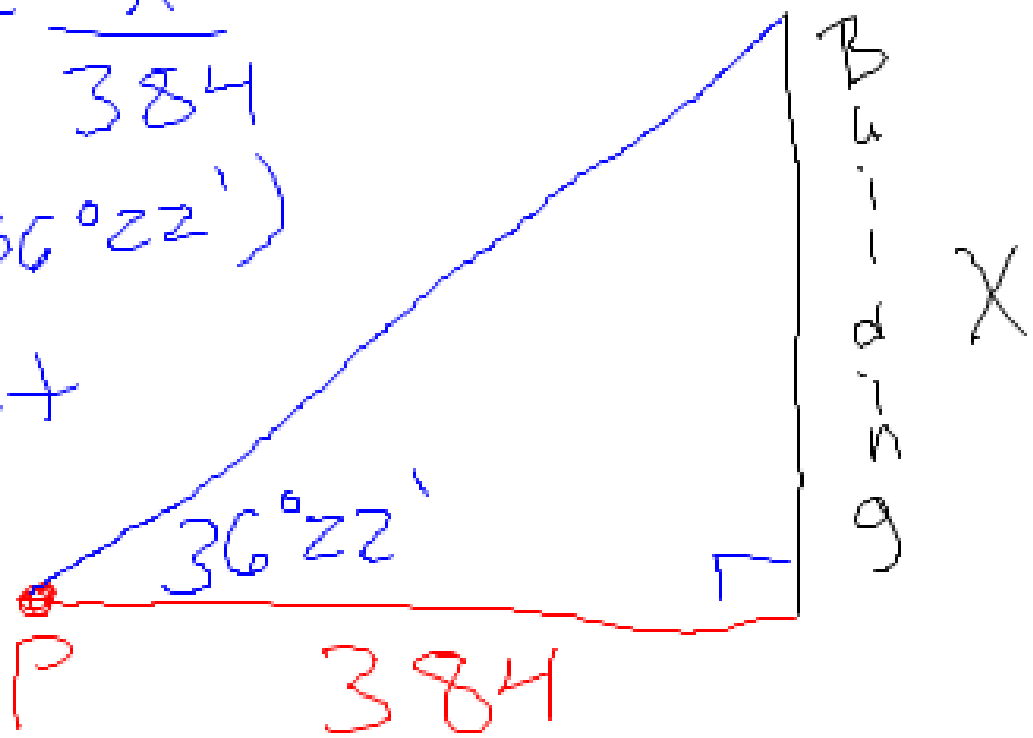
We will use the trig functions to help us solve these word problems

Example 1: From a point 384 ft in a horizontal line from the base of a building, the angle of elevation to the top of the building is $36^\circ 22'$. How tall is the building?

$$\tan(36^\circ 22') = \frac{X}{384}$$

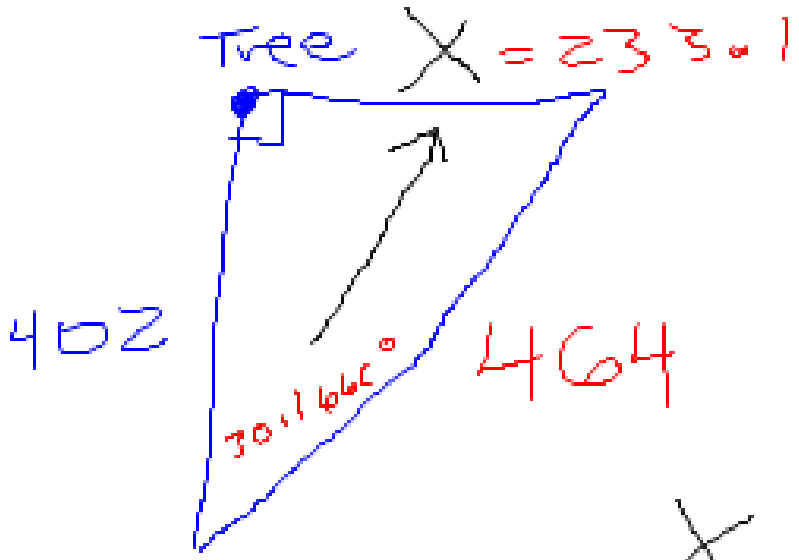
$$X = 384 \tan(36^\circ 22')$$

Building is about 283 ft tall



Example 2: Find the area of a parcel of land whose boundaries are marked as follows: beginning at the old oak tree, thence 402 ft south, thence 464 ft N 30.1666° E, and thence due west back to the old oak tree.

$A = \frac{1}{2}bh$



$\sin 30.1666^\circ = \frac{X}{464}$ (464 cancels)

$X = 233.1$

$A = \frac{1}{2}(402)(233.1)$

Area of land is $46853.1 ft^2$.

Example 3: Determine the measure of the missing angle on the wheelchair ramp below.

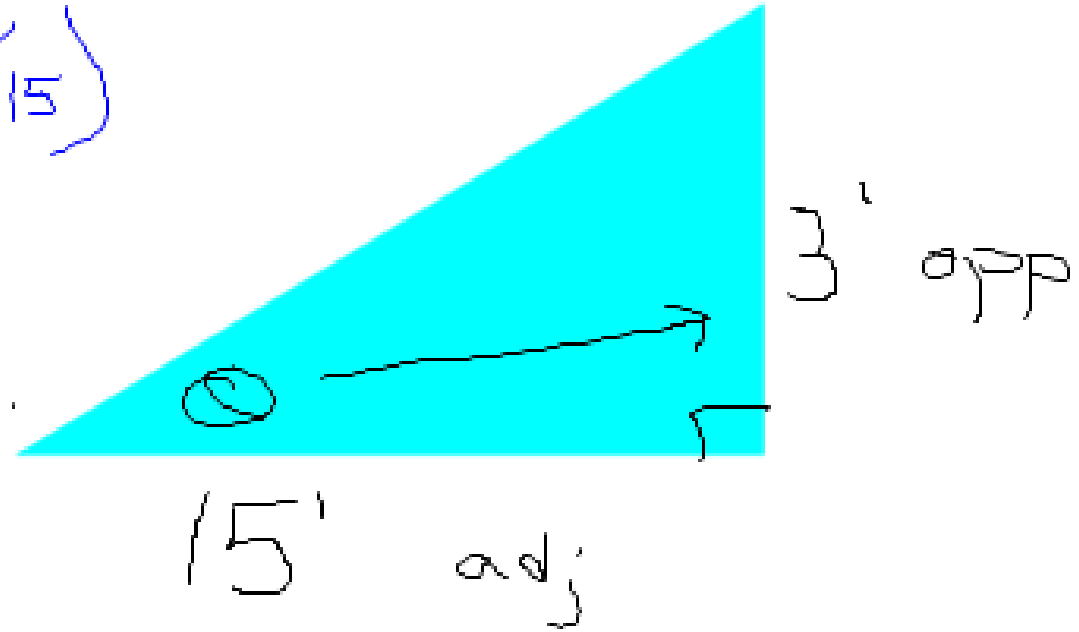
$\tan^{-1}$ (inverse)

$\tan\theta = \frac{3}{15}$

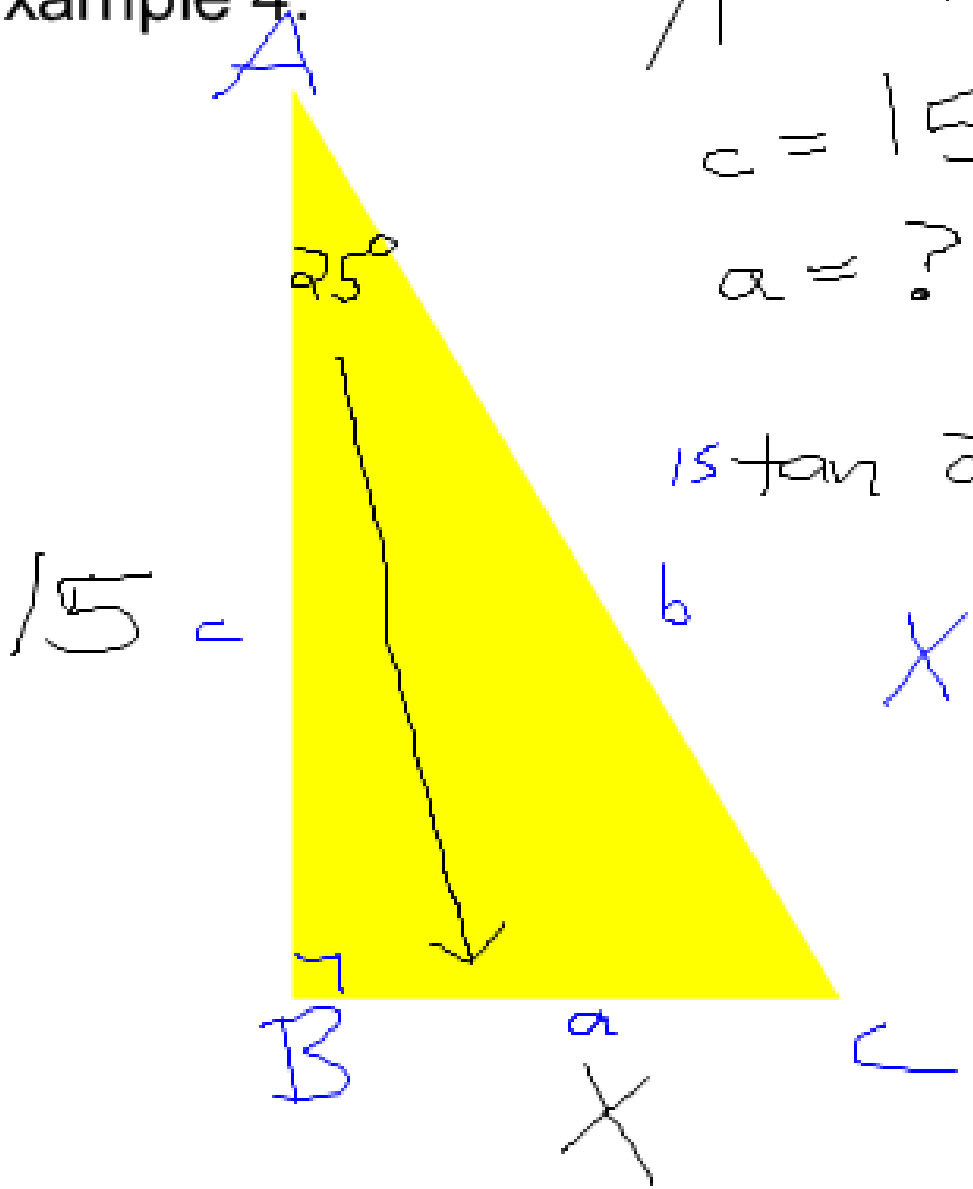
2nd $\tan(3/15)$

so

$\theta = 11.3^\circ$



Example 4:



$A = 25^\circ$

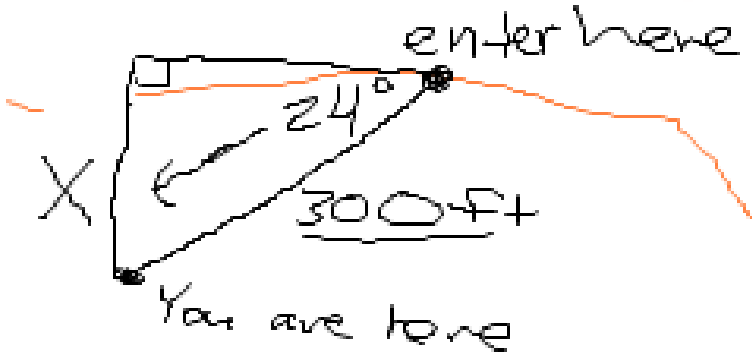
$c = 15$

$a = ?$

$15 \tan 25^\circ = \frac{x}{15}$ ·15

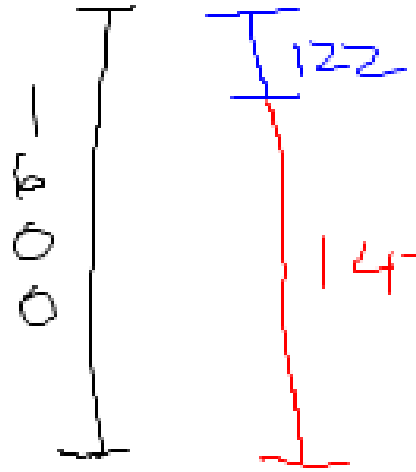
$x = 6.99$

11. The elevation above sea level at the entrance to a mine is 1600 ft. The mine shaft descends in a straight line for 300 ft at an angle of depression of 24°. Find the elevation of the bottom of the mine shaft above sea level.



$300 \sin 24^\circ = \frac{X}{300} \cdot 300$

$122 \text{ ft} = X$



Mine is 1478' above sea level at bottom.

Homework
p302
#10-30 even