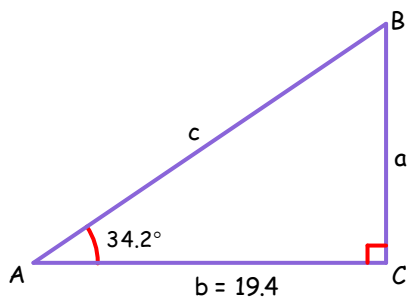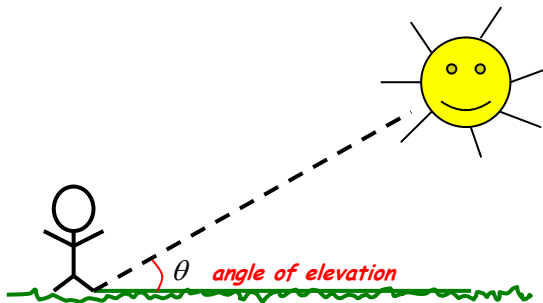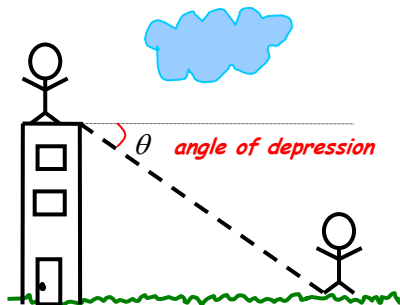# 4.8...APPLICATIONS AND MODELS

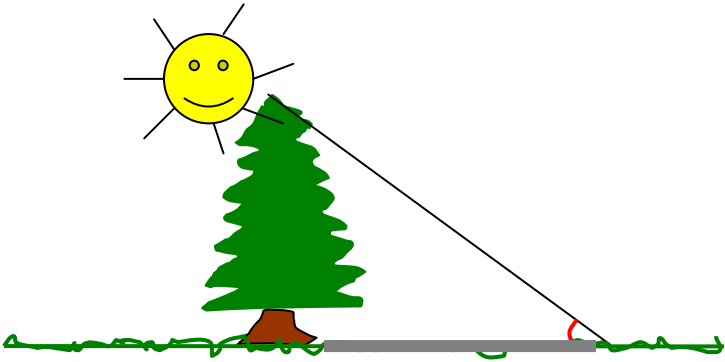## APPLICATIONS

EXAMPLE #1...Solve the right triangle below.

- Previously, we defined an *ANGLE OF ELEVATION* to be the angle from the horizontal *UPWARD*.


- Also, we defined an *ANGLE OF DEPRESSION* to be the angle from the horizontal *DOWNWARD*.

EXAMPLE #2…If the angle of elevation of the sun is $28°$, find the height of a tree that casts a 150-foot shadow.

EXAMPLE #3…At a point 200 feet from the base of a building, the angle of elevation to the bottom of a smokestack is $35°$, and the angle of elevation to the top is $53°$. Find the height s of the smokestack alone.
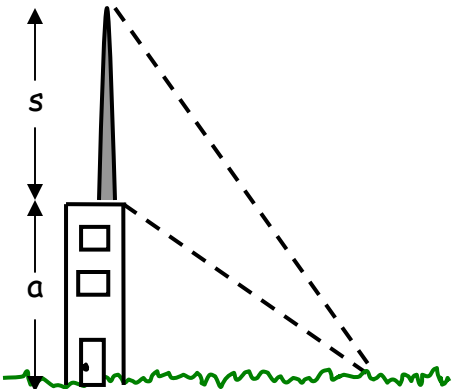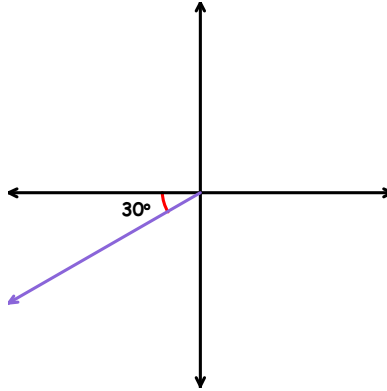
TRIGONOMETRY AND BEARINGS

•   Directions are generally given in terms of *BEARINGS* and measure the *ACUTE ANGLE* a path or line of sight makes with a fixed *NORTH-SOUTH* line.

EAST OF SOUTH	WEST OF SOUTH	WEST OF NORTH	EAST OF NORTH
S 30° E	*S 45° W*	*N 75° W*	*N 35° E*

EXAMPLE #4...Write the bearing for the path shown in the diagram below.

EXAMPLE #5...A ship leaves port at noon and heads due west at 20 knots. At 2 *P.M.* the ship changes course to N 54° W . Find the ship's bearings and distance from the port of departure at 3 *P.M.*

EXAMPLE #6...A ship is 40 miles west and 15 miles south of port. If the captain wants to sail directly to port, what bearing should be taken?

HARMONIC MOTION

- *SIMPLE HARMONIC MOTION* can be described by a *SINE* or *COSINE* curve.

DEFINITION OF SIMPLE HARMONIC MOTION

A point that moves on a coordinate line is said to be in *SIMPLE HARMONIC MOTION* if its distance d from the origin at time t is given by either…

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

where a and ω are real numbers such that $\omega > 0$. The motion has amplitude $|a|$, period $\dfrac{2\pi}{\omega}$, and frequency $\dfrac{\omega}{2\pi}$.

PERIOD IS $\dfrac{2\pi}{\omega}$ *FREQUENCY* $\dfrac{\omega}{2\pi}$

EXAMPLE #7…Given the equation for simple harmonic motion $d = 3\sin\dfrac{t}{2}$, find:

A. the maximum displacement,

B. the frequency of the simple harmonic motion, and

C. the period of the simple harmonic motion.