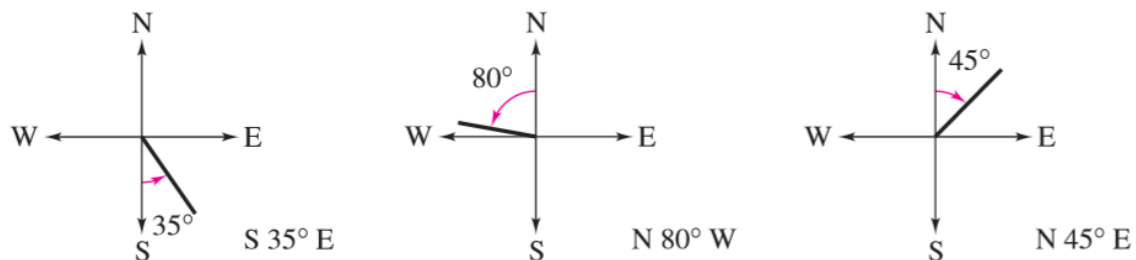


Unit 4.8 Modeling

Trigonometry and Bearings

How do we measure bearings?

A bearing measures the acute angle that a path or line of sight makes with a fixed north-south line.



In air navigation, bearings are measured in degrees clockwise from north. Examples of air navigation bearings are shown below.

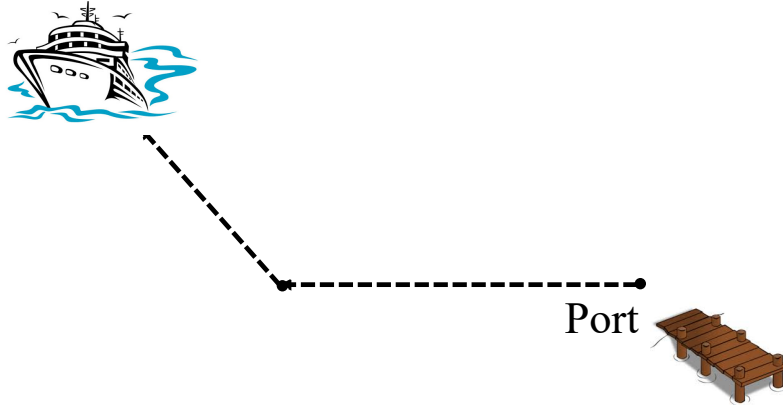
Draw a sketch

A rocket travelling on a bearing of 200° .

An aircraft flying on a bearing of 75° .

A helicopter flying on a bearing of 310° .

A ship leaves port at noon and heads due west at 20 knots, or 20 nautical miles (nm) per hour. At 2 P.M. the ship changes course to $N 54^\circ W$, as shown in Figure 4.83. Find the ship's distance from the port of departure at 3 P.M.



A jet leaves Reno, Nevada and is headed toward Miami, Florida at a bearing of 100° . The distance between the two cities is approximately 2472 miles.

- How far north and how far west is Reno relative to Miami?
- If the jet is to return directly to Reno from Miami, at what bearing should it travel?

Two forest ranger towers were located on an East-West line, 24 miles apart. Smoke was detected from tower B at a bearing of S 28° W. The same smoke was detected at a bearing of S 62° E from tower A. How far is the location of the smoke from tower A?

Harmonic Motion

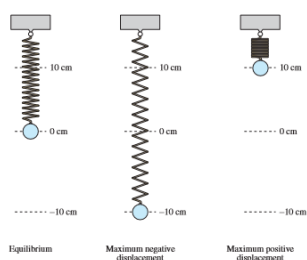
The periodic nature of the trigonometric functions is useful for describing the motion of a point on an object that vibrates, oscillates, rotates, or is moved by wave motion.

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

$$d = a \sin \omega t \quad \text{or} \quad d = a \cos \omega t$$

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

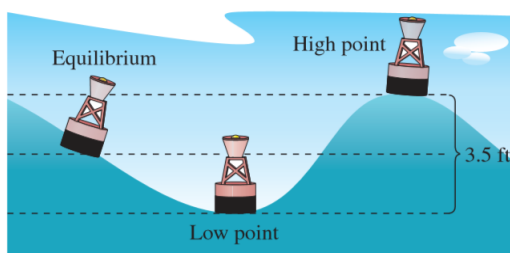


Find a model for simple harmonic motion satisfying the specified conditions.

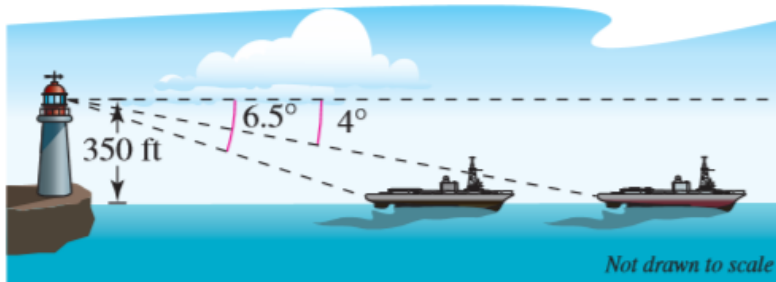
- How do you know whether to use Sine or Cosine?

	Displacement ($t = 0$)	Amplitude	Period
1.	0	3 meters	6 seconds
2.	2 feet	2 feet	10 seconds

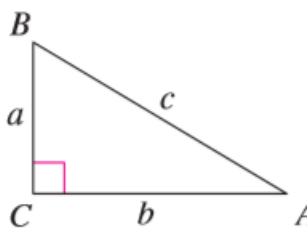
A buoy oscillates in simple harmonic motion as waves go past. It is noted that the buoy moves a total of 3.5 feet from its low point to its high point (see figure), and that it returns to its high point every 10 seconds. Write an equation that describes the motion of the buoy if its high point is at $t = 0$.



An observer in a lighthouse 350 feet above sea level observes two ships directly offshore. The angles of depression to the ships are 4° and 6.5° . How far apart are the ships?

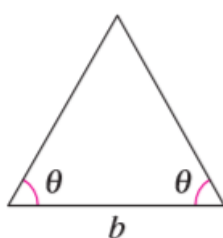


Solve the right triangle shown in the figure for all unknown sides and angles.



$$B = 54^\circ, c = 15$$

Find the altitude of the isosceles triangle shown in the figure.



$$\theta = 18^\circ, b = 10$$

Section 4.8 Pgs. 335-337

5, 9, 17, 19, 21, 23, 33, 34, 35, 37, 38, 40, 45, 47, 50, 58