

Enrichment**LESSON 1**

Finding Direction at Sea

Today, satellites can transmit information from space, giving an observer on Earth his or her exact position. This technology is particularly useful for navigating on the open ocean, where landmarks are few and far between.

Satellites, however, are modern technology. How did sailors at sea determine their position in earlier times?

Early sailors stayed close to shore, using the apparent motion of the Sun and stars, well-known landmarks, and wind currents to navigate from harbor to harbor. By the 1400s, however, European sailors were venturing far out to sea to explore new worlds. They had to develop a frame of reference to guide them. The system they created is still in use today. It involves latitude and longitude.

Latitude

Latitude measures distance in degrees north or south of the equator. The equator is at 0° latitude. The poles are at 90° latitude. A location halfway between the equator and the North Pole is at 45° north latitude, or 45°N . A location halfway between the equator and the South Pole is at 45° south latitude, or 45°S .

Sailors used an instrument called a sextant to find their latitude. They measured

the angle of Polaris, also known as the North Star, above the horizon. The resulting angle corresponded to their latitude.

Longitude

Longitude measures distance in degrees east or west of the prime meridian, which runs through Greenwich, England. The prime meridian is at 0° longitude. Locations east of the prime meridian have longitudes of 0° to 180°E . Locations west of the prime meridian have longitudes of 0° to 180°W .

Sailors had a difficult time determining their exact longitude. The problem was solved with the invention of an accurate, seaworthy clock in the 1700s. Sailors knew that the Sun appears to move 15° longitude each hour. This fact, an accurate clock, and a clear sky are all they needed to find their longitude.

Here's how to find your longitude. At your point of departure, set the clock to noon when the Sun is directly overhead. When you need to find your longitude on the ocean, note the clock time when the Sun is directly overhead. The clock still tells what the time is at your departure point. How many hours different is that time from noon? Use the difference to calculate how many degrees you have traveled from your original point.

Applying Critical-Thinking Skills

Directions: Respond to each statement.

- 1. Apply** Most globes have lines of latitude and longitude. Use a globe to find the latitude and longitude of your town.
- 2. Calculate** Imagine that you are sailing across the ocean. You are carrying an accurate clock on board that is set to the correct time for your departure port. When the Sun is directly overhead, the clock reads 5:00 P.M. Calculate how many degrees of longitude you have crossed and indicate the direction you were moving when you crossed them.

Challenge**LESSON 1*****Finding Your Way***

A new family has just moved into your neighborhood. They live next door to you. They would like to know the location of the school, the library, and the grocery store. In the space below, draw a map for the family, using their home as the reference point. Assume the following conditions when you draw the map:

- The reference direction is east.
- The school is -1 km from the family's home.
- The library is $+2$ km from the family's home.
- The grocery store is -4 km from the family's home.

Draw and label each building on your map. Include an arrow showing the reference direction. Also, show the distance from the reference point to each building.