

Navigation

Navigation is the process of accurately determining one's position and planning and following a route. Throughout history, humans have used a number of different navigation techniques. In this lesson, we will discuss both historical and modern methods of navigation.

Ancient Methods

The earliest sailors navigated primarily by staying in sight of land. This allowed them to use landmarks on the coast to determine their location. If they ventured out of sight of land, they risked getting disoriented and lost.

Navigating by staying in sight of land had some drawbacks. First was the simple fact that you couldn't go anywhere that wasn't in sight of land (for example, someone from America couldn't have sailed to Hawaii). Second, the coastlines of many landmasses often have rocks submerged just below the surface. Ships traveling near the coast ran the risk of hitting these rocks and sinking.

Some civilizations used a tool called a sounding weight to help them navigate when out of sight of land. This tool was a bell shaped weight attached to a long rope. When out to sea, sailors could lower the sounding weight in order to determine how deep the waters were. From this depth, they could estimate how far from land they were.

By the time of the Greeks, many civilizations had begun to use celestial navigation. This method involved accurately knowing the locations of particular stars which were used to orient the ship in the correct direction.

Celestial navigation had the advantage of allowing sailors to venture out of sight of land. However, it was not without its drawbacks. Most notably, one could only navigate when one could see the stars (or the Sun during the day). If it was cloudy, the ship would have to be anchored until it cleared up enough to navigate.

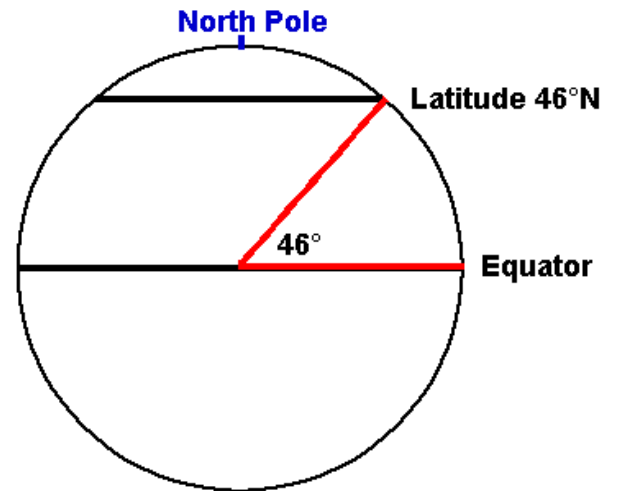
Medieval Methods

By the 11th century AD, the magnetic compass had become a standard tool for navigational purposes. Some civilizations also used primitive instruments to determine the altitude of the stars. When combined with detailed maps of the time, sailors were able to sail across oceans rather than skirt along the coast.

Renaissance Methods

By the early 15th century AD, sailors had begun to navigate using a type of coordinate system. This system divided the Earth into a grid (like graph paper). The grid lines that run parallel to the equator are known as lines of **latitude**. The grid lines that run from the north pole to the south pole are known as lines of **longitude**.

Latitude is used to express how far north or south of the equator you are. It is typically expressed in degrees. To determine your latitude, you would need to determine the angle formed between the line joining you to the center of the Earth and the equator, as shown in the diagram to the right.



If you were on the equator, your latitude would be zero degrees.

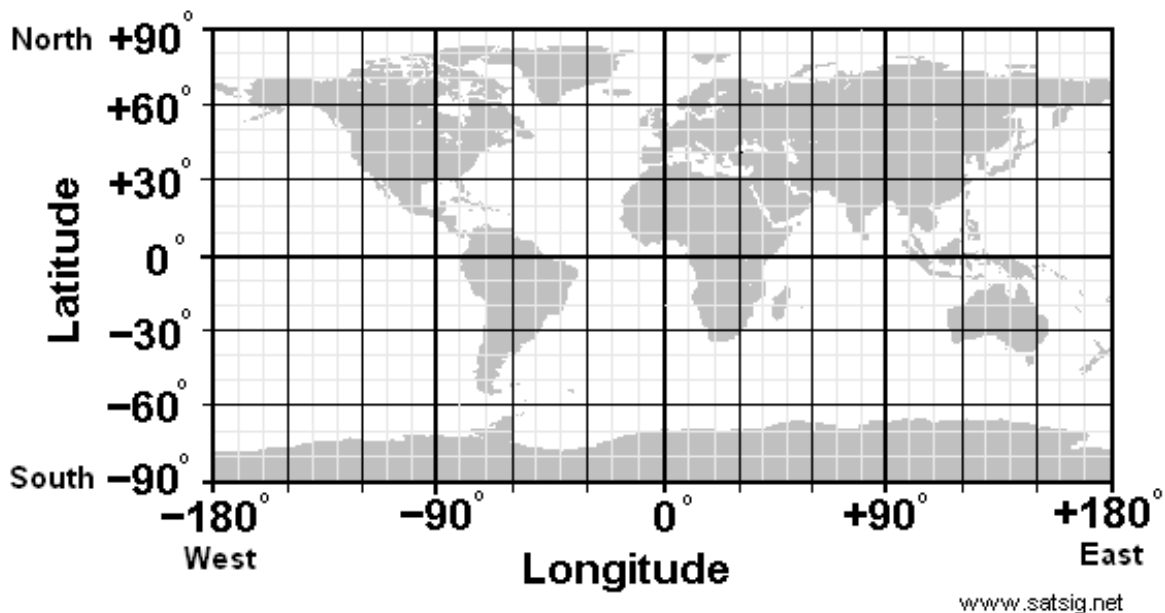
Any position north of the equator would be expressed as "X degrees north latitude." For example, the north pole is 90 degrees north latitude.

Similarly, any position south of the equator would be expressed as "X degrees south latitude." For example, the south pole is 90 degrees south latitude.

Longitude shows your location in an east-west direction, relative to a line called the meridian, which runs from the north pole, through Greenwich, England, to the south pole.

Places to the west of Greenwich (such as Winnipeg), have angles ranging from 0 to 180 degrees west. Places to the east of Greenwich have angles ranging from 0 to 180 degrees east.

The diagram below illustrates the concept of latitude and longitude.



Note: A quick way to determine latitude is to use an astrolabe to find the altitude of Polaris (the north star). The altitude of Polaris at your location is the same as your latitude.

It should also be noted that longitude was not nearly as easy to determine as latitude. It was not until the early 18th century AD that reliable methods for determining a ship's longitude were discovered.

Modern Methods

Ships today still use the latitude and longitude system of navigation. However, we have come up with much more reliable methods of determining these values.

Since 1978, a satellite system controlled by the United States Air Force, called the Global Positioning System (GPS), has provided worldwide coverage. This system of satellites is capable of reporting the latitude and longitude of any object equipped with a GPS to within a few feet (for publically available systems) or a few inches (for military systems).

