

# WHAT IS NAVIGATION?

In the story of *Hansel and Gretel*, the two main characters leave a trail of breadcrumbs through the forest so they can find their way back out. Unfortunately, when they try to go home, birds have eaten all the breadcrumbs, so they get lost!



Have you ever wondered what would have happened if Hansel and Gretel had been able to use other tools to find their way through the woods? Keep reading to find out more about **navigation**, or the science of finding your way to and from places!

## Short History of Navigation

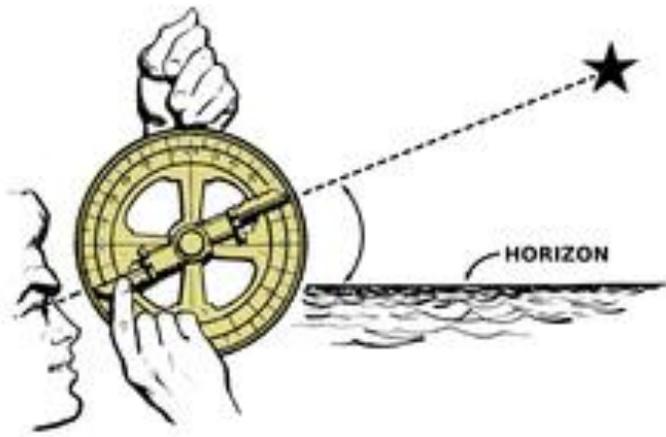
The earliest known record of boats used to travel long distances for trade is around **3500 B.C.E.** **Navigating**, or **getting from one place to another**, was especially important for sailors because they traveled far from the shore and could not always use **familiar landmarks** to see where they were. Sailors from all around the world developed different **tools and methods of estimating** where they were when they could not see land.



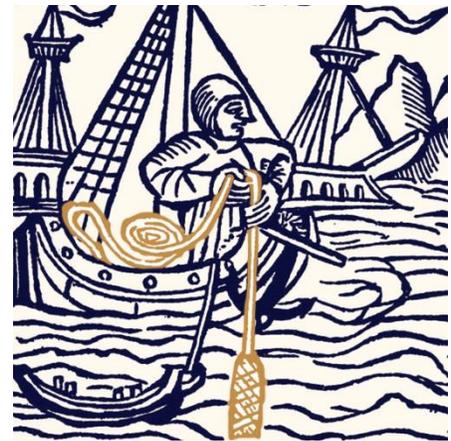
# NAVIGATIONAL TOOLS

## Early Tools

The earliest navigators used **celestial navigation**, or tracking the **sun, stars, and moon**, to help them figure out where they were. Certain **constellations**, or groups of stars, would help experienced **mariners** estimate **latitude**, or how far **north or south** of the **equator** they were. This wasn't always accurate, so they developed tools such as the **sounding reed** or the **lead line** to determine how deep the water was. Many other tools, including the **cross-staff** and the **astrolabe**, were invented to measure the **angle of the sun and stars above the horizon**.

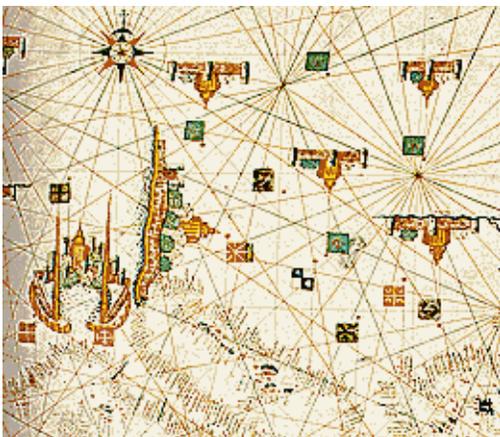


An astrolabe



A sailor using a lead line

## Maps



Around the mid-1200s, sailors realized that drawing **maps**, or representations of the earth, sea, or sky, could be helpful in finding their way from place to place. They drew **nautical charts**, which were not very accurate and kept secret. These charts also included a **compass rose** showing which directions to travel. Over time, as navigational tools became more accurate, maps also developed.

# THE MAGNETIC COMPASS

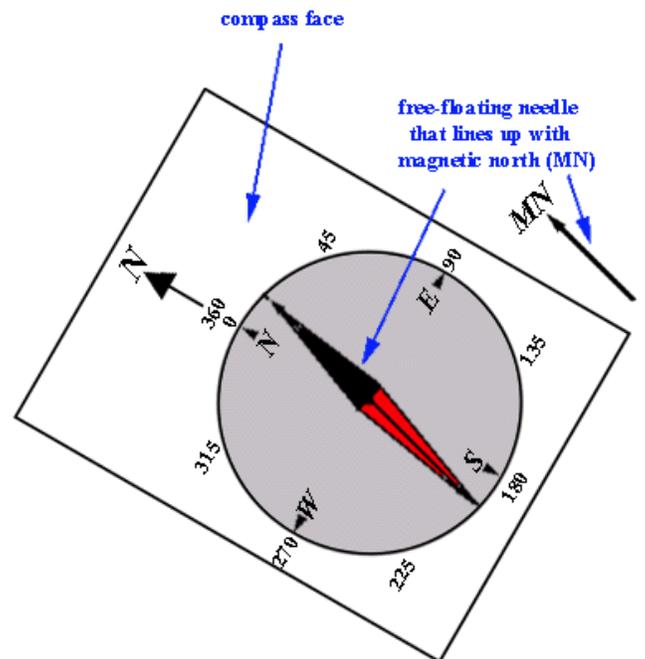


## What is a Compass?

A compass is a navigational tool that tells which way is North and South. The **mariner's compass** was one of the earliest human-made navigational tools, which helped the sailors identify which direction the wind was blowing when they couldn't see the sun. Early sailors thought the compass was inaccurate and inconsistent because they didn't yet understand much about Earth's **magnetism!**

## How Does a Magnetic Compass Work?

Earth produces a **magnetic field**, or an **area with force created by moving charged particles**. Earth's magnetic field is not very strong, but **magnetized objects**, or items that are attracted to certain metals, can detect it. Magnetic compasses contain a **magnetized needle** that floats in liquid so it **rotates freely**, which lets the needle **line up with Earth's magnetic field**. This lets the needle point to the **North or South pole**—whichever is closest to the person holding the compass!



# EXPERIMENT WITH COMPASSES!

If you or your parents have a smartphone, you can use the compass app on the smartphone to find which way is North, South, East, and West.

Try the following experiments!



## NAVIGATE TO A DIFFERENT CITY

Try to figure out which direction you would need to go from where you are now to travel to a different city. Try navigating to places like:

- Seoul, South Korea (West)
- Buenos Aires, Argentina (South)
- Capetown, South Africa (Southeast)
- Vancouver, Canada (North)
- Manila, Philippines (West)
- Paris, France (Northeast)
- Any city you can think of!

## FIND A FAMILY MEMBER

Have a family member face North, then have them close their eyes. Stand somewhere farther away from them and give them directions (North, East, South, or West) to try to find where you're standing!