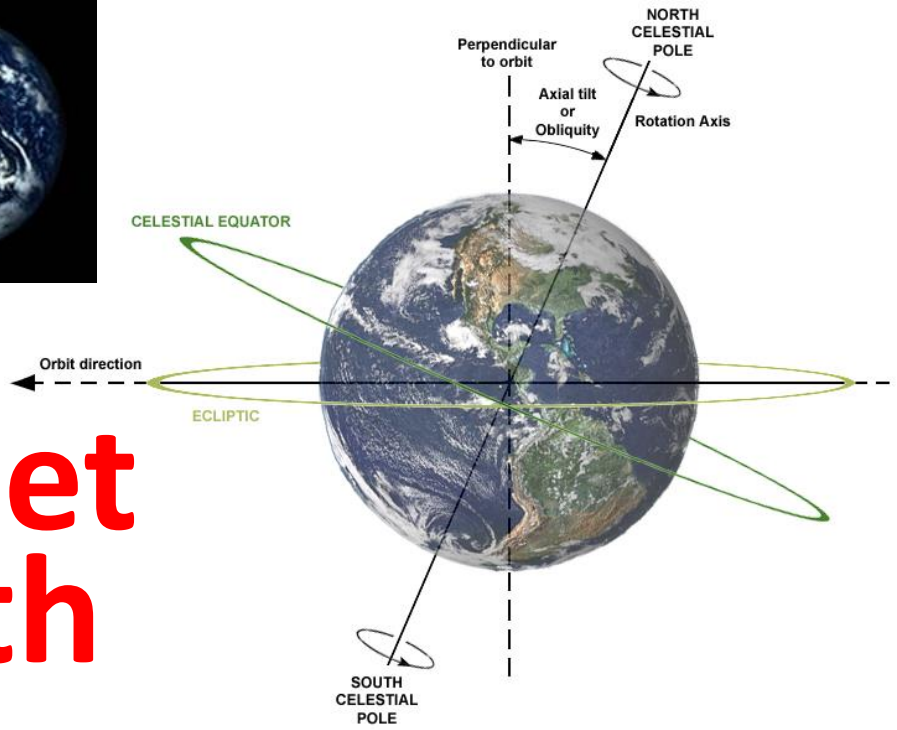
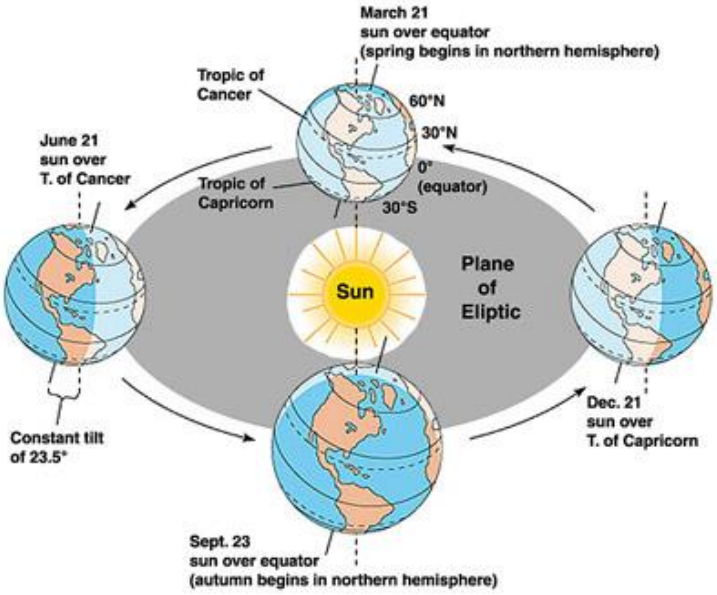
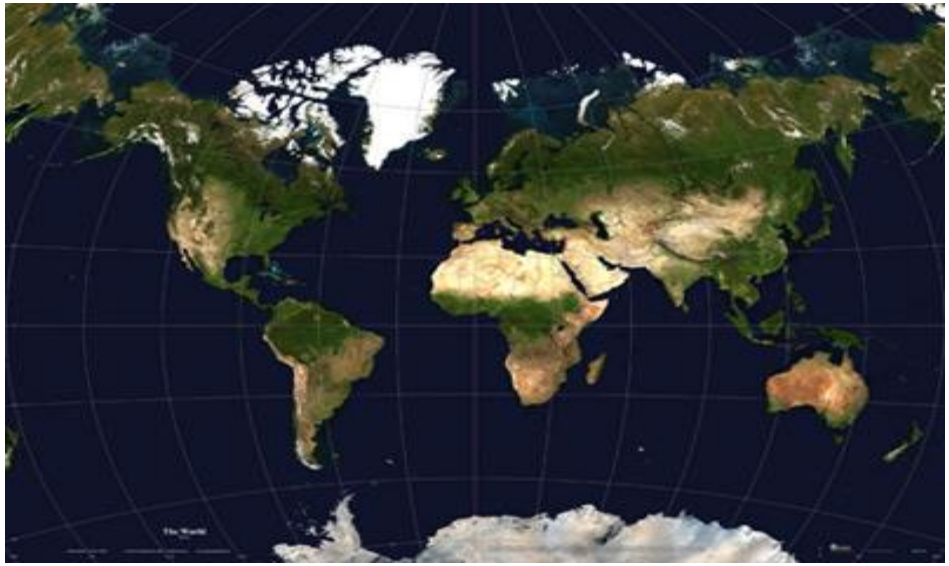


Planet Earth





Earth Facts

- Earth is a terrestrial planet (rocky body), *third* from the Sun.
- Earth has a *single natural satellite*, the Moon.
- Earth has LIFE!
- Of the four terrestrial planets in the Solar System:
  - Earth is the largest both in size and mass.
  - Earth has the highest density, the strongest magnetic field, and the fastest rotation.
  - Earth has the highest surface gravity equal to 9.798 m/s.

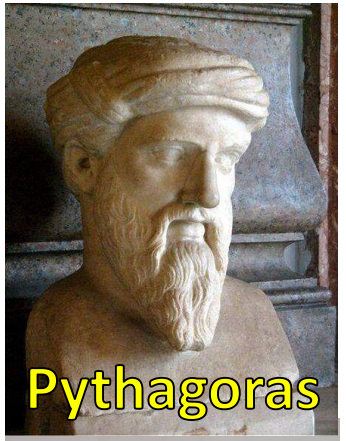
From the Earth's surface, the apparent sizes of the Sun and the Moon are approximately the same.

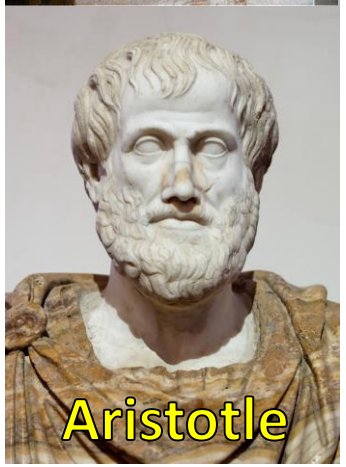
Earth Shape and Size

- Earth's shape is nearly round/spherical with a mean radius of approximately 6371.0 km (3959 miles).
- Notion of spherical Earth was first made by Pythagoras in 6th century BC.
- Aristotle (4th century BC) provided physical and observational arguments supporting the idea of a spherical Earth:

  - Travelers going south see southern constellations rise higher above the horizon.
  - The shadow of Earth on the Moon during a lunar eclipse is round.

- Earth's circumference was first estimated by Eratosthenes (3th century BC) as 250000 *stades*.

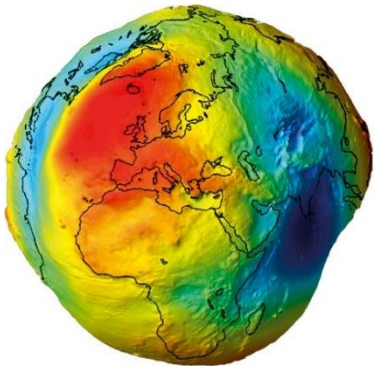




Earth Shape and Size

- **Ferdinand Magellan (1480-1521) led the 1st expedition around the world that proved that Earth is round.**

- **Actual Earth shape is a sphere flattened along the axis from pole to pole such that there is a bulge around the equator (resulting from the planet's rotation): the diameter at the equator is 43 km (27 mi) larger than the pole-to-pole diameter.**



The Globe

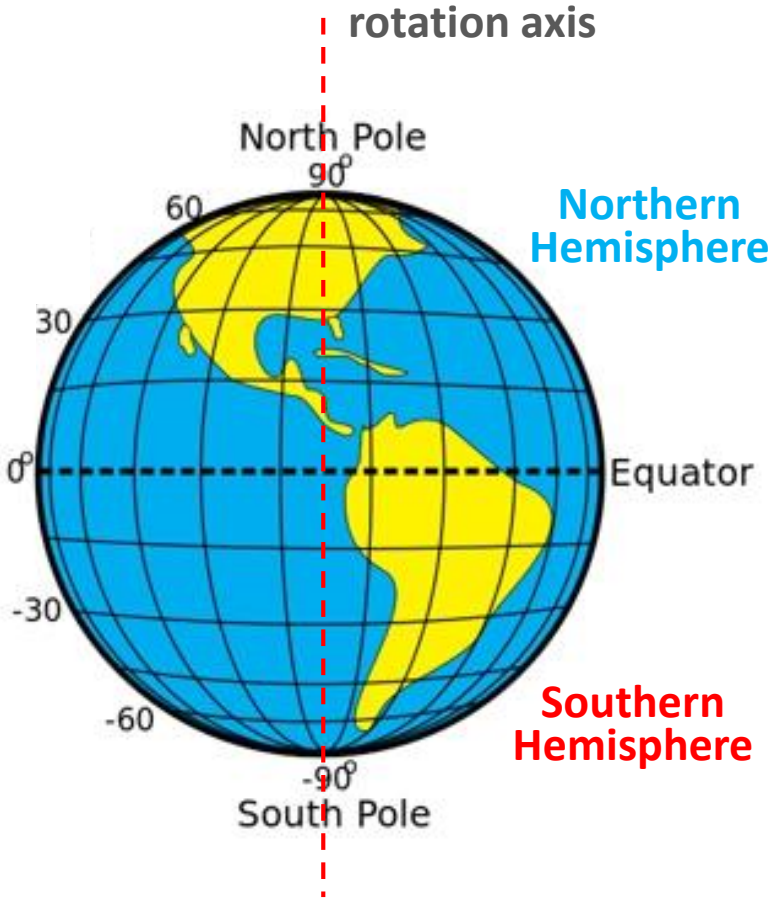
The Globe is a three-dimensional scale model of Earth (also called geographical globe or terrestrial globe).

- The earliest known example of the terrestrial globe was constructed by Crates of Mallus (who lived on the territory of modern-day Turkey) in the mid-2nd century BC.
- The oldest surviving terrestrial globe is the Erdapfel ("earth apple"), created in 1492 by Martin Behaim in Nuremberg, Germany. Overlaid with a meticulously painted map, it shows an enlarged Eurasian continent, an oversized Japan and an empty ocean between Europe and Asia.
- The world's largest geographical globe is the Unisphere in Queens, New York (12-story high!).

Earth's Axis, Poles and Equator

Our planet Earth spins around on an imaginary line running through it. This line is called the Earth's axis. The two points where axis meets the surface are called the Geographic North Pole and the Geographic South Pole.

- **The area around the North Pole is called the Arctic, while the area around the South Pole is called the Antarctic.**
- **The Equator is an imaginary line on the Earth's surface which is at equal distance from the North Pole and South Pole. It is about 40,075 km (24,901 mi) long; 78.7% is across water and 21.3% is over land.**
- **The Equator divides Earth into the Northern Hemisphere and Southern Hemisphere.**

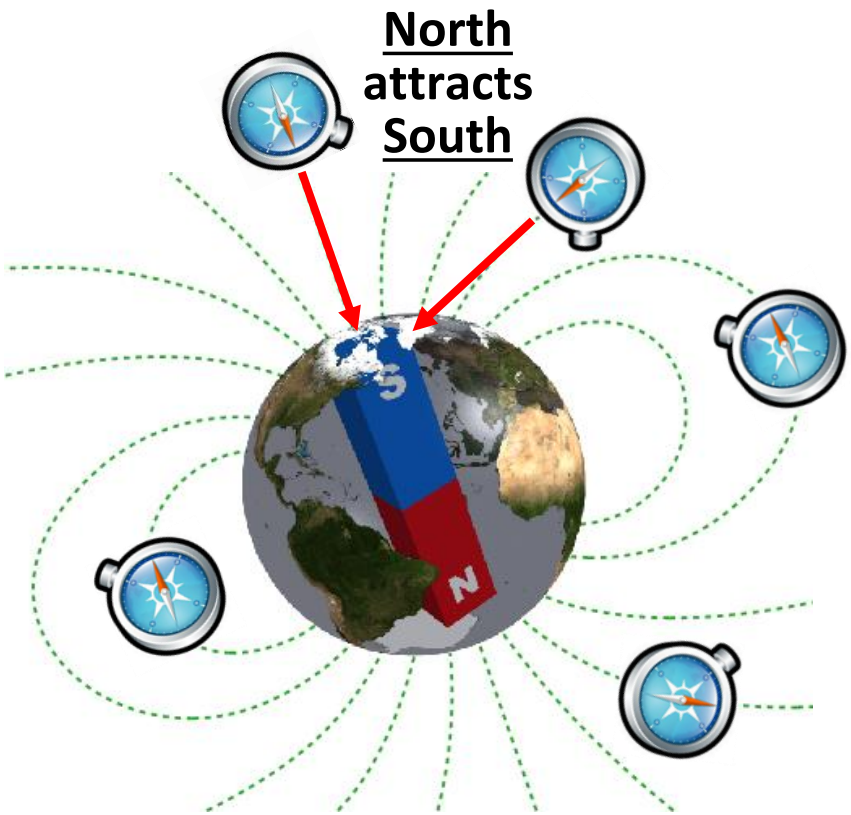


North Pole vs South Pole

Arctic	Antarctic
Basically is a frozen ocean	Continent
A *little bit* of ice	90% of all ice on Earth!
Half of the world's remaining oil deposits	No oil deposits
Temperature from 0˚C to -49˚C	Temperature from -25˚C to -72˚C
Polar bears	Penguins

Compass

- **Compass is a magnetized piece of metal that can spin freely to align itself with Earth's magnetic field.**
- **The N (north) tip of the compass always points towards the North Pole of the Earth.**

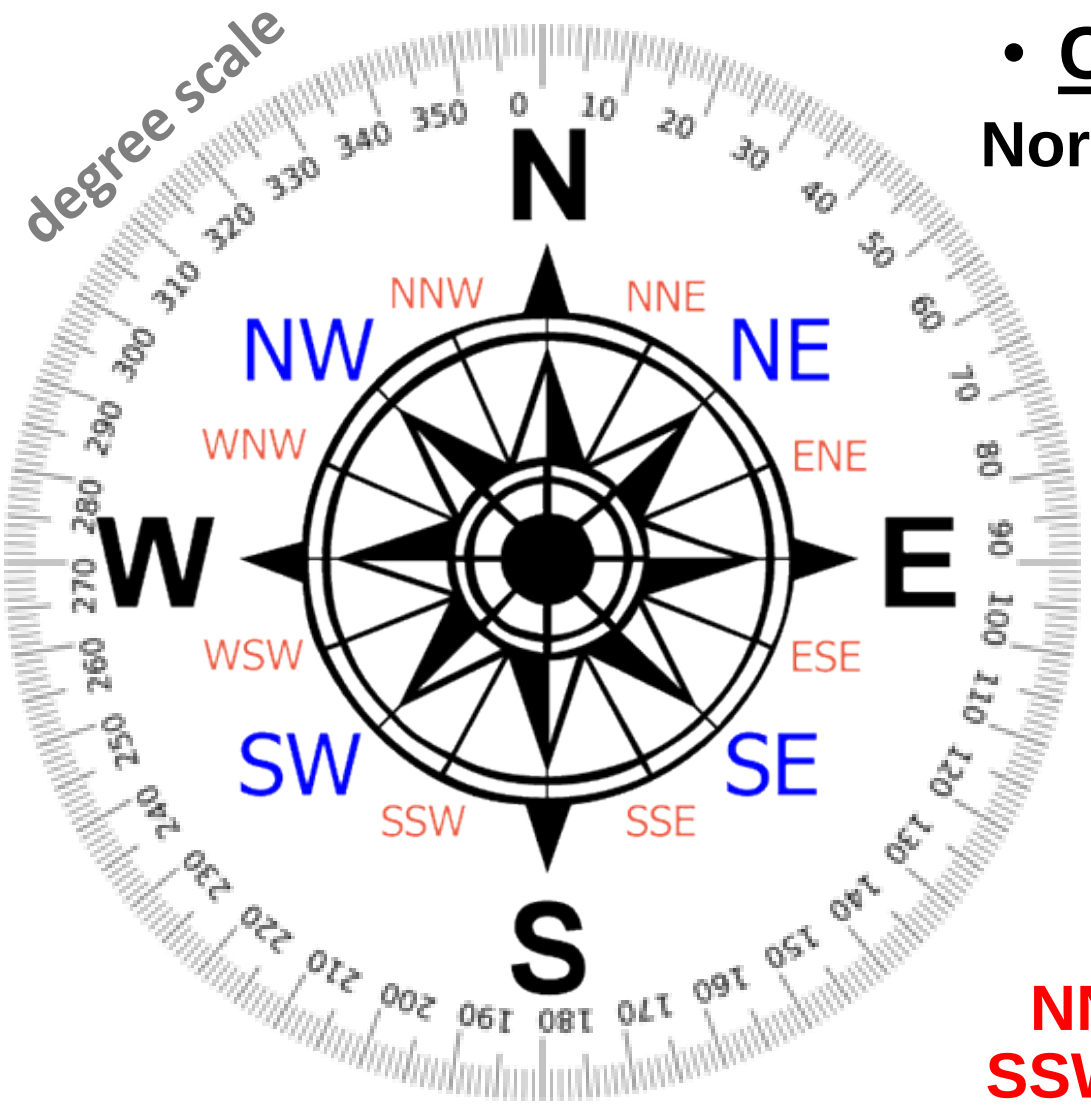


The magnetic compass was first invented as a device as early as the Chinese Han Dynasty about 206 BC (**"wet"** compass). The compass was used for maritime navigation by ~1120. The **"dry"** compass was invented in Europe around 1300.

Wet Compass

Dry Compass

Compass Rose



- **Cardinal directions:**

North, East, South, West

- **Half-cardinal (*intercardinal*) directions:**

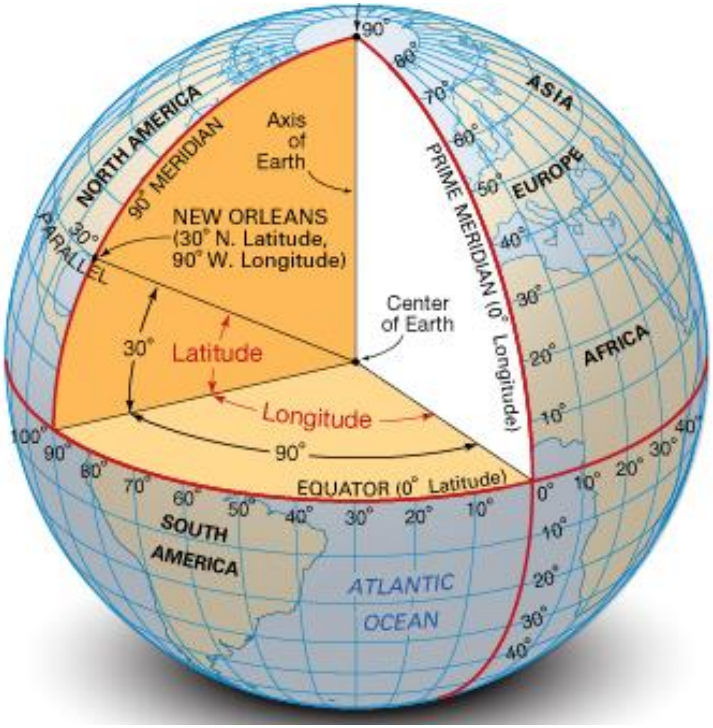
Northeast, Southeast, Southwest, Northwest

- **Intermediate directions:**

NNE, ENE, ESE, SSE, SSW, WSW, WNW, NNW

Coordinates on the Globe

- **Every location on Earth's surface can be specified by a set of numbers and letters using a geographic coordinate system.**
- **A common choice of coordinates is latitude and longitude, forming the *grid system*, and elevation.**



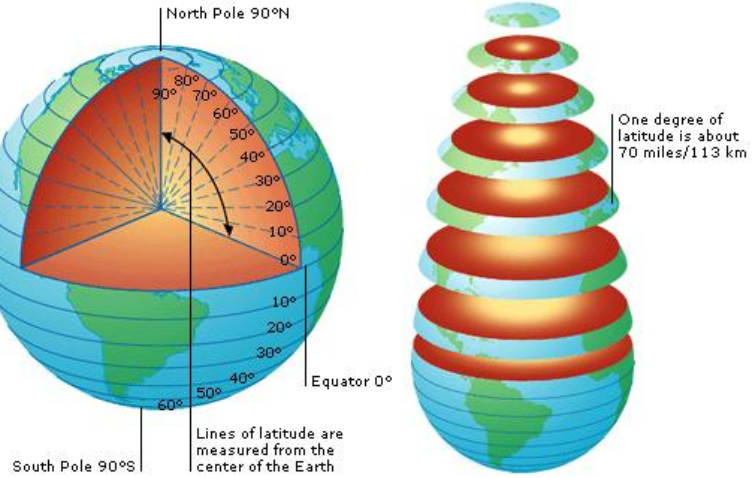
New Orleans, N30° W90°

Washington DC, N39° W77°

Latitude and Longitude

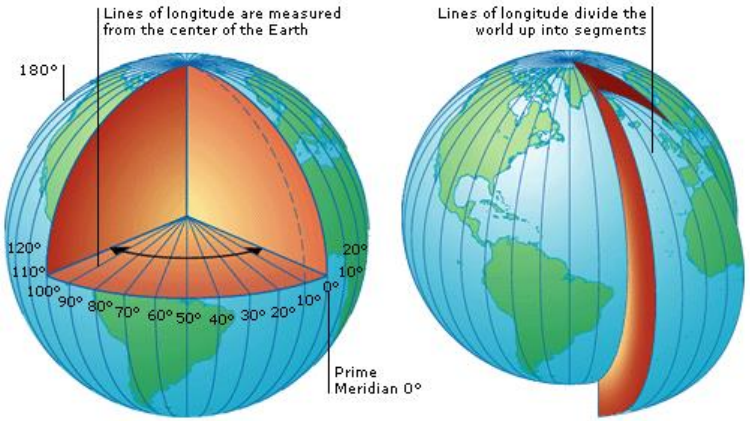
Latitude and longitude are measured in degrees (°) with submultiples of minutes (′) and seconds (″).

Latitude lines (parallels) run horizontally. They are parallel to and an equal distance from each other.



Zero degrees latitude is at the Equator. The latitude directions are North (+) and South (-). North Pole is 90°N, South Pole is 90°S. Each degree of latitude corresponds to approximately 70 miles (113 km).

Longitude lines (meridians) run vertically, perpendicular to the Equator. They meet at the Poles and are spaced widest at the Equator.



Zero degrees longitude is called the Prime Meridian (goes through Royal Observatory, Greenwich, UK). The longitude directions are East (+) and West (-).

Exercise: on the last day of September, a **tiger** was detected by surveillance cameras at the following locations: **N40°55′12″ and W73°03′**; **N40°51′40″ and W73°12′**; **N40°52′13″ and W72°85′**.

Identify the towns that might be at risk…