

Name _____

Section _____

Partner(s) _____

Date _____

COORDINATE SYSTEMS: LOCATING YOURSELF ON A SPHERE

How can you locate your position on Earth or the Moon?

As a review, look at one of the Earth globes in the classroom. Explain what the lines running east-west and north-south represent.

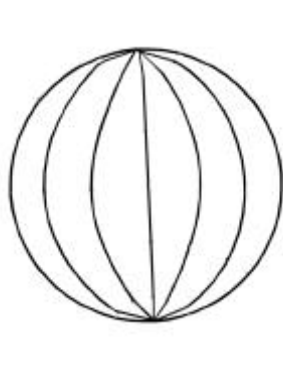
The best way to pinpoint your position is to use a grid system. Because planetary bodies like the Earth and Moon are spherical, we need to employ a grid system on a curved surface. As you may recall, the system currently in use defines the north and south poles as reference points. These points represent the imaginary positions where the rotation axis of the Earth emerges. The current system employs grid lines referred to as **longitude** and **latitude**.

Latitude

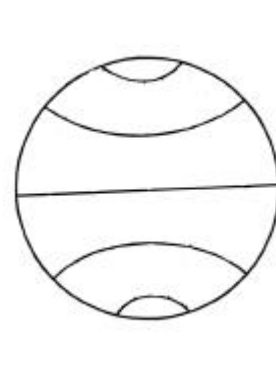
The equator is an east-west line that encircles the globe exactly midway between the north and south poles. It is designated 0° (zero degrees). Additional lines parallel to the equator are marked off, to the north and south. These lines are referred to as lines of latitude or parallels. Northern latitudes values are marked N or with a plus (+) sign. Southern latitudes are marked with an S or minus (-) sign. The north pole is designated as 90°N or $+90^\circ$ while the south pole is 90°S or -90° . See the illustration below. Your latitude is how many degrees north or south you are from the equator.

Longitude

A series of north-south lines which converge at either pole are called **meridians** or lines of longitude. They divide the 360° globe into east-west sections. On any planetary body, a prime meridian with a value of 0° must be defined so that values can be assigned to the other lines of longitude. On Earth, the prime meridian passes through Greenwich, England. Earth longitude is measured from 0 to 180° to the west and 0 to 180° to the east. Your longitude is the number of degrees your site is east or west of the prime meridian. You should note that values from 0 to 180° W are also sometimes designated as negative values (-85° equals 85°W). On other planets, such as Mars, longitude values run from 0° to 360° and no east-west direction is implied. See the illustration below.



LONGITUDE LINES ON A GLOBE



LATITUDE LINES ON A GLOBE

So, using latitude and longitude, you can locate a position on any planet or moon. In this activity you will explore site location on Earth, the Moon, and Mars.

- Using the map of the Earth at the end of this activity, determine the longitude and latitude of the following sites:

Point	Place	Latitude	Longitude
A	Big island of Hawaii		
B	central Iceland		
C	northernmost tip of New Zealand		
D	Chesapeake Bay		

- There are approximately 140 known impact structures on the Earth made by space debris. Plot and label the following crater locations on the Earth map.

Point	Crater	Latitude	Longitude
E	Meteor Crater, AZ	35°N	111°W
F	Sudbury, Canada	47°N	81°W
G	Ust-Kara, Russia	69°N	65°E
H	Teague, Australia	26°S	121°E
I	Monturaqui, Chile	24°S	68°W

3. Listed in the table below are possible and actual landing sites for various Mars missions such as Viking I and II (1976) and Pathfinder (1997).

Site #	Landing Site	Latitude	Earth System Longitude	Mars System Longitude
1	Viking 1	22°N	48°W	48°
2		20°N	108°E	152°
3	Viking 2	46°N	150°W	150°
4		7°S	43°W	43°
5	Pathfinder	19°N	34°W	34°

- a. Plot and locate the sites on the Mars map that is attached. Explain why you think these sites might have been selected.
- b. Plot and label the same sites (same longitude and latitude) on the Earth map. Would the Mars landers have been in trouble with any of these sites? Explain.
4. Using the National Geographic Society Earth's Moon Map provided, answer the following questions. **DO NOT MAKE ANY MARKS ON THE MAP!**
- a. Determine the latitude and longitude for the features listed in the table below: (Use the index on the map for general area location.)

Feature	Latitude	Longitude
Copernicus (a crater)		
Daedalus (a crater)		
Apollo 17 landing site		
Surveyor 7 landing site		

- b. List three features that the lunar prime meridian crosses:

- c. From lunar latitude and/or longitude values, explain how you could quickly recognize that a feature is located on the *far side* of the Moon.