

Name _____

Earth Science

Lab 6: Latitude and Longitude

Date: _____

Introduction: If you were on a ship in the middle of an ocean, you would have to determine where you were in order to radio your location to someone else. The system that is used to locate and describe your position, latitude and longitude, is a worldwide method that is used by all nations.

Objective: You will learn how to determine positions on Earth using the coordinate system of latitude and longitude.

Vocabulary:

Latitude: _____

Polaris: _____

Equator: _____

Parallel: _____

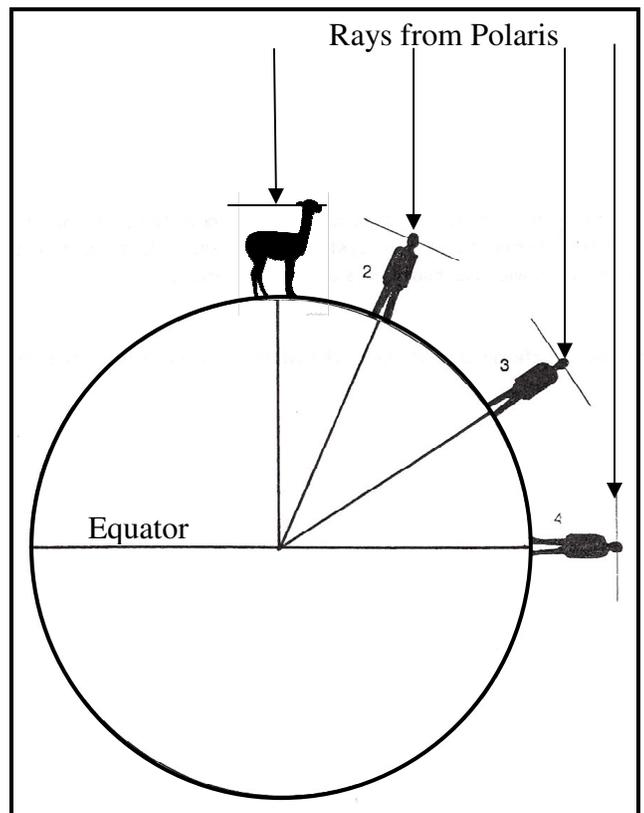
Longitude: _____

Meridian: _____

Local Noon: _____

Procedure A: Because of the large distance between the sun and Earth, and comparatively small size of Earth, light rays reaching us from distance stars, including the sun, are essentially parallel.

1. Using a protractor, measure the angle between the light rays coming from Polaris and each observer's horizon (line going through their head) on the diagram to the right. Record this data on Data Table 1.
2. Using a protractor, measure the angle between each observer and the equator. Record the data in column 3 of Data Table 1.
3. Look up the definition of Latitude. Complete column 4 in Data Table 1.



Data Table 1

Observer	Altitude of Polaris	Angle to Equator	Latitude
1			
2			
3			
4			

Procedure B: Imagine you could remove the entire Northern Hemisphere of Earth by cutting through Earth at the equator. This is represented by the plastic model and the diagram on it. The diagram is a view looking down at Earth from the North Star, Polaris.

1. On the diagram, find 0° of longitude (the Prime Meridian, line P).
2. Measure the following angles and record it in Data Table 2.
 - a. POA b. POB c. POC d. POF e. POG
3. Look up the definition of Longitude. Determine the longitude of each of the following points.
 - a. Point A b. Point B c. Point C d. Point F e. Point G

Data Table 2

Angle	Measure Deg.	Location	Longitude
POA		A	
POB		B	
POC		C	
POF		F	
POG		G	

4. In Data Table 2 you found the Longitude for points A-G. Use that information and the information given to you in the following table to determine the number on the blue globe that represents each lettered location. Then determine the geographic location for each numbered location.

Locations	Latitude	Number	Country/Ocean
A	$10^\circ 00' S$		
B	$23^\circ 30' S$		
C	$21^\circ 30' N$		
F	$23^\circ 30' N$		
G	$66^\circ 30' S$		
P	$50^\circ 00' N$		

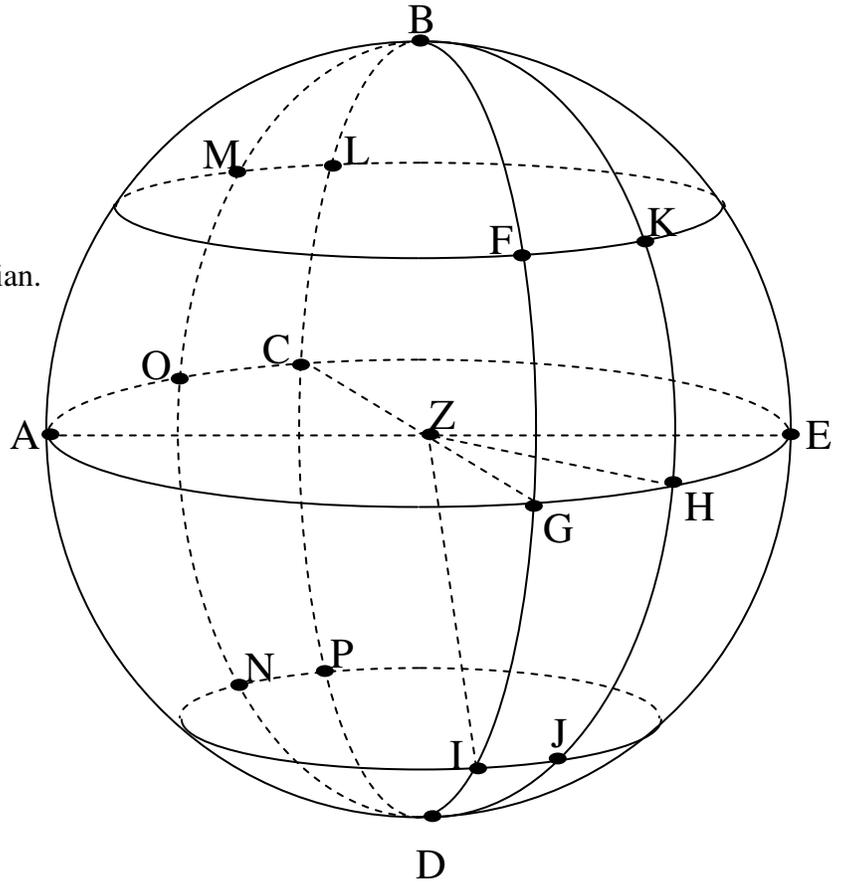
Question: Use the Blue Globe to answer the following questions.

1. Which number represents the location that would experience sunrise on a particular day first? _____
2. If it is Local Noon at location 3, what is the time at location 2? _____
3. What is the altitude of Polaris for Location 2? _____
4. Using your ESRT, which numbered location(s) are affected by a cold ocean current? _____

Procedure: Referring to the diagram and information below, determine the latitude and longitude of points A-P. Record your answers in Data Table 3. Remember to include N, S, E, or W with your numerical answer. (All your answers are determined without the use of a protractor). The dashed lines (- - - -) represent the back side of the globe.

Given Information:

- a. Angle AZC is 80° .
- b. Angle GZH is 50° .
- c. Angle GZI is 70° .
- d. Solid line AGHE is the equator.
- e. Solid line BGD is the Prime Meridian.
- f. Point Z is the center of the Earth.
- g. Point F is 45°N Latitude.
- h. Point N is 180° from Point J.



Math reminders

Vertical Angles:

Opposite angles created by intersecting lines which are congruent.

Supplementary Angles:

Two angles whose sum is 180° .

Data Table 3

Point	Latitude	Longitude	Point	Latitude	Longitude
A			I		
B			J		
C			K		
D			L		
E			M		
F			N		
G			O		
H			P		

Procedure D: Using your Earth Science Reference Tables, determine the latitude and longitude for the places listed below. Your numerical values should be in degrees ($^{\circ}$), and minutes ($'$) with an accuracy of $\pm 10'$. Also, remember to properly label the direction of each location with the appropriate direction (N, S, E, or W).

Location	Latitude	Longitude	Location	Latitude	Longitude
Buffalo			Albany		
Mt. Marcy			Rochester		
Slide Mt.			Plattsburgh		
Tri state border (NY, MA, CT)			Grand Island		
			Ithaca		

Questions:

- The maximum distance in degrees of longitude that a person can travel East or West from Greenwich, England is...

- The maximum distance in degrees of latitude that a person can travel North or South of the Equator is...

- What is the Latitude of the North Pole? _____

5. Explain why two circles of latitude will never cross. _____

- You are on a boat that is crossing the Prime Meridian. The altitude of Polaris is 50 degrees.
What is the latitude and longitude of the boat? _____
Explain your answer. _____

- On the surface of Earth, it is approximately 6200 miles from the Equator to the North or South Pole. How many miles is it between two parallels 1 degree apart?