

## Chapter 1 Introduction to Earth Science

## Exploration Lab

**Determining Latitude and Longitude**

Using maps and globes to find places and features on Earth's surface is an essential skill required of all Earth scientists. The grid that is formed by lines of latitude and longitude form the basis for locating points on Earth. Latitude lines indicate north-south distance, and longitude lines indicate east-west distance. Degrees are used to mark latitude and longitude distances on Earth's surface. Degrees can be divided into sixty equal parts called minutes ('), and a minute of angle can be divided into sixty parts called seconds ("). Thus,  $31^{\circ}10'20''$  means 31 degrees, 10 minutes, and 20 seconds. This exercise will introduce you to the systems used for determining location on Earth.

**Problem** How are latitude and longitude calculated, and how do they indicate a particular location on the globe?

**Materials**

- globe
- protractor
- ruler
- world map

**Skills** Interpreting, Measuring, Inferring

**Procedure****Part A: Determining Latitude**

- Figure A represents Earth, with point B its center. Locate the equator on the globe. Sketch and label the equator on Figure A. Label the Northern Hemisphere and Southern Hemisphere on Figure A.
- On Figure A, make an angle by drawing a line from point A on the equator to point B (the center of Earth). Then extend the line from point B to point C in the Northern Hemisphere. The angle you have drawn ( $\angle ABC$ ) is  $45^{\circ}$ . By definition of latitude, point C is located at  $45^{\circ}\text{N}$  latitude.
- Draw a line on Figure A through point C that is also parallel to the equator. What is the latitude at all points on this line? Record this number on the line you draw.
- Draw a line on Figure A from point D to point B. Using a protractor, measure  $\angle ABD$  on your paper. Then draw a line parallel to the equator that also goes through point D. Label the line with its proper latitude.
- How many degrees of latitude separate the latitude lines (or parallels) on the globe that you are using? Record the degrees of latitude.

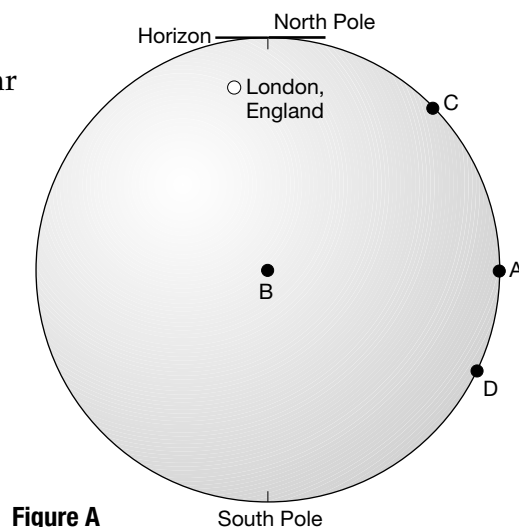


Figure A

6. Refer to Figure B. Determine the latitude for each point A–F. Be sure to indicate whether it is north or south of the equator and include the word “latitude.” Record these numbers.

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7. Use a globe or map to locate the cities listed below. Record their latitude to the nearest degree.

A. Moscow, Russia \_\_\_\_\_

B. Durban, South Africa \_\_\_\_\_

C. Your home city \_\_\_\_\_

8. Use the globe or map to find the name of a city or feature that is equally as far south of the equator as your home city is north.

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### Part B: Determining Longitude

9. Locate the prime meridian on Figure C. Sketch and label the prime meridian on Figure C. Label the Eastern and Western Hemispheres.
10. How many degrees of longitude separate each meridian on your globe?

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11. Refer to Figure C. Determine the longitude for each point A–F. Be sure to indicate whether it is east or west of the prime meridian.

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12. Use the globe or map to give the name of a city or feature that is equally as far east of the prime meridian as your home city is west.

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### Analyze and Conclude

1. **Applying Concepts** What is the maximum number of 1 degree longitude or latitude lines that can be drawn on a globe?
2. **Comparing and Contrasting** Why do longitude lines converge while latitude lines do not?

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3. **Thinking Critically** Amelia Earhart, her flight engineer, and her plane are believed to have been lost somewhere over the Pacific Ocean. It is now thought that the coordinates that she was given for her fuel stop at Howley Island in the Pacific Ocean were wrong. Knowing what you do about how latitude and longitude coordinates are written, why would a wrong number have been so catastrophic for her?

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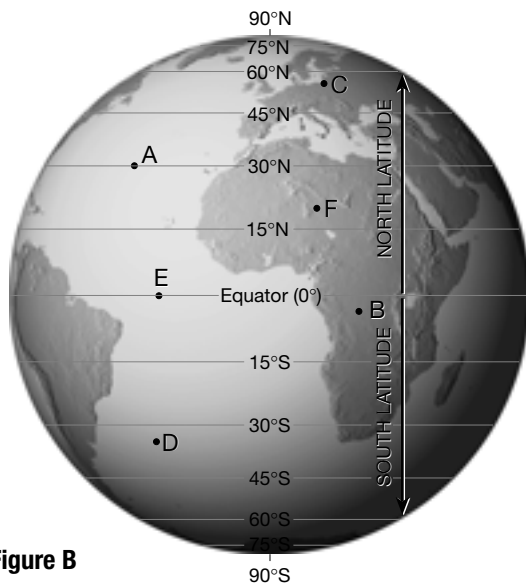


**Figure B**

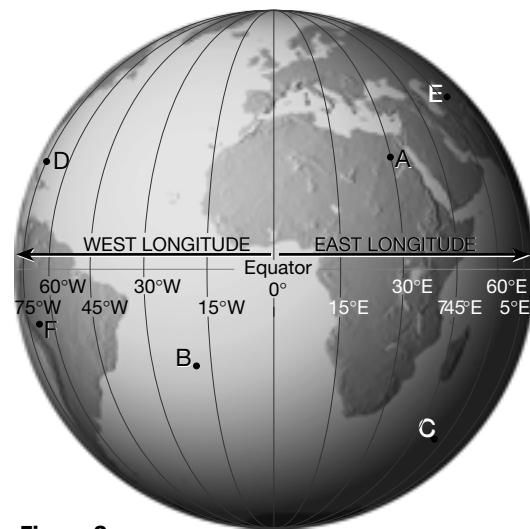


**Figure C**