LESSON 3

Student

How can I say where I am on the Earth?

Look around your classroom. Decide a way to communicate to a friend where you are in the classroom. Write a paragraph, draw a map, plot a graph, or represent on a piece of paper some way to communicate your location.

(The teacher should collect all students' representations, mix them up, and then select five different methods. Have students determine each of the five students' location and the various methods used.)

In this activity, we will be using a globe of the Earth to better understand the sky coordinates and placement of the Sun in the sky. Because the sky coordinates are very analogous to the Earth's coordinates of latitude and longitude, it is important to first establish an understanding of positions on the Earth.

Part 1 - Latitude and Longitude

We will begin this activity by first locating a few key locations. Mark with an X each of the following when you have located them on the globe. Describe in one sentence what each location looks like.

The Equator of the Earth

The North Pole

The South Pole

The approximate position of Lexington, KY

In order to fully describe a position on the surface of the Earth, we need two positional measurements. One is the location on a line that is North-South, and one that defines the location East-West. A North-South (N-S) position is called the latitude for a given location, and the East-West (E-W) position is called longitude.

Does Lexington, KY lie south of the Equator, north of the Equator or on the Equator of the Earth?

Find another city in the world, BUT outside of North America, which is about at the same N-S location as Lexington. Record the city and country. EXPLAIN how you decided this location was correct.

The line around the Earth that marks the Equator is a line of constant latitude. Both latitude and longitude is given in degrees on the globe.

What is the latitude given for the Equator?

What is the latitude given for the North Pole?

What is the latitude given for the South Pole?

Given these values and that the numbers relate to an angle in degrees, make a sketch of the Earth showing how these latitude values are found. In other words, explicitly show in your sketch how this angle is defined. Describe in words what your sketch is showing.

What would you estimate the latitude of Lexington to be?

The lines on the globe that run from the North Pole all the way down to the South Pole are lines of constant Longitude. They measure your angular location East and West.

Record the name of a city and country that is approximately at 0 degrees longitude.

What is the longitude of Lexington, KY?

What is the largest longitude value you can find on the globe?

Record the latitude and longitude for the following locations:

Lexington, KY _____

New York, New York _____

Hong Kong, China _____

Rio de Janeiro, Brazil _____

Ask your instructor to pick a location for you to find the latitude and longitude. Record the name of the location and its latitude and longitude.

Find a city on the Earth and its latitude and longitude. Tell classmates the latitude and longitude of your chosen city and have them find it.

Part II - The Sun's position

Next we want to think about where in the sky you will find the Sun at different times of day and at different places on Earth. To be able to predict positions of the Sun more effectively we must first think about how much of the sky we can see.

If you place your right hand facing directly west and your left hand pointing straight up, how many degrees are separating your two arms?

Now bring your left hand down to due East. How many degrees of the sky can you see from the Western horizon to the Eastern horizon?

(Teacher should use a stiff piece of paper held close to the globe, tangential to a particular location, to demonstrate the horizon.)

If the sun is rising here in Lexington, KY, where in the world (find a city) will the Sun be setting at the same moment? Write out the latitude and longitude and explain how you decided your answer.

Suppose it is Noon in London, England. Where in the world (find a city) will the Sun just be setting? Write the out the latitude and longitude and explain how you decided your answer.

Where will the Sun just be rising?

Where will it now be midnight?

On March 21st the Sun will be directly above the Equator of the Earth all day long.

If you are on the Equator on March 21st, sometime during the day (actually at noon), the Sun will pass directly over your head. Will the Sun pass directly over the head of someone here in Lexington, KY at noon on this day? If not, where will it pass? Give your answer in degrees from directly overhead and tell if it will be North or South of overhead. Explain how you arrived at this answer.

Finally, on March 21st, where will you see the Sun if you are standing directly on the North Pole of the Earth? Explain the reasoning you used to arrive at this answer. {Note to teacher: The Sun is very far from Earth.}