Introduction to Maps

As we move to focus on aspects of geology, we will be using maps to examine patterns on the Earth’s surface. Thus, a short introduction to maps is in order.

Maps are representation of the Earth’s surface, but few maps can show all the details that are present on the real Earth. Therefore, the makers of each map usually choose to focus on representing only certain types of information/details (for example, political boundaries, roads, vegetation type or geographic features.)

In addition mapmakers face the challenge of trying to represent a round planet on a flat surface. Historically, this challenge has been met in several different ways. In this module you will examine several different types of maps and

Pick up a copy of “World Ocean Map” and use it to answer the questions below.

- Briefly describe what details of the surface of the Earth are emphasized on this map.
- List at least 3 important factors found on the real world that are missing from this map.
- Which continent appears to be the biggest and which is the smallest?
- Which ocean appears to be the biggest and which is the smallest?
- What geographic region(s) of the world are missing from this map? Speculate about why this may be.
In the real world, approximately 71% of the surface of the Earth is covered by water, while only around 29% of the surface is covered by land. How does the proportion of ocean to land differ on THIS MAP?

How does the amount of land differ in the northern vs. the southern hemisphere? (Note: a hemisphere means ½ a sphere, so the northern hemisphere = the northern half of the world)

A map depicts the surface of the Earth use a projection, a way of translating the three-dimensional real surface of the Earth into a two-dimensional picture. Perhaps the best-known world-map projection is the Mercator Projection, originally designed as a form of nautical chart. The “World Ocean Map” you have been examining is a Mercator Projection of the Earth. However, because of the difficulty of projecting a 3-dimensional sphere onto a flat surface, the relative size of geographic features are somewhat distorted on the Mercator Projection.

Pick up one of the globes available and compare it to the World Ocean Map.

What is the relative apparent size of Greenland and Australia on the Map? (Does one look bigger than the other or do they appear about the same size?)

How does their relative East-to-West width appear?

How does their relative North-to-South width appear?
Now do the same comparison on a globe.

➢ What is the relative apparent size of Greenland and Australia on the globe?

How does their relative East-to-West width appear?

How does their relative North-to-South width appear?

Now find the scale on the globe and measure the distances on each landmass (you may want a piece of string or if you are familiar with the program “Google Earth,” you can measure the distances using a computer). Note: You only need approximate distances, don’t worry about being precise to the exact miles.

<table>
<thead>
<tr>
<th>Maximum Distance North-to-South</th>
<th>Maximum distance East-to-West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
</tr>
<tr>
<td>Greenland</td>
<td></td>
</tr>
</tbody>
</table>

Which distance is more distorted in Greenland on the map North/South or East West? Why do you suppose this is?

Now compose the size of the state of Alaska with the size of the lower 48 states (If you want to remind yourself of the political boundaries, check the globe). Speculate about which parts of the Earth are more distorted in the map: near the poles or near the equator. How does this match your speculation above?

Check your answers with an instructor before going on.
So you're looking at a map and you want to know where a city or a place is. And you want to tell someone else. How do you do it? Let's say you want to tell your friend where Paris is. You could say, "Well, it's in France." That's general. But what if your friend wants to know exactly where Paris is? You need to use **latitude** and **longitude**.

** Latitude and longitude** are two of the most basics terms in all of geography. To understand them, you need to think of Earth as a globe. Further, you need to think of the globe as divided into lots of little sections. Some run east-to-west while others run north-to-south.

Remember that a circle has 360 degrees. Well, that's also true for Earth. If you put your finger on the city of Paris and trace all the way around the globe, from right to left, you will trace the full 360 degrees. Go just halfway and you get 180 degrees.

You have just traced 360 degrees of **longitude**. Longitude lines that run north and south, but they help measure east or west.

The values for 0º longitude is called "**The Prime Meridian**" and it is the longitude lines that runs through Greenwich, England (because the map makers that came up with the concept were English). Rather than have lines numbered for all 360º around the Earth. Mapmakers divided the Earth into a western half (=the western hemisphere), where longitude lines have values ranging from 0-180ºW, and an eastern half (= eastern hemisphere) where longitude lines have values ranging from 0-180ºE.

Now put your finger on Paris again. Trace around the globe, this time going around the top of the globe, then around the bottom, and back to Paris. You've just traced the full 180 degrees of **latitude**. Latitude is only divided into 180 degrees. **Latitude lines** run east and west and measure north or south.

The Equator is at 0 degrees latitude. Lines of latitude: The North Pole = 90ºN, South Pole = 90ºS, and the Equator = 0º. Except for the Equator each measurement of latitude needs to indicate N or S.

So, what does all this give us? Well, you want to tell your friend exactly where Paris is, right? So check out a map that has latitude and longitude marked on it. You'll find that the latitude and longitude markings are every 10 degrees. (Some maps have markings for every 15 degrees or even every 5 degrees.)

See how Paris is almost halfway between 45 degrees and 50 degrees markings? You'll have to estimate here. It's probably about 47.5 degrees. Let's call it 48.

That's latitude. What about longitude? Well, the Prime Meridian is at 0 degrees. That's in England. France is just east of England (for the most part). See how Paris is just less than halfway between the 0 degrees and 5 degrees markings? You'll have to estimate here, too. It's probably about 2 degrees.

So, what is the exact location of Paris? Well, geographers tell us that Paris is indeed at 48 degrees north and 2 degrees east.
If you need a more precise measurement you can subdivide each degree into unit called “arc minutes” (abbreviation = ‘) there are 60 arc minutes in each degree. If you want to be even more precise, then each arc minute can be subdivided into 60 “arc seconds” (abbreviation = “). 

Now lets go back to the World Ocean map and examine Latitude and Longitude

Remember: Latitude gives the location of a place on Earth north or south of the equator. Latitude is measured by using an angular measurement in degrees (marked with °) ranging from 0° at the Equator (low latitude) to 90° at the poles (90° N for the North Pole or 90° S for the South Pole; high latitude).

➢ What are the most Northern and most Southern latitude(s) indicated on this map. Be precise.

➢ List the approximate latitudes (to the nearest 5°) of the following locations.

   The southernmost point in Florida______________
   The southern end of Puget Sound______________
   The southern most point of Africa_____________
   The northernmost point of Australia____________
   The southern tip of Greenland_______________

Check your measurements using Google Earth. How well did you do?

➢ Which of latitude(s) on this map has the least amount of land (= the most open ocean). Approximately what percent of this latitude(s) represent open ocean?

➢ Which latitude had the most amount of land? Approximately what percent of this latitude(s) represent open ocean?
Remember: **Longitude** describes the location of a place on Earth east or west of the Prime Meridian. Longitude values range from 0° at the Prime Meridian to 180°E and −180°W.

List the approximate longitudes of the following locations:

- The southernmost point in Florida
- The southern end of Puget Sound
- The most western point of Africa
- The most eastern point of Australia
- The southern tip of India

Check your answers on Google Earth. How did you do?

Test your understanding of latitude and longitude:

- Refer the following table to answer the questions below:

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York, New York</td>
<td>40° 38' N</td>
<td>73° 50' W</td>
</tr>
<tr>
<td>Reno, Nevada</td>
<td>39° 30' N</td>
<td>119° 46' W</td>
</tr>
<tr>
<td>Los Angeles, California</td>
<td>33° 42' N</td>
<td>118° 15' W</td>
</tr>
<tr>
<td>San Francisco, California</td>
<td>37° 19' N</td>
<td>122° 25' W</td>
</tr>
<tr>
<td>Seattle, Washington</td>
<td>47°37' N</td>
<td>122° 19' W</td>
</tr>
</tbody>
</table>

- Which city is farther west: San Francisco or Seattle?

- Which city is farther north: Seattle or New York?

- Indicate on the map provided on the following page the location of the cities listed in Table 1. (map from: http://www.enchantedlearning.com/usa/activity/latlong2/map.GIF)
Below is an elliptical map projection or homolographic equal-area projection. It looks funny, but all regions of the globe are represented at their proper relative sizes.

Feel free to check a globe or Google Earth to answer the questions below

Label the following latitude:
0° (the Equator)
30°N, 60°N, and 90°N
30°S, 60°S, and 90°S

Label the following longitudes:
0° (the Prime Maridian)
30°E, 60°E, 90°E, 120°E, 150°E, and 180°E
30°W, 60°W, 90°W, 120°W, 150°W, and 180°E (a.k.a. 180°W)

Note: because 180° from 0 is ½ way around the world, 180°W = 180°E.

Label the approximate location of the points listed below on the homolographic map above:

<table>
<thead>
<tr>
<th>Point</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Point</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>45°N</td>
<td>45°W</td>
<td>D</td>
<td>0°N</td>
<td>0°W</td>
</tr>
<tr>
<td>B</td>
<td>15°S</td>
<td>180°E</td>
<td>E</td>
<td>60°S</td>
<td>90°E</td>
</tr>
<tr>
<td>C</td>
<td>75°N</td>
<td>30°W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>