Maps and their Special Purposes

Maps are visual pictures or geographic representations of the earth or a part of the earth. Through the picture, a map provides a description or a portrayal of a geographic area. Maps are an essential tool in geographic inquiry.

Maps can show a variety of spatial scales from small areas like a neighborhood to the earth itself.
Remember….

- Every map serves a purpose.
- Every map advances an interest.
- Every map has a story to tell.

Since all maps are created for a purpose, they show particular information about a geographic area. These are called thematic or special purpose maps because they are made to reflect particular information about a geographic area.

There are many different kinds of thematic or special purpose maps, including maps that have political, geographic, economic, or cultural information. For example, a map can show political information, like the different states in the United States or different countries.

Another type of special purpose map is called a physical map. A physical map shows major natural characteristics of a place like landforms and bodies of water. The types of special purpose maps are only limited by the map maker’s imagination.

Figure 4: This thematic map is a political map because it shows the different countries of North America.

Figure 5: This map shows topographical features.

Source: https://www.cia.gov/library/publications/the-world-factbook/docs/refmaps.html

Source: http://literacylessonsforall.wikispaces.com/The+Tongue+Cut+Sparrow+online+catalog
Below are two special purpose maps. Look at each map. Can you figure out the special purpose of each?

![Map A](http://serc.carleton.edu/NAGTWorkshops/hazards/events/japan2011.html)

![Map B](http://www.seos-project.eu/modules/oceancurrents/oceancurrents-c02-p03.html)

These special purpose maps would be useful in exploring the effects of a tsunami (“soo-nah-mee”). A tsunami is a series of ocean waves that is most often caused by earthquakes, landslides, or volcanic activity occurring on the ocean floor. If the disturbance is large enough, it can cause huge waves on the ocean’s surface. When these huge waves hit the shoreline, it can destroy the area.

Map A above shows the predicted wave size and speed during a tsunami. Map B shows the direction of the ocean currents. Both of these special purpose maps could be useful in determining where the tsunami effects may reach.

**Relative and Absolute Location**

Maps are used most often to explore the geographic theme of location. Geographers use two types of location to find particular places on Earth -- relative and absolute location.

Relative location describes where a place is in relation to another. “My house is two blocks north of Kensington Park” is an example of a relative
location. When someone says, “The United States is north of Mexico,” they are using relative location. In order to provide the relative location of a place, one needs to know something about a place and its surroundings.

Absolute location is a very specific location of a place. For instance, a street address would be an absolute location. Buildings and homes in each town, city, state, and country have different addresses. However, there are some places on Earth that don’t have addresses. How would you explain the absolute location of the state of Michigan or the highest peak on Mount Kilimanjaro? Because not all places on Earth have been assigned addresses, geographers have devised a system (known as a global grid) to pinpoint specific places on Earth, even places where no one lives.

**The Global Grid**

The global grid is a system of imaginary lines on the earth. These lines are used to describe the absolute location of places on Earth. This system of lines consists of both latitude and longitude lines.

Latitude lines are imaginary lines that run east-west around the globe. The equator is the line of latitude that circles Earth halfway between the North and South Poles. The equator is at 0 degrees latitude. The rest of the latitude lines measure a location’s distance north or south from the equator. Notice that latitude lines are parallel to each other. Sometimes latitude lines are referred to as parallels.
Longitude lines are imaginary lines that run north-south around the globe. The Prime Meridian is the line of longitude that runs from the North Pole to the South Pole through Greenwich, England, and it marks 0 degrees longitude. The rest of the longitude lines measure a location’s distance east or west from the Prime Meridian. Notice that longitude lines intersect at the poles. Sometimes longitude lines are referred to as meridians.

![Longitude Diagram](image)

**Figure 10:** This illustration shows some of the lines of longitude. Source: MC3 Project. PPT Slide 16. SS060202.

By using the latitude and longitude lines that make up the global grid, it is easy to describe an absolute location for any place on the entire earth based on the intersections of these lines.

![Latitude and Longitude Diagram](image)

**Figure 11:** Lesson Graphic. MC3. SS060202.
The figure to the right shows a yellow star at a specific location on the earth. To describe the absolute location of that point, you need to know what lines intersect there. In the figure the yellow star is located at 15 degrees south (15°S) of the equator and 45 degrees east (45°E) of the Prime Meridian. This is the absolute location of the yellow star.

**Latitude and Climate**

Climate is the long-term weather pattern of a region. A place’s latitude is one factor that can determine the climate of an area. Lines of latitude divide the earth into three large regions: tropical, temperate, and polar. The region closest to the equator, the tropical zone, is typically the warmest region, and the region farthest from the equator, the polar zone, is the coldest climate. Of course, other factors like elevation and proximity to large bodies of water can affect climate. However, the latitude of a place is the greatest factor in determining climate.
Representations of Earth and their Limitations

Globes are tools often used by geographers. They are three-dimensional representations of Earth and are therefore very accurate. However, globes have some limitations: they do not show much detail, are difficult to transport, tend to be expensive, and make it hard to see two far apart places at the same time. Because of these limitations, sometimes it is more useful to use maps.

People who make maps are referred to as cartographers. Cartographers who make world maps are faced with many challenges because they take the globe, which is three-dimensional, and make it into a map projection, which is only two-dimensional. As a result, something will always be distorted, or inaccurate, on a world map. The distortions may include the shapes of land and water areas, the relative sizes of land and water areas, distances between places, or the angles of directions between places. When a cartographer is given the task to create a map projection, his or her personal perspective or purpose for making the projection will determine what will remain accurate on the map and what will be distorted.

The map projection in Figure 14 was developed in 1569 by Gerardus Mercator. The purpose of the map was to use it as a navigation tool. Therefore, it was crucial that direction and shape remain as accurate as possible, so sailors would not be lost at sea. In prioritizing direction and shape, Mercator sacrificed accuracy in the size of land and water bodies. Notice that as you move north and south from the equator, the size of the continents become more and more distorted. That is why it has limited use today.

Figure 14: A Mercator projection map.
Source: http://www.progonos.com/furuti/MapProj/Normal/ProjTbl/projTbl.html
Another common map projection is called the Gall-Peters projection. The map in Figure 15 was originally called the Peters Projection, but because a cartographer name James Gall had created a similar projection in the 1800’s, it is now more commonly referred to as the Gall-Peters projection.

Arno Peters was a strong critic of the Mercator projection and felt the map made the developing countries of the world, many of which were in South America and Africa, seem less significant by making them smaller than they really were. So, in 1974 he created the projection below which shows more accurate sizes of landforms. However, the price of accurate sizes of the landforms is that their shape becomes distorted.

A third cartographer, Arthur Robinson, created another world map projection in 1963. The Rand McNally map company hired Robinson to develop a ‘map projection that would have limited distortion’ and be ‘pleasing to the eye.’ Robinson succeeded at keeping shapes and sizes relatively accurate in his map. However, direction and land and water areas near the poles are
The Robinson projection is commonly used today in reference books and textbooks and is sometimes called a ‘compromise map’ because his purpose was to provide a balance between size and shape.

In addition to the map projections described above, there is a wide variety of others. Although many world maps use the intersection of the Prime Meridian and equator as their center, this does not have to be the case. Some people may perceive what is put in the center as being the most important place shown on the map. Cartographers with differing perspectives may choose different centers for their map projections.

Look at the two maps that follow. How are they centered? Can you guess where the cartographers are from who made these maps?
Spatial Scales

One should use caution when using world map projections for measuring distance. The smaller the spatial scale, the more inaccurate distances may be between two points.

Look at the two maps on the following page. Which map shows a larger region?

On Map A, the scale shows that the unit of measurement equals 1000 miles. On Map B, the scale shows that the unit of measurement equals 2000 miles. Map B shows a larger area because it is using a smaller scale.

This difference is visible when looking at distances. On Map A, the distance between Kesennuma, Japan, and Craig, Alaska, measures a little over 4,000 miles. Map B shows a larger region of the world because the cartographer is using a smaller scale. As a result, the distance between Kesennuma and Craig is 5,000 miles on Map B. The actual distance between these two cities is 3,905 miles. Clearly, neither map has accurate distances. However, the distances on Map A are more accurate because it is showing a smaller region by using a larger spatial scale.
Clearly, cartographers are faced with the challenge of deciding where it’s important for a map to remain accurate and where it’s okay to allow some distortion. As users of maps, we should always use caution, keeping in mind that a map may not be perfect and that distortions will be based on the perspective and/or purpose of the person who created that map.

The Cartographer's Challenge

Projections
- Mercator
- Gall-Peters
- Robinson

Distortions
- Size
- Shape
- Direction
- Distance

Source: MC3 Project. Lesson Graphic Organizer. SS060203.