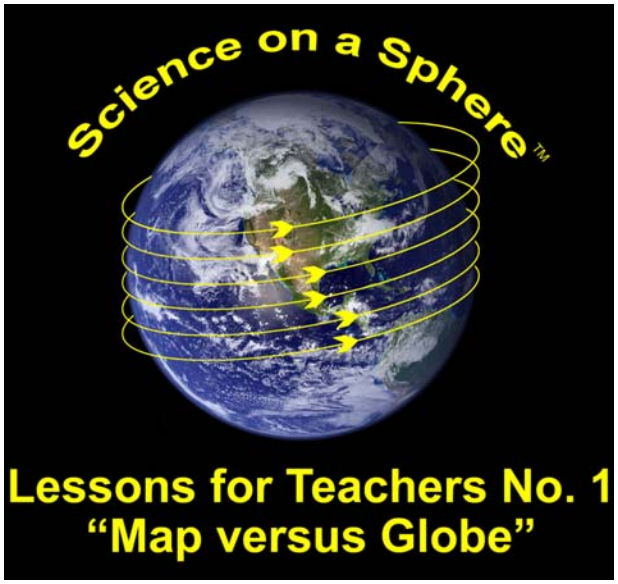


***Question:*** ***How do shapes, sizes, distances, and directions on a globe differ from a two-dimensional map?***

***Materials:*** ***Science on a Sphere™ globe with topographic map data set and a two dimensional map (Miller Projection) for each student***

## *Procedure*

### *Preliminary*

***(Instruct students to walk clockwise around the Sphere and observe the Earth by night and day. Allow students time to observe two or three rotations. Then, ask them to be seated on the floor so that they can observe the Sphere's daytime side. Now distribute Miller Projection maps to students.)***

### *Primary*

- Emphasize to students that, for this lesson, “map” refers specifically to the Miller Projection. Other map projections have their own strengths and weaknesses.
- Ask students the following questions and help them to answer correctly. For example, identify in advance locations like Cape Horn, South America when you are about to use the name of this location.

## *Questions*

1. How are the globe and map similar and different?
2. How does Antarctica appear different on the map compared to the globe?
3. How does Greenland appear different on the map compared to the globe?
4. What can you say (conclude) about shape and size on a globe compared to a map?

5. Is the globe or the map more true to scale?

   ***(Operator now stops the motion on the Sphere so that the geographic locations below are visible on the daylight side of the Sphere.)***

6. Identify the most direct route between Cape Horn, South America and Tasmania, Australia on the map.

   ***(Give a laser pointer to a student. Then, ask the student to trace the most direct route on the Sphere between Cape Horn, South America and Tasmania, Australia on the sphere.)***

   Is the route on the globe or on the map more direct?

7. Identify the most direct route between Seattle, Washington and the country of Kazakhstan on the map.

   ***(Give a laser pointer to a student. Then, ask the student to trace the most direct route on the Sphere between Seattle and Kazakhstan.)***

   Is the route on the globe or the map more direct?

8. What can you say (conclude) about the distances and directions on a globe compared to a map.

   ***(For each of the situations in Questions 9 - 11, ask students to find the opposite location (antipode) on the map. Then, give a laser pointer to a student. Ask the student to point to the location on the Sphere that is listed. Ask a second student to use the laser to point to the opposite geographic location on the Sphere. The objective is to realize that it is easier to find the correct antipode on the globe than on the map.)***

FYI

◆ Note: To find the antipode on any map, add 180 degrees to the longitude and flip the sign of the latitude.

Les 1-2

9. Identify a location that is opposite from the United States.

10. Identify the location that is opposite from Antarctica.

11. Identify the location that is opposite from Australia.

12. Does the globe or the map make it easier to accurately identify the "opposite" location? Why?

## Conclusion

***(Ask students to answer the question stated at the beginning.)***

A globe accurately represents shapes, sizes, distances and directions; whereas, parts of all two-dimensional maps are distorted.

**(Collect the maps.)**

FYI

The following figure is a sample of the Miller Projection world map provided to students involved in this lesson.

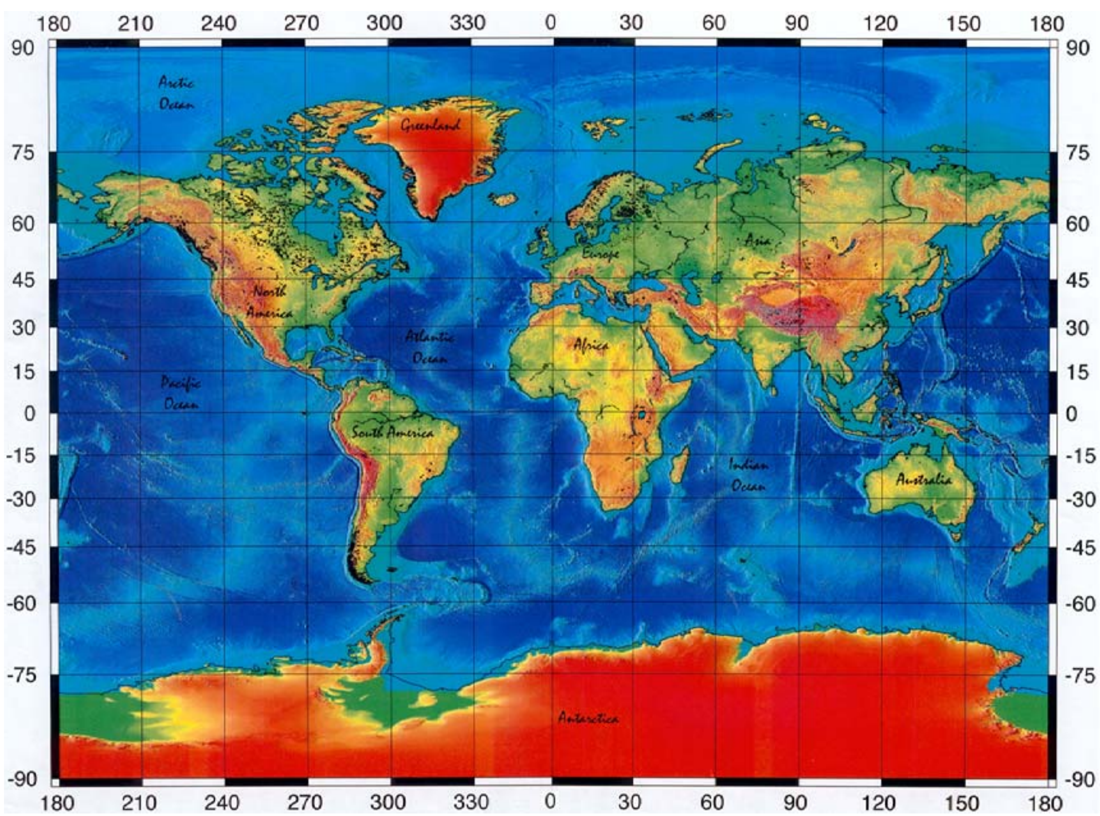


***Figure L1.1. Example of Miller Projection World Map***

Les 1-3

# Answer Key

(Accept any logical answers and encourage accurate observations and inferences.)

1. A globe is a sphere; a map is flat.
   Miller projection cannot display polar areas.
   A map is more convenient to carry around.

2. Antarctica looks long and narrow on a map and more like a circle on the globe.

3. Greenland looks larger on a map than on the globe.

4. Shape and size on a globe are accurate and distorted on a map.

5. Globe is more true to scale.

6. A circle route across Antarctica. Globe.

7. A circle route across the Arctic Ocean. Globe.

8. More direct routes are easier to identify on a globe.

9. Indian Ocean.

10. Arctic Ocean.

11. Nova Scotia.

12. Globe because it accurately represents distances and direction.