CLASSROOM ACTIVITY
Making Map Projections

The most accurate way to represent the Earth is as a globe; but a globe is very hard to put in your pocket! How do cartographers create their flat representations of a three-dimensional object? Scientists and mathematicians have developed different types of map projections—representations of the three-dimensional Earth on a flat surface. In this investigation you will create two different map projections: a planar (or polar) and a cylindrical (or Mercator) projection. Focus your investigation on the questions below. After you and your team have completed the activity, your teacher may ask you to view some animations on the computer. Respond to these questions directly in your journal.

- What are the challenges of transferring information from a sphere to a flat surface?
- Which type of projection is most accurate?

Gather with your team and choose a captain and a note taker for today, as well as an artist to illustrate the group's findings.

The captain appoints group members to collect the required materials while the rest of the group reviews today's procedure. Before beginning, the captain makes sure that the group has all required materials, and that everyone knows the day's procedure.

The note taker takes notes on the group's findings for your team. Remember to record your observations and explanations in your journal for your own research notes. Include drawings to illustrate your findings.

MATERIALS

- 1 clear plastic 2-liter soda bottle
- sharp knife (optional)
- 1 flashlight
- 1 marker or grease pencil
- journal
- scissors
- 1 ruler or tape measure
- 2 sheets of tracing paper
- tape

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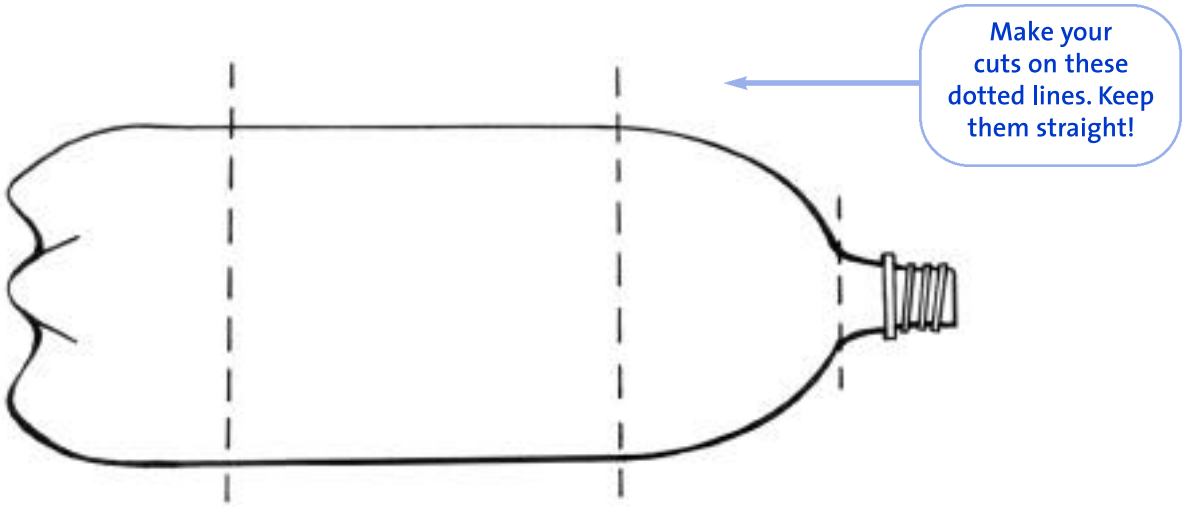
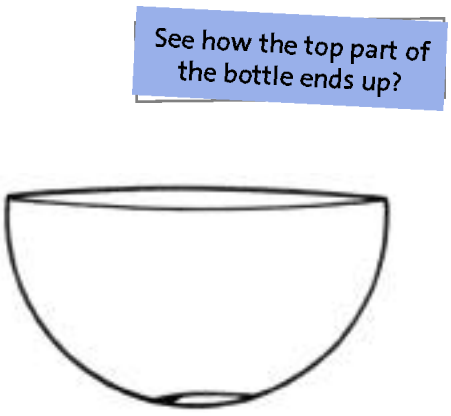
PROCEDURE

1. Examine the globe and brainstorm ideas for transferring spherical representation to a flat surface. Record your ideas on the activity sheet.

2. To prepare the bottle, cut two separate sections from the soda bottle, one to use for the planar projection and an additional piece to use for the cylindrical projection.



3. To make the polar or planar projection, cut off the screw top section of the bottle at the point where the curve flattens. Measure down about 7.5 cm (3 in) from that cut and draw a line around the circumference of the bottle. Cut on the line. The result should look like half of a globe.



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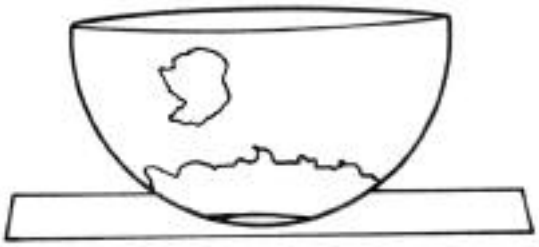
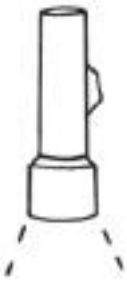
4. Use a marker or grease pencil to draw the following on your half-globe model: lines of latitude and longitude, one continent that encircles the bottom or polar area of the globe, and one continent that is at a different latitude. These continents do not need to be representations of a real continent. For this activity, it is their locations, not their shapes, that are important.

Look! An imaginary polar continent!



5. Place a sheet of tracing paper on the desk. Put the half-globe model on the paper with the small hole down, equator side up.

6. Shine the flashlight from above. Trace the shadows made by the lines of latitude and longitude and the two continents onto the paper.



Shine the flashlight directly above so that you can get a true "projection" on the paper beneath.

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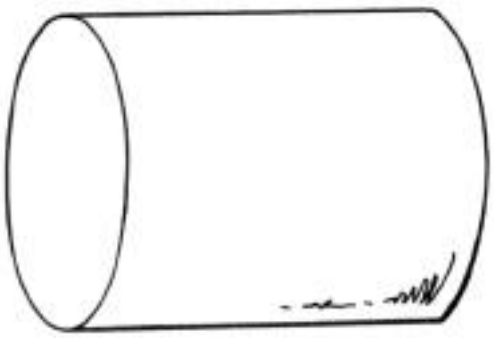
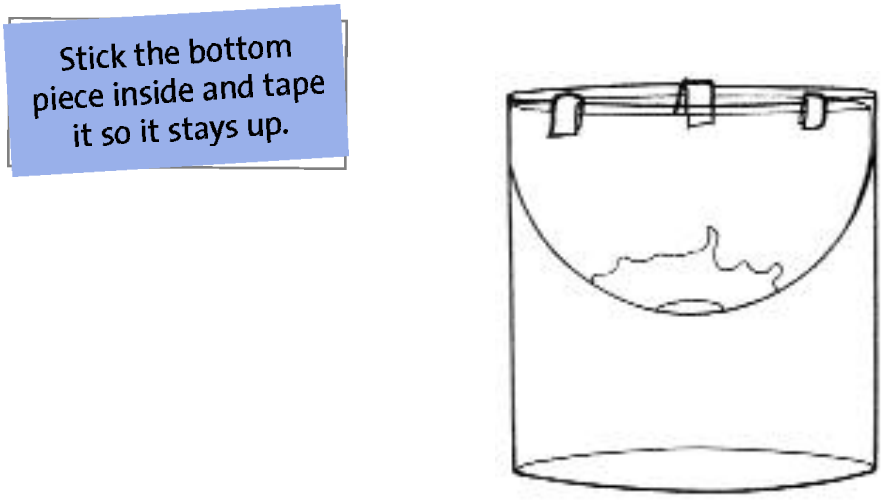


7. To make the cylindrical, or Mercator, projection, use the half globe portion of the bottle. Cut off the bottom of the bottle at the point where the curve flattens. The result should be a cylinder. Tape the half-globe model to the inside of the cylindrical part of the bottle. The equator side of the globe should be lined up with the outer edge of the cylinder, facing outward as shown in the illustration.



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Hold the flashlight straight up to get a real projection of the continent from the globe (or half-globe) onto the cylinder.

8. Tape a sheet of tracing paper around the outside of the cylinder.

9. Shine the flashlight into the open end of the globe. Trace the shadows made by the lines of latitude and longitude and the two continents onto the paper you have taped around the cylinder.

10. Discuss the projections with your team and record your observations on the activity sheet. As your group draws conclusion, remember to take notes in your own journal. Include drawings to illustrate your ideas. Take a look at animated versions of the polar and Mercator projections. You can find some at the Museum's Antarctica resources Web site:

http://www.amnh.org/education/resources/antarctica

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GROUP WORKSHEET
ANTARCTIC TEAM __

GROUP MEMBERS _____

CAPTAIN _____ **NOTE TAKER** _____

1. Create two types of flat maps from a globe. Begin your investigation by examining a globe. With your team, brainstorm some ideas for transferring information from the sphere onto a flat surface. What problems might you have?

2. Follow the instructions to create the two projections. Describe them using the chart below. In your description, describe any distortions that you notice.

TYPE OF PROJECTION	DESCRIPTION
PLANAR PROJECTION	
CYLINDRICAL PROJECTION	

3. Compare the planar and the cylindrical projections: Which one do you think best represents the two different continents you drew? Why?

PROGRESS REPORT, GROUP DYNAMICS

Describe your process in making the two projections. Include any problems you encountered and how you solved them. Discuss how each group member participated in today's activity.