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Earth's Shape ***Lab # 1***

Introduction: If you have ever seen a movie where they show the Earth from a distance you know that it appears to be a big round circle and blue in color. For an object to be a true circle means that every point from the center is equidistant. In this activity we are going to see how an object may appear to be a circle, but in fact is not.

Materials
- ✓ Pencil
- ✓ ESRT's
- ✓ Ruler
- ✓ Calculator

Objective:
- Compare the true roundness and smoothness of the Earth with its appearance

Part I: Roundness

The ratio of the polar diameter to the equatorial diameter of a sphere is a measure of its roundness. Dividing the polar diameter by the equatorial diameter would give a value of one, since *both diameters of a perfect sphere are equal*. The farther from 1 the actual computed ratio is, the less spherical a globe is.

$$\text{Roundness-Ratio} = \frac{\text{Polar Diameter}}{\text{Equatorial Diameter}}$$

1. Using a calculator and the Roundness-Ratio above, determine the roundness-ratio for the Earth. Place your results in your data table below.

2. Using diagram 2-1.1 (next page), measure the equatorial and polar diameters to the nearest tenth of a centimeter with a ruler, and place those values in the chart.

	Polar Diameter	**Equatorial Diameter**	**Roundness-ratio**
Earth	12,714 km	12, 756 km	
Diagram	cm	cm	

3. Calculate the roundness-ratio for the diagram and record this value in the Chart.

4. Answer the following questions:

a. (circle one) According to the roundness-ration, is Earth a perfect sphere? Y / N

b. What geometric shape does diagram 2-2.1 appear to be? _____

c. Looking at the roundness-ratios you calculated which is more nearly a perfect sphere? _____

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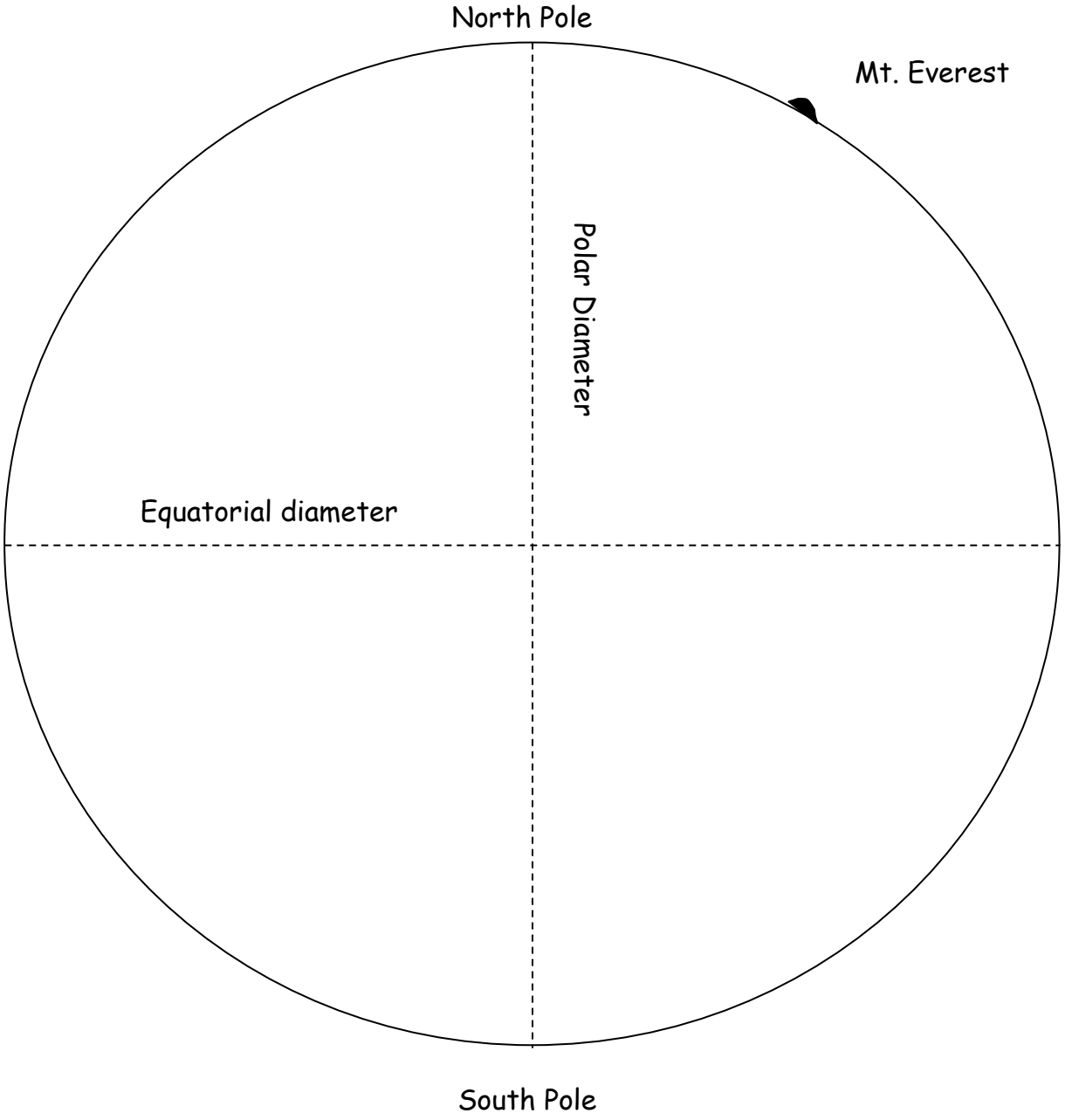
Diagram 2-2.1



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Part II: Smoothness

A relief globe shows the relative height of its surface features, such as mountains. It is a model of the earth. The following procedures will show you whether or not these features are constructed to scale on such a globe. Mt. Everest has been labeled and drawn on a relief Globe on Diagram 2-2.1. Use the proportion shown below to determine the accuracy of the relief globe as a "true" model of the Earth.

1. Using the *assumption* that the Relief Globe height of Mt. Everest is correct, determine the height of Mt. Everest to the nearest tenth of a kilometer.

2. Follow the steps below

Substitute the formula below with the following values:

1. Measure the height of Mt. Everest from the surface to the summit on the diagram for Relief Globe height to the nearest tenth of a centimeter.

2. Use the values from Part I of the activity for the Relief Globe Diameter. Make sure your measurement is to the nearest tenth of a centimeter.

3. Use the value for the Earth's diameter that is found in the solar system data table on page 15 of the Earth Science Reference Tables.

4. Solve for Height of Mt. Everest (km)
   - cross multiply, solve

Formula:

$$\frac{\text{Height of Mt. Everest (km)}}{\text{Earth Diameter (km)}} = \frac{\text{Relief Globe height of Mt. Everest (cm)}}{\text{Relief Globe Diameter (cm)}}$$

Fill in formula spaces below

$$\frac{\text{X (this space stays empty)}}{} = \frac{}{}$$

work space

_____ km is the calculated height of Mt. Everest

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Questions:

1. The **Actual** height of Mt. Everest is 8.8 km. Was the model (diagram or relief globe) truly accurate? _____

2. Do you think it would be possible to draw Mt. Everest at the scale that the model is at on Diagram 2-2.1? _____.

3. Which is smoother, the Earth's surface or a relief globe? _____.

Problem: use the information in the problem to solve.

4. A 0.1 cm deep scratch was made in the surface of a globe with a diameter of 40.0cm. Using the proportion below, calculate the actual depth of the surface feature (represented by the scratch) if you blew up the globe to the size of the Earth. (Show all work)

$$\frac{\text{Depth of scratch on Earth}}{\text{Earth Diameter (km)}} = \frac{\text{Scratch on globe (cm)}}{\text{Relief Globe Diameter (cm)}}$$

$$\frac{\text{X}}{} = \frac{}{}$$

5. If the scratch on the relief globe was used to illustrate the depth of the Grand Canyon. Which would be proportionately deeper, the scratch or the Grand Canyon (1.6 km deep)? _____

6. Describe the roundness and smoothness of Earth.
   _____
   _____
   _____

7. List three objects that would be a good model of the earth.

1. _____
2. _____
3. _____