Earth Science Name: _____

LAB #3: SIZE AND SHAPE OF EARTH Date: _____

Size and Shape of Earth Lab #3

Discussion: As we move around our planet, the Earth appears to have very low valleys and very high mountains. But when viewed from space, the Earth appears to be very round and smooth. Very accurate measurements of Earth show that the poles are slightly flattened and that the equator has a slight bulge of about 0.3% which makes the equatorial diameter slightly larger than the polar diameter.

Purpose: To gain an understanding of the roundness and smoothness of the Earth.

Hypothesis: Using models helps us understand the world around us.

Vocabulary: define the following terms.

Relief: _____

_____

Model: _____

_____

Oblate Spheroid: _____

_____

Sphere: _____

_____

Theory:

Roundness:

Calculating the ratio of the polar and equatorial diameters and expressing the result as a percent allows us to calculate how much the Earth is out of round as a percent.

$$100\% - \frac{polar\ diameter}{equatorial\ diameter} \times 100\% = \%\ Roundness\ Error$$

Comparing the roundness error for the Earth to the roundness error of a relief globe allows us to evaluate the accuracy of the relief on a typical globe.

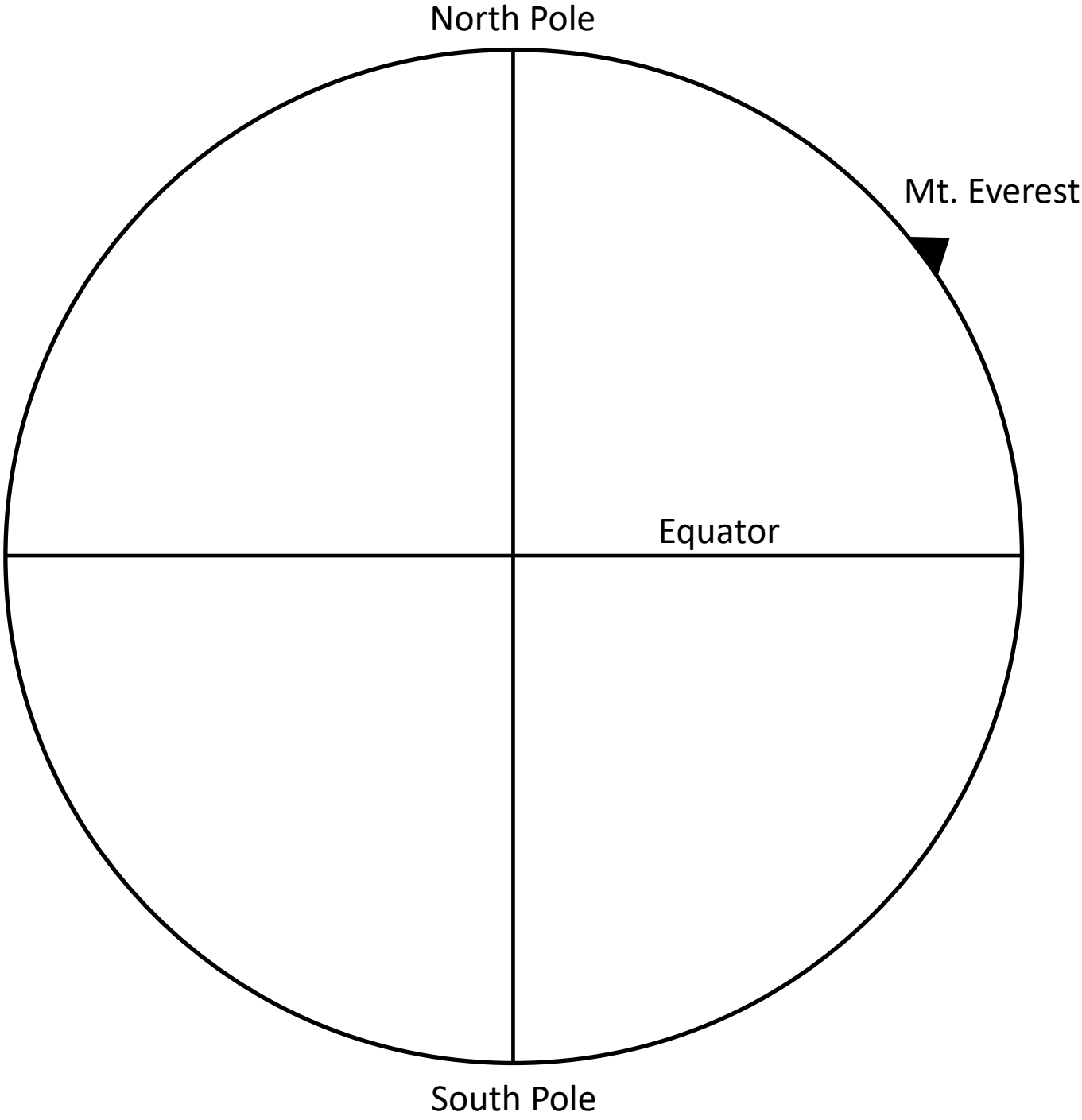
Smoothness:

Calculating the ratio of the height of Mt. Everest (Sagarmatha) to the diameter of the Earth and comparing to the same ratio on a relief globe allows us to evaluate the accuracy of the scale on a typical relief globe.

$$\frac{height\ of\ Earth\ feature\ (km)}{Earth\ diameter\ (km)} = \frac{height\ of\ globe\ feature\ (cm)}{Globe\ diameter\ (cm)}$$

Materials: pen / pencil calculator metric ruler

Relief Globe



Method:

Roundness:

1. Research the answers to Roundness data collection part of the Data Collection and Processing section below. Record your answers in the spaces provided.

Smoothness:

1. Research the answers to Smoothness data collection part of the Data Collection and Processing section below. Record your answers in the spaces provided.

Data Collection and Processing:

Roundness Data:

1. Polar diameter of Earth (km): _____
2. Equatorial diameter of Earth (km): _____
3. Polar diameter of relief globe (cm): _____
4. Equatorial diameter of relief globe (cm): _____

Smoothness Data:

1. Actual height of Mt. Everest (km): _____
2. Average diameter of Earth (km): _____
3. Height of Mt. Everest on relief globe (cm): _____
4. Average diameter of relief globe (cm): _____

Roundness Calculations:

1. Roundness error of Earth: _____
2. Roundness error of globe: _____

Smoothness Calculations:

1. Everest / diameter ratio of Earth (%): _____ (accepted scale)
2. Everest / diameter ratio of globe (%): _____ (measured scale)
3. Calculate the percent deviation between the accepted and measured scale for Mt. Everest.

Analysis and Conclusions: (Use complete sentences.)

1. Using the roundness ratios you calculated, which is more nearly a perfect sphere, the Earth or classroom globes?

2. How does Earth's polar diameter compare to its equatorial diameter?

3. Is the Earth a perfect sphere? How does your data support your answer?

4. Look at your data and calculations for the smoothness of Earth. Which is smoother, the average classroom globe or the actual Earth? Why do you think this is true?

5. If a 0.03 cm scratch is made in a classroom globe with a diameter of 40 cm, calculate the actual depth the scratch would form on the Earth. Show your equations, substitutions, and final answer.

6. Now that you have finished this lab, what would you say about the roundness and smoothness of the Earth?

7. What sport uses a ball that approximates the roundness and smoothness of Earth? Why did you choose this ball?