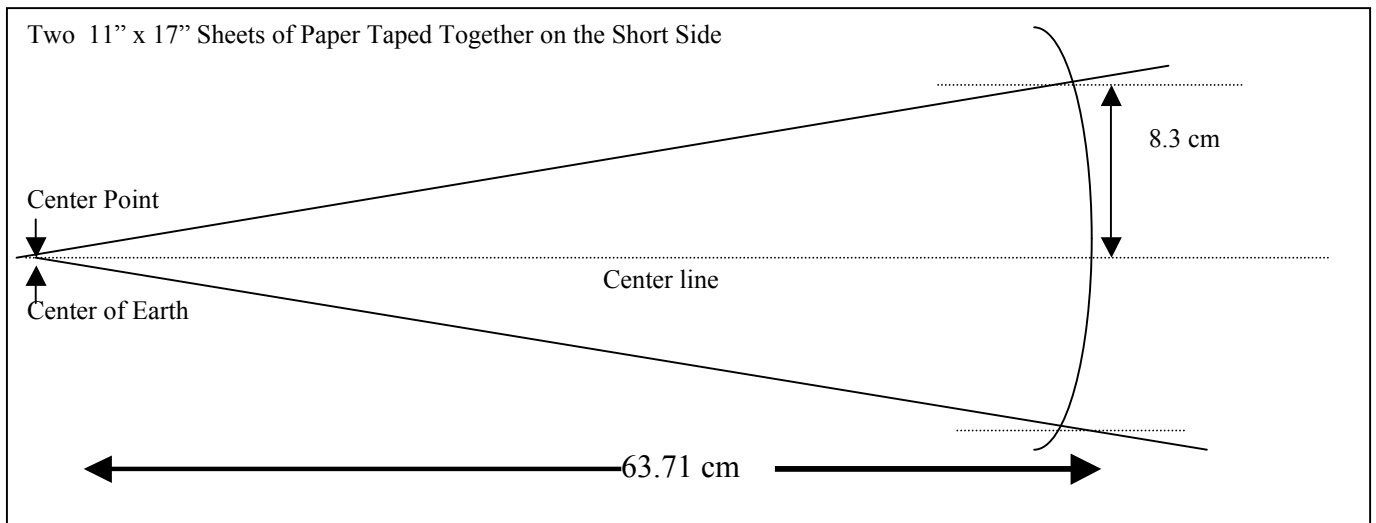


Data Table 2: Layers of the Earth Data

| Radius (km) | Depth (km) | Layer | Boundary | Density (g/cm ³) |
|-------------|------------|--------------|---------------------------|------------------------------|
| 6371 | 0 | - | Surface | 1-2.7 |
| - | - | Crust | - | 2.8 |
| 6336 | 35 | - | Moho | - |
| - | - | Upper Mantle | - | 3.3 |
| 6271 | 100 | - | Lithosphere/Asthenosphere | - |
| - | - | Upper Mantle | - | 3.3 |
| 5701 | 670 | - | Base Upper Mantle | 4.2 |
| - | - | Lower Mantle | - | 5.0 |
| 3486 | 2885 | - | Core/Mantle | - |
| - | - | Outer Core | - | 11.0 |
| 1216 | 5155 | - | Inner Core | 13.5 |
| 0 | 6371 | - | Center of Earth | 13.5 |

Figure 1: Construction Detail



Go Figure:

1. How do the layers of your pie slice compare to those in the play dough models?
2. As you progress down through the layers of the Earth, what pattern do you see for the densities of the layers? How can you explain this pattern in density?
3. Explain how could you use this data and change the overall size/scale of the Earth's pie slices and the final model?
4. Give two scientific reasons for the importance of understanding the cross section of Earth's layers.

Teacher Notes
A Piece of Earth's Pie
Application

GEOMES Topic: The Dynamic Earth – Inside the Earth

| | | | | |
|-------------------------|------------------|------------------|--------------------------|-----------|
| Lab setup: | none | <u>easy</u> | moderate | difficult |
| Reasoning level: | easy | <u>moderate</u> | difficult | |
| Time required: | 20-40 minutes | 40-60 minutes | <u>60-90 minutes</u> | |
| Process skills: | <u>measuring</u> | <u>inferring</u> | <u>interpreting data</u> | |

Objective: Students will each create a pie slice representing Earth's layers and combine efforts to make a class map.

National Science Education Standards:

Content Standard: Earth and Space Science – Structure of the earth system

Unifying Concepts and Processes: Systems, orders and organization

Materials: two 11" x 17" sheets of paper string
meter stick tape
colored pencils or crayons data table

Teaching Strategies:

Allow students time to work through the scaling down process. Don't intercede with advice until they have had a chance to think it through. You will find that many students can figure it out on their own. It may be helpful to discuss the categories shown in Data Table 2 to ensure students understand the differences between boundaries and layers. Using a string and pencil as a drawing compass may be a new skill for some of the students. Depending on the grade level of the students, you may need to demonstrate to special needs students on the chalk board how to draw the initial constructional detail lines and the first arc to create the outline of the slice. Having a model of a slice available in advance as a template may be helpful to special needs students.

The students also need to decide what colors to make each layer so that all pieces match. If the pie slices do not have a sufficient overlap, there may be a small gap in the final model. This can be easily remedied by inserting blank paper behind the gap and color coding it to match the layers.

Some students will require more assistance in measuring and drawing the pie slice. You may want to have students who work more quickly assist those having difficulties. It is also a good idea to have some students make a few additional pie slices to substitute for those who do not finish on their own.

Sample Responses to Go Figure:

1. The layers in the pie slice should very closely resemble the three dimensional model made from clay only with more accuracy.
2. The pattern in density is that density increases with depth in the Earth. This pattern follows the rules of nature whereby substances with greater densities layer themselves at the lowest depth and substances with the least densities layer themselves at the highest level.
3. It is possible to make the Earth model any size by simply dividing 360° in a circle by the number of slices you want and also figuring a percentage of the numbers listed in the radius column on the data table. If the exact figures are used from the angle of slice chart, the numbers for the distance of the boundary from the center point of Earth are the numbers for radius with the decimal point moved two places to the left. This is the 1:100 scale as described to the students.
4. There are several scientific reasons for the importance of understanding the cross section of Earth. Student responses might include the importance of understanding the following: the propagation of seismic waves through Earth's layers; the chemical composition of Earth as per density (even though samples cannot be obtained, the behavior of seismic waves indicate the composition); the opportunity for convective movements in the Earth; the magnetism of Earth; and the uplifting of mineral resources to Earth's surface at plate boundaries.