Earth Science

LAB #6: ELLIPSES

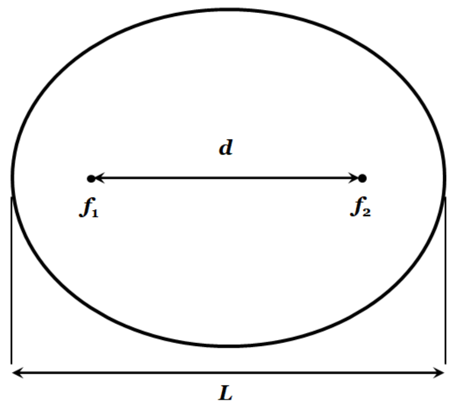
Name: ______________________________

Date: ______________________

Ellipses

Lab #6

Discussion: The earth revolves around the sun in an elliptical path or an oval (a flattened circle). An ellipse has two center points. Each point is called a focus (plural foci). The sun is not in the exact center of the ellipse, rather it lies on one of the foci.



Purpose: To compare the elliptical paths of the planets with a perfect circle (find the eccentricity).

Hypothesis: Using drawings and mathematical models helps us understand the world around us.

Vocabulary: define the following terms.

Ellipse: ____

____

Eccentricity: ____

____

Focus (foci): ____

____

Major axis: ____

____

Theory:

Eccentricity:

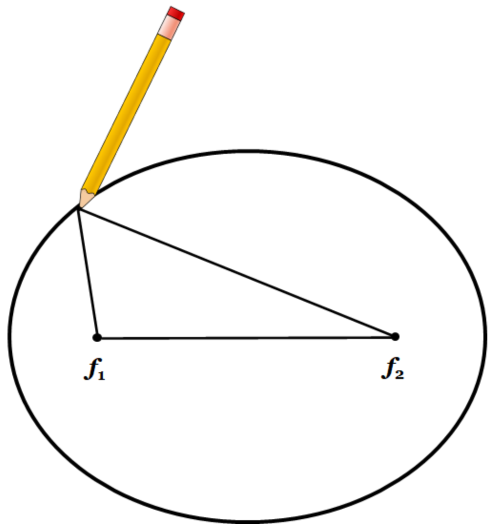
According to the equations on the Earth Science Reference Tables,

$$Eccentricity = \overline{\qquad\qquad\qquad}$$

Materials:

pencil	two thumbtacks	cardboard	28 cm string (loop)
white paper	colored pencil	ESRTs	lab handout

Method:



1. Fold the paper in half long-ways then open it back up.
2. Near the center and on the fold, draw two dots 3.0 cm apart.
3. Place the paper on the cardboard and put the thumbtacks through the dots making sure ***not*** to go all the way through the cardboard.
4. Tie a 28 cm string into a loop and place the loop around the base of the thumbtacks.
5. place your pencil in the loop and pull the loop taught, then spin around drawing an ellipse.
6. Label the first ellipse “Ellipse #1”. Label subsequent ellipses in numerical order.
7. Remove the thumbtacks and string.
8. Measure the distance between the tack holes and record your distance between foci data (0.1 cm) on the Data Collection and Processing page.
9. Measure the width of your ellipse along the fold (major axis) and record to the nearest 0.1 cm on the Data Collection and Processing page.
10. Measure out 1 cm from each of the previous tack holes, mark with dots and repeat from step #3 until you have drawn and labeled 4 ellipses.
11. Place a dot on the fold in the exact center of the first two tack holes.
12. Place one thumbtack on this dot and use a colored pencil (or pen) to draw a circle and label it “Ellipse #5 – circle”.
13. In the calculation space provided for each ellipse on the Data Collection and Processing page, write the equation for eccentricity, show the substitutions, and then calculate the eccentricity.

Data Collection and Processing:

Ellipse #1:

Calculation:

d = ____________________

L = ____________________

e = ____________________

Ellipse #2:

Calculation:

d = ____________________

L = ____________________

e = ____________________

Ellipse #3:

Calculation:

d = ____________________

L = ____________________

e = ____________________

Ellipse #4:

Calculation:

d = ____________________

L = ____________________

e = ____________________

Ellipse #5 – circle:

Calculation:

d = ____________________

L = ____________________

e = ____________________

Analysis and Conclusions: (Use complete sentences.)

1. Based on your calculations, which of your ellipses has the *most* eccentric orbit? (Support your answer.)

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2. Which of your ellipses has the *least* eccentric orbit? (Support your answer.)

   ____

   ____

3. How are the eccentricity of the orbit and the distance between foci related? (Think carefully and support your answer.)

   ____

   ____

   ____

   ____

4. What is the name of the shape that has an eccentricity of zero?

   ____

   ____

   ____

5. Name the position the sun occupies within Earth's orbit.

   ____

   ____

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6. Which orbit is closer to being round, the Earth's orbit or ellipse #1 from your lab? (Support your answer with evidence.)

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