Lab Activity: Earth's Motions

INTRODUCTION:

The earth revolves around the sun in an orbit which is a special geometric figure called an ellipse. An ellipse has two "center points". Each one is called a focus. The Sun is not in the exact middle of the earth's orbit, rather the Sun is found at one of the focal points.

OBJECTIVE:

You will create an series of ellipses and compare the shape of the Earth's orbit and orbits of other planets with the shape of a circle.

VOCABULARY:

Ellipses -

Focus [foci] -

Major Axis -

Circle -

Line -

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PROCEDURE:

1. Carefully cut out the Ellipse Worksheet located on page 26.
2. Place the Ellipse Worksheet on three pieces of cardboard and place a thumbtack in each point labeled #1.
3. Loop the string around the thumb tacks and draw the ellipse by placing your pencil inside the loop and label this ellipse #1.
4. Measure the distance between the thumbtack holes. Record this as "d" on your Report Sheet.
5. Measure the length of the major axis. Record this as "L" on the Report Sheet.
6. Move each thumbtack to the points labeled #2 and draw a new ellipse. Measure and record the distance between foci and the length of the major axis for ellipse #2.
7. Move each thumbtack to the points labeled #3 and draw a new ellipse. Measure and record the distance between foci and the length of the major axis for ellipse #3.
8. Move each thumbtack to the points labeled #4 and draw a new ellipse. Measure and record the distance between foci and the length of the major axis for ellipse #4.
9. Place one thumbtack at the pointed labeled #5 and draw a new ellipse. The distance between the foci is 0. Measure and record the length of the major axis for ellipse #5.
10. Using the equation below, calculate the eccentricity [e] of each of the five figures. Show ALL work on your report sheet. Round your answers to thousandths place.

$$\text{Eccentricity} = \frac{\text{distance between focus}}{\text{length of major axis}}$$

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REPORT SHEET

Ellipse #1 d = _____ L = _____ e = _____	Calculations:
Ellipse #2 d = _____ L = _____ e = _____	Calculations:
Ellipse #3 d = _____ L = _____ e = _____	Calculations:
Ellipse #4 d = _____ L = _____ e = _____	Calculations:
Ellipse #5 [circle] d = _____ L = _____ e = _____	Calculations:

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DISCUSSION QUESTIONS:

1. As you increase the distance between the foci, what change takes place in the eccentricity?

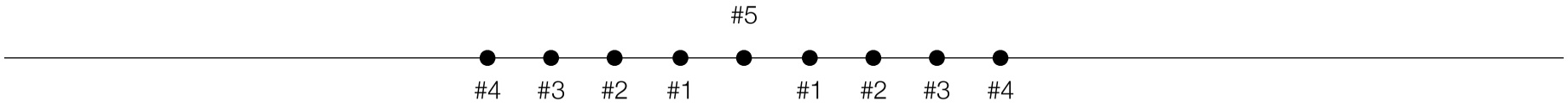
2. Which of the four ellipses you drew [not counting the circle] was the most eccentric?

3. Which of the four ellipses you drew [not counting the circle] was the least eccentric?

4. What is the minimum eccentricity an ellipse can have and the name of that geometric figure?

5. Where is the sun located on a diagram of the earth's orbit?

CONCLUSION: Describe the true shape of Earth's orbit?



ELLIPSE WORKSHEET