05-01	Ellir	tical	Orbits	Lah
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Name: _____

Adapted from Take-Home Physics by Michael Horton

Objectives

• Understand how elliptical the earth's orbit is.

Materials

- Corkboard (15 cm × 15 cm)
- 2 Push pins
- String loop (20 cm string tied in loop)
- Paper

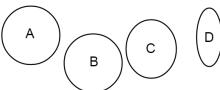
Procedure

All planets and moons, or satellites, orbit in ellipses. The measure for the ovalness of an ellipse is called eccentricity. This is a number between 0 and 1 for ellipses. 0 means perfect circle whereas near 1 means a very stretched out ellipse. The formula for eccentricity is

$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

where *a* is the semimajor axis (distance from center to farthest point) and *b* is the semiminor axis (distance from the center to closest point).

- 1. Place a piece of paper over the corkboard. Push the push pins into the paper about 3 cm apart. Make sure the midpoint between the pins is approximately the center of the corkboard.
- 2. Place the loop of string over the pins and draw an ellipse by using your pencil to hold the string taunt as you draw.
- 3. Take off the loop and push pins. Using the holes from the pins, draw a line across the center of the ellipse. This is the major axis.
- 4. Find the center of the major axis and draw a perpendicular line. This is the minor axis.
- 5. Measure from the center to the end of the major axis. a =_____
- 6. Measure from the center to the end of the minor axis. *b* = ______
- 7. Find the eccentricity. *e* = ______
- 8. Move the pins farther apart and repeat steps 2-7. a =______, b =______, e =______
- 9. Move the pins closer together and repeat steps 2-7. *a* = ______, *b* = ______, *e* = ______
- 10. What effect did moving the pins have on the eccentricity? ______
- 11. The earth's orbit eccentricity is about 0.0167. One of these ellipses has an eccentricity of 0.0167. Which is it? _____



12. Does the ovalness of the earth's orbit cause the seasons as based on the shape of the earth's orbit from this lab?

______ If not, what does cause the seasons? (Look it up after class) ______