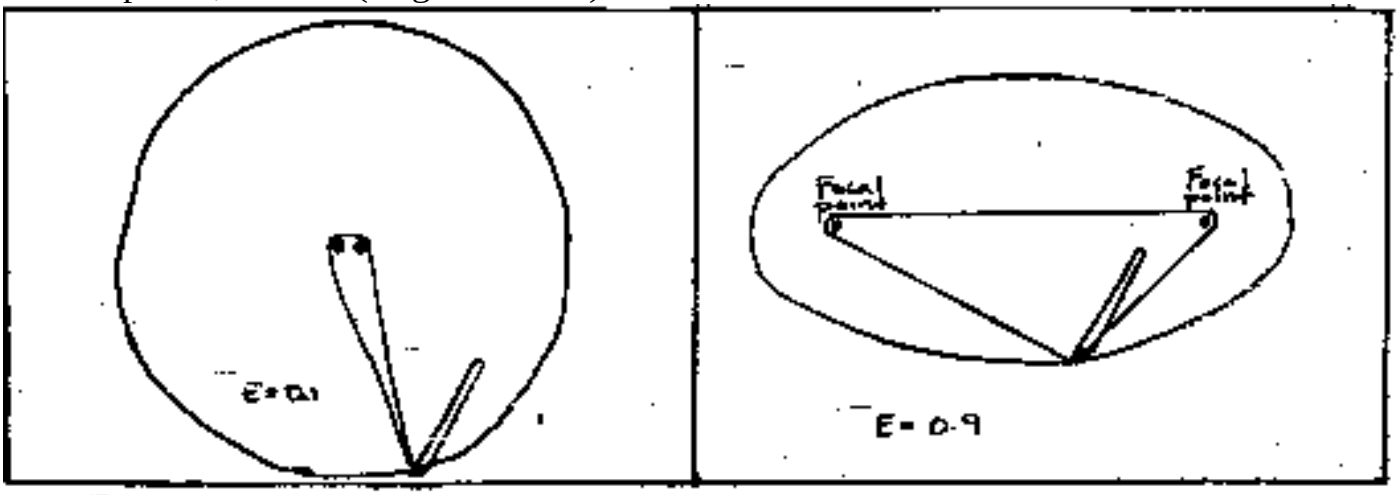
Drawing Ellipses Lab

Name_____Block____

Background:
All orbits are ellipses. But what are ellipses? Instead of one point of interest, the center, there are two points, the foci (singular: focus).



Be sure that you move the tacks (they act as the focal points.)

The farther apart an ellipse/s foci are, the more eccentric it is said to be. A circle is just a special case of an ellipse; if the two foci are at exactly the same place, the ellipse is a **circle**. The Earth's orbit is very nearly a circle. If the Earth's orbit were very eccentric, the distance from the Earth to the sun throughout the year would vary a great deal more than it does. This could make the sun appear much larger when we were closer and much smaller when we were farther away. It would also vary the amount of light and heat the Earth receives from the Sun.

Materials:
Thick cardboard; paper, string, sharp pencil, two push pins

Procedure:
1. Place the paper on the cardboard and secure the two push pins.

2. Hook the string around the two push pins.

3. Pull the loop taut with the point of a sharp pencil. Keeping the loop taut, move the pencil around to draw an ellipse.

4. Read the questions below and experiment to find the answers.

Questions:

1. What happens when the foci are farther apart?
   closer together?

2. How can you make the ellipse rounder (less eccentric)?
flatter (more eccentric)?

3. What if the two push pins are right next to one another?

4. What if there's only one push pin?

5. **Eccentricity** is the flatness of an ellipse. Eccentricity (e) can be calculated by dividing the distance between the foci (d) by the length of the major axis (L). e = d/L The major axis of an ellipse is the line connecting the two farthest ends of the ellipse and passing through the two foci.

Complete the following table for two of the ellipses you drew. **Measure in cm.** (You can do more for BONUS points!)

		BONUS	BONUS	BONUS
A	B	C	D	E
d (distance between foci)				
L (length of major axis)				
e (e = d/L)				
shape (more/less elliptical)				

6. Study the shapes and eccentricities of the ellipses you drew. Describe the relationship between how flat an ellipse appears and its eccentricity. **Give evidence for your answer.**
(As Statement)

7. Which factor, distance between foci (d), length of major axis (L), or eccentricity (e = d/L) has to be equal in order for two ellipses to have the same shape? **How do you know?**

8. What geometric shape would result if both foci were located at the (0,0) point of a graph? What would the eccentricity of this ellipses be?

9. Many comets have an eccentricity of close to 1. Describe the shape of this orbit.

10. Table C on Page 409 in your Earth Science book shows the eccentricity of the orbits of the planets. Write the names of the planets in order from **most eccentric** to **least eccentric**.

11. Which ellipse that you drew best represents the most eccentric planet's orbit? Why?

12. Would you say the planets' orbits are more elliptical or more circular?