

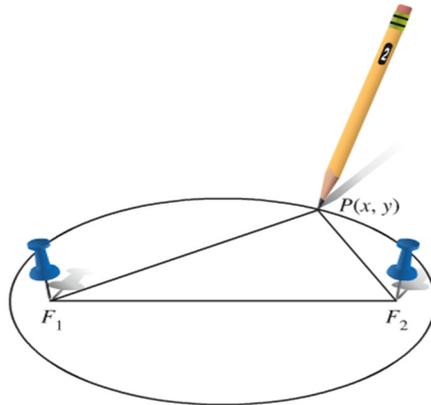
Honors Precalculus

Constructing Ellipses to Explore Eccentricity: When is an Ellipse more like a Circle?

Name: _____

Each group will need

- A marker or 2
- A string of length slightly longer than 20 in. to make a loop 20 inches in circumference
- Two pushpins (tacks)
- Sticky note plain paper
- Space at a bulletin board



The diagram above shows a method for constructing an ellipse. The pushpins are the foci. Refer to the diagram as you complete this investigation.

1. The circumference of your string is 20 in. How can you use this information to determine a relationship that will always exist between 20 and two or more of the key values of an ellipse (a , b , or c)? Explain. Make sure to check your answer to this question with me because this relationship will remain constant throughout the investigation.

2. Place the large sticky-note piece of paper on a bulletin board. In the top half of the paper, carefully place the two pushpins 2 inches apart near the center of the paper. Calculate the values for a , b and c in the space below and record them in the table on the next page. Also, compute the ratios $e = \frac{c}{a}$ and $\frac{b}{a}$ and put them in the table as well. Round to two decimal places once you have put them in ratio form.

3. Construct an ellipse using the loop of string, the marker (as the pencil) and the pushpins placed 2 in apart as shown in the diagram on the first page.
4. Repeat steps 2 and 3 placing the pushpins 4, 6, and 8 inches apart. Use the space below to do any calculations.

Distance between pushpins	a	b	c	$e = \frac{c}{a}$	$\frac{b}{a}$
2 in					
4 in					
6 in					
8 in					

5. Which of your ellipses looks the most circular? The least circular? What is their respective values for the eccentricity? What is their respective values for the ratio $\frac{b}{a}$?

6. Make some observations/conjectures about what information the value of e gives you in terms of the shape of the ellipse, and discuss why you think this is occurring. How does the ratio $\frac{b}{a}$ have anything to do with eccentricity's relationship to the ellipse's shape? In the space below write down your thoughts and explain your reasoning.