4.10 Modeling Data with a Quadratic Function

MATERIALS • compass • 50 pennies • graphing calculator   **TEKS** *a.5, a.6, 2A.1.B*

QUESTION How can you fit a quadratic function to a set of data?

EXPLORE Collect and model quadratic data

STEP 1 *Collect data*
Draw five circles using a compass. Use diameters of 1 inch, 2 inches, 3 inches, 4 inches, and 5 inches. Place as many pennies as you can in each circle, making sure that each penny is completely within the circle.
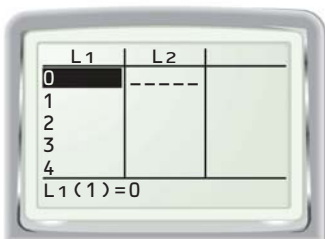
STEP 2 *Record data*
Record your results from Step 1 in a table like the one shown at the right. Also, record the number of pennies that would fit in a circle with a diameter of 0 inch.

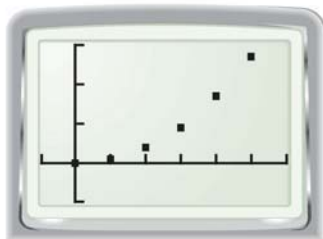| Diameter of circle (in.), x	Number of pennies, y
0	?
1	?
2	?
3	?
4	?
5	?

STEP 3 *Enter data*
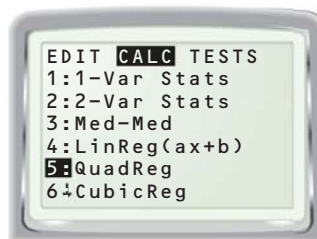Enter the data you collected into two lists of a graphing calculator.

STEP 4 *Display data*
Display the data in a scatter plot. Notice that the points appear to lie on a parabola.

STEP 5 *Find model*
Use the *quadratic regression* feature to find a quadratic model for the data.

DRAW CONCLUSIONS Use your observations to complete these exercises

1. Graph your model from Step 5 on the same screen as the scatter plot. *Describe* how well the model fits the data.

2. Use your model from Step 5 to predict the number of pennies that will fit in a circle with a diameter of 6 inches. Check your prediction by drawing a circle with a diameter of 6 inches and filling it with pennies.

3. *Explain* why you would expect the number of pennies that fit inside a circle to be a quadratic function of the circle's diameter.

4. The diameter of a penny is 0.75 inch. Use this fact to write a quadratic function giving an upper limit L on the number of pennies that can fit inside a circle with diameter x inches.