Exponential Growth and Decay

SET UP
Work with a partner.

MATERIALS
• paper
• pencil
• graph paper

▶ **QUESTION** **What relationships exist between exponential growth and exponential decay when a piece of paper is folded repeatedly?**

▶ **EXPLORING THE CONCEPT**

1 Fold a rectangular piece of paper in half. The fold divides the paper into two regions, each of which has half the area of the paper.

2 Fold the paper in half again. Into how many regions has the original piece of paper been folded? What fraction of the paper's area does each region have?

3 Continue to fold the paper until it is no longer possible to make another fold. After each fold, record in a table like the one shown the fold number, the number of regions into which the paper has been folded, and the fraction of the paper's area that each region has.

Fold number	0	1	2	3	4	5
Number of regions	1	2	?	?	?	?
Fractional area of each region	1	$\frac{1}{2}$	?	?	?	?

4 Make two scatter plots of the data in the table. The first scatter plot will have ordered pairs of the form (*fold number*, *number of regions*) and the second will have ordered pairs of the form (*fold number*, *fractional area of each region*).

▶ **DRAWING CONCLUSIONS**

1. The first scatter plot is an example of exponential growth. Write an equation for the graph.

2. Use the equation from Exercise 1 to determine the number of regions there would be after 8 folds.

3. The second scatter plot is an example of exponential decay. Write an equation for the graph.

4. Use the equation from Exercise 3 to determine the fractional area of each region after 8 folds.

5. Multiply the exponential expressions from Exercise 2 and Exercise 4. Explain why the product should be 1.