8.6 Write and Graph Exponential Decay Functions

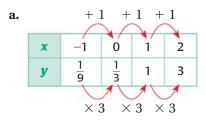| Before | You wrote and graphed exponential growth functions. |
| Now | You will write and graph exponential decay functions. |
| Why? | So you can use a graph to solve a sports problem, as in Ex. 50. |

Key Vocabulary
• exponential decay

A table of values represents an exponential function $y = ab^x$ provided successive y-values are multiplied by b each time the x-values increase by 1.
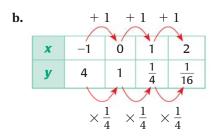
EXAMPLE 1 Write a function rule

Tell whether the table represents an exponential function. If so, write a rule for the function.

a.

$+1 \quad +1 \quad +1$

x	-1	0	1	2
y	$\frac{1}{9}$	$\frac{1}{3}$	1	3

$\times 3 \quad \times 3 \quad \times 3$

The y-values are multiplied by 3 for each increase of 1 in x, so the table represents an exponential function of the form $y = ab^x$ with $b = 3$.

The value of y when $x = 0$ is $\frac{1}{3}$, so $a = \frac{1}{3}$.

The table represents the exponential function $y = \frac{1}{3} \cdot 3^x$.

b.

$+1 \quad +1 \quad +1$

x	-1	0	1	2
y	4	1	$\frac{1}{4}$	$\frac{1}{16}$

$\times \frac{1}{4} \quad \times \frac{1}{4} \quad \times \frac{1}{4}$

The y-values are multiplied by $\frac{1}{4}$ for each increase of 1 in x, so the table represents an exponential function of the form $y = ab^x$ with $b = \frac{1}{4}$.

The value of y when $x = 0$ is 1, so $a = 1$.

The table represents the exponential function $y = \left(\frac{1}{4}\right)^x$.

✓ **GUIDED PRACTICE** for Example 1

1. Tell whether the table represents an exponential function. If so, write a rule for the function.

x	-1	0	1	2
y	5	1	$\frac{1}{5}$	$\frac{1}{25}$