

4.1 Exponential Growth

- ▶ Make a table showing exponential growth.
- ▶ Draw a graph showing exponential growth.
- ▶ Find an exponential growth rate.

Calculating Exponential Growth

A quantity has **exponential growth** when the quantity *increases* by the same percent from one time period to the next.

Study Tip

Be sure you see that the rate of growth is written in decimal form. For instance, a rate of 4% is written as 0.04.

Formula for Exponential Growth

A quantity A that has exponential growth can be modeled by

$$A = P(1 + r)^n$$

A measures the quantity at any time.

P is the initial value of A, when $n = 0$.

r is the rate (%) of growth, in decimal form.

n is the elapsed time.

EXAMPLE 1 Making a Table

The growth rate of a bacteria culture is 52% each hour. Initially, there are two bacteria. Make a table showing how many bacteria there are each hour for up to 12 hours.

SOLUTION

The formula for this exponential growth is

$$A = P(1 + r)^n = 2(1 + 0.52)^n \qquad P = 2, r = 52\% = 0.52$$



Hours, n	Formula	Number of Bacteria
0	$A = 2(1.52)^0$	$A = 2$
1	$A = 2(1.52)^1$	$A = 3$
2	$A = 2(1.52)^2$	$A = 4$
\vdots	\vdots	\vdots
10	$A = 2(1.52)^{10}$	$A = 131$
11	$A = 2(1.52)^{11}$	$A = 200$
12	$A = 2(1.52)^{12}$	$A = 304$

A nonzero number raised to an exponent of 0 is defined to be 1. Try it on your calculator.

✔ Checkpoint

Help at Math.andYOU.com

The bacteria culture grows exponentially for a full day. How many bacteria are in the culture?