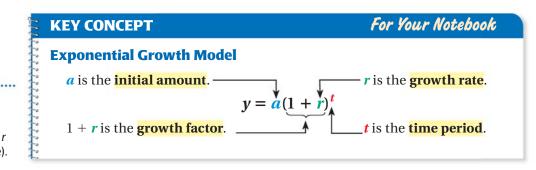
EXPONENTIAL GROWTH When a > 0 and b > 1, the function $y = ab^x$ represents **exponential growth**. When a quantity grows exponentially, it increases by the same percent over equal time periods. To find the amount to which the quantity grows after *t* time periods, use the following model.



Notice the relationship between the growth rate *r* and the growth factor 1 + r. If the initial amount of a quantity is *a* units and the quantity is growing at a rate of *r*, then after one time period the new amount is:

Initial amount + amount of increase = $a + r \cdot a = a(1 + r)$

roblem

REWRITE **EQUATIONS** Notice that you can rewrite $y = ab^x$ as $y = a(1 + r)^{t}$ by replacing *b* with 1 + rand *x* with *t* (for time).

	EXAMPLE 4 TAKS REASONING: Multi-Step Problem
ANOTHER WAY For alternative methods for solving Example 4, turn to page 528 for the Problem Solving Workshop.	COLLECTOR CAR The owner of a 1953 Hudson Hornet convertible sold the car at an auction. The owner bought it in 1984 when its value was \$11,000. The value of the car increased at a rate of 6.9% per year.
	a. Write a function that models the value of the car over time.
	b. The auction took place in 2004. What was the approximate value of the car at the time of the auction? Round your answer to the nearest dollar.
	Solution
	a. Let <i>C</i> be the value of the car (in dollars), and let <i>t</i> be the time (in years) since 1984. The initial value <i>a</i> is \$11,000, and the growth rate <i>r</i> is 0.069.
	$C = a(1 + r)^{t}$ Write exponential growth model.
AVOID ERRORS The growth rate in this example is 6.9%, or 0.069. So, the growth factor is 1 + 0.069, or 1.069, not 0.069.	$= 11,000(1 + 0.069)^t$ Substitute 11,000 for <i>a</i> and 0.069 for <i>r</i> .
	$= 11,000(1.069)^t$ Simplify.
	b. To find the value of the car in 2004, 20 years after 1984, substitute 20 for <i>t</i> .
	$C = 11,000(1.069)^{20}$ Substitute 20 for <i>t</i> .
	$\approx 41,778$ Use a calculator.
	▶ In 2004 the value of the car was about \$41,778.

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