LESSON 16-2

Modeling Exponential Growth and Decay
Reteach

In the exponential growth and decay formulas, y = final amount, a = original amount, r = rate of growth or decay, and t = time.

Exponential growth: $y = a\,(1 + r)^t$ 　　　　 Exponential decay: $y = a\,(1 - r)^t$

The population of a city is increasing at a rate of 4% each year. In 2000, there were 236,000 people in the city. Write an exponential growth function to model this situation. Then find the population in 2009.	**The population of a city is decreasing at a rate of 6% each year. In 2000, there were 35,000 people in the city. Write an exponential decay function to model this situation. Then find the population in 2012.**

Step 1: Identify the variables. 　　　　 **Step 1:** Identify the variables.

　　　 $a = 236{,}000$　　$r = 0.04$ 　　　　　　 $a = 35{,}000$　　$r = 0.06$

Step 2: Substitute for a and r. 　　　　 **Step 2:** Substitute for a and r.

　　　　 $y = a\,(1 + r)^t$ 　　　　　　　　　 $y = a\,(1 - r)^t$

　　　　 $y = 236{,}000\,(1 + 0.04)^t$ 　　　　　 $y = 35{,}000\,(1 - 0.06)^t$

　　　 The exponential growth function is 　　 The exponential decay function is
　　　 $y = 236{,}000\,(1.04)^t$. 　　　　　　 $y = 35{,}000\,(0.94)^t$.

Growth; the growth factor is greater than 1.

Decay; the growth factor is less than 1 and greater than 0.

Step 3: Substitute for t. 　　　　　 **Step 3:** Substitute for t.

　　　　 $y = 236{,}000\,(1.04)^9$ 　　　　　　 $y = 35{,}000\,(0.94)^{12}$

　　　　　 $\approx 335{,}902$ 　　　　　　　　 $\approx 16{,}657$

The 2009 population was about 335,902 people. 　　　 The 2009 population was about 16,657 people.

Write an exponential growth function to model each situation. Then find the value of the function after the given amount of time.

1. Annual sales at a company are $372,000 and increasing at a rate of 5% per year; 8 years _____ $y =$ _____(1 + _____) —

2. The population of a town is 4200 and increasing at a rate of 3% per year; 7 years _____ $y =$ _____(1 + _____) —

Write an exponential decay function to model the situation. Then find the value of the function after the given amount of time.

3. Monthly car sales for a certain type of car are $350,000 and are decreasing at a rate of 3% per month; 6 months 　 $y =$ _____(1 + _____) —

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