NAME _____ DATE _____ PERIOD _____

10-6

Study Guide and Intervention

Growth and Decay

Exponential Growth Population increases and growth of monetary investments are examples of **exponential growth**. This means that an initial amount increases at a steady rate over time.

Exponential Growth	The general equation for exponential growth is $y = C(1 + r)^t$. • y represents the final amount. • C represents the initial amount. • r represents the rate of change expressed as a decimal. • t represents time.

Example 1 **POPULATION** **The population of Johnson City in 1995 was 25,000. Since then, the population has grown at an average rate of 3.2% each year.**

a. Write an equation to represent the population of Johnson City since 1995.

The rate 3.2% can be written as 0.032.

$y = C(1 + r)^t$
$y = 25{,}000(1 + 0.032)^t$
$y = 25{,}000(1.032)^t$

b. According to the equation, what will the population of Johnson City be in the year 2005?

In 2005, t will equal 2005 − 1995 or 10.

Substitute 10 for t in the equation from part a.

$y = 25{,}000(1.032)^{10}$ $t = 10$
$\approx 34{,}256$

In 2005, the population of Johnson City will be about 34,256.

Example 2 **INVESTMENT** **The Garcias have $12,000 in a savings account. The bank pays 3.5% interest on savings accounts, compounded monthly. Find the balance in 3 years.**

The rate 3.5% can be written as 0.035.

The special equation for compound interest is $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A represents the balance, P is the initial amount, r represents the annual rate expressed as a decimal, n represents the number of times the interest is compounded each year, and t represents the number of years the money is invested.

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$A = 12{,}000\left(1 + \frac{0.035}{12}\right)^{36}$

$A \approx 12{,}000(1.00292)^{36}$
$A \approx 13{,}328.09$

In three years, the balance of the account will be $13,328.09.

Exercises

1. **POPULATION** The population of the United States has been increasing at an average annual rate of 0.91%. If the population of the United States was about 284,905,400 in the year 2001, predict the U. S. population in the year 2005. **Source:** U. S. Census Bureau

2. **INVESTMENT** Determine the amount of an investment of $2500 if it is invested at in interest rate of 5.25% compounded monthly for 4 years.

3. **POPULATION** It is estimated that the population of the world is increasing at an average annual rate of 1.3%. If the population of the world was about 6,167,007,000 in the year 2001, predict the world population in the year 2010. **Source:** U. S Census Bureau

4. **INVESTMENT** Determine the amount of an investment of $100,000 if it is invested at an interest rate of 5.2% compounded quarterly for 12 years.