

## Lesson 10-6

### Example 1 Exponential Growth

In 1990, the population of Idaho was 1,006,749. Since then, that number has increased an average of 2.85% per year.

- a. Write an equation to represent the population of Idaho since 1990.

The rate 2.85% can be written as 0.0285.

$$y = C(1 + r)^t \quad \text{General equation for exponential growth}$$

$$y = 1,006,749(1 + 0.0285)^t \quad C = 1,006,749 \text{ and } r = 0.0285$$

$$y = 1,006,749(1.0285)^t \quad \text{Simplify.}$$

An equation to represent the population of Idaho is  $y = 1,006,749(1.0285)^t$ , where  $y$  represents the population and  $t$  represents the number of years since 1990.

- b. According to the equation, what was the population of Idaho in 2000?

In 2000,  $t$  will equal 2000 – 1990 or 10.

$$y = 1,006,749(1.0285)^t \quad \text{Equation for population of Idaho}$$

$$y = 1,006,749(1.0285)^{10} \quad t = 10$$

$$y \approx 1,333,411$$

In 2000, they were about 1,333,411 people in Idaho.

### Example 2 Compound Interest

Anna has \$4,000 to attend college in 5 years. Her parents plan to invest the money in an account with an interest rate of 9% compounded monthly for the 5 years. How much money will Anna have for college?

$$A = P\left(1 + \frac{r}{n}\right)^{nt} \quad \text{Compound interest equation}$$

$$A = 4000\left(1 + \frac{0.09}{12}\right)^{12(5)} \quad P = 4000, r = 9\% \text{ or } 0.09, n = 12, \text{ and } t = 5$$

$$A = 4000(1.0075)^{60} \quad \text{Simplify.}$$

$$A \approx \$6262.72 \quad \text{Use a calculator.}$$

Anna would have about \$6262.72 in 5 years.

### Example 3 Exponential Decay

In 1995 the prairie dog population of a nature preserve was 1,500. Since then, the population has been decreasing by 4.5% per year.

- a. Write an equation to represent the prairie dog population since 1995.

$$A = C(1 - r)^t \quad \text{General equation for exponential decay}$$

$$A = 1500(1 - 0.045)^t \quad C = 1500 \text{ and } r = 4.5\% \text{ or } 0.045$$

$$A = 1500(0.955)^t \quad \text{Simplify.}$$

An equation to represent the prairie dog population is  $A = 1500(0.955)^t$ , where  $A$  represents the number of prairie dogs and  $t$  represents the number of years since 1995.

- b. Estimate the prairie dog population in 2005.

$$A = 1500(0.955)^t \quad \text{Equation for population}$$

$$A = 1500(0.955)^{10} \quad t = 2005 - 1995 \text{ or } 10$$

$$A \approx 947 \quad \text{Use a calculator.}$$

In 2005, there will be about 947 prairie dogs in the nature preserve.

**Example 4 Depreciation**

**A computer sells for \$2100. If the computer depreciates at a rate of 20% per year, find the value of the computer in 3 years.**

$$A = C(1 - r)^t$$

General equation for exponential decay

$$A = 2100(1 - 0.20)^3$$

$C = 2100$ ,  $r = 20\%$  or  $0.20$ , and  $t = 3$

$$A = 2100(0.80)^3$$

Simplify.

$$A = 1075.20$$

Use a calculator.

The computer will be worth \$1075.20 in 3 years.