

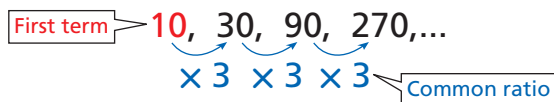
# Section Overview

## Geometric Sequences

Lesson 11-1

**Why?** Geometric sequences are used in physical science and geometry.

In a geometric sequence, each term is multiplied by a common ratio.



What is the 12th term?

$$a_n = a_1 r^{n-1}$$

$$a_{12} = 10(3)^{12-1}$$

$$a_{12} = 10(3)^{11}$$

$$a_{12} = 1,771,470$$

## Exponential Functions

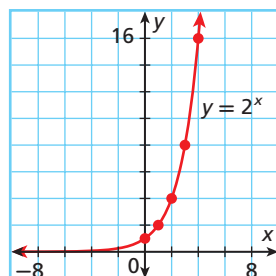
Lessons 11-2, 11-3

**Why?** Exponential functions are often used to predict population growth and decline.

An exponential function is of the form  $f(x) = ab^x$ , where  $a \neq 0$ ,  $b \neq 1$ , and  $b > 0$ .

Graph  $y = 2^x$ .

x	y
0	1
1	2
2	4
3	8
4	16



An **exponential growth function** has the form:

$$y = a(1 + r)^t$$

where  $a > 0$ .

$y$  = the final amount  
 $r$  = rate of growth

The number of students at a high school is 600 and is increasing at a rate of 3% per year. What will the population be after 4 years?

An **exponential decay function** has the form:

$$y = a(1 - r)^t$$

where  $a > 0$ .

$a$  = original amount  
 $t$  = time

$$y = a(1 + r)^t$$

$$= 600(1 + 0.03)^4$$

$$= 600(1.03)^4$$

$$\approx 675$$

## Linear, Quadratic, and Exponential Models

Lesson 11-4

**Why?** Analyzing patterns in data helps you determine the correct model to use to make predictions.

For a constant change in  $x$ -values

...linear models have constant **first differences**.

x	y
0	2
1	7
2	12
3	17

+1  $\rightarrow$  +5  
+1  $\rightarrow$  +5  
+1  $\rightarrow$  +5

$$y = 5x + 2$$

...quadratic models have constant **second differences**.

x	y
2	10
4	28
6	54
8	88

+2  $\rightarrow$  +18  $\rightarrow$  +8  
+2  $\rightarrow$  +26  $\rightarrow$  +8  
+2  $\rightarrow$  +34  $\rightarrow$  +8

$$y = x^2 + 3x$$

...exponential models have constant **ratios**.

x	y
0	4
1	8
2	16
3	32

+1  $\rightarrow$   $\times 2$   
+1  $\rightarrow$   $\times 2$   
+1  $\rightarrow$   $\times 2$

$$y = 4(2)^x$$