

10-7

Geometric Sequences (Pages 567–572)

A sequence of numbers such as 2, 4, 8, 16, 32,... forms a **geometric sequence**. Each number in a geometric sequence increases or decreases by a common factor r , called the **common ratio**.

Geometric Sequence	A geometric sequence can be written in the form of $a, ar, ar^2, ar^3, ar^4, \dots$ where $r \neq 0$ or 1.
Calculating the nth term	The n th term of a geometric series with initial term a_1 and common ratio r is calculated by $a_n = a_1 \cdot r^{n-1}$.

Examples

a. Determine if the sequence is geometric.

$-1, 3, -9, 27, \dots$

$\frac{27}{-9} = -3$ Find the common ratio.

$(-1)(-3), 3(-3)$ Test for each element.

Yes, the sequence is geometric.

b. Find the 12th term of the sequence 4, 16, 64, 256,....

$a_n = a_1 \cdot r^{n-1}$ Formula for the n th term.

$\frac{16}{4} = 4$ Find the common ratio.

$a_{12} = 4 \cdot 4^{12-1}$ Substitute.

$a_{12} = 4 \cdot 4^{11}$ Simplify.

$a_{12} = 4 \cdot 4,194,304$ Multiply.

$a_{12} = 16,777,216$ Multiply.

Practice

Find the next three terms in each sequence.

- $\frac{1}{2}, -1\frac{1}{2}, 4\frac{1}{2}, -13\frac{1}{2}, \dots$
- $-2, -15, -112.5, -843.75, \dots$
- $1, 6, 36, 216, \dots$
- $56, 28, 14, 7, \dots$
- $64, -48, 36, -27, \dots$
- $2, 22, 242, 2662, \dots$
- Find the 10th term of the geometric sequence whose first term is 3 and common ratio is -2 .
- Find the 9th term of $25, 12.5, 6.25, 3.125, \dots$
- A geometric sequence begins with 5 and has a common ratio of $-\frac{1}{4}$. What is the sequence's 4th term?

10. Standardized Test Practice The 15th term of a geometric sequence is 32,768. Which choice shows the possible first term and the possible common ratio?

- A** 2, 2 **B** 4, 3 **C** 15, 4 **D** 8, -4

Answers: 1. $40\frac{1}{2}, -121\frac{1}{2}, 364\frac{1}{2}$ 2. $-6328, 125, -47460, 9375, -47460, 9375, -355957, 03125$ 3. $1296, 7776, 46656$ 4. $3.5, 1.75, 0.875$ 5. $20, 25, -15, 1875, 11,390625$ 6. $29282, 322102, 3543122$ 7. -1536 8. 0.0976765625 9. -0.078125 10. A
