



6-8 Geometric Sequences (Pages 312–316)

A sequence of numbers such as 1, 2, 4, 8, 16, 32, 64 forms a **geometric sequence**. Each number in a geometric sequence increases or decreases by a common *factor* called the **common ratio**.

Geometric Sequence	A geometric sequence is a sequence in which the ratio between any two successive terms is the same.
Using Algebra with Geometric Sequences	You can use the expression $a \cdot r^{n-1}$ to find the n th term in a geometric sequence where a is the first term in the sequence and r is the common ratio.

EXAMPLES

A Is the sequence 4, 12, 36, 108, geometric? If so, state the common ratio and list the next two terms.

Notice that $4 \times 3 = 12$, $12 \times 3 = 36$, and $36 \times 3 = 108$.

$$\begin{array}{ccccccc} 4 & 12 & 36 & 108 & & & \\ \times 3 & \times 3 & \times 3 & & & & \end{array}$$

This sequence is geometric with a common ratio of 3. The next two terms are 108×3 or 324 and 324×3 or 972.

B Use the expression $a \cdot r^{n-1}$ to find the sixth term in the geometric sequence 2, 8, 32, 128, .

The first term is 2, so $a = 2$. The common ratio is $8 \div 2$ or 4, so $r = 4$, and $n = 6$.

$$\begin{aligned} a \cdot r^{n-1} &= 2 \cdot 4^{6-1} \\ &= 2 \cdot 4^5 \text{ or } 2084 \end{aligned}$$

PRACTICE

State whether each sequence is a geometric sequence. If so, state the common ratio and list the next two terms.

- 2, -4, -8, -16, 2. 1, 2, 4, 6, 3. 1, 3, 9, 27,
- 0.5, 1.5, 4.5, 13.5, 5. 3, 6, 9, 15, 29, 6. 2, -4, 8, -16,
- Write the first five terms in a geometric sequence whose common ratio is -3 and whose first term is -3.
- Write the first three terms a geometric sequence if $a = -5$ and $r = \frac{1}{3}$
- Use the expression $a \cdot r^{n-1}$ to find the seventh term in the geometric sequence $\frac{1}{2}, 3, 18, 108, \dots$
- Zoology** Between 1982 and 1992 a population of endangered kangaroo rats increased from 500 to 600. Find the ratio of these numbers. If the population continues to grow by the same factor over the next three decades, what will the population be in 2022?



11. Standardized Test Practice Find the eighth term of the following geometric sequence. 3, 6, 12, 24, 48,

- A** 2 **B** 96 **C** 192 **D** 384

<p>Answers: 1. geometric; $r = 2$; -32, -64 2. not geometric 3. geometric; $r = 3$; 81, 243 4. geometric; $r = 3$; 40.5, 121.5 5. not geometric 6. geometric; $r = -2$; 32, -64 7. -3, 9, -27, 81, -243 8. -5, -$\frac{5}{3}$, -$\frac{25}{9}$ 9. 23, 328 10. 1.2; 1,036 kangaroo rats 11. D</p>
