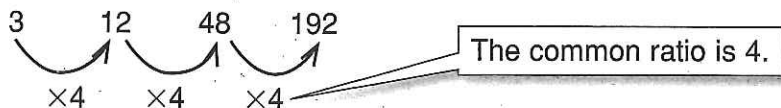


LESSON

Reteach

11-1 Geometric Sequences

In a **geometric sequence**, each term is *multiplied* by the same number to get to the next term. This number is called the **common ratio**.



Determine if the sequence 2, 6, 18, 54, ... is a geometric sequence.

Divide each term by the term before it.

$$\frac{54}{18} = 3 \quad \frac{18}{6} = 3 \quad \frac{6}{2} = 3$$

This is a geometric sequence; 3 is the common ratio.

Determine if the sequence 5, 10, 15, 20, ... is a geometric sequence.

Divide each term by the term before it.

$$\frac{20}{15} = \frac{4}{3} \quad \frac{15}{10} = \frac{3}{2} \quad \frac{10}{5} = 2$$

This is not a geometric sequence; there is no common ratio.

Find the next three terms in the geometric sequence 1, 4, 16, 64,

Step 1: Find the common ratio.

$$\frac{64}{16} = 4 \quad \frac{16}{4} = 4 \quad \frac{4}{1} = 4$$

Step 2: Continue to multiply by the common ratio.

$$64 \times 4 = 256 \quad 256 \times 4 = 1024 \quad 1024 \times 4 = 4096$$

The next three terms are 256, 1024, and 4096.

Determine if each sequence is a geometric sequence. Explain.

1. 2, 4, 6, 8, ... _____

2. -4, 8, -16, 32, ... _____

3. 32, 16, 8, 4, ... _____

Find the common ratio in each geometric sequence below. Then find the next three terms.

4. 1, 5, 25, 125, ... _____

5. -6, 12, -24, 48, ... _____

6. 4, 6, 9, 13.5, ... _____

7. $\frac{1}{4}, \frac{1}{2}, 1, 2, \dots$ _____

LESSON

Research

11-1 Geometric Sequences (continued)

There are two ways to find a given term of a geometric sequence.

Find the 8th term in the geometric sequence 5, 10, 20, 40,

Method 1: Extend the sequence to the 8th term.

Step 1: Find the common ratio.

$$\frac{40}{20} = 2 \quad \frac{20}{10} = 2 \quad \frac{10}{5} = 2$$

The common ratio is 2.

Step 2: Continue to multiply each term by 2.

5, 10, 20, 40, 80, 160, 320, **640**, ...

Stop at the 8th term.

The 8th term is 640.

Method 2: Use a formula to find the 8th term.

Look at Method 1. The first term, 5, was multiplied by 2 seven times to get to the eighth term.

$$\text{8th term} = 5(2)(2)(2)(2)(2)(2)(2) = 5(2)^7$$

Written as a formula, this would be:

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

where n is the number of terms and r is the common ratio.

To find the 8th term of the sequence, use $n = 8$ and $r = 2$.

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

$$a_8 = 5(2)^{8-1}$$

$$a_8 = 5(2)^7$$

$$a_8 = 5(128)$$

$$a_8 = 640$$

The 8th term is 640.

Find the indicated term.

8. $a_1 = 7, r = -2$; 10th term

$$a_{10} = \square(\square)^{\square-1}$$

9. $a_1 = -4, r = 3$; 8th term

$$a_8 = \square(\square)^{\square-1}$$

10. The first term of a geometric sequence is 2, and the common ratio is 3. What is the 7th term?

11. The first term of a geometric sequence is -3 , and the common ratio is -2 . What is the 9th term?

12. Find the 12th term in the geometric sequence 5, -15 , 45, -135 ,

13. Find the 8th term in the geometric sequence 243, 81, 27, 9,
