

6-3

9-11 Geometric Sequences

EQ: How can you recognize and extend geometric sequences?

Extend the sequence:

$$1, 2, 4, 8, \dots 16, 32$$

$$2, 6, 18, 54, \dots 162, 486$$

$$4, 2, 1, \frac{1}{2}, \dots \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$$

$$\frac{1}{2}, \frac{1}{2}$$

Geometric Sequence: a sequence in which the ratio of each successive term is the same.

* you multiply by the same number to get the next term.

Common Ratio (r): the constant ratio (the number you multiply by)

SWORD MAKING

Number of Folds (n)	1	2	3	4	5
Layers F(n)	2	4	8	16	32

$\xrightarrow{\times 2}$ $\xrightarrow{\times 2}$ $\xrightarrow{\times 2}$ $\xrightarrow{\times 2}$

WRITING RULES FOR GEOMETRIC SEQUENCES

EXPLICIT RULE

$$f(n) = \boxed{f(1)} * \boxed{r}^{n-1}$$

first term common ratio

□ Step 1: Find r by dividing each term by the one before it.

□ Step 2: Replace $f(1)$ with the value of the first term, and " r " with the value you found in step 1.

Example: Write an explicit rule for the geometric sequence.

2, 6, 18, 54, ...

① $\frac{6}{2} = 3, \frac{18}{6} = 3 \quad r = 3$

② $f(n) = 2 \cdot 3^{n-1}$

USING THE RULE (find the n th term of the sequence)

Example: Find the 10th term of the sequence 2, 6, 18, 54, ...

$$f(n) = 2 \cdot 3^{n-1}$$

$$f(10) = 2 \cdot 3^{10-1}$$

$$f(10) = 2 \cdot 3^9$$

$$f(10) = 2 \cdot 19,683$$

$$f(10) = 39,366$$

RECURSIVE RULE

$$f(1) = \boxed{\text{first term}}$$

$$f(n) = f(n-1) * \boxed{r}$$

common ratio

Example: Write a recursive rule for the geometric sequence.

8, 4, 2, 1, ...

① $\frac{4}{8} = \frac{1}{2}, \frac{2}{4} = \frac{1}{2} \quad r = \frac{1}{2}$

② $f(1) = 8$
 $f(n) = f(n-1) \cdot \frac{1}{2}$

USING THE RULE (find the n th term of a sequence)

Example: Find the 6th term of the sequence above.

$$f(1) = 8$$

$$f(2) = f(2-1) \cdot \frac{1}{2} = f(1) \cdot \frac{1}{2} = 8 \cdot \frac{1}{2} = 4$$

$$f(3) = f(3-1) \cdot \frac{1}{2} = f(2) \cdot \frac{1}{2} = 4 \cdot \frac{1}{2} = 2$$

$$f(4) = f(4-1) \cdot \frac{1}{2} = f(3) \cdot \frac{1}{2} = 2 \cdot \frac{1}{2} = 1$$

$$f(5) = f(5-1) \cdot \frac{1}{2} = f(4) \cdot \frac{1}{2} = 1 \cdot \frac{1}{2} = \frac{1}{2}$$

$$f(6) = f(6-1) \cdot \frac{1}{2} = f(5) \cdot \frac{1}{2} = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$