TOPIC: GEOMETRIC SEQUENCES

Geometric Sequences – Recursive Formula

◆ **Geometric Sequence**: Type of sequence where the _____ between terms is *always* the _____ number.

- This **common ratio** (r) can be used to find additional terms using a recursive formula.

Recall	Arithmetic Sequence	New	Geometric Sequence
	$\{3, 6, 9, 12, \dots\}$		$\{3, 9, 27, 81, \dots\}$
	$a_1 = 3$ $a_n = a_{n-1} + 3$		$a_1 = 3$ $a_n =$ _____
	$a_n = a_{n-1} + d$		$a_n = a_{n-1} \cdot$ ___
	[+ | ×] number to get next term Grow **[SLOWER | FASTER]**		**[+ | ×]** number to get next term Grow **[SLOWER | FASTER]**

◆ To write a recursive formula for a geometric sequence, first find the common ratio.

EXAMPLE Write a recursive formula for the sequence.

$\{5, 20, 80, 320, \dots\}$

HOW TO: Write a Recursive Formula for Geometric Sequences

1) Find r by dividing *any* 2 consecutive terms.

2) Write the formula, including the 1st term:

$$a_n = a_{n-1} \cdot r; \quad a_1 = \#$$

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PRACTICE Write a recursive formula for the arithmetic sequence

$\{18, 6, 2, \frac{2}{3}, \ldots\}$

Recall
$a_n = a_{n-1} \cdot r$
(Geometric, Recursive)

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Geometric Sequences – General Formula

◆ The **General Formula** of geometric sequences gives the n^{th} term based on the ____ term & common ratio r.

- Remember: These equations allow you to calculate ***ANY*** terms *without* having to calculate previous terms!

	Recall: Recursive Formula	New: General Formula
Arithmetic	$a_n = a_{n-1} + d$	$a_n = a_1 + d(n-1)$
Geometric	$\{3,6,12,24,\dots\}$ $a_n = a_{n-1} \cdot 2; \quad a_1 = 3$ $a_2 = a_1 \cdot 2 = (3) \cdot 2 = 6$ $a_3 = a_2 \cdot 2 = (6) \cdot 2 = 12$ $a_4 = a_3 \cdot 2 = (12) \cdot 2 = 24$ $a_n = a_{n-1} \cdot r$	$\{3,6,12,24,\dots\}$ $a_n = \_\_\_ \cdot \_\_\_^{(\_\_\_\_)}$ $a_2 = \cdots$ $a_3 = \cdots$ $a_4 = \_\_\_ \cdot \_\_\_^{(\_\_\_\_)}$ $a_n = a_1 \cdot r^{(\_\_\_\_\_)}$

EXAMPLE For each sequence below, write a formula for the general or nth term and use it to find the 12th term.

$\{5, 20, 80, 320, \dots\}$

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PRACTICE Find the 10th term of the geometric sequence in which $a_1 = 5$ and $r = 2$.

Recall

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

(Geometric, General)

PRACTICE Write a formula for the general or n^{th} term of the geometric sequence where $a_7 = 1458$ and $r = -3$.

Recall

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

(Geometric, General)