Geometric Sequences – Recursive Formula

- ◆ Geometric Sequence: Type of sequence where the ______ between terms is always the _____ number.
 - lacktriangle 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,} | {3,9,27,81,} |
| $a_1 = 3$ $a_n = a_{n-1} + 3$ | $a_1 = 3$ $a_n = \underline{\hspace{1cm}}$ |
| $a_n = a_{n-1} + d$ | $a_n = a_{n-1} \cdot _$ |
| [+ *] 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

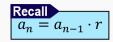
- 1) Find r by dividing any 2 consecutive terms.
- 2) Write the formula, including the 1st term:

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

PRACTICE

Write a recursive formula for the arithmetic sequence

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



(Geometric, Recursive)

Geometric Sequences – General Formula

- ullet 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 | $\boxed{a_n = a_{n-1} + d}$ | $a_n = a_1 + d(n-1)$ |
| Geometric | $\{3,6,12,24,\dots\}$ $a_{n} = a_{n-1} \cdot 2; a_{1} = 3$ $a_{2} = a_{1} \cdot 2 = (3) \cdot 2 = 6$ $a_{3} = a_{2} \cdot 2 = (6) \cdot 2 = 12$ $a_{4} = a_{3} \cdot 2 = (12) \cdot 2 = 24$ $a_{n} = a_{n-1} \cdot r$ | $\{3,6,12,24,\dots\}$ $a_n = \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} $ $a_2 = \cdots$ $a_3 = \cdots$ $a_4 = \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} $ $a_n = a_1 \cdot r^{(\underline{\hspace{1cm}})}$ |

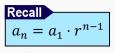
EXAMPLE

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, ...}

PRACTICE

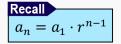
Find the 10th term of the geometric sequence in which $a_1=5$ and r=2.



(Geometric, General)

PRACTICE

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



(Geometric, General)