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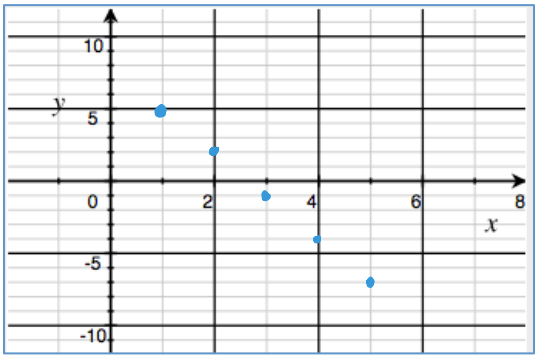
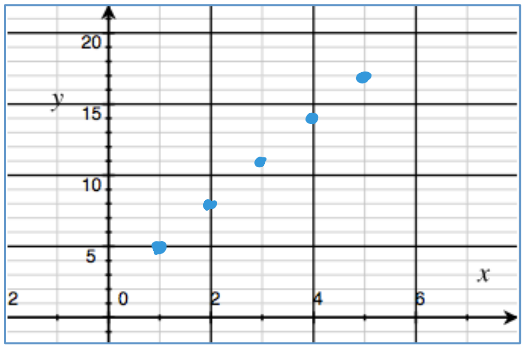
LEARNING OBJECTIVE:

We will differentiate between arithmetic and geometric sequences. (Alg1M3L3)

ACTIVATING PRIOR KNOWLEDGE

We can identify the outputs of sequences:

RECURSIVE FORMULA →

What does the sequence $A(n+1) = A(n) - 3$ *and* $A(1) = 5$ *for* $n \geq 1$ yield?	What does the sequence $A(n+1) = A(n) + 3$ *and* $A(1) = 5$ *for* $n \geq 1$ yield?
5, 2, -1, -4, -7	5, 8, 11, 14, 17 EXPLICIT → $A(n) = 5 + 3(n-1)$
	

RECURSIVE

CONCEPT DEVELOPMENT

Arithmetic Sequence: A sequence is *arithmetic* is there's a real number d (common difference) such that each term in the sequence is the sum of the previous term and d. They are sometimes called "linear sequences."

Examples: $-2, 2, 6, 10, \ldots$

RECURSIVE → $A(n+1) = A(n) + 4$ for $n \geq 1$ and $A(1) = -2$ or

EXPLICIT → $A(n) = -6 + 4n$ for $n \geq 1$

EXPLICIT → $A(n) = -2 + 4(n-1)$ $\quad A(n) = A(1) + d(n-1)$

Geometric Sequence: A sequence is *geometric* if there is a real number r (common ratio) such that each term in the sequence is a product of the previous term and r.

Examples: 1, 3, 9, 27 Multiply by 3

RECURSIVE $A(n+1) = A(n) \cdot 3$ for $n \geq 1$ and $A(1) = 1$ or

EXPLICIT $A(n) = 3^{n-1}$ for $n \geq 1$

$\frac{4}{3}, \frac{2}{3}, \frac{1}{3}, \frac{1}{6}, \frac{1}{12}$ $r = \frac{1}{2}$	$xz, x^2z^3, x^3z^5, x^4z^7, \ldots$ $r = xz^2$

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GUIDED PRACTICE

Steps for Writing Sequences

1. Study the information given. Determine if your sequence is arithmetic or geometric.
2a. Write the terms in the sequence if given the formula for the sequence.
2b. Define the sequence based on the terms given.

$A(n+1) = A(n) - 3$ $for\ n \geq 1\ and\ A(1) = 31$ Geometric or Arithmetic? Arithmetic First 4 terms in the sequence? 31, 28, 25, 22 Write as an explicit formula: $A(n) = A(1) + d(n-1)$ $A(n) = 31 - 3(n-1)$	$A(n) = 2n + 2$ $for\ n \geq 1$ Geometric or Arithmetic? Arithmetic, ADDS 2 First 4 terms in the sequence? 4, 6, 8, 10 Write as a recursive formula: $A(n+1) = A(n) + 2,\ n \geq 1,$ $A(1) = 4$
$A(n) = \left(\frac{3}{2}\right)^n$ $for\ n \geq 1$ Geometric or Arithmetic? Geometric First 4 terms in the sequence? $\frac{3}{2}, \frac{9}{4}, \frac{27}{8}, \frac{81}{16}$ Write as a recursive formula: $A(n+1) = A(n) \cdot \frac{3}{2},\ n \geq 1,$ $A(1) = \frac{3}{2}$	$A(n+1) = A(n) \cdot \frac{3}{4}$ $for\ n \geq 1\ and\ A(1) = 1$ Geometric or Arithmetic? Geometric First 4 terms in the sequence? $1, \frac{3}{4}, \frac{9}{16}, \frac{27}{64}$ Write as an explicit formula: $A(n) = \left(\frac{3}{4}\right)^{n-1}$ $n \geq 1$

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First four terms in a sequence:

$-12, -9, -6, -3, \ldots$

ADDING 3

Arithmetic or Geometric?

ARITHMETIC

Write as an explicit formula

$A(n) = -12 + 3(n-1)$

$n \geq 1$

Write as a recursive formula

$A(n+1) = A(n) + 3$

$A(1) = -12$

$n \geq 1$

First four terms in a sequence:

$1, 10, 19, 28, \ldots$

ADDING 9

Arithmetic or Geometric?

ARITHMETIC

Write as an explicit formula

$A(n) = 1 + 9(n-1)$ $n \geq 1$

Write as a recursive formula

$A(n+1) = A(n) + 9$ $n \geq 1$

$A(1) = 1$

First four terms in a sequence:

$144, 48, 16, 5\frac{1}{3}, \ldots$

MULTIPLY BY $\frac{1}{3}$

Arithmetic or Geometric?

Geometric

Write as an explicit formula

$A(n) = 144 \cdot \left(\frac{1}{3}\right)^{n-1}$

Write as a recursive formula

$A(n+1) = A(n) \cdot \frac{1}{3}$

$n \geq 1$

$A(1) = 144.$

First four terms in a sequence:

$\frac{2}{9}, 2, 18, 162, \ldots$

MULTIPLY BY 9

Arithmetic or Geometric?

GEOMETRIC

Write as an explicit formula

$A(n) = \frac{2}{9} \cdot 9^{n-1}$ $n \geq 1$

Write as a recursive formula

$A(n+1) = A(n) \cdot 9$ $n \geq 1$

$A(1) = \frac{2}{9}$

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INDEPENDENT PRACTICE

$A(n+1) = A(n) + 0.2$ $for\ n \geq 1\ and\ A(1) = -0.5$ Geometric or Arithmetic? First 4 terms in the sequence? Write as an explicit formula:	$A(n) = \left(\frac{2}{3}\right)^n$ $for\ n \geq 1$ Geometric or Arithmetic? First 4 terms in the sequence? Write as a recursive formula:
First four terms in a sequence: $1, 1.1, 1.21, 1.331, \ldots$ Arithmetic or Geometric? Write as an explicit formula Write as a recursive formula	First four terms in a sequence: $4, 12, 36, 108, \ldots$ Arithmetic or Geometric? Write as an explicit formula Write as a recursive formula

CLOSURE

1. The first term in a geometric sequence is 54 and the 5th term is $\frac{2}{3}$. Find an explicit formula for the sequence.

2. Find the explicit form $f(n)$ for a geometric sequence if $f(3) - f(1) = 48$ and $\frac{f(3)}{f(1)} = 9$.

$r = 3$

$f(1)r^2 - f(1) = 48$

$f(1)(r^2 - 1) = 48$

$f(1) \cdot 8 = 48 \quad f(1) = 6$

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

$A(n) = 6 \cdot 3^{n-1} \quad n \geq 1$

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NOTES

Use index cards as suggested in lesson.

Students maybe complete exercises??