TOPIC: ARITHMETIC SEQUENCES

Arithmetic Sequences – Recursive Formula

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

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

$$\{\mathbf{2}, \mathbf{7}, \mathbf{12}, \mathbf{17}, \ldots\}$$

$a_1 =$ ___ $\qquad\qquad$ $d =$ ___

New

$a_n = a_{n-1} +$ ___

EXAMPLE For each sequence below, find the common difference and write the first 4 terms.

$(\boldsymbol{A})$ $a_n = a_{n-1} + 4; \quad a_1 = 3$

$(\boldsymbol{B})$ $a_n = a_{n-1} - 6; \quad a_1 = 9$

◆ To write a recursive formula from a given arithmetic sequence, first find the common difference.

EXAMPLE Write a recursive formula for the sequence

$\{2, 5, 8, 11, 14\}$

HOW TO: Write a Recursive Formula for Arithmetic Sequences

1) Find d by subtracting *any* 2 consecutive terms.

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

$$a_n = a_{n-1} + d; \quad a_1 = \#$$

TOPIC: ARITHMETIC SEQUENCES

PRACTICE Write a recursive formula for the arithmetic sequence

$\{8,2,-4,-10,\ldots\}$

Recall

$a_n = a_{n-1} + d$

(Arithmetic, Recursive)

TOPIC: ARITHMETIC SEQUENCES

Arithmetic Sequences – General Formula

◆ The **General Formula** of arithmetic sequences gives the n^{th} term based on the ____ term & common difference d.

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

Recall **Recursive Formula**	New **General Formula**
$\{2, 7, 12, 17, \ldots\}$	$\{2, 7, 12, 17, \ldots\}$
$\boldsymbol{a_n = a_{n-1} + 5}; \quad a_1 = 2$	$a_n =$ ___ + ___( )
$a_2 = a_1 + 5 = (2) + 5 = 7$	$a_2 = \cdots$
$a_3 = a_2 + 5 = (7) + 5 = 12$	$a_3 = \cdots$
$a_4 = a_3 + 5 = (12) + 5 = 17$	$a_4 =$ ___ + ___( )
$a_n = a_{n-1} + d$	$a_n = a_1 + d($_____$)$

EXAMPLE For the sequence below, write a formula for the general or nth term and use it to find the 101st term.

$\{2, 5, 8, 11, 14\}$

TOPIC: ARITHMETIC SEQUENCES

PRACTICE Find the general formula for the arithmetic sequence below. Without using a recursive formula, calculate the 30th term.

$\{-9, -4, 1, 6, \ldots\}$

Recall

$a_n = a_1 + d(n-1)$

(Arithmetic, General)

EXAMPLE Write a general formula from the recursive formula below. What would be the 15th term in this sequence?

$a_n = a_{n-1} + 3; \quad a_1 = 2$

Recall

$a_n = a_1 + d(n-1)$

(Arithmetic, General)

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EXAMPLE The 4th & 6th terms of a sequence are $a_4 = -2$ and $a_6 = 6$. Find the 18th term of the sequence.

Recall

$$a_n = a_1 + d(n-1)$$

(Arithmetic, General)