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.

$$\{2, 7, 12, 17, \dots\}$$
 $d = \underline{\qquad}$

$$\begin{array}{c}
\text{New} \\
a_n = a_{n-1} + \underline{\qquad}
\end{array}$$

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

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

(**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

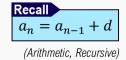
- 1) Find d by subtracting any 2 consecutive terms.
- 2) Write the formula, including the 1st term:

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

PRACTICE

Write a recursive formula for the arithmetic sequence

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



<u>Arithmetic Sequences – General Formula</u>

- ullet The **General Formula** of arithmetic sequences gives the $n^{ ext{th}}$ 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,}	{2,7,12,17,}
$a_n = a_{n-1} + 5; a_1 = 2$	$a_n = \underline{\hspace{1cm}} + \underline{\hspace{1cm}} (\hspace{1cm})$
$a_2 = a_1 + 5 = (2) + 5 = 7$	$a_2 = \cdots$
$a_3 = a_2 + 5 = (7) + 5 = 12$	$a_3 = \cdots$
$a_4 = a_3 + 5 = (12) + 5 = 17$	<i>a</i> ₄ = +()
$a_n = a_{n-1} + d$	$\boxed{a_n = a_1 + d(\underline{\hspace{1cm}})}$

EXAMPLE

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

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

PRACTICE

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

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

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)

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)