# State the pattern for each set.

- 3, 6, 9, 12, 15, 18, 21, 24, …

+3 +3 +3

- 25, 20, 15, 10, 5, 0, -5, -10, …

-5 -5

$3+(-5)=-2$

$-2+(-5)=-7$

- -21, 3, 27, 51, 75, 99, 123, …

+24 +24

Unit 8: Recursive Functions

8.1

# ARITHMETIC SEQUENCES

# Definition: Arithmetic Sequence

A sequence in which there is a **common difference (d)** between consecutive terms.

+5 +5 +5

$$-26, -21, -16, -11, -6, \ldots$$

$d = 5$

Is the given sequence arithmetic? If so, identify the common difference.

2, 4, 8, 16, … no

4, 6, 12, 18, 24, … no

2, 5, 7, 12, … no

48, 45, 42, 39, … yes $d = -3$

1, 4, 9, 16, … no

10, 20, 30, 40, … yes $d = 10$

# Arithmetic Sequence Formula

The 1st term in the sequence.

The common difference.

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

The "nth" term in the sequence.

ex. $a_5$ is the 5th term.

The same as the n in $a_n$.

If you're looking for the 5th term in the sequence, n = 5.

# Example 1:

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

+9 +9 +9

Given the sequence -4, 5, 14, 23, 32, 41, 50,…,

find the $14^{th}$ term.

$a_1 = -4$

$n = 14$

$d = 9$

$a_n = 113$

$a_n = -4 + (14-1) \cdot 9$

$a_n = 113$

# Example 2:

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

+4 +4 +4

Given the sequence 6, 10, 14, 18, 22, 26,…, find the $17^{th}$ term.

$a_1 = 6$

$n = 17$

$d = 4$

$a_n = a_{17} = 70$

$a_{17} = 6 + (17-1)\,4$

$a_{17} = 6 + (16) \cdot 4$

$a_{17} = 70$

PEMDAS

# Example 3:

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

-.5 -.5 -.5

Given the sequence 81, 80.5, 80, 79.5, 79,..., find the $9^{th}$ term.

$a_1 = 81$

$n = 9$

$d = -.5$

$a_9 = 81 + (9-1) \cdot (-.5)$

$a_9 = 77$

# Example 4:

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

-4 -4 -4

Given the sequence 79, 75, 71, 67, 63,…, find the term that has a value of -169.

$a_1 = 79$
$n = ?$
$d = -4$
$a_n = -169$

$n = 63$

$-169 = 79 + (n-1)(-4)$
$-79 \quad -79$
$-248 = (n-1)(-4)$
$-4 \quad -4$
$62 = n - 1$
$+1 \quad +1$
$63 = n$

# Example 5:

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

Given the sequence 4,7,10,13,…, find the term that has a value of 301.

$a_1 = 4$

$n =$

$d = 3$

$a_n = 301$

$301 = 4 + (n-1)(3)$

$-4 \quad -4$

$\frac{297}{3} = \frac{(n-1)(3)}{3}$

$99 = n - 1$

$+1 \quad +1$

$= 100$

# Try this!

## Write a formula for the following sequences.

a) 1, 7, 13, 19, . . .

b) The first term is 3 and the common difference is -21

c) The second term is 8 and the common difference is 3

-3 -3 -3 -3

d) x+10, x+7, x+4, x+1, . . .

**rmine if the sequence is arithmetic. If it is, find the common difference.**
**e the formula for each sequence.**

5, 32, 29, 26, ...

d $a_{15}$

2) −3, −23, −43, −63, ...

Find $a_{10}$

34, −64, −94, −124, ...

d the 34th term

4) −30, −40, −50, −60, ...

Find the 21st term

7, −9, −11, −13, ...

d the term that has the value of -91

6) 9, 14, 19, 24, ...

Find the term that has th
value of 59

# Recursive Formula for Arithmetic Sequences

- Each term in an arithmetic sequence can be obtained recursively from its preceding term by adding *d*:

$$a_n = a_{n-1} + d \text{ (for all } n \geq 2)$$