Name: _____ Date: _____

Recursive Sequences Day 2

Do Now:
Determine if the sequence below is arithmetic or geometric. For each sequence write an explicit rule that can be used to find the nth term of the sequence.

a) 4, 7, 10, 13, ...

ARITHMETIC

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

b) 1, 3, 9, 27, ...

GEOMETRIC

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

Arithmetic and Geometric Sequences can be defined Recursively and Explicitly

Let's take a closer look at the sequences from the Do Now.

Can the sequence 4, 7, 10, 13, ... be defined with a **recursive** rule?

(1) $a_n = a_{n-1} + 3$ (2) $a_1 = 4$

Can the sequence 1, 3, 9, 27, ... be defined with a **recursive** rule?

(1) $a_n = a_{n-1} \cdot 3$ (2) $a_1 = 1$

Writing Rules to Generate Arithmetic and Geometric Sequences

Arithmetic	Geometric
Explicit Rule: $a_n = a_1 + d(n-1)$ a_1 represents the **first term** in the sequence **d** represents the **common difference** This formula is used to find the nth term of the sequence.	**Explicit Rule: $a_n = a_1 \cdot r^{n-1}$** a_1 represents the **first term** in the sequence **r** represents the **common ratio** This formula is used to find the nth term of the sequence.
Recursive Rule: $a_n = a_{n-1} + d$; a_1 = a_{n-1} represents the **previous term** in the sequence **d** represents the **common difference** This formula uses the previous term to find the next term in the sequence.	**Recursive Rule: $a_n = a_{n-1} \cdot r$; a_1 =** a_{n-1} represents the **previous term** in the sequence **r** represents the **common ratio** This formula uses the previous term to find the next term in the sequence.

Write a recursive formula for the following sequences. GEOMETRIC

1) 100, 96, 92, ... ARITHMETIC

$a_1 = 100$

$a_n = a_{n-1} - 4$

2) 200, 40, 8, ... $r = \frac{1}{5}$

$a_1 = 200$

$a_n = a_{n-1} \cdot \frac{1}{5}$

$a_n = a_{n-1} \div 5$

Find the first 3 terms in each sequence below.

3) $a_n = a_{n-1} - 0.25$ *and* $a_1 = 3.5$

3.5 (a_1), 3.25, 3

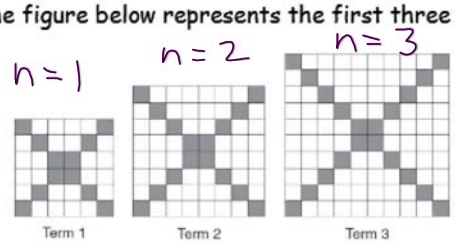
4) $a_n = a_{n-1} \cdot 4$ *and* $a_1 = \frac{1}{8}$

.125 (a_1), .5, 2

$\frac{1}{8}$, $\frac{1}{2}$, 2

both ✓

5) The figure below represents the first three terms of a sequence.



shaded boxes: 12, 16, 20

Which of the following rules can be used to define the sequence? Select all that apply.
Justify your response.

4(1) + 8 = 12
4(2) + 8 = 16 ...

✓ A. $a_n = a_{n-1} + 4;\ a_1 = 12$ — Recursive Rule

✓ B. $a_n = 4n + 8$ — substitute n!

C. $a_{n+1} = a_n + 4;\ a_1 = 12$ — what? ✗

✓ D. $a_n = 12 + 4(n - 1)$ — $a_n = a_1 + d(n-1)$ Explicit Rule

E. $a_n = a_{n-1} + 12;\ a_1 = 4$ ✗ first term is 12, not 4

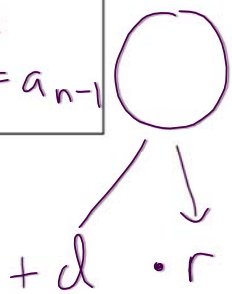
F. $a_n = 4 + 12(n - 1)$ ✗

CONCLUSION!

Sequences defined **recursively** use the previous term(s) to find the next term of the sequence.

Sequences defined **explicitly** use the explicit formula to find the *n*th term.

① $a_1 =$
② $a_n = a_{n-1}$



HOMEWORK!

Given the following formulas, find the first 4 terms.

1. $t_1 = 0$, $t_n = t_{n-1} + 6$

2. $t_1 = -4$, $t_n = t_{n-1} + 2$

3. $t_1 = 8$, $t_n = t_{n-1} - 4$

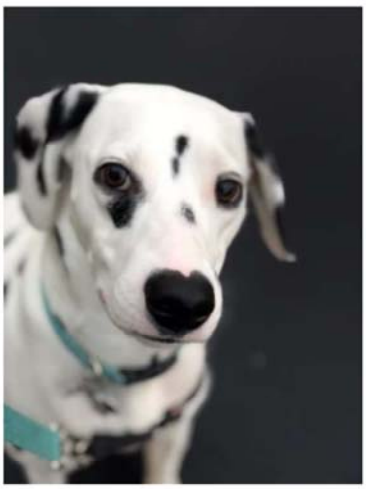
4. $t_n = 3n - 1$

$3(1)-1$, $3-1=2$; $3(2)-1$, $6-1=5$; $3(3)-1$, $9-1=8$; 2, 5, 8, 11

5. $t_n = 4n + 3$

6. $t_n = -5n + 2$

There's more on the next page, but I still wanted to fill this space with something.



7. Write an explicit and recursive formula for the following sequences.

a. -4, -6, -8, -10…

Explicit: _____

Recursive: _____

b. 84, 71, 58, 45…

Explicit: _____

Recursive: _____

c. 19, 13, 7, 1…

Explicit: _____

Recursive: _____

d. 9, 17, 25, 33…

Explicit: _____

Recursive: _____

e. -3, -1, 1, 3…

Explicit: _____

Recursive: _____

f. 110, 88, 66, 44…

Explicit: _____

Recursive _____