Name: Key

Date:

UNIT 5

LESSON 3

Do Now:

a. Is the following sequence *arithmetic* or *geometric*?

7, 14, 21, 28.....

$d = 14-7 = \boxed{7}$

b. Write an explicit formula for the above sequence.

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

$a_n = 7 + (n-1)(7)$

$a_n = 7 + 7n - 7$

$\boxed{a_n = 7n}$

c. Using the formula, find the *8th* term of the sequence.

$a_8 = 7(8)$

$\boxed{a_8 = 56}$

AIM: RECURSIVE FORMULA

1. Could you state the term values for terms five through eight without using the formula?

7, 14, 21, 28.....

$a_1 = 7$

$a_2 = 14$

$a_3 = 21$

$a_4 = 28$

$a_5 = 28 + 7 = 35$

$a_6 = 35 + 7 = 42$

$a_7 = 42 + 7 = 49$

$a_8 = 49 + 7 = 56$

Recursive Formula

- Dependent on the previous term to develop a pattern.
- Gives you the n^{th} term of a sequence using the term before, *n-1*.
- To find a term using a recursive formula you need the previous term to find the next one.

a_1 = the first term in the sequence
a_n = the n^{th} term in the sequence
a_{n-1} = the term before the n^{th} term
n = the term number
d = the common difference.

a_1 = first term ← always state first term

$a_n = a_{n-1} + d$ (previous term; common difference)

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$a_1 = 7 \quad a_n = a_{n-1} + d$

$\boxed{a_1 = 7,\ a_n = a_{n-1} + 7}$

2. Use the following to find the *first 4 terms* of the sequence:

$a_1 = -2$

$a_n = a_{n-1} + 3$

previous term

$a_1 = -2$

$a_2 = -2 + 3 = 1$

$a_3 = 1 + 3 = 4$

$a_4 = 4 + 3 = 7$

$\boxed{-2, 1, 4, 7}$

3. Write the first 5 terms of the recursive sequence:

$a_1 = -4$

$a_n = a_{n-1} + 5$

$a_1 = 4$

$a_2 = 4 + 5 = 9$

$a_3 = 9 + 5 = 14$

$a_4 = 14 + 5 = 19$

$a_5 = 19 + 5 = 24$

$\boxed{4, 9, 14, 19, 24}$

* 4. Write the first 4 terms of the recursive sequence:

$a_1 = 12$

$a_{n+1} = a_n + 2$

a little different but same process!

$a_1 = 12$

$a_2 = 12 + 2 = 14$

$a_3 = 14 + 2 = 16$

$a_4 = 16 + 2 = 18$

$\boxed{12, 14, 16, 18}$

To summarize the process of writing a recursive formula for an arithmetic sequence:

1. Determine if the sequence is arithmetic (*Do you add or subtract the same amount from one term to the next?*)
2. Find the common difference. (*The number you add or subtract.*)
3. Create a recursive formula by stating the first term, and then stating the formula to be the previous term plus the common difference.

5. State *recursive formula* for this sequence: 7, 11, 15, 19, 23, ...

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

$d = a_2 - a_1$

$a_1 = 7$

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

$d = 11 - 7 = 4$

6. State *recursive formula* for this sequence: 3, 5, 7, 9, 11, ...

$a_1 = 3$

$a_n = a_{n-1} + 2$

$d = 5 - 3 = 2$

7. State *recursive formula* for this sequence: 32, 38, 44, 50, …

$a_1 = 32$

$a_n = a_{n-1} + 6$

$d = 38 - 32 = 6$

8. Consider the sequence following: 35, 30, 25, 20, 15, 10, ...

a) Write a *recursive formula* for the sequence.

$a_1 = 35$

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

$d = 30 - 35 = -5$

b) Write an *explicit formula* for the sequence.

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

$a_n = 35 + (n-1)(-5)$

$a_n = 35 - 5n + 5$

$a_n = 40 - 5n$

c) Find the 18th term. Which formula is easier to use? Why?

explicit b/c we don't have the previous term (a_{17})

$a_{18} = 40 - 5(18)$

$a_{18} = -50$