Algebra I **Name**______________________________

Unit #2: Sequences & Exponential Functions **Period**_____

Lesson #3: Recursive Formulas **Date**_______

<u>Ex #1</u>: Consider the sequence 5, 8, 11, 14, 17…

- What is the pattern of the sequence? ______________________________
- Is the sequence arithmetic or geometric? ______________________________
- What is the next number in the sequence? ______________________________
- What is an explicit formula for the sequence? ______________________________

Another formula that can be used to describe the pattern is

$$A_{n+1} = A_n + 3 \text{ and } A_1 = 5$$

______________ → A_{n+1}

______________ → A_n

______________ → 3

______________ → $A_1 = 5$

But what does A_{n+1} even mean? Let's look back at the pattern…

5

8 = 5 + 3

11 = 8 + 3

14 = 11 + 3

17 = 14 + 3

What we call the 5th term? ____________

How do we find the 5th term if we know the 4th term? ______________________

How do we write that? ______________________________

How do we find the 6th term if we know the 5th term? ______________________

How do we write that? ______________________________

How do we find the (n+1)th term if we know the nth term? ____________________

How do we write that? ______________________________

The statement $A_{n+1} = A_n + 3$ is a ________________formula. A recursive formula relates a ______________ in the sequence to preceding __________ or ______________ of the sequence.

<u>NOTE</u>: You may see the same sequence written as A(n+1) = A(n) + 3. It means the EXACT SAME THING!!!

Ex #2: Find the first five terms of the sequence defined by

$$A_{n+1} = A_n - 3 \text{ where } A_1 = 5$$

Ex #3: Find the first five terms of the sequence defined by

$$A_{n+1} = 3A_n \text{ where } A_1 = 5$$

Ex #4: Find the first five terms of the sequence defined by

$$f(n + 1) = 2f(n) - 3 \text{ where } f(1) = 5$$

Ex #5: Find the first five terms of the sequence defined by

$$A_{n+1} = 3A_n + 4 \text{ where } A(1) = 1$$

Ex #6: Consider the sequence given by the formula

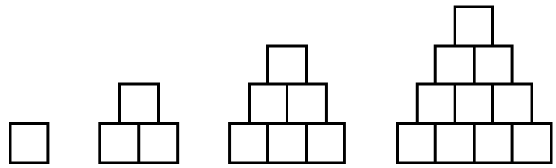
$$A_n = A_{n-1} - 5 \text{ where } A_1 = 12$$

The first five terms of the sequence are ______________________________

An explicit formula for the sequence would be ______________________________

Find A_6 ______________ Find A_{11} ______________ Find A_{100} ______________

<u>Ex #6</u>: A sequence of blocks is shown in the diagram below.



This sequence can be defined by the recursive function $a_1 = 1$ and $a_n = a_{n-1} + n$
Assuming the pattern continues, how many blocks will there be when n = 7 ?

1) 13
2) 21
3) 28
4) 36

<u>Ex #7</u>: In 2014, the cost to mail a letter was 49¢ for up to one ounce. Every additional ounce cost 21¢. Which recursive function could be used to determine the cost of a 3-ounce letter, in cents?

1) $a_1 = 49$; $a_n = a_{n-1} + 21$
2) $a_1 = 0$; $a_n = 49a_{n-1} + 21$
3) $a_1 = 21$; $a_n = a_{n-1} + 49$
4) $a_1 = 0$: $a_n = 21a_{n-1} + 49$

<u>Ex #8</u>: Which recursively defined function represents the sequence 3, 7, 15, 31,… ?

1) $f(1) = 3$, $f(n + 1) = 2^{f(n)} + 3$
2) $f(1) = 3$, $f(n + 1) = 2^{f(n)} - 1$
3) $f(1) = 3$, $f(n + 1) = 2f(n) + 1$
4) $f(1) = 3$, $f(n + 1) = 3f(n) - 2$