Algebra I Block   **Name**_____

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

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

Ex #1: 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

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

_____   _____

_____   _____

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.

NOTE: 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
$$A_n = A_{n-1} - 5 \text{ where } A_1 = 12$$
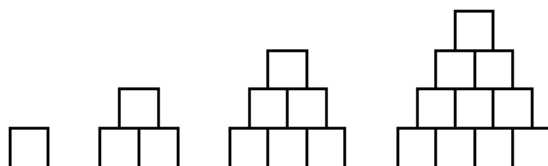
The first five terms of the sequence are _____

An explicit formula for the sequence would be _____

Find A_6 _____   Find A_{11} _____   Find A_{100} _____

Ex #6: 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   3) 28
  2) 21   4) 36

Ex #7: 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) $a_1 = 0:\ a_n = 21a_{n-1} + 49$

Ex #8: 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) $f(1) = 3,\ f(n + 1) = 3f(n) - 2$

Try these...

1.) **45, 41, 37, 33...**
- What is the pattern for this sequence?_____
- Is this sequence arithmetic or geometric? _____
- Is there a common difference or a common ratio? _____
- What is the first term? _____
- What is the common difference/ratio? _____

- The explicit formula for this sequence is: _____

- The recursive formula for this sequence is: _____

- What is the 15th term of the sequence? _____

2.) **28, 33, 38, 43,...**
- What is the pattern for this sequence?_____
- Is this sequence arithmetic or geometric? _____
- Is there a common difference or a common ratio? _____
- What is the first term? _____
- What is the common difference/ratio? _____

- The explicit formula for this sequence is: _____

- The recursive formula for this sequence is: _____

- What is the 22nd term of the sequence? _____

3.) **1, 3, 9, 27...**
- What is the pattern for this sequence?_____
- Is this sequence arithmetic or geometric? _____
- Is there a common difference or a common ratio? _____
- What is the first term? _____
- What is the common difference/ratio? _____

- The explicit formula for this sequence is: _____

- The recursive formula for this sequence is: _____

- What is the 8th term of the sequence? _____

4.) **320, 160, 80,...**
- What is the pattern for this sequence?_____
- Is this sequence arithmetic or geometric? _____
- Is there a common difference or a common ratio? _____
- What is the first term? _____
- What is the common difference/ratio? _____

- The explicit formula for this sequence is: _____

- The recursive formula for this sequence is: _____

- What is the 9th term of the sequence? _____

5.) **7, 19, 31, 43,...**
- What is the pattern for this sequence?_____
- Is this sequence arithmetic or geometric? _____
- Is there a common difference or a common ratio? _____
- What is the first term? _____
- What is the common difference/ratio? _____

- The explicit formula for this sequence is: _____

- The recursive formula for this sequence is: _____

- What is the 57th term of the sequence? _____