CH.4, L2– WRITING EXPLICIT AND RECURSIVE FUNCTIONS

Objective: Given a sequence, I will create a recursive or explicit formula by identifying the initial term and growth rate or ratio.

Think About It: A scholar took the sequence below and organized it into a table where the outputs were defined as the numbers in the sequence using $a(n)$ and the inputs were the position in the sequence, n. For example, $a(3) = 7$ implies that the third term in the sequence is 7. Knowing this, answer the following questions

3, 5, 7, 9, 11, …

Position in the sequence, n	1	2	3	4	5
Term in the sequence, $a(n)$	3	5	7	9	11

Key Point:

a) What is the first term and how would you represent it using function notation $a(n)$?

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b) Explain how you would find the value the 25th term if you knew the value of the 24th term.

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c) Write a linear or exponential equation that represents the function.

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Key Point:

Keywords: sequence, explicit, recursive

Big Idea:

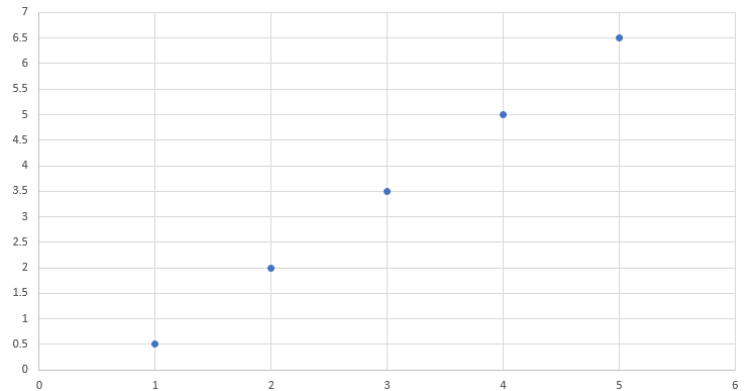CFS: 1
1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations

Interaction with New Material:

Ex. 1) Which of the following recursive functions represents the graph shown?

a. $a(0) = 0.5, \quad a(n) = a(n-1) + 1.5$
b. $a(1) = 0.5, \quad a(n) = a(n) + 1.5$
c. $a(1) = 0.5, \quad a(n) = a(n-1) + 1.5$
d. $a(1) = -1, \quad a(n) = a(n-1) + 1.5$

Ex. 2) Given the sequence, write a recursive and explicit function representing it.

½, 1, 2, 4, 8, …

CFS: 2
1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations
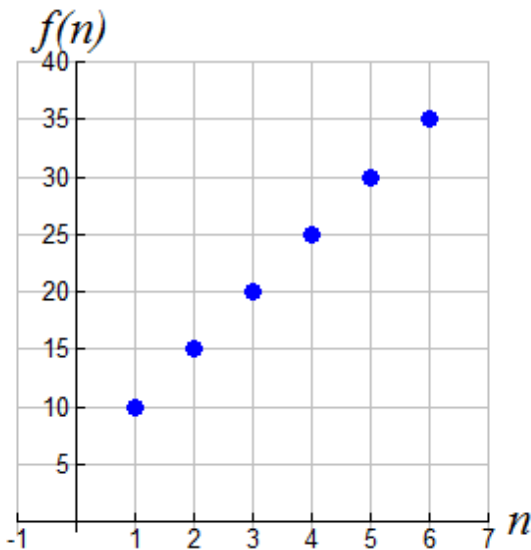
Partner Practice: *(Low Difficulty)*

    1.   Write the recursive function for the following sequences:

a. 1, 3, 5, 7, 9	b. 1, 3, 9, 27, 81

    2.   Write the explicit function and the recursive function for the following sequence:

$$45, 39, 33, 27, 21, \dots$$

   3.   Create a table of values in order to write a recursive and explicit function that represents the graph below.

1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations
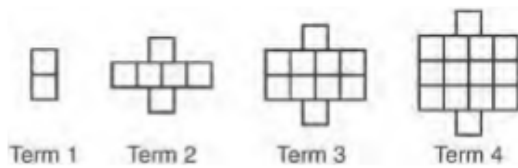
Partner Practice: *(Medium Difficulty)*

4. Write an explicit and recursive function for the table and accompanying graph below. Explain how the shape of the graph lets you know what type of function to write.
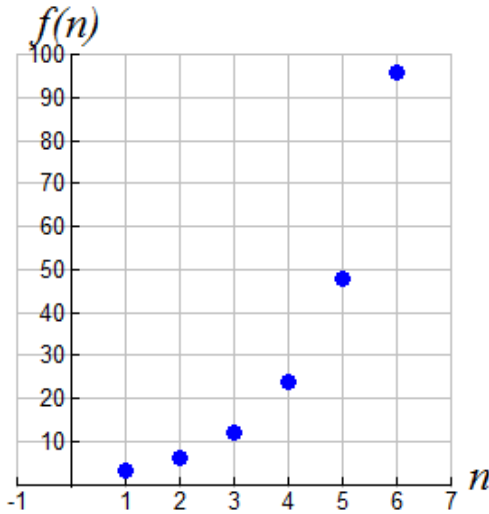
Term Number	Term
1	3
2	6
3	12
4	24
5	48
6	96

5. Regents Problem!

A pattern of blocks is shown below.

Term 1   Term 2   Term 3   Term 4

If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the *n*th term?

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

1 I and II
2 I and III
3 II and III
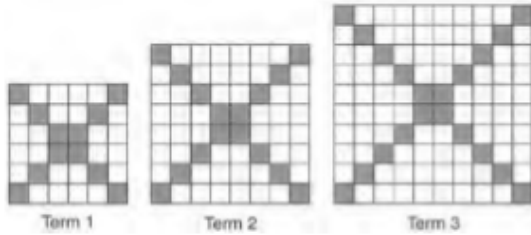4 III, only

CFS: 4
1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations

6. Regents Problem! - Answer the question below and identify if the equation is explicit or recursive. Write the other form of the equation (e.g. if the equations below are recursive, write an explicit equation or vice versa).

The diagrams below represent the first three terms of a sequence.

Term 1   Term 2   Term 3

Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?

1   $a_n = 4n + 12$
2   $a_n = 4n + 8$
3   $a_n = 4n + 4$
4   $a_n = 4n + 2$

Partner Practice: *(Hard Difficulty)*

7. For the functions below; if it is explicit, write the equivalent recursive function. If it is recursive, write the explicit function.

a) $a(n) = 3n - 1$

b) $a(1) = 2, \ a(n) = (2)a(n - 1)$

CFS:
1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations

CFS: 6

1. Sequence is annotated for growth rate or ratio
2. Recursive functions have initial value and recursive rule
3. Explicit functions are in linear or exponential equations