LEARNING OBJECTIVE: We will define integer sequences and give explicit formulas to define the pattern of a sequence. (Alg1M3L1)

ACTIVATING PRIOR KNOWLEDGE
We can recognize patterns in numbers.

What are the next three numbers in the pattern:	What could the next three numbers in the pattern be?
2, 5, 8, 11, _14_, _17_, _20_	2, 4, 8, _16_, _32_, _64_ (14 22 32)
Describe the pattern: ADDING 3	Describe the pattern: Multiplying by 2

CONCEPT DEVELOPMENT
A **sequence** can be thought of as an ordered list of elements.
Each element in the list is a term.
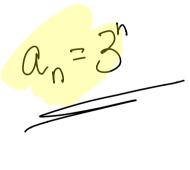The terms are indexed by a subscript to make sure that they are in order.
Example:
Stephan thought of a pattern that shows powers of 3. Here are the first five numbers of his sequence: 3, 9, 27, 81, 243,… 3^n

What expression can we write for the nth number in Stephan's sequence?

Can we make a few different tables of values?

Term Number	Term
1	3
2	9
3	27
4	81
5	243

Sequence Term	Term
a_1	3
a_2	9
a_3	27
a_4	81
a_5	243

$a_n = 3^n$

$f(n) = 3^n$

Function notation: Instead of using a_n, we can use $f(n)$ notation, which means the formula for the nth term.
Example: $a_n = n^2 - 1$ becomes $f(n) = n^2 - 1$

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FOR NOW, we are always starting when n=1!

GUIDED PRACTICE

Steps to Writing Explicit Formulas for Sequences
1. Consider the given sequence, and define the pattern.
2. Write a formula that can be used to predict the nth term in the formula.
**Remember, start when $n = 1$.
3. Rewrite your formula as an explicit formula by including $(n - 1)$ in your formula (if necessary).
4. Answer any questions as required by applying the formula.

Sequence: ④ 7, 10, 13, 16,…

ADDS 3

Formula: (a_n and $f(n)$notation) n=1

$a_n = 3n + 1$

$f(n) = 3n + 1$

Explicit

Formula (when $n = 0$):

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

$$\begin{array}{c|c} 0 & 1 \\ 1 & 4 \\ ② & 7 \\ 3 & 10 \end{array}$$

What is the 13th term in the sequence?

$a_{13} = 3(13) + 1 = 40$

Sequence ② 6, 10, 14,…

ADDING 4

Formula: (a_n and $f(n)$notation)

$a_n = 4n - 2$ ✓

$f(n) = 4n - 2$ ✓

$$\begin{array}{c|c} 0 & -2 \\ 1 & 2 \\ 2 & 6 \end{array}$$

Formula (when $n = 0$):

$a_n = 4(n-1) + 2$ ✓

What is the 19th term in the sequence?

$f(19) = 4 \cdot 19 - 2 = 74$

Sequence: 30, 25, 20, 15,…

SUBTRACTING 5

Formula: (a_n and $f(n)$notation)

$a_n = -5n + 35$

$f(n) = -5n + 35$

$a_1 = 30$

$$\begin{array}{c|c} 1 & 30 \\ 2 & 25 \end{array}$$

Formula (when $n = 0$):

$a_n = -5(n-1) + 30$

What is the 26th term in the sequence?

$a_{26} = -5(26) + 35 = -95$

$f(26)$

Sequence: 119, 117, 115, 113,…

-2

Formula: (a_n and $f(n)$notation)

$a_n = -2n + 121$

$f(n) = -2n + 121$

Formula (when $n = 0$):

$a_n = -2(n-1) + 119$

What is the 17th term in the sequence?

Sequence: 1, 5, 25, 125, 625	Sequence: 1, 16, 256, 4096,...
Multiply 5 <u>Formula</u>: (a_n and $f(n)$ notation) $a_n = 5^{n-1}$ $n=1$ $f(n) = 5^{n-1}$ $\begin{array}{c\|c} 1 & 1 \\ -2 & 5 \\ -3 & 25 \\ -4 & 125 \end{array}$ <u>Formula (when $n=0$)</u>: $a_n = 5^n$ What is the 9th term in the sequence? $390,625$	Multiply 16 <u>Formula</u>: (a_n and $f(n)$ notation) <u>Formula (when $n=0$)</u>: What is the 8th term in the sequence?
<u>Sequence</u>: Consider the following sequence: <u>Formula</u>: (a_n and $f(n)$ notation) <u>Formula (when $n=0$)</u>: What does the 8th term look like?	Sequence: 1, 8, 27, 64,... <u>Formula</u>: (a_n and $f(n)$ notation) <u>Formula (when $n=0$)</u>: What is the 9th term in the sequence?

Name:_____   Math _____, Period _____

Mr. Rogove   Date: _____

<u>Sequence</u>: A standard piece of paper has a length and width of 8.5 inches by 11 inches. Find the area of one piece of paper.	<u>Sequence</u>: Janet won the lottery—her after tax winnings were $1,000,000,000. Each year she spent exactly half of the money she had. How much money did she spend the first year?
	How much money does she have left after the 3rd year?
If the paper were folded completely in half, what would be the area of the resulting rectangle?	
Write a formula for a sequence to determine the area of the paper after n folds.	Write a formula for a sequence to determine the amount of money after n years.
What is the area after 7 folds?	How much money does she have left after 10 years?

INDEPENDENT PRACTICE
Complete Problem Set for Module 3, Lesson 1.

CLOSURE

NOTES
Module 3, Lesson 1. Algebra 1