Name: _____ Date: _____

Do Now: Create a sequence of numbers using the following information below.

Write the sequence here: 2, 7, 32, 157

1) The first number of the sequence is 2. ✓
2) To find the second number of the sequence, take the first number, multiply it by 5 then subtract 3. ✓
3) To find the third number of the sequence, take the second number, multiply it by 5 then subtract 3. ✓
4) To find the fourth number of the sequence, take the third number, multiply it by 5 then subtract 3.

Let's take a closer look at the sequence from the Do Now.

2, 7, 32, 157

1) Is the sequence arithmetic? No, there is no common difference.
2) Is the sequence geometric? No, there is no common ratio.
3) Does the sequence follow a pattern? YES.

The sequence from the Do Now can be defined recursively.

Using a Recursive Rule to Generate a Sequence

A **recursive** rule for a sequence defines the **nth** term by relating it to one or more previous terms.

A **recursive formula** will help you find the **next term** in a sequence. Each term is found by doing something (+, -, x, ÷) to the **previous term(s)**.

A **recursive formula** is written with **two parts**:

1. a statement of the **starting term**
2. a statement of the **formula** used to arrive at the next term

Let's define the sequence from the Do Now recursively.

The **first term** is 2. The **nth** term equals 5 times the **previous term** minus 3.

$a_1 = 2$ $a_n = 5\,a_{n-1} - 3$

1) $a_1 =$ ~~~
2) $a_n = 5a_{n-1} - 3$

☆ a_{n-1}

Find the first four terms of each sequence given the recursive rule. formula

1) $a_1 = 6$; $a_n = 2a_{n-1} + 1$ ←

n	$a_n = 2a_{n-1} + 1$	a_n
1	$a_1 = 6$	6
2	$a_n = 2a_{n-1} + 1$ $a_2 = 2a_{2-1} + 1$ $a_2 = 2a_1 + 1$ $a_2 = 2(6) + 1$	13
3	$a_3 = 2a_2 + 1$ $a_3 = 2(13) + 1$	27
4	$a_4 = 2a_3 + 1$ $a_4 = 2(27) + 1$	55

1st term

2nd term

2) $a_1 = -12$; $a_n = \frac{1}{2}a_{n-1} - 4$

n	$a_n = \frac{1}{2}a_{n-1} - 4$	a_n
1	$a_1 = -12$	-12
2	$a_n = \frac{1}{2}a_{n-1} - 4$ $a_2 = \frac{1}{2}a_1 - 4$ $a_2 = \frac{1}{2}(-12) - 4$	-10
3	$a_3 = \frac{1}{2}a_2 - 4$ $a_3 = \frac{1}{2}(-10) - 4$	-9
4	$a_4 = \frac{1}{2}a_3 - 4$ $a_4 = \frac{1}{2}(-9) - 4$ $a_4 = -4.5 - 4$	-8.5

3) $f(1) = \frac{1}{2}$; $f(n) = -4f(n-1) + 6$

n		f(n)
1	$f(1) = \frac{1}{2}$	$\frac{1}{2}$
2	$f(2) = -4f(2-1) + 6$ $f(2) = -4f(1) + 6$ $f(2) = -4(\frac{1}{2}) + 6$ $-2 + 6$	4
3	$f(3) = -4f(2) + 6$ $= -4(4) + 6$ $-16 + 6$	-10
4	$f(4) = -4f(3) + 6$ $= -4(-10) + 6$ $40 + 6$	46

KEEP IN MIND!

- Sequences defined **recursively** use the *previous term* to find the next term of the sequence.
- The symbols a_{n-1} and $f(n-1)$ represent the *previous term* in the sequence.