Essential Questions: What is a recursive rule? How do we use recursive formulas to find the terms in a sequence?

<u>Do Now:</u> Create a sequence of numbers using the following information below.

Write the sequence here: __

- 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.

- 1) Is the sequence arithmetic?
- 2) Is the sequence geometric?
- 3) Does the sequence follow a pattern?

The sequence from the Do Now can be defined ______.

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 $(+, -, \times, \div)$ to the previous term(s).

A recursive formula is written with two parts:

- a statement of the starting term
- 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.





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

1) $a_1 = 6$; $a_n = 2a_{n-1} + 1$

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

n	an	n	an
1		1	
2		2	
3		3	
4		4	

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

n	f(n)
1	
2	
3	
4	



- Sequences defined recursively use the <u>previous term</u> to find the next term of the sequence.
- The symbols **a**_n 1 and **f(n 1)** represent the <u>previous term</u> in the sequence.

More Recursive Rules

4) If a sequence is defined recursively by f(1) = 10 and f(n) = -f(n-1) + 3 then find f(5).

5) A sequence is defined recursively by adding 4 to twice the value of the previous term. Write a recursive rule for this sequence if the first term is 15.



When creating a sequence using a recursive rule, it is important to understand that

each term of the sequence is found using the ______ term. If the

nth term of the sequence is denoted by \mathbf{a}_n then the previous term is _____

PIPS CORNER

One of the most famous sequences in mathematics is The Fibonacci Sequence. It is defined recursively as follows: $\mathbf{a}_n = \mathbf{a}_{n-1} + \mathbf{a}_{n-2}$; $\mathbf{a}_0 = \mathbf{1}$ and $\mathbf{a}_1 = \mathbf{1}$. Using this rule, find the first five terms of the sequence.