Name:_____ Date:_____

# Notes: Sequences

Do Now:

1) Consider the sequence below.

$$4, 7, 10, 13, 16, 19, \ldots$$

What are the next 4 terms?

What is the pattern of the sequence?

2) At Mount Morris Elementary School, the auditorium has thirty-five rows of seats. The front row has 12 seats and each subsequent row has two more seats than the previous row. How many seats are in the fourteenth row?

# What Should I Be Able to Do?

**- I can define sequence.**
**- I can create a sequence of my own.**
**- I can write a recursive formula given a context.**
**- I can interpret a recursive formula and state any term in the sequence.**
**- I can graph a sequence.**
**- I can define an arithmetic sequence.**
**- I can decipher whether a sequence is arithmetic or not arithmetic and provide reasoning.**

# Vocab Breakdown

**Sequence:** An ordered list of numbers that often has a pattern.

The first term is denoted $a_1$, second term $a_2$, third term $a_3$, etc...

$$a_1, a_2, a_3, a_4, a_5, a_6, a_7, \ldots, a_n, \ldots.$$

(Other common notations are $a(1)$ or $f(1)$ for the first term, $a(2)$ or $f(2)$ for the second term, etc...)

Example:

$$3, 9, 15, 21, 27, 33, 39, \ldots$$

1) What is the pattern in the sequence above?

2) What is $a_5$?

3) What is $a(1)$?

4) What is $f(10)$?

Create your own sequence!!!

Step 1: State the first term.

Step 2: State the pattern of your sequence.

Step 3: State the first 5 terms of your sequence.

The sequence I created started with a first term of 5 and then added 10 to the previous term to get the next term. Let's list as many terms a will fit on the page.

This sequence would go on forever! There is a better way of representing sequences and that is by using a **RECURSIVE FORMULA.**

# Vocab Breakdown

**Recursive Formula:** A way of writing sequences that relates each term of the sequence to the previous term.

*** You must always state the first term to specify where the sequence starts!**

Let's look at how I would write my sequence in a recursive formula:

$$a_1 = 5$$

$$a_n = a_{n-1} + 10$$

Put this recursive formula into words.

_____

_____

_____

_____

How else could you write this recursive formula using different notation?

Interpret each recursive formula. Then find the first 5 terms of each sequence.

1) $a_1 = 3$

$a_n = a_{n-1} - 2$

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2) $a_1 = -4$

$a_n = 2a_{n-1}$

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3) $a(1) = 1$

$a(n) = -3a(n-1) - 2$

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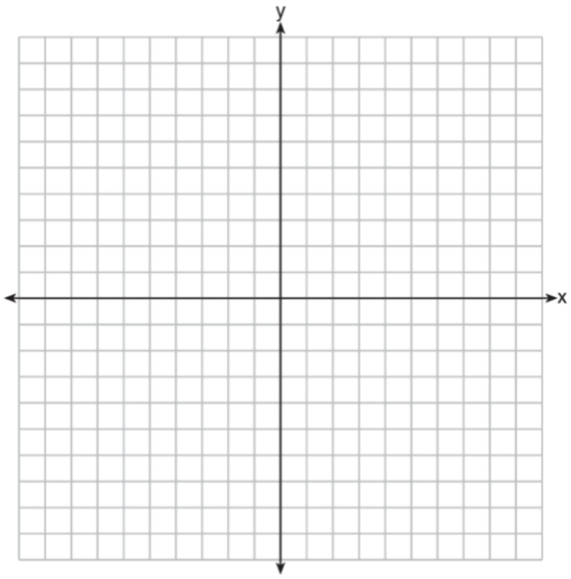
Simon is saving up for a new pair of soccer cleats. He has $15 dollars saved from his first week and then saves $10 dollars each week from mowing lawns.

a) Write a recursive formula to represent the how much money Simon has saved in $n$ weeks.

b) Fill in the following table for the first five terms.

| $n$ | $a(n)$ |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

c) Graph the sequence below.




What quadrant(s) should not be included in our graph? Explain your reasoning.

_____

_____

How does the graph of a sequence differ from graphs of other equations?

_____

_____

# Checkpoint:

1) $a_1 = \frac{1}{2}$

$a_n = 4a_{n-1} - 2$

a) Interpret the recursive formula.

_____

_____

b) Find the first 5 terms of each sequence.

2) $a(1) = 2$

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

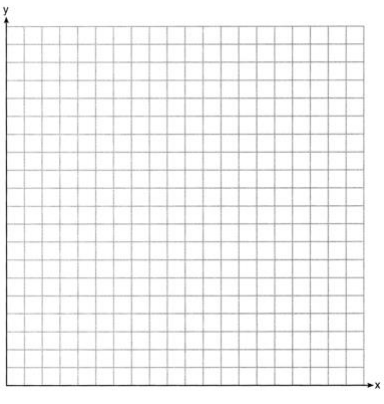
a) Interpret the recursive formula.

_____

_____

b) Find the first 5 terms of each sequence.

c) Graph the first 5 terms of the sequence



# Vocab Breakdown

**Arithmetic Sequence:** A sequence that has a common difference between terms.

Examples:

$3, 9, 15, 21, 27, 33, 39, \ldots$ $4, 0, -4, -8, -12, -16, -20, \ldots$

**General Recursive Formula for Arithmetic Sequence:**

$$a_1 = first\ term$$

$$a_n = a_{n-1} + d$$

Write the recursive formula for each of arithmetic sequence above.

Determine whether each of the following sequences is arithmetic. Explain your reasoning. Then, find the sequence's recursive formula.

1) $-1, 6, 13, 20, 27, \ldots$ 2) $2, 4, 8, 16, 32, 64, \ldots$ 3) $10, 2, -6, -14, \ldots$

# Success Criteria

**- I can define sequence.**
Define sequence.

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**- I can create a sequence of my own.**
Create your own sequence. Write the recursive formula of your sequence and find the first five terms.

**- I can write a recursive formula given a context.**
Find the recursive formula for each scenario.

1) $-8, -28, -48, -68, -88, \ldots$

2) A store sells packages of apples that have a dozen apples in each package. How many apples are sold after $n$ packages are sold?

**- I can interpret a recursive formula and state any term in the sequence.**
Interpret each recursive formula. Then find the first 5 terms of each sequence.

1) $a_1 = 7$

$a_n = a_{n-1} + 9$

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2) $f(1) = 10$

$f(n) = 10f(n-1) - 100$

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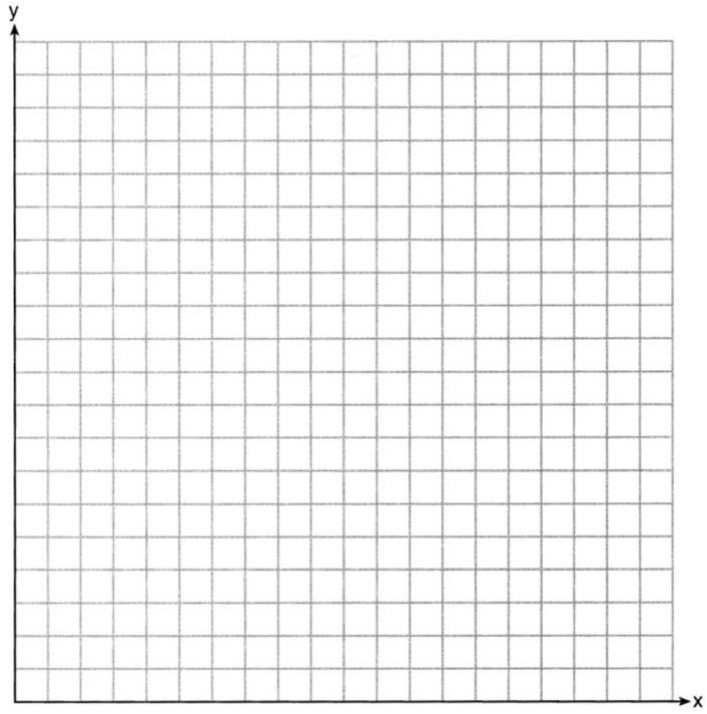
**- I can graph a sequence.**

Graph the first seven terms of the following sequence.

$$a(1) = 10$$

$$a(n) = a(n-1) + 20$$




**- I can define an arithmetic sequence.**

Define arithmetic sequence.

_____

_____

**- I can decipher whether a sequence is arithmetic or not arithmetic and provide reasoning.**

Determine whether each of the following sequences is arithmetic. Explain your reasoning.

1) $1, 3, 7, 13, \ldots$ 2) $-15, -18, -21, -24, \ldots$ 3) $\frac{1}{3}, \frac{5}{3}, 3, \frac{13}{3} \ldots$

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# Classwork: Sequences

Interpret each recursive formula. Then find the first 5 terms of each sequence.

1) $a_1 = -8$

$a_n = a_{n-1} - 7$

_____

_____

2) $f(1) = -1$

$f(n) = -2f(n-1) + n$

_____

_____

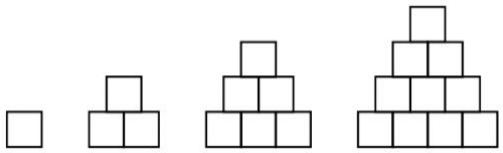
3) What is the common difference of the arithmetic sequence $5, 8, 11, 14$?

4) What is the common difference of the arithmetic sequence $-7x, -4x, -x, 2x, 5x$?

5) In a sequence, the first term is 7 and the common difference is 6. What is the sixth term of the sequence?

6) In 2014, the cost to mail a letter was 49 cents for up to one ounce. Every additional ounce cost 21 cents. Write a recursive formula that can be used to determine the cost of an $n$-ounce letter, in cents.

7) 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 $n = 7$?

8)

Given the following three sequences:

I. 2, 4, 6, 8, 10...
II. 2, 4, 8, 16, 32...
III. $a, a + 2, a + 4, a + 6, a + 8...$

Which ones are arithmetic sequences?

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

9)

Given the recursive formula:

$$a_1 = 3$$
$$a_n = 2(a_{n-1} + 1)$$

State the values of $a_2$, $a_3$, and $a_4$ for the given recursive formula.

10) Write a sequence using a recursive formula that has a sixth term of 3.

11) Given the sequence

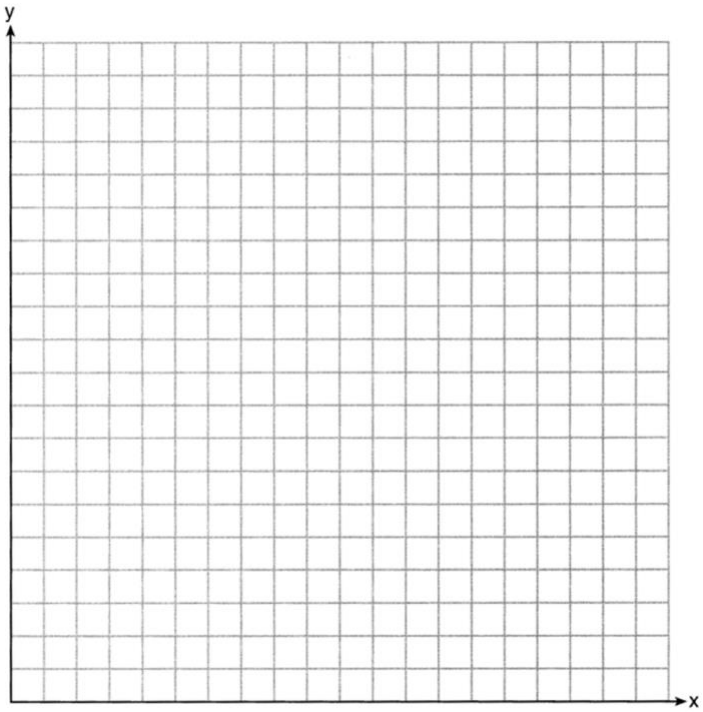
$$a(1) = 3$$

$$a(n) = 2a(n-1) - 1$$

a) Fill in the following table for the first five terms of the sequence.

| $\boldsymbol{n}$ | $\boldsymbol{a(n)}$ |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

b) Graph the sequence on the interval $1 \leq n \leq 5$.




c) Kent states the domain of the sequence graphed is $[1,5]$ and the range of the sequence is $[3,33]$. Is Kent correct or incorrect? Explain your reasoning.