ALGEBRA UNIT 7-SEQUENCES
Arithmetic vs. Geometric Sequences (Day 1)

A **sequence** is a set of ________________ written in a given ________________.

1. Complete the table below and answer the following questions.

n	f(n)
0	0
1	5
2	10
3	15

a) What type of function is this? Why??

This pattern can also be called an _____________________ sequence because it has a __________________ ______________________

b) What is the Rate of Change?

c) Write the equation of the function. ___________________

d) Find f(25).

2. Complete the table below and answer the following questions.

n	f(n)
0	4
1	16
2	64
3	256

a) What type of function is this? Why??

This pattern can also be called an _____________________ sequence because it has a __________________ ______________________

b) Write the equation of the function. ___________________

c) Find f(8).

TYPES OF SEQUENCES:

Arithmetic Sequence: a set of numbers in a specific order each having a ________________ ________________________. Represents a ________________________ function.

Geometric Sequence: a set of numbers in a specific order each having a ________________ ________________________. Represents an ________________________ function.

Given the Sequences below:

a) Determine if they are geometric, arithmetic, or neither.
b) Identify the common difference (d) or common ratio (r) to justify part a.
c) Identify the type of function for each sequence

1. 5, 10, 15, 20, 25, …

2. 64, 32, 16, 8, 4, …

3. 10, 30, 90, 270, 810, …

4. 1, 4, 9, 16, 25, …

Sequential Notation uses ___________________ Notation (a_n) to identify each ___________ in the sequence. Similar to Function Notation, f(n).

	FUNCTION NOTATION $f(n)$	SUBSCRIPT NOTATION a_n
How to Say it	**f _______ n**	**a ________ n**
How to Use it	**EX. Given** $f(n) = 2n+1$ **Find** $f(4)$	**EX. Given** $a_n = 2n+1$ **Find** a_4
How it is written as an ordered pair	$(n, f(n))$	(n, a_n)

Given the following Sequences:

a. Identify the terms of the sequence using subscript notation a_n
b. State the next three terms in the sequence?
c. Describe the type of sequence?

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1. $4, \ -1, \ -6, \ -11, \ \ldots$

2. $3, \ -1, \ \frac{1}{3}, \ -\frac{1}{9}, \ \ldots$

How to write a function for sequences in order to find ANY term in the sequence:

- Identify the type of function that is being represented
    - Linear ($y = ax + b$)
    - Exponential ($y = ab^x$)
- Write a basic equation
    - Using R.O.C for the linear function
    - Using first term and r# for the exponential function
- Create a BASIC SEQUENCE from these equation
    - Compare the BASIC sequence to the GIVEN sequence to determine any ADJUSTMENTS that need to be made to the equation.
- Apply adjustments to equation and write final version of the equation.

TYPES OF FORMULAS FOR SEQUENCES
Explicit vs. Recursive formulas (DAY 2)

RECALL: Given the sequence -2, 2, 6, 10, …, find:

a. What are the next three terms?

b. What type of sequence is it and why?

d. What type of function does the sequence represent?

c. Write a formula for the sequence above?

e. What is the 100th term of the sequence?

This formula is called an _________________________ formula. This formula can be used to find ___________ term (a_n) immediately.

Another formula called the ________________ formula is done in multiple steps.

- Must be given the first term (a_1) of the sequence
- Must determine common difference (d) or common ratio (r) to use in formula
- Identify the previous term using appropriate SUBSCRIPT NOTATION.
    - Given the expression ______ the previous term would be expressed as ______
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    - Given the express1ion ______ the previous term would be expressed as ______
    - Given the expression ______ the previous term would be expressed as ______

Write a RECURSIVE formula for the sequence above.

In 1-6, a sequence is described below

- Identify if the description represents an Explicit or a Recursive formula
- Find the first four terms of the sequence.

1. $a_n = 7n + 3$

2. $b_1 = 12$
   $b_n = b_{n-1} - 3$

3. $a_1 = 5$
   $a_n = 2a_{n-1} + 3$

4. $t_n = -6n^3 - 48n$

5. $k_n = 12 - 3(n-1)$

6. $j_1 = 3$
   $j_{n+1} = (j_n)^2$

7. Write both a recursive and an explicit definition for the following sequence:

4, 8, 12, 16, 20

Explicit Formula **Recursive Formula**

8. Write both a recursive and an explicit definition for the following sequence:

2, 4, 8, 16,…

Explicit Formula **Recursive Formula**

9. Erin is memorizing words for a vocabulary test. She currently knows 25 words. Each day for the next 6 days, she increased the words memorized by 3.

a) Write the sequence for the number of words that Erin memorized for each of the seven days. What type of sequence does this create?

b) Write a recursive formula for this sequence.

WRITING EXPLICIT/RECURSIVE ARITHMETIC FORMULAS DAY 3

A teacher asked the students to create a formula for the sequence 5, 8, 11, 14, …,

Anthony came up with the formula: $a_n = 5 + (n-1)3$

- Is his formula correct and how do you know?
- Is it an explicit or recursive formula?
- Does it look like the formulas we have been creating? Are they the same?

Johnny came up with the formula as:

$$J_1 = 5$$
$$J_{n+1} = J_n + 3$$

- Is his formula correct and how do you know?
- Is it an explicit or recursive formula?
- Does it look like the formulas we have been creating? Are they the same?

If you have struggled creating explicit formulas for Arithmetic Sequences…

Using the GENERAL EQUATION below, you just need to fill in the missing information to create an Explicit Formula for an Arithmetic Sequence:

Rule for the nth term of an Arithmetic Sequence **Explicit ARITHMETIC formula (a_n)**
$$a_n = a_1 + (n-1)d$$
You must be given the ________ term (a_1) and the common ________________ (d)

1. For the sequence 100, 97, 94, 91, …,

   a) Write an explicit formula (a_n) for the sequence.

   b) Find the 20th term of the sequence.

2. Given the sequence 5, 8, 11, …

   a) Write a rule k_n for the nth term of the sequence

   b) Find k_{122}

3. The local football team won the championship several years ago, and since then, ticket prices have been increasing \$4 per year. The year they won the championship, tickets were \$20. Write an explicit formula for a sequence that will model ticket prices. What will the ticket price be 10 years after that championship year?

4. Cooper is saving to buy a guitar. In the first week, he put aside \$10 that he received for his birthday. In each of the following weeks, he decided he will add put aside \$8 more than the week before. How much money will he be putting aside in the 7th week?

5. Joey wants to go on vacation to Disneyland. The cost of the trip is \$2450. He already has \$1650 saved for the trip. If he continues to save \$60 a week, how many weeks will it take before he has enough money to go on vacation?

6. Dan collects baseball cards. His currently has 225 baseball cards. Each week he is able to pick up 3 additional cards. How many weeks will it take for Dan to reach 350 baseball cards?

WRITING EXPLICIT/RECURSIVE GEOMETRIC FORMULAS DAY 4

Write both a recursive and an explicit definition for the following sequence:

2, 4, 8, 16,…

If you have struggled creating explicit formulas for Arithmetic Sequences…

Using the GENERAL EQUATION below, you just need to fill in the missing information to create an Explicit Formula for a Geometric Sequence:

Rule for the nth term of an Geometric Sequence Explicit GEOMETRIC formula (a_n)
$$a_n = a_1(r)^{n-1}$$
You must be given the _________ term (a_1) and the common ________________ (r)

1. Given the sequence: 4, 12, 36, 108, 324, …

   b) Write an explicit formula (a_n) for this sequence.

   c) What is the 10^{th} term of this sequence?

2. Write an explicit rule for finding the n^{th} term for the sequence 6, 9, 13.5, 20.25, …

3. What is the 8^{th} term of the geometric sequence 125, 25, 5,…?

4. Determine if the following situations describe an arithmetic or geometric sequence and if they require a linear or exponential growth model? Write an explicit formula for the sequence that models the growth for each case.

a. A savings account that starts with $5000 and receives a deposit of $825 per month.

b. The value of a house that starts at $150,000 and increases by 1.5% per year.

c. An alligator population starts with 200 alligators and every year, the alligator population is $\frac{9}{7}$ of the previous year's population.

d. The temperature increases by 2° every 30 minutes from 8:00 a.m. to 3:30 p.m. for a July day that has a temperature of 66° at 8:00 a.m.

REVIEW OF SEQUENCES (DAY 5)

1. Given the arithmetic sequence: $4, a_2, a_3, a_4, 28$.

   a) Find the common difference.

   b) Find the three missing arithmetic means.

   c) Find the 25th term of the sequence.

2. Find five arithmetic means between 2 and 23.

3. Suppose that an employee earns $32,000 in the first year on the job. Each year thereafter, the employee receives a raise of $2,500. Find the amount that employee earns in 20 years.

List the first four terms of each sequence below.

4. $a_1 = 6$,
$a_n = 2a_{n-1} - 3$

5. $a_n = 4n - 1$

In 6-9, For the following sequences, answer…

a) What are the next three terms.
b) Are the following arithmetic or geometric and why?
c) Write an explicit formula.
d) Write a recursive formula.
e) Use a formula to find the a(9).

6. 14, 11, 8, 5, …

7. 1, 10, 100, 1000, …

8. 14, 21, 28, 35, …

9. 2, 10, 50, 250,…