Name: Key Date: 4/30/18

CC ALGEBRA 2 TROICI

LESSON #1: WHAT IS A SEQUENCE?

Do Now: Find the pattern and fill in the missing numbers.

a) 1,3,5,7, 9, 11, 13

b) 4, 12, 36, 108, 324, 972

A sequence is an ordered set of numbers. Each number in the sequence is called a _____.

The terms of a sequence are referred to in subscripted form:

Ex. 1, 4, 7, 10, 13, 16, ... "a sub n"

a_1 a_2 a_3 a_4 a_5 a_6

↓

1st term

Sequences can sometimes be expressed as an **Explicit Formula**: (**n** represents the term's position in the sequence)

1) $a_n = 12n$

Write out the first 5 terms of the sequence.

$a_1 = 12(1) = 12$ $a_2 = 12(2) = 24$ $a_3 = 12(3) = 36$ $a_4 = 12(4) = 48$ $a_5 = 12(5) = 60$

$\{12, 24, 36, 48, 60\}$

2) Find the 5th and 10th terms of the sequence whose n^{th} term is given by the explicit formula

$b_n = \frac{n}{n+1}$

$b_5 = \frac{5}{5+1} = \frac{5}{6}$ | $b_{10} = \frac{10}{10+1} = \frac{10}{11}$

3) Write an explicit formula for the n^{th} term of a sequence of negative even integers starting with -2

$-2, -4, -6, -8, -10 \ldots -2n$

↓ ↓ ↓ ↓ ↓ ↓

a_1 a_2 a_3 a_4 a_5 a_n

$a_n = -2n$

Special Types of Sequences

4) Identify a pattern in the sequence and then find the missing terms:

3, 6, 9, 12, 15, 18, 21, 24, 27

Rule: $a_n = 3n$

5) Identify a pattern in the sequence and then find the missing terms :

48, 42, 36, 30, 24, 18, 12

$a_n = a_1 + d(n-1)$

$48 + -6(n-1)$

$48 - 6n + 6$

Rule: $a_n = 54 - 6n$

In an Arithmetic sequence, the amount by which the terms change each time is called the **common** Difference.

The **common difference** is represented by d. $\mathbf{d = a_2 - a_1}$

In an arithmetic sequence, you are adding/subtracting to find the next term!

EXPLICIT FORMULA FOR ARITHMETIC SEQUENCES:

$$a_n = a_1 + d(n-1)$$

6) Identify a pattern in the sequence and then find the missing terms:

3, 6, 12, 24, 48, 96, 192

$a_n = 3(2)^{n-1}$

Rule:

7) Identify a pattern in the sequence and then find the missing terms :

81, 27, 9, 3, 1, $\frac{1}{3}$, $\frac{1}{9}$

$a_n = 81\left(\frac{1}{3}\right)^{n-1}$

Rule:

In a Geometric sequence, the amount by which the terms change each time is called the **common** ratio.

The common ratio is represented by r. $\mathbf{r = a_2 \div a_1}$

In a geometric sequence, you are multiplying to find the next term!

EXPLICIT FORMULA FOR GEOMETRIC SEQUENCES:

$$a_n = a_1(r)^{n-1}$$

8) Consider a sequence that follows 1, 3 ,9...

a) What is the first term? 1

b) What is the common ratio? $r = 3$

c) What are the next four terms?

27, 81, 243, 729

9) Consider a sequence that follows 160, 80, 40, ..

a) What is the first term? 160

b) What is the common ratio? $r = \frac{1}{2}$

c) What are the next four terms?

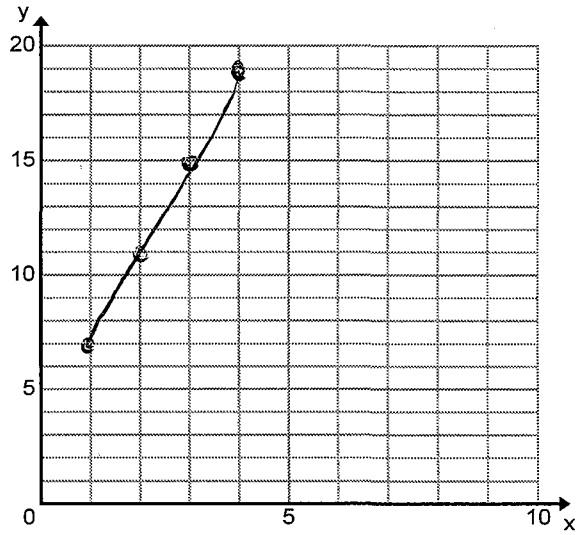
20, 10, 5, 2.5

10. Consider a sequence that follows 3, 7, 11, 15, ...

a. Complete the table and graph the sequence.

b. Find the equation of the graph.

Term Number "n"	Term
a_1	3
a_2	7
a_3	11
a_4	15
a_5	19



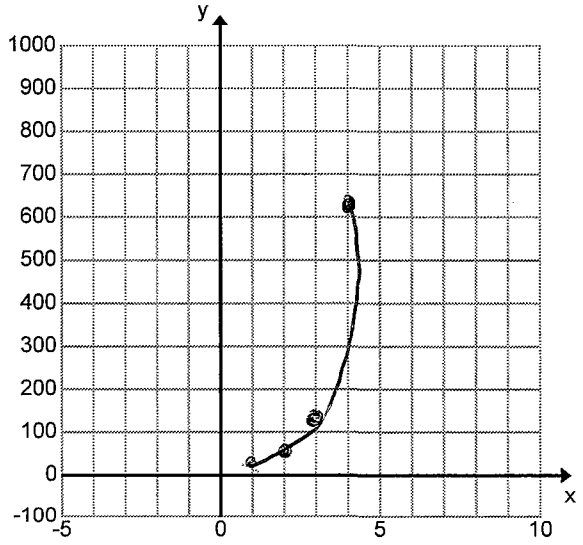
*** Arithmetic Sequences follow a** linear **pattern!**

11. Consider a sequence that follows 1, 5, 25, 125, ...

a. Complete the table and graph the sequence.

b. Find the equation of the graph.

Term Number "n"	Term
a_1	1
a_2	5
a_3	25
a_4	125
a_5	625



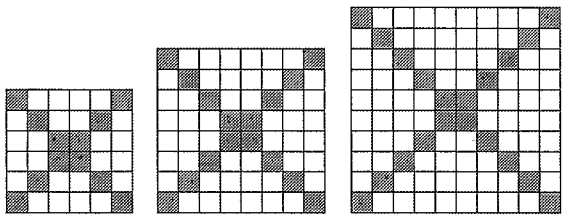
*** Geometric Sequences follow an** exponential **pattern!**

12. Determine whether each sequence is an arithmetic sequence, geometric sequence, or neither. If the sequence is arithmetic or geometric, state the common difference or common ratio.

Sequence	**A**rithmetic, **G**eometric, or **N**either (Write A,G, or N)	Common difference (D) or Common ratio (R) & State Value
A. 1, -4, 16, -64, ...	G	$r = -4$
B. 108, 66, 141, 99, ...	N	NO pattern
C. -96, -48, -24, -12, ...	G	$r = \frac{1}{2}$
D. 7, 13, 19, 25, ...	A	$d = 6$
E. 3, 9, 81, 6561, ...	N	NO common pattern

REGENTS PRACTICE!

1 The diagrams below represent the first three terms of a sequence.



12 16 20

+4 +4

$a_1 = 12$

$d = 4$

$a_n = 12 + 4(n-1)$

$12 + 4n - 4$

$4n + 8$

Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the *n*th term?

1) $a_n = 4n + 12$

2) $a_n = 4n + 8$

3) $a_n = 4n + 4$

4) $a_n = 4n + 2$

2 Which function defines the sequence $-6, -10, -14, -18, \ldots$, where $f(6) = -26$?

1) $f(x) = -4x - 2$
$f(x) = 4x - 2$

3) $f(x) = -x + 32$

4) $f(x) = x - 26$

$a_1 = -6$
$d = -4$
$a_n = -6 + -4(n-1)$
$-6 - 4n + 4$
$-4n - 2$

3 A theater has 35 seats in the first row. Each row has four more seats than the row before it. Which expression represents the number of seats in the nth row?

1) $35 + (n + 4)$

2) $35 + (4n)$

3) $35 + (n + 1)(4)$

4) $35 + (n - 1)(4)$

$a_n = 35 + 4(n-1)$
$35 + 4n - 4$

4 What is the nth term of the sequence $-1, 3, 7, 11, \ldots$?

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

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

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

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

$a_1 = -1$
$d = 4$
$a_n = -1 + 4(n-1)$
$-1 + 4n - 4$
$4n - 5$

5 Given $f(9) = -2$, which function can be used to generate the sequence $-8, -7.25, -6.5, -5.75, \ldots$?

1) $f(n) = -8 + 0.75n$

2) $f(n) = -8 - 0.75(n - 1)$

3) $f(n) = -8.75 + 0.75n$

4) $f(n) = -0.75 + 8(n - 1)$

$a_1 = -8$
$d = .75$
$-8 + .75(n-1)$
$-8 + .75n - .75$
$-8.75 + .75n$

6 The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1, which is an equation for the nth term of this sequence?

1) $a_n = 8n + 10$

2) $a_n = 8n - 14$

3) $a_n = 16n + 10$

4) $a_n = 16n - 38$

$a_3 = 10$ use slope!
$a_5 = 26$
$\frac{26-10}{5-3} = \frac{16}{2} = 8 = d$
$-6 + 8(n-1)$
$-6 + 8n - 8$
$8n - 14$
$-6, 2, 10, 18, 26$
a_1

7 In an arithmetic sequence, $a_4 = 19$ and $a_7 = 31$. Determine a formula for a_n, the n^{th} term of this sequence.

$\frac{31-19}{7-4} = \frac{12}{3} = 4 = d$
$7, 11, 15, 19.$
a_1
$a_n = 7 + 4(n-1)$
$7 + 4n - 4$
$4n + 3$