Unit 5 Study Guide Sequences & Exponential Function

Arithmetic Sequences- Each term is determined by adding a common difference.

- **Common difference (d = $a_2 - a_1$)**
- **Arithmetic sequence graph linear patterns**

Arithmetic Explicit Formula

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

***this formula will be given to you on the Regents!**

Explicit Formula: This formula allows you the find the nth term of a sequence of any # term.

a_n = nth term
a_1 = the 1st term
n = number of the term
d = common difference ($a_2 - a_1$)

Example of Arithmetic Sequence
Given the arithmetic sequence 3, 5, 7, 9…

a) Write an explicit formula for this arithmetic sequence.

$$a_n = a_1 + (n-1)d \qquad a_1 = 3$$
$$a_n = 3 + (n-1)2 \qquad d = 2$$
$$a_n = 3 + 2n - 2$$
$$a_n = 2n + 1$$

b) Determine the 100th term in the sequence.

$$a_n = 2n + 1 \qquad n = 100$$
$$a_{100} = 2(100) + 1$$
$$a_{100} = 201$$

Arithmetic Recursive Formula

$$a_n = a_{n-1} + d$$
$$a_1 = \#$$

***this formula will not be given to you!**

****Don't forget to include the first term!**

Given the arithmetic sequence 3,5,7,9. write a recursive formula.

$$a_n = a_{n-1} + d \qquad d = 2$$

$$\boxed{\begin{array}{c} a_1 = 3 \\ a_n = a_{n-1} + 2 \end{array}}$$

Write the first four terms of the recursive sequence.

$$a_1 = -4$$
$$a_n = a_{(n-1)} + 5$$

$$a_1 = -4$$
$$a_2 = -4 + 5 = 1$$
$$a_3 = 1 + 5 = 6$$
$$a_4 = 6 + 5 = 11$$

First four terms: $\{-4, 1, 6, 11\}$

Geometric Sequences- Each term is determined by **multiplying** a common ratio

- **Common ratio (r = $a_2 \div a_1$)**
- **Geometric sequence graph exponential patterns**

Geometric Explicit Formula

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

Explicit Formula: This formula allows you the find the nth term of a sequence of any # term.

a_n = nth term
a_1 = the 1st term
n = number of the term
r = common ratio ($a_2 \div a_1$)

Example of Geometric Sequence

a) Given the geometric sequence 2, 6, 18, 54…

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

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

b) Determine the 7th term of the sequence

$$a_7 = 2(3)^{7-1}$$

$$a_7 = 2(3)^6$$

$$a_7 = 1458$$

Geometric Recursive Formula

$$a_n = r * a_{n-1}$$

$$a_1 = \#$$

***this formula will not be given to you!**

****Don't forget to include the first term!**

Given the geometric sequence 2, 6, 18, 54…

$$a_n = r * a_{n-1} \qquad r = 3$$

$$\boxed{\begin{array}{l} a_n = 3 * a_{n-1} \\ a_1 = 2 \end{array}}$$

Write the first four terms of the recursive sequence.

$a_1 = 3$
$a_n = 5 * a_{(n-1)}$

$a_1 = 3$

$a_2 = 3 * 5 = 15$

$a_3 = 15 * 5 = 75$

$a_4 = 75 * 5 = 375$

First four terms: {3, 15, 75, 375}

Growth Formula

$$Y = A(1+r)^t$$

Decay Formula

$$Y = A(1-r)^t$$

Y = final amount
A = initial amount
r = rate as a decimal
t= time