Name _____ Date _____

Arithmetic and Geometric Sequences

A sequence is a function whose Domain is a set of consecutive whole numbers. So the input in any sequence is {1, 2, 3, ...}

The output of a sequence are called the range of the sequence.

A sequence can be specified by an list or a formula.

REVIEW: Arithmetic Sequence:

A sequence of terms that have a common difference between them. To find the common difference, subtract the second term by the first term. Verify that the difference is consistent.

Let's recall the two types of formulas for Arithmetic Sequences:

Arithmetic Explicit Formula	**Used for finding the n^{th} term of a sequence**	$a_n = a_1 + d(n-1)$
Recursive Formula	**Used for finding the NEXT term in a sequence**	$a_n = a_{n-1} + d$; $a_1 =$ ____

1. 97 is the 26 th term of the sequence: -3, 1, 5, 9, ...

$97 = -3 + 4(n-1)$

$97 = -3 + 4n - 4$

$97 = 4n - 7$

$104 = 4n$

$26 = n$

2. – 73 is the ____ th term of the sequence: 5, 2, -1, -4, ...

$-73 = 5 + -3(n-1)$

$-73 = 5 - 3n + 3$

$-73 = -3n + 8$

$-81 = -3n$

$27 = n$

Geometric Sequence:

A sequence of terms that have a Common Ratio between them.
To find the common ratio, divide the second term by the first term. Verify that the ratio is consistent.

Determine if the sequence is geometric and find the common ratio.

1. 4, 8, 16, 32, ...

$\frac{8}{4}=2$ $\frac{16}{8}=2$ $\frac{32}{16}=2$ ✓

$r=2$

2. 256, 64, 16, 4, ...

$\frac{64}{256}=\frac{1}{4}$ $\frac{16}{64}=\frac{1}{4}$ $\frac{4}{16}=\frac{1}{4}$ ✓

$r=\frac{1}{4}$

3. 3, 6, 9, 12, ...

$\frac{6}{3}=2$ $\frac{9}{6}=\frac{3}{2}$ ✗

Not geometric

So, what are the TWO different types of formulas for Geometric Sequences:

Geometric Explicit Formula	**Used for finding the nth term of a sequence**	$a_n = a_1(r)^{n-1}$
Recursive Formula	**Used for finding the NEXT term in a sequence**	$a_n = a_{n-1}(r)$; $a_1 =$ ___

Sequence	Common Ratio (r)	Explicit Formula	Recursive Formula	Given Term (n^{th})
6, 3, 1.5, .75, ...	.5	$a_n = 6(.5)^{n-1}$	$a_n = a_{n-1}(.5)$; $a_1 = 6$	$a_7 = .09375$
-4, -12, -36, -108, ...	3	$a_n = -4(3)^{n-1}$	$a_n = a_{n-1}(3)$; $a_1 = -4$	$a_{10} = -78{,}732$
3, 12, 48, 192, ...	4	$a_n = 3(4)^{n-1}$	$a_n = a_{n-1}(4)$; $a_1 = 3$	$a_5 = 768$