# Sequence Notes

10/23/2013

## Arithmetic Sequence

**A sequence of terms that have a common difference between them**

- add or subtract the same # everytime -

*similar to linear function*

EX:

① 2, 5, 8, 11 $d = 3$

② 10, 5, 0, -5 $d = -5$

## Geometric Sequence

**A sequence of terms that have a common ratio between them**

- multiply by the same # everytime -

*similar to exponential function*

EX:

① 2, 4, 8, 16 $r = 2$

② 27, 9, 3, 1, 1/3 $r = 1/3$

## Explicit Formula

**Formula used to find the $n^{th}$ term of a sequence**

*use this with both Arithmetic & geometric sequences*

## Explicit Formula for Arithmetic Sequence

($n^{th}$ term, 1st term, term #, difference)

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

$$a_n = dn + a_0$$

## Explicit Formula for Geometric Sequence

($n^{th}$ term, 1st term, ratio, term #)

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

## Arithmetic or Geometric?

*Example:*

-22, -15, -8, -1, ...

Arithmetic

$d = 7$

## Arithmetic or Geometric?

*Example:*

**7, 4, 1, -2, -5**

Arithmetic

$d = -3$

## Arithmetic or Geometric?

*Example:*

**256, 64, 16, 4, …**

Geometric $\frac{64}{256} = \frac{1}{4}$

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

## Arithmetic or Geometric?

*Example:*

$4, \frac{8}{3}, \frac{16}{9}, \frac{32}{27}, \ldots$

Geometric $\frac{8}{3} \div 4$

$r = \frac{2}{3}$

Arithmetic

**Find the common difference, the explicit formula, and the tenth term.**

-3 **3, 9, 15, 21, …** $d = 6$

$a_n = 3 + (n-1)6$ $\quad a_n = 6n + -3$

$= 3 + 6n - 6$

$a_n = 6n - 3$ $\quad a_{10} = 6(10) - 3$

$a_{10} = 57$

Geometric

**Find the common ratio, the explicit formula, and the seventh term.**

**3, 1.5, 0.75, 0.375, …** $r = \frac{1.5}{3} = \left(\frac{1}{2}\right)$

$a_n = 3\left(\frac{1}{2}\right)^{n-1}$

$a_7 = 3\left(\frac{1}{2}\right)^{7-1}$

$a_7 = 3\left(\frac{1}{2}\right)^6$ $\quad a_7 = .046875$

$a_7 \approx .047$

**The fifth term is 1,792. The constant ratio is 4. Write the explicit formula.**

$a_5 = 1792$ and $n = 5$ and $r = 4$