Arithmetic Sequences

A **sequence** is an ordered set of numbers.

Each object in a sequence is called a **term**.

Example: a = 3, 5, 7, 9, …

Note: a is the name of the sequence. "

If it has and ellipsis (…), the sequence is **infinite**. (goes on forever).

If it ends with a number, then it is **finite**.

Notation for terms: Each term in sequence a has the form a_n , where n signifies that it is the nth term in the sequence.

So for $a = 3, 5, 7, 9 \ldots$, $a_1 = 3$, $a_2 = 5$, $a_3 = 7$, $a_4 = 9$

Sequences can have all types of patterns.

IF the difference between every two consecutive terms is always the same number, the sequence is called an **arithmetic sequence**.

For the above example: 5 – 3 = 2, 7 – 5 = 2, 9 – 7 = 2, so the sequence is arithmetic

The number that is added or subtracted every time is called the **common difference**.

Ex: For the following arithmetic sequence: a = 5, 9 , 13, 17, 21, 25, … the common difference = 4

Explicit Formulas: You can write an equation for a sequence that gives you the nth value of the sequence for any value n that you plug into it.

Explicit Formula for Arithmetic Sequences: $a_n = a_1 + d(n-1)$

Where a_1 = initial term , d = common difference

For the example, $a = 3, 5, 7, 9 \ldots$: a_1 = 3 , d = 2 , so the formula is $a_n = 3 + 2(n-1)$

Ex: Write an explicit formula for the sequence $a = 6, 12, 18, 24, 30, \ldots$

$$a_1 = 6, \quad d = 12 - 6 = 6, \; so \quad a_n = 6 + 6(n-1)$$

Ex: Write an explicit formula for the sequence $a = 12, 9, 6, 3, \ldots$

$$a_1 = 12, \quad d = 9 - 12 = -3, \; so \quad a_n = 12 - 3(n-1)$$