

## Arithmetic Sequence Notes

Arithmetic Sequence

A sequence is arithmetic if the differences between consecutive terms are the same.

$$a_1, a_2, a_3, a_4, \dots, a_n$$

Is arithmetic if

$$a_2 - a_1 = d \quad a_3 - a_2 = d \quad a_{n-1} - a_n = d$$

d is the common difference of the sequence.

Example:

The following sequence is arithmetic:

$$3, 5, 7, 9, 11, 13\dots$$

because  $5-3=2$ ,  $7-5=2$ ,  $9-7=2\dots$  with the common difference being 2.

 $n^{\text{th}}$  Term of an Arithmetic Sequence

The  $n^{\text{th}}$  term of an arithmetic sequence is given by:

$$a_2 = a_1 + d(1-1) \quad a_3 = a_1 + d(2-1) \quad a_n = a_1 + d(n-1)$$

Example:

Given the sequence above (3, 5, 7, 9, 11, 13...) find the 78<sup>th</sup> term:

$$n = 78$$

$$a_{78} = 3 + 2(78 - 1) = 157$$

Sum of a Finite Amount of Terms of an Arithmetic Sequence

The sum of the terms from  $a_1$  through  $a_n$  is given by:

$$S = \frac{n}{2}(a_1 + a_n)$$

Example:

Find the sum of the first 78 terms in the sequence above:

$$n = 78$$

$$a_{78} = 157$$

$$S = \frac{78}{2}(3 + 157) = 6240$$