

**Precalculus**  
**Lesson 12.2: Arithmetic Sequences**  
**Mrs. Snow, Instructor**

When any two numbers in a sequence differ by a constant value, the sequence is identified as an **Arithmetic Sequence**.

An arithmetic sequence may be **defined recursively** as:

$$a_1 = a, \quad a_n - a_{n-1} = d$$

For an arithmetic sequence  $\{a_n\}$  whose first term is  $a_1$  and common difference is  $d$ , the ***n*th term** is determined by the formula:

$$a_n = a_{n-1} + d$$

Is 4, 6, 8, 10 .... arithmetic? What is the common difference?

Determine if the following is an arithmetic sequence, find the first term and the common difference:

$$\{s_n\} = \{3n + 5\}$$

Determine if the following is an arithmetic sequence, find the first term and the common difference:

$$\{t_n\} = \{4 - n\}$$

### ***n*th Term of an Arithmetic Sequence**

For an arithmetic sequence  $\{a_n\}$  whose first term is  $a_1$  and whose common difference is  $d$ , the  $n$ th term is determined by the formula

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

Find the forty-first term of the arithmetic sequence: 2, 6, 10, 14, 18, ...

The 8<sup>th</sup> term of an arithmetic sequence is 75, and the 20<sup>th</sup> term is 39.

- Find the first term and the common difference
- Give a recursive formula for the sequence.
- What is the  $n$ th term of the sequence?

The sum of the first  $n$  terms of an arithmetic sequence is known as a **Partial Sum of an Arithmetic Sequence**

Let  $\{a_n\}$  be an arithmetic sequence with first term  $a_1$  and common difference of  $d$ .  
The sum  $S_n$  of the first  $n$  terms of  $\{a_n\}$  may be found in two ways:

$$S_n = a_1 + a_2 + a_3 + \cdots + a_n$$
$$= \sum_{k=1}^n [a_1 + (k-1)d] =$$

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

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

Find the sum  $S_n$  of the first  $n$  terms of the sequence:  $\{a_n\} = \{3n + 5\}$

Find the sum:  $60 + 64 + 68 + 72 + \cdots + 120$