

## 8.2 Arithmetic Sequences and Series

**Arithmetic Sequence:** a sequence in which each term after the first **differs** from the preceding term by a **constant amount**

Ex.  $-4, -1, 2, 5, 8, \dots$

**Common Difference:** the **difference** between consecutive terms

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

$d$ : **common difference** of a sequence

$a_n$ : **the  $n$ th term**, or **general terms**, of a sequence

Ex. Find the common difference of  $7, 2, -3, -8, -13, \dots$ .

Ex. Write the first six terms of the arithmetic sequence in which  $a_1 = 200$  and  $d = -60$ .

### ❖ The General Term of an Arithmetic Sequence

**Formula for The  $n$ th term (the General Term) of an Arithmetic Sequence**

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

Ex. Find  $a_{60}$  of the arithmetic sequence with  $a_1 = 8$  and  $d = 6$ .

Ex. Find  $a_{25}$  of the arithmetic sequence with  $a_1 = 14$  and  $d = -3$ .

Ex. Find the formula for the  $n$ th term (the general term) if  $a_1 = 6$  and  $d = 7$ . (Use the formula above.)

Ex. Given the arithmetic sequence  $2, 7, 12, 17, \dots$ .

(a) Write a formula for the  $n$ th term of the arithmetic sequence. (Use the formula above.)

(b) Use the formula for  $a_n$  to find  $a_{20}$ .

Ex. (#32) Find the 19<sup>th</sup> term of an arithmetic sequence with  $a_1 = -11$  and  $a_{30} = 163$ .

Ex. (#36) Find the number of terms of the finite arithmetic sequence.  
 $7, 16, 25, 34, \dots, 574$

❖ **The Sum of the First  $n$  Terms of an Arithmetic Sequence**

**Formula for the Sum of the First  $n$  Terms of an Arithmetic Sequence**

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

Ex. Find the sum of the first 50 terms of the arithmetic sequence:

$$-15, -9, -3, 3, \dots$$

Ex. Find the sum of  $2 + 4 + 6 + 8 + \dots + 200$ .

Ex. Given  $\sum_{i=1}^{200} 4i$ .

(a) Write out the first three terms and the last term.

(b) Find the indicated sum.

Ex. Given  $\sum_{i=1}^{40} (-2i + 6)$ .

(c) Write out the first three terms and the last term.

(d) Find the indicated sum.

Ex. (#66) Jose must choose between two job offers. The first job pays \$50,000 per year. Each year thereafter, he would receive a raise of \$2400. A second job offers \$54,000 per year with a raise of \$2000 each year thereafter. However, with the second job, Jose would have to pay \$100 per month out of his paycheck for health insurance. If Jose anticipates working for the company for 6 years, find the total amount he would earn from each job.