

# Arithmetic Sequences and Series

 Guided Notes

## Arithmetic Sequences

An **arithmetic sequence** is an ordered list of terms in which the difference between consecutive terms is constant.

This constant is called the **common difference**  $d$ .

If you subtract the first term from the second term for any two consecutive terms of the sequence, you will arrive at the common difference  $d = a_n - a_{n-1}$ .

**Sample Problem 1:** Decide whether each sequence is arithmetic.

a. 4, 8, 12, 16 ... ..

b. -8, -1, 1, 8 ... ..

The explicit formula for the general term of an arithmetic sequence is  $a_n = a_1 + (n - 1)d$ .

$a_1$  – the first term

$n$  – the number of term

$d$  – the common difference

$a_n$  – the general term or  $n$ th term

The recursive formula for the general term of an arithmetic sequence is  $a_n = a_{n-1} + d$ .

The terms between any two nonconsecutive terms of an arithmetic sequence are called **arithmetic means**.

**Sample Problem 2:** Find the first four terms and common difference of each arithmetic sequence.

a.  $a_n = 2n + 2$

b.  $a_n = 3 - 2n$

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**Sample Problem 3:** Find the specified term of each arithmetic sequence.

a. **22th term =?**  
 $a_1 = -1, d = 3$

b. **43th term =?**  
 $a_1 = 13, d = 12$

## An Arithmetic Series

An arithmetic series is the indicated sum of the terms of an arithmetic sequence.

$$a_1 + a_2 + a_3 + \dots + a_n$$

The sum of the first  $n$  terms of the arithmetic series is called the  **$n$ th partial sum** and is denoted  $S_n$ .

$$S_n = \frac{n}{2}(a_1 + a_n) \qquad S_n = \frac{n}{2}(2a_1 + (n - 1) * d)$$

**Sample Problem 4:** Find the indicated sum for each sequence.

a.  $a_1 = 4, d = -4$   
 $S_{12} = ?$

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- b.  $-1, 5, 11, 17 \dots \dots \dots$   
 $S_{30} = ?$