Precalculus
Lesson 12.2: Arithmetic Sequences
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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:

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

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

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

Determine if the sequence is Arithmetic, what is the common difference?

$4, 6, 8, 10 \dots$

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

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

Finding the formula for an Arithmetic Sequence:

nth Term of an Arithmetic Sequence

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

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

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

Finding the Recursive Formula for an Arithmetic Sequence:

The 8th term of an arithmetic sequence is 75, and the 20th term is 39.
   a) Find the first term and the common difference
   b) Give a recursive formula for the sequence.
   c) What is the nth term of the sequence?

Finding the Sum of an Arithmetic 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: $60 + 64 + 68 + 72 + \cdots + 120$