Lesson 2 Arithmetic Series

A **series** is a sum of the terms in a sequence.
An **arithmetic series** is the **sum** of the terms in an **arithmetic sequence**.

For example:
1, 4, 7, 10 is an arithmetic sequence
$1 + 4 + 7 + 10$ is an arithmetic series — $S_4 = 22$
S_n is the partial sum of the first n terms of an arithmetic series.

The partial sum of n terms of an Arithmetic Series is given by

$$S_n = \frac{n(t_1 + t_n)}{2} \text{ or } S_n = \frac{n[2t_1 + d(n-1)]}{2}$$

where:
S_n is the partial sum of the first n terms
n is the number of terms
t_1 is the first term
d is the common difference
t_n is the n^{th} term

Examples

1. Determine the S_6 sum of the first 6 terms of the given arithmetic series.

$25 + 14 + 3 - 8 - 19 - 30$

t_1 ↑ ↑ t_6 (last term where $n=6$)

$$S_n = \frac{n(t_1 + t_n)}{2}$$

$$S_6 = \frac{6(25 + (-30))}{2}$$

$$S_6 = 3(-5)$$

$$= -15$$

2. Given an arithmetic series has $t_1 = 3$ and $d = -4$, determine S_{25}.

$S_n = \frac{n[2t_1 + d(n-1)]}{2}$

$S_{25} = \frac{25[2(3) - 4(25-1)]}{2}$

$= -1125$

S_{25} ↑ n

$t_1 = 3$

$d = -4$

3. An arithmetic series has $S_{32} = 1712, d = 3$, and $t_{32} = 100$. Determine the first 3 terms of the series.

↑ n ↑ n

$S_n = \frac{n(t_1 + t_n)}{2}$

$S_{32} = \frac{32(t_1 + 100)}{2}$

$1712 = \frac{32(t_1 + 100)}{2}$

$1712 = 16(t_1 + 100)$

$107 = t_1 + 100$

$7 = t_1$

since $d = 3$ seq 7, 10, 13

series $7 + 10 + 13 + \ldots$ ← Answer

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1 c, h

2a, b, c, e, f, j