Today's Learning Goal(s):

By the end of the class, I will be able to:

a) calculate the sum of the terms of an arithmetic series.

7.5 Arithmetic Series

Date: ____________________

Recall: An arithmetic sequence is a list of numbers with a ______________ .

An **Arithmetic Series** is the **sum** of the terms of an arithmetic sequence.

Sequence: 3, 5, 7, 9, ...

Series: 3 + 5 + 7 + 9 + ...

Karl Friedrich Gauss
(1777-1855)

Ex.1 Add the following:

$S_n = 1 + 2 + 3 + 4 + \ldots + 97 + 98 + 99 + 100$

$S_n = 100 + 99 + 98 + 97 + \ldots + 4 + 3 + 2 + 1$

$2S_n = \quad + \ldots +$

$2S_n = 100(101)$

$S_n = \frac{100(101)}{2}$

$= 5050$

S_n - partial sum

or the sum of the first n terms

Note: From Gauss, the sum of the first n numbers: $S_n = \frac{n(n+1)}{2}$

In general:

$$S_n = a + a+d + a+2d + \ . \ . \ . + a+(n-3)d + a+(n-2)d + a+(n-1)d$$

t_n ①

② $$S_n = a+(n-1)d + a+(n-2)d + a+(n-3)d + \ . \ . \ . + a+2d + a+d + a$$

$$2S_n = 2a+(n-1)d + 2a+(n-1)d + 2a+(n-1)d + \ . \ . \ . \ 2a+(n-1)d + 2a+(n-1)d + 2a+(n-1)d$$

$\underbrace{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad}_{n \text{ terms}}$

$$2S_n = n[2a+(n-1)d]$$

The Arithmetic Series Formula:

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

where n is the term's position number,

$a = t_1$,

d is the common difference, and

t_n = last term

Ex.2 Find S_{50} for $8 + 11 + 14 + ... + t_n$

Ex.3 Find the sum of: $-12 - 7 - 2 + 3 + ... + 138$

Today's Homework Practice includes: pp. 452-453 #(1 – 7)ace, 11, 13 [15,16]