Section 11-4: Arithmetic Series

Series: When the terms of a sequence are added.

Find the sum of this series:

1+2+3+...+10+11+12 = 78

This is called a FINITE SERIES

has a last term.

3+5+7+9+11+...

What do these three dots mean?
What is another word that means to continue on forever?

What is a good name for this kind of series?
INFINITE SERIES

There is no last term

What is the sum of an INFINITE SERIES?

It doesn't have one!

An Arithmetic Series is the sum of the terms in an Arithmetic Sequence.

All FINITE Arithmetic Series have a sum.

Find the sum of the first 100 natural numbers:

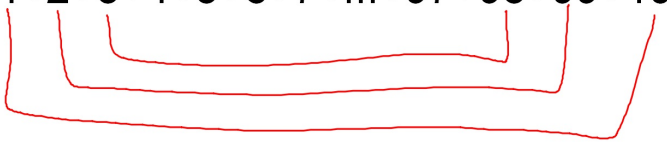
1+2+3+4+5+6+7+...+97+98+99+100 =

The famous mathematician Karl Friedrich Gauss was 10 years old, when his teacher assigned a problem to the class: find the sum of the first 100 natural numbers, thinking this would keep the class busy for a while.

Gauss, being quite bright, came up with the answer within minutes.

Find the sum of the first 100 natural numbers:

1+2+3+4+5+6+7+...+97+98+99+100 =



101 +101 +101...

there will be 50 pairs

Each pair of number adds to 101

$101(50) = 5050$

The sum of a Finite Arithmetic Series:

S_n represents the sum of the first n terms of a finite Arithemtic Series

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

n = Number of terms

a_1 = First term

a_n = Last Term

What is the Explicit Formula for this Arithmetic Sequence?

4, 10, 16, 22, 28, ...

$a_n = 4 + (n-1)6$

How many terms are there in this Finite Arithmetic Series?

4, 10, 16, 22, 28, ..., 106

$106 = 4 + (n-1)6$

$102 = (n-1)6$

$17 = n-1$

$18 = n$

Find the sum this Finite Arithemtic Series

4+10+16+22+28+ ...+ 106

$S_{18} = \frac{18}{2}(4 + 106)$

990

Find the sum of this Finite Arithemtic Series

21+29+37+45+ ...+117

$a_n = 21 + (n-1)8$

$117 = 21 + (n-1)8$

$n = 13$

$n = 13$

$S_{13} = \frac{13}{2}(21 + 117)$

$= 897$

Find the sum of this Finite Arithemtic Sequence

74 + 65 + 56 + 47+ ...+ -52

$n = 15$

$S_{15} = \frac{15}{2}(74 + -52)$

$= 165$

Section 11-4

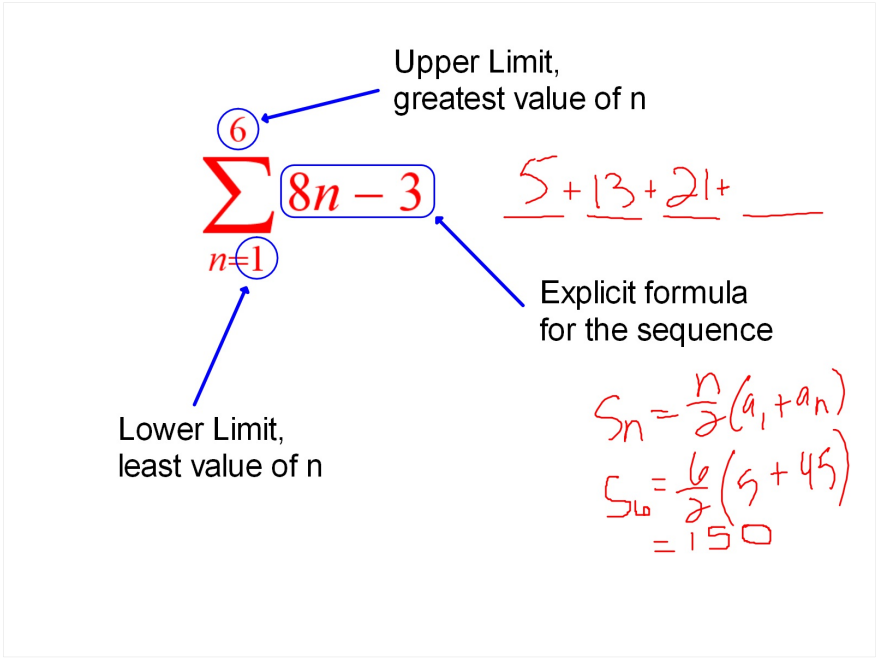
$\sum$ → Capital Greek letter Sigma

"sum of"

Summation Notation

$$\sum_{n=1}^{6} 8n - 3$$

"the sum of 8n-3 from 1 to 6"


Upper Limit,
greatest value of n
6
$\sum$
$8n - 3$
$n=1$
Explicit formula
for the sequence
Lower Limit,
least value of n
$5 + 13 + 21 + \_\_\_$
$S_n = \frac{n}{2}(a_1 + a_n)$
$S_6 = \frac{6}{2}(5 + 45)$
$= 150$