What's Going On?

Checking In

Minds on Add 'Em Up!

Action! Arithmetic Series Formulae

Consolidation Using The Formulae

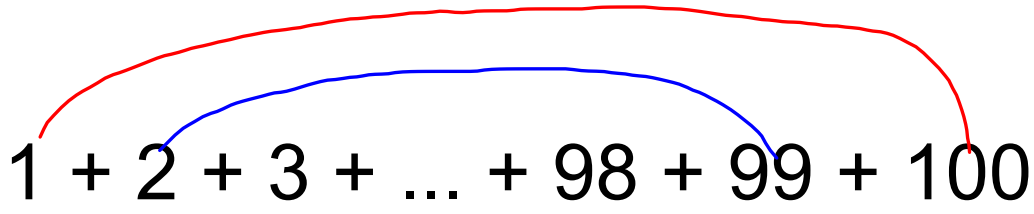
Learning Goal - I will be able to calculate the sum of an arithmetic series.

Minds on

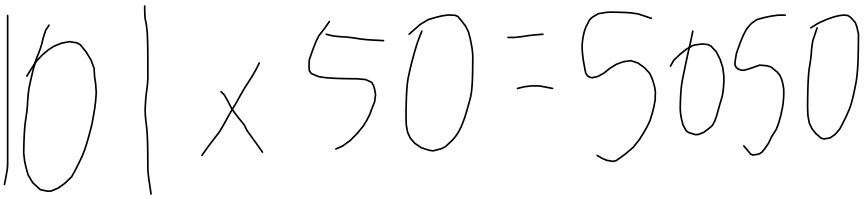
Add 'Em Up!

Calculate the sum of the numbers from 1 to 100.

***This is not a question from last time!**



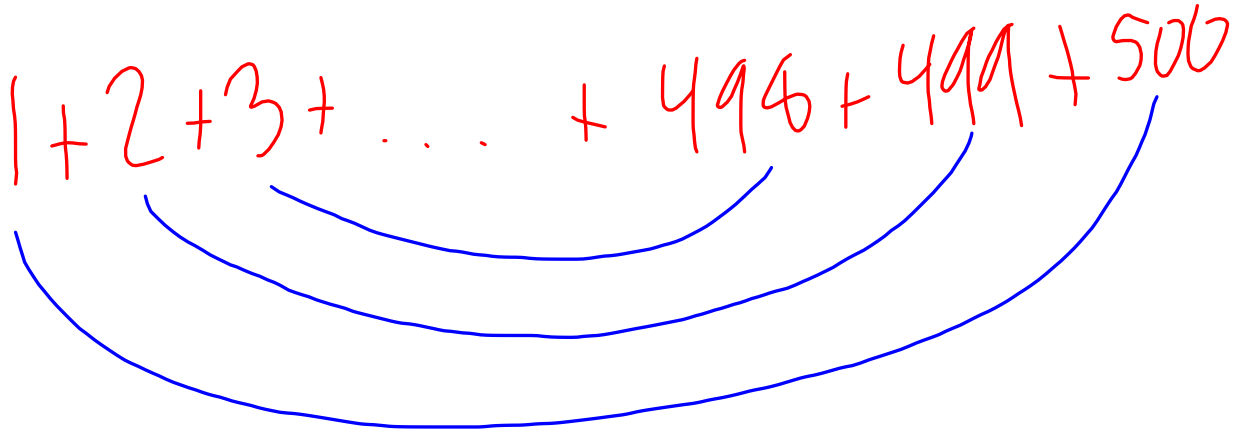
1 + 2 + 3 + ... + 98 + 99 + 100



Minds on

Add 'Em Up!

Calculate the sum of the numbers from 1 to 500.



250×501

$= 125250$

Minds on

Add 'Em Up!

Calculate the sum of all the **odd** numbers from 1 to 100.

$1+3+5+\ldots+95+97+99$

$25 \times 100 = 2500$

$$1 + 2 + 3 + \ldots + 98 + 99 + 100$$

$101 \times 50 = 5050$ (n, $\frac{n}{2}$)

$1 + 2 + 3 + \ldots + 496 + 499 + 500$

$250 \times 501 = 125250$ ($\frac{n}{2}$)

$1 + 3 + 5 + \ldots + 95 + 97 + 99$

$25 \times 100 = 2500$ ($\frac{n}{2}$)

Minds on

Sequences vs. Series

Series

The sum of the terms of a sequence.

Partial Sum

The sum, S_n, of the first *n* terms of a sequence

Action!

Sum of an Arithmetic Series

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

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

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

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

Action!

Sum of an Arithmetic Series

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

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

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

Action!

The Formulae

Arithmetic

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

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

Consolidation

Using the Formulae

In an amphitheatre, seats are arranged in 50 semicircular rows. The first row contains 23 seats, and each row contains 4 more seats than the previous row. How many seats are in the theatre?

n

$d = 4$

$a = 23$

Method 1

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

$$= \frac{50[2(23) + (50-1)(4)]}{2}$$

$$= 25(46 + 196)$$

$$= 25(242)$$

$$= 6050$$

Consolidation

Using the Formulae

In an amphitheatre, seats are arranged in 50 semicircular rows. The first row contains 23 seats, and each row contains 4 more seats than the previous row. How many seats are in the theatre?

n

$d = 4$ $a = 23$

Method 2

find t_n first

$t_n = 23 + (50-1)4$

$t_n = 23 + 196$

$t_n = 219$

$S_n = \frac{50(23+219)}{2}$

$= 25 \times 242$

$= 6050$

Consolidation

Using the Formulae

Determine the sum of

- 31, - 35, - 39, ... - 403

$a = -31 \quad t_n = -403$

$d = -4 \quad n = ?$

$t_n = a + (n-1)d$

$-403 = -31 + (n-1)(-4)$

$+31 \quad +31$

$\frac{-372}{-4} = \frac{(n-1)(-4)}{-4}$

$93 = n - 1$

$n = 94$

$S_n = \frac{94(-31-403)}{2}$

$S_n = 47 \times (-434)$

$S_n = -20398$