What's Going On?

Checking In

Minds on Let's Get Gaussian

Action! Using The Formulae

Consolidation The Formulae

Learning Goal - I will be able to calculate the sums of arithmetic and geometric series.

Minds on

Let's Get Gaussian!

Calculate the sum of the numbers (integers) from 1 to 100.

S_n

$S_n(1 + 2 + 3 + \ldots + 98 + 99 + 100)$

$S_n(100 + 99 + 98 + \ldots + 3 + 2 + 1)$

$S_n + S_n = 100(101)$

$2S_n = n(t_1 + t_n)$

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

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

first term

last (nth) term

number of terms

Minds on

Let's Get Gaussian!

1265

Calculate the sum of the numbers from 5 to 50.

$t_1 = 5$

$t_n = 50$

$n = 46$

$S_n = \frac{46(5+50)}{2}$

$S_n = 23 \times 55$

$S_n = 1265$

Calculate the sum of the series that starts at 3, goes up by 2 and ends at 267.

$t_1 = 3$ (a)

$d = 2$

$t_n = 267$

$n =$ _____

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

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

Minds on

Sum of an Arithmetic Series

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

$t_1 = a$

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

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

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

n
a
d

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

Minds on

Sum of a Geometric Series

Determine the sum of the first *n* terms of a geometric series.

$$rS_n = ar + ar^2 + ar^3 + \ldots + ar^{n-2} + ar^{n-1} + ar^n$$

$$-S_n = -(a + ar + ar^2 + ar^3 + \ldots + ar^{n-2} + ar^{n-1})$$

t_n

$$rS_n - S_n = -a + ar^n$$

$$\frac{S_n(r-1)}{r-1} = \frac{a(r^n-1)}{r-1}$$

$$S_n = \frac{a(r^n-1)}{r-1}$$

first term

number of terms

ratio

Action!

The Formulae

Arithmetic

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

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

Geometric

$$S_n = \frac{a\left(r^n - 1\right)}{r - 1}$$

$$S_n = \frac{t_{n+1} - t_1}{r - 1}$$

Action!

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?

SEE HANDOUT FOR SOLUTIONS

Action!

Using the Formulae

Determine the sum of

$$-31 - 35 - 39 - \ldots - 403$$

SEE HANDOUT FOR SOLUTIONS

Action!

Using the Formulae

At a fish hatchery the number of fish that hatched on each of the first four days after fertilization was 2, 10, 50 and 250. How many fish will hatch in the first 10 days?

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Action!

Using the Formulae

Calculate the sum of the geometric series

$$7{,}971{,}615 + 5{,}314{,}410 + 3{,}542{,}940 + \ldots + 92{,}160$$

SEE HANDOUT FOR SOLUTIONS

Consolidation

The Formulae