8.2 Arithmetic Sequence and Partial Sums

Finding the formula for an arithmetic sequence

Finite Partial Sums

An arithmetic sequence has a common difference between terms

5, 8, 11, 14, 17 ... 3n+2 ...

the common difference is +3

9, 5, 1, -3, -7 ... -4n+13 ...

the common difference is -4

$1, \frac{7}{6}, \frac{4}{3}, \frac{3}{2}, \frac{5}{3} \ldots \frac{n+5}{6} \ldots$ or $\frac{1}{6}n+\frac{5}{6}$

the common difference is $\frac{1}{6}$

Finding the n^{th} term of a sequence

We use $a_n = d(n-1) + a_1$ (common diff; 1st term)

Find the formula for nth term of sequence if

$d = -2 \quad a_1 = 4$

$a_n = -2(n-1) + 4$

$a_n = -2n + 6$

$a_n = -2n + 6$

Now find the 10^{th} term

$a_{10} = -2(10) + 6$

$a_{10} = -14$

Write the first 6 terms where

$a_8 = 26 \qquad a_{12} = 42$

d= $\frac{\text{diff of values}}{\text{diff of terms}}$

$\frac{42-26}{12-8} = \frac{16}{4} = 4$

$a_n = 4(n-1) + a_1$

$26 = 4(8-1) + a_1$

$26 = 28 + a_1$

$a_1 = -2$

-2, 2, 6, 10, 14, 18

Find the 10^{th} term if $a_1 = 6$ and $a_2 = 4$

$d = -2$ $a_n = -2(n-1) + 6$

$a_n = -2n + 8$

$a_{10} = -2(10) + 8$

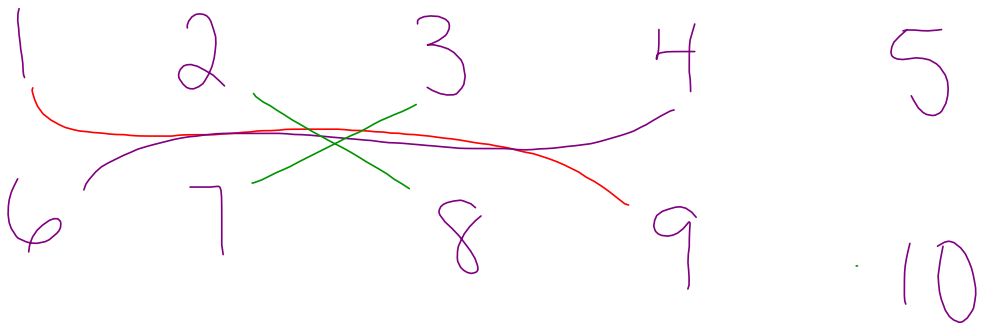
$a_{10} = -12$

Parital Finite Sums of Arithmetic Sequences

Let's find the sum of the integers 1 thru 100.

Too much for you?

How about the sum of 1 thru 10



$5 \cdot 10 + 5$

$5(10+1)$

$\rightarrow \frac{n}{2}(a_{10}+a_1)$

To find the sum of finite arithmeticsequence we use the formula

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

Apply this to $S_n = 2+4+6+8+10+12+14$

Find the sum of the first 100 positive integers.

$n = 100$

$a_1 = 1$

$a_{100} = 100$

$S_{100} = \frac{100}{2}(1+100)$

$= 50(101)$

$= 5050$

Summation notation uses the Greek letter capital Sigma $\sum$

$S_n = \frac{n}{2}(a_1 + a_n)$ can be written as $\sum_{i=1}^{n} a_i$

Examples:

$\sum_{n=1}^{50}(50-2n)$

$n=50$ $\frac{50}{2}(48-50)$

$a_1=48$ $25(-2)$

$a_{50}=-50$ -50

$\sum_{n=0}^{50}(50-2n)$

$n=51$ $\frac{51}{2}(50-50)$

$a_0=50$ 0

$a_{50}=-50$

$\sum_{n=12}^{50}(50-2n)$

$n=39$

$a_{12}=26$

$a_{50}=-50$

$\frac{39}{2}(26-50)$

$\frac{39}{2}(-24)$

$39(-12)$

-468

39×12

78

390

468

HOMEWORK

p 598

3-42 by 3's

53-74 by 3's

$e^{2x} + 4e^{x} + 3$

$(e^{x} + 1)(e^{x} + 3)$

$e^{x} = -1$ $e^{x} = -3$

$\ln -1$ $\ln -3$