

5.2 Arithmetic & Geometric Series

Ex: Add the numbers 1 to 100 as quickly as you can

• Series: the sum of a sequence

sum of an arithmetic series: $S_n = \frac{n(a_1 + a_n)}{2}$

Ex: $1 + 2 + 3 + \dots + 100$

$$S_{100} = \frac{100(1+100)}{2} = \boxed{5050}$$

a_1 = 1st term
 a_n = last term

Ex: $6 + 11 + 16 + 21 + 26$

$$S_5 = \frac{5(6+26)}{2} = \boxed{80}$$

sigma: summation notation

\sum

$\sum_{\text{start}}^{\text{stop}}$ explicit formula

Ex: $\sum_{n=1}^7 5n - 6$ means the first 7 terms of $5n - 6$

1. $5(1) - 6 = -1$ (first term)

2. $5(7) - 6 = 29$ (7th term)

$n = 7$

$$S_7 = \frac{7(-1 + 29)}{2} = \boxed{98}$$

geometric series: Sum of all the terms of a geometric sequence

Sum of geometric: $S_n = \frac{a_1(1-r^n)}{1-r}$

n = # of terms

a_1 = first term

r = common ratio

Ex: $4 + 8 + 16 + 32 + 64$

$r = 2$

$n = 5$

$S_5 = \frac{4(1-2^5)}{1-2} = \boxed{124}$

or in calc: $4(1-(2^5)) \div -1$

Ex: $\sum_{k=1}^6 -3(4)^{k-1}$

$a_1 = -3$

$r = 4$

$n = 6$

$S_6 = \frac{-3(1-4^6)}{1-4} = \boxed{-4095}$