Chapter 7 - Arithmetic Series

AP = Arithmetic Progression
(AP) is a sequence of numbers in order, in which the difference between any two consecutive numbers is a constant value

- ∟ First term (a)
- ∟ Common difference (d)
- ∟ nth Term (an)
- ∟ The sum of the first n terms (Sn)

General formula = **a + (n – 1) d**
General term = **an = a + (n − 1) × d**
Sum of terms = **Sn = n/2[2a + (n − 1) × d]**

GP = Geometric Progression
(GP) is a type of sequence where each succeeding term is produced by multiplying each preceding term by a fixed number, which is called a common ratio

- ∟ Three non-zero terms – a, b, c – are in GP only if <u>b2 = ac</u>
- ∟ In a GP, three consecutive terms can be taken as a/r, a, ar
- ∟ Four consecutive terms can be taken as a/r^3, a/r, ar, ar^3
- ∟ Five consecutive terms can be taken as a/r^2, a/r, a, ar, ar^2
- ∟ In a finite GP, the product of the terms equidistant from the beginning and the end is the same. That means, t1.tn = t2. tn-1 = t3. tn-2 = ...
- ∟ If each term of a GP is multiplied or divided by a non-zero constant, then the resulting sequence is also a GP with the same standard ratio
- ∟ The product and quotient of two GPs is again a GP
- ∟ If each term of a GP is raised to the power by the same non-zero quantity, the resultant sequence is also a GP

General formula = **ar^{n-1}**
General term formula = **an = tn = ar^{n-1}**
Sum of terms formula = **Sn = $a[(r^n – 1)/(r – 1)]$ if r ≠ 1 and r > 1**

Sum to infinity formula = **S∞= a/(1-r)**

The sum to infinity of a geometric sequence is the sum of the first n terms as n approaches infinity. This, however, does not exist for all geometric sequences. Let's relate this to two examples.

2 + 4 + 8 + 16 + 32 + ...

Each term is twice the previous term (r = 2). The sum of the series is not finite, since each term is bigger than the previous. This is known as a <u>divergent sequence</u>.

2 + 1 + ½ + ¼ + ⅛ + ...

In this sequence, each term is half the previous term (r = ½). The sum of this kind of series is finite since eventually, the terms will reach 0. This is known as a <u>convergent sequence</u>.

A geometric sequence is only convergent if |r| < 1

<u>Sigma Notation</u>