1. Arithmetic and Geometric Progressions

Preliminaries

Let $a_n$, $d$, and $S_n$ be, respectively, the $n$th term, the common difference and the sum of the first $n$ terms of an arithmetic progression. Then

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

and

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

(1)

(2)

If $u_n$, $q$, and $S_n$ are the $n$th term, the common ratio and the sum of the first $n$ terms of a geometric progression, then

$$u_n = u_1q^{n-1}$$

and

$$S_n = \frac{u_1q^n - u_1}{q-1} = \frac{u_1(q^n - 1)}{q-1}.$$  

(3)

(4)

Finally, if $S$ is the sum of an infinite geometric series with $|q| < 1$ then

$$S = \frac{u_1}{1-q}.$$  

(5)