



Grade 12 Maths Unit 1: Sequences & Series

General Notation

- **Summation Notation:** Represents the sum of terms in a sequence.

$$\sum_{k=1}^n a_k = a_1 + a_2 + a_3 + \cdots + a_n$$

Arithmetic Sequences & Series

An arithmetic sequence is a sequence of numbers such that the difference between the consecutive terms is constant. This constant difference is called the **common difference (d)**.

- **Formula for the n-th Term:**

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

- **Sum of the First n Terms (Version 1):** Use when you know the first term, the number of terms, and the common difference.

$$S_n = \frac{n}{2}[2a_1 + (n - 1)d]$$

- **Sum of the First n Terms (Version 2):** Use when you know the first term, the last term, and the number of terms.

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

Geometric Sequences & Series

A geometric sequence is a sequence of numbers where each term after the first is found by multiplying the previous one by a fixed, non-zero number called the **common ratio (r)**.

- **Formula for the n-th Term:**

$$a_n = a_1 \cdot r^{n-1}$$

- **Sum of a Finite Geometric Series:**

$$S_n = a_1 \frac{(1 - r^n)}{(1 - r)}$$

(This formula is valid for $r \neq 1$)

- **Sum of an Infinite Geometric Series:** This formula only works if the series **converges**, which happens when $|r| < 1$ (i.e., $-1 < r < 1$).

$$S_\infty = \frac{a_1}{1 - r}$$

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