Sequences and Series

Arithmetic Sequences and Series

Sequences

An **arithmetic sequence** is a sequence of numbers in which the difference (denoted *d*) between consecutive terms is always the same.

Recursive Formula

$$a_n = a_{n-1} + d$$

Explicit Formula

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

Series

An **arithmetic series** is the sum of the terms in an arithmetic sequence.

$$a_1 + (a_1 + 2d) + (a_1 + 3d) + \ldots + (a_1 + (n-1)d)$$

Sigma Notation

$$\sum_{k=1}^{n}(a_1 + (k-1)d)$$

Closed Form

$$S_n = \tfrac{n}{2}(2a_1 + (n-1)d)$$

Geometric Sequences and Series

Sequences

A **geometric sequence** is a sequence of numbers in which each term is found by multiplying the previous term by a fixed, non-zero constant known as the common ratio (denoted as *r*).

Recursive Formula

$$a_n = a_{n-1} \cdot r$$

Explicit Formula

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

Series

A **geometric series** is the sum of the terms of a geometric sequence.

$$a_1 \cdot r^0 + a_1 \cdot r^1 + a_1 \cdot r^2 + \ldots + a_1 \cdot r^{n-1}$$

Sigma Notation

$$\sum_{k=1}^{n}(a_1 \cdot r^{k-1})$$

Closed Form

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