

Introduction to Sequences

- A sequence is a collection of terms in a **definite order**. We'll concentrate on sequences of numbers.

$$a_1, a_2, a_3, \dots, a_{n-1}, a_n, \dots$$

a_n is the n -th or general term.

We'll also use designations like b_n, c_n, F_n etc. to stand for other sequences.

- Arithmetic sequence: The difference between successive terms is constant -

$$a_n - a_{n-1} = d \quad \Rightarrow \quad a_n = a_1 + (n - 1)d$$

e.g.

$$1, 3, 5, 7, 9, \dots,$$

- Geometric sequence: The ratio of successive terms is constant -

$$\frac{a_n}{a_{n-1}} = r \quad \Rightarrow \quad a_n = a_1 r^{n-1}$$

e.g.

$$1, 2, 4, 8, 16, \dots$$

- Fibonacci sequence-

$$1, 1, 2, 3, 5, 8, 13, \dots$$

defined by the *recurrence relation*

$$F_n = F_{n-1} + F_{n-2}, \quad n \geq 2$$

together with the two specified initial terms: $F_1 = 1$ and $F_2 = 1$.

- Properties of sequences are frequently established using *mathematical induction*.