

# 1 Hello!

## 2 Sequences

Sequences are a collection of objects in some particular order.

### 2.0.1 Notation

A sequence is written in the form  $t_1, t_2, \dots, t_n$  where  $t_1$ ,  $t_2$ , and  $t_n$  represent the first, second and  $n$ th terms of the sequence respectively.

#### Example

Let us consider the sequence of odd numbers  $1, 3, 5, \dots$ . We can then identify the terms as follows:

$t_1$	$t_2$	$t_3$	$t_4$	$\dots$	$t_n$
1	3	5	7	$\dots$	$2n - 1$

### 2.1 Arithmetic Sequences

Arithmetic sequences are sequences where each term differs by the same amount (referred to as the common difference). Examples of arithmetic sequences include:

- $1, 3, 5, 7, 9, 11, \dots$  (odd numbers)
- $2, 4, 6, 8, 10, 12, \dots$  (even numbers)
- $5, 10, 15, 20, 25, 30, 35, \dots$  (multiples of 5)
- $-4, -1, 2, 5, 8, 11, \dots$

An arithmetic sequence has two key components that allow us to determine all of its terms:

- a starting term, denoted  $t_1$  ( $a$  in other resources), and
- a common difference, denoted  $d$ .

#### Example

Using the same examples as listed at the beginning of the chapter:

Arithmetic Sequence	$t_1$	$d$
$1, 3, 5, 7, 9, 11, \dots$	1	2
$2, 4, 6, 8, 10, 12, \dots$	2	2
$5, 10, 15, 20, 25, 30, 35, \dots$	5	-4
$-4, -1, 2, 5, 8, 11, \dots$	-4	3

### 2.1.1 Recursive Formula of an Arithmetic Sequence

### 2.1.2 General Formula of an Arithmetic Sequence

The general formula of an arithmetic sequence can be represented as

$$t_n = t_1 + (n - 1)d$$

where

- $n$  is the term number, and
- $d$  is the common difference.

## 2.2 Geometric Sequences

Geometric sequences are sequences where each term differs by the same ratio (referred to as the common ratio). Examples of geometric sequences include:

- $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$
- $3, 9, 27, 81, \dots$  (powers of 3)

A geometric sequence has two key components that allow us to determine all of its terms:

- a starting term, denoted  $t_1$  ( $a$  in other resources), and
- a common ratio, denoted  $r$ .

#### Example

Using the same examples as listed at the beginning of the chapter:

Geometric Sequence	$t_1$	$r$
$1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$	1	$\frac{1}{2}$
$3, 9, 27, 81, \dots$	3	3