

Arithmetic Sequences

**Raise My**  
**MArks**

RaiseMyMarks.com

2020

## Sequences

There are two types of sequences we will consider, *arithmetic* and *geometric*. Regardless of the type of sequence, we will call the general term of the sequence  $t_n$  and the first term,  $t_1 = a$ . The value  $n$  is the *position* of the term in the sequence. When writing the term of a sequence, there are two ways: A formula for the *general term*  $t_n$  in terms of  $n$  and a *recursive* formula for  $t_n$  that involves the previous,  $t_{n-1}$  term. Let's start with arithmetic sequences.

### Arithmetic sequences

An **arithemic sequence** can be thought of a sequence of numbers where the next number, or term, in the sequence, is the previous value or term plus a fixed value,  $d$ , say. Let's consider a few examples to see this idea explicitly.

$$\begin{aligned} S_1 &= 1, 3, 5, 7, 9, 11, 13, 15, \dots \\ S_2 &= 2, 7, 12, 17, 22, 27, 32, 37, \dots \\ S_3 &= 6, 3, 0, -3, -6, -9, -12, -15, \dots \end{aligned}$$

If we look at the three arithmetic sequences above in greater detail we see that for, sequence  $S_1$ , the sequence starts at 1 and each term is increasing by 2; sequecne  $S_2$ , the sequence starts at 2 and each term is increasing by 5; sequence  $S_3$ , the sequence starts at 6 and each term is decreasing by  $-3$ . We call the value that the sequence starts at  $a$  and the amount that the sequence changes by  $d$ . The *general term* for an arithmetic sequence is given by,

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

The *recursive* formula for an arithmetic sequence is given by,

$$t_n = t_{n-1} + d$$

## Exercises

1. Which sequences are arithmetic sequences?

a)  $\{-18, -7, 4, 15, 26, \dots\}$

g)  $\{5, 7, 9, 11, 13, \dots\}$

b)  $\{1, 2, 4, 8, 16, 32, \dots\}$

h)  $\{3, 15, 75, 375, 1875, \dots\}$

c)  $\{1, -1, 1, -1, 1, -1, \dots\}$

i)  $\{1, 3, 5, 7, 9, \dots\}$

d)  $\{-1, 3, 7, 11, 15, \dots\}$

j)  $\{2, 2/3, 2/9, 2/27, 2/81, \dots\}$

e)  $\{7, 4, 1, -2, -5, \dots\}$

k)  $\{20, 200, 2000, 20000, \dots\}$

f)  $\{1/2, 1/4, 1/8, 1/16, \dots\}$

l)  $\{1, 4, 7, 10, 13, 16, 19, 22, 25, \dots\}$

m)  $\{2/3, 2/9, 2/17, 2/81, \dots\}$

o)  $\{3, 6, 12, 24, \dots\}$

n)  $\{88, 78, 68, 58, 48, \dots\}$

p)  $\{3, 8, 13, 23, 28, 33, 38, \dots\}$

2. For the arithmetic sequences in #1 find  $a$ ,  $d$ , the general term and the recursive term for the sequence.