

## 3.1) Arithmetic sequences

## Worked example

The  $n$ th term of an arithmetic sequence is

$$u_n = 35 - 3n.$$

- a) Write down the first 3 terms of the sequence.
- b) Find the first term in the sequence that is negative.

## Your turn

The  $n$ th term of an arithmetic sequence is

$$u_n = 55 - 2n.$$

- a) Write down the first 3 terms of the sequence.
- b) Find the first term in the sequence that is negative.

$$\text{a) } u_1 = 53, u_2 = 51, u_3 = 49$$

$$\text{b) } u_{28} = -1$$

## Worked example

Find the  $n$ th term of each arithmetic sequence.

a)  $-6, 2, 10, 18, 26, \dots$

b)  $788, 785, 782, 779, 886, \dots$

## Your turn

Find the  $n$ th term of each arithmetic sequence.

a)  $6, 20, 34, 48, 62, \dots$

b)  $101, 94, 87, 80, 73, \dots$

a)  $u_n = 14n - 8$

b)  $u_n = 108n - 7$

## Worked example

A sequence is generated by the formula  $u_n = an + b$  where  $a$  and  $b$  are constants to be found.

Given that  $u_5 = 17$  and  $u_9 = 33$ , find the values of the constants  $a$  and  $b$ .

## Your turn

A sequence is generated by the formula  $u_n = an + b$  where  $a$  and  $b$  are constants to be found.

Given that  $u_3 = 5$  and  $u_8 = 20$ , find the values of the constants  $a$  and  $b$ .

$$a = 3, b = -4$$

## Worked example

For which values of  $x$  would the expression  $-2$ ,  $4x^2$  and  $17x$  form the first three terms of an arithmetic sequence?

## Your turn

For which values of  $x$  would the expression  $-8$ ,  $x^2$  and  $17x$  form the first three terms of an arithmetic sequence?

$$x = \frac{1}{2}, x = 8$$

## Worked example

An arithmetic sequence has first term  $k^2$  and common difference  $k$ , where  $k < 0$ . The third term of the sequence is 24. Find the value of  $k$

## Your turn

An arithmetic sequence has first term  $k^2$  and common difference  $k$ , where  $k > 0$ . The fourth term of the sequence is 40. Find the value of  $k$

$$k = 5$$

## Worked example

Is 100 in the sequence:

$-3, 4, 11, 18, \dots$  ?

Is 10 in the sequence:

$127, 118, 109, 100, \dots$  ?

## Your turn

Is 100 in the sequence:

$4, 7, 10, 13, \dots$  ?

Yes – the 33<sup>rd</sup> term

Is 10 in the sequence:

$85, 78, 71, 64, \dots$  ?

No

$-7n + 92 = 10$  solves to give  $n = \frac{82}{7}$  which is not an integer.

## Worked example

The first five terms of each sequence are shown. Find two numbers which are in both sequences.

3, 10, 17, 24, 31, ...

-4, -1, 2, 5, 8, ...

## Your turn

The first five terms of each sequence are shown. Find two numbers which are in both sequences.

2, 7, 12, 17, 22, ...

-4, -1, 2, 5, 8, ...

**2, 27**



## Worked example

Find the  $n^{\text{th}}$  term of the sequence

$$\frac{1}{3}, \frac{4}{5}, \frac{7}{7}, \frac{10}{9}, \dots$$

## Your turn

Find the  $n^{\text{th}}$  term of the sequence

$$\frac{1}{3}, \frac{3}{6}, \frac{5}{9}, \frac{7}{12}, \dots$$

$$\frac{2n - 1}{3n}$$

## Worked example

The fifth term of an arithmetic sequence is 9. The twelfth term of the same arithmetic sequence is 23. Find the first term and the common difference.

## Your turn

The third term of an arithmetic sequence is 8. The eleventh term of the same arithmetic sequence is 40. Find the first term and the common difference.

$$a = 0, d = -4$$