

Example 2

The second term of an arithmetic sequence is 1 and the seventh term is 26.

- Find the first term and the common difference.
- Find the 100th term.

Answers

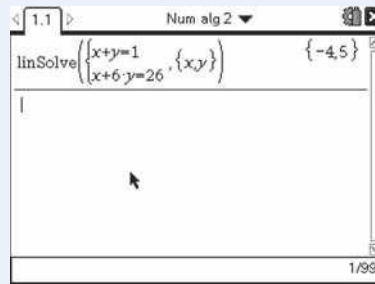
$$\begin{aligned} \text{a } u_2 &= u_1 + d = 1 \\ u_7 &= u_1 + 6d = 26 \\ u_7 - u_2 &= 6d - d = 26 - 1 \\ &5d = 25 \\ &d = 5 \end{aligned}$$

$$\begin{aligned} u_1 + d &= 1 \\ u_1 + 5 &= 1 \\ u_1 &= -4 \end{aligned}$$

The first term is -4 and the common difference is 5 .

$$\begin{aligned} \text{b } u_{100} &= u_1 + 99d \\ &= -4 + 99 \times 5 \\ &= 491 \end{aligned}$$

Here you have two simultaneous equations. Solve them using algebra or a GDC.



Use the formula for the n th term with $n = 100$, $u_1 = -4$, $d = 5$.

For solving simultaneous equations on a GDC, see Chapter 12, Section 1.1.

GDC help on CD: *Alternative demonstrations for the TI-84 Plus and Casio FX-9860GII GDCs are on the CD.*



Example 3

Here is a sequence of numbers 6 10 14 ... 50

- Write down the common difference.
- Find the number of terms in the sequence.

Answers

$$\begin{aligned} \text{a } d &= 4 \\ \text{b } u_n = 50 &\Rightarrow u_1 + (n-1)d = 50 \\ &6 + (n-1)4 = 50 \\ &(n-1)4 = 44 \\ &(n-1) = 11 \\ &n = 12 \end{aligned}$$

So the sequence has 12 terms.

Use the formula for the n th term with $u_1 = 6$, $d = 4$. Solve for n .

50 is the last term = u_n

Exercise 7A

EXAM-STYLE QUESTIONS

- The first four terms of an arithmetic sequence are 3 7 11 15
 - Write down the eighth term in the sequence.
 - Find the 150th term.
- The third term of an arithmetic sequence is 8 and the ninth term is 26.
 - Write down two equations in u_1 and d to show this information.
 - Find the values of u_1 and d .

EXAM-STYLE QUESTIONS

- 3 The first term of an arithmetic sequence is -12 and the ninth term is 16 .
Calculate the value of the common difference.
- 4 The first four terms of an arithmetic sequence are $3, 7, 11, 15, \dots$
a Write down the n th term of this sequence.
b Calculate the 50th term of this sequence.
- 5 The n th term of an arithmetic sequence is $u_n = 42 - 3n$.
a Calculate the values of the first two terms of this sequence.
b Which term of the sequence is -9 ?
c Two consecutive terms of this sequence, u_k and u_{k+1} , have a sum of 33 . Find k .
- 6 The sixth term of an arithmetic sequence is 34 . The common difference is 6 .
a Calculate the first term of the sequence.
The n th term is 316 .
b Calculate the value of n .
- 7 The first term of an arithmetic sequence is 8 and the common difference is 7 . The n th term is 393 . Find the value of n .
- 8 Here is a finite sequence.
 $-5 \quad -1 \quad 3 \quad 7 \quad 11 \quad \dots \quad 75$
a Write down the value of the common difference.
b Find the 13th term.
c Find the number of terms in the sequence.
- 9 Here is a finite sequence.
 $8 \quad 10.5 \quad 13 \quad 15.5 \quad \dots \quad 188$
a Write down the value of the common difference.
b Find the 12th term.
c Find the number of terms that the sequence has.
- 10 The n th term of a sequence is given by the formula $u_n = 12 + 7d$.
a Write down the first two terms.
b Write down the common difference.
c Find the 25th term.

Consecutive means the two terms are next to one another.

The sum of the first n terms of an arithmetic sequence

The sum of the first n terms of an arithmetic sequence is called an **arithmetic series** and is written as S_n .

$$S_n = u_1 + u_2 + u_3 + u_4 + \dots + u_n$$

Carl Friedrich

Gauss (1777–1855)

is often said to have been the greatest mathematician of the 19th century. Find out how Gauss worked out the sum of the first 100 integers.