

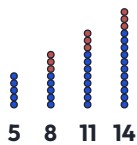


Finding the nth term of a sequence

The nth term is a rule that gives any term of a sequence straight from its position, n . For a sequence that goes up or down by the same amount each time, the rule is always (that amount) $\times n$, plus or minus a fixed number.

Find the rule for 5, 8, 11, 14, ... in four steps

1 Difference



each term adds the same amount:
the red dots

- it goes up by 3 each time

2 Times n

$$3n$$

- write the difference in front of n
- $3n$

3 Fix the gap

$$+ 2$$

- $3 \times 1 = 3$, but the first term is 5
- so add 2

4 Rule and test

$$3n + 2$$

- $3n + 2$
- check: $n = 4$ gives $12 + 2 = 14 \checkmark$

Worked example

Find the nth term of 7, 12, 17, 22, ...

The difference is 5, so the rule starts $5n$. When $n = 1$, $5n = 5$, but the first term is 7, so the rule is $5n + 2$.

Test it: $n = 3$ gives $15 + 2 = 17$, which is the third term. Correct.

The common mistake

"The sequence adds 3 each time, so the nth term is $n + 3$."

"Add 3" is the term-to-term rule: it only tells you how to get the next term. The nth term must give any term from its position, so for a sequence with common difference 3 the rule starts $3n$. The rule $n + 3$ describes a different sequence (4, 5, 6, 7, ...), which goes up by 1.

Test yourself

- ☐ Find the nth term of 4, 7, 10, 13, ...
- ☐ What is the 10th term of the sequence $2n + 5$?
- ☐ Is 50 a term of the sequence $3n + 2$?

Your turn

Find the nth term of 6, 10, 14, 18, ...

Find the nth term of 18, 14, 10, 6, ... (it goes down)

Next topic

Geometric sequences

thelearnden.com/year-9/maths/use-geometric-sequences/

Answers: 1. $3n + 1$. 2. 25 ($2 \times 10 + 5$). 3. Yes: $3n + 2 = 50$ gives $3n = 48$, so $n = 16$, a positive integer. 50 is the 16th term.