

Accelerating Progress: mathematics

Nth formula helpsheet

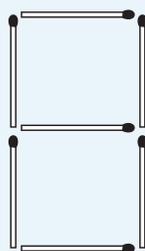


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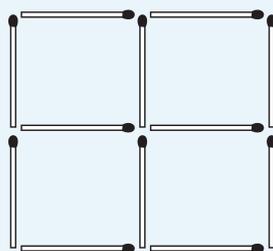
Challenge ref. 5A1

Pattern sequences

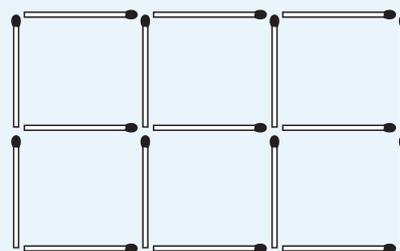
The patterns of matchsticks below make a number sequence. By counting the matches, you get the number sequence.



7 matches



12 matches



17 matches

You could continue this pattern by adding 5 each time. This could be written as a formula:

- Next term = previous term + 5

To work at a higher level you need to write an nth term formula – this is a formula that links the position in the sequence (n) to the term itself.

Generating sequences

You can use the nth term formula to write the terms of a sequence.

For example:

nth term = $2n + 1$

$$n = 1 \quad 2n + 1 = 2 \times 1 + 1 = 3$$

$$n = 2 \quad 2n + 1 = 2 \times 2 + 1 = 5$$

$$n = 3 \quad 2n + 1 = 2 \times 6 + 1 = 7$$

$$n = 4 \quad 2n + 1 = 2 \times 4 + 1 = 9$$

nth term = $2n - 2$

$$n = 1 \quad 2n - 2 = 2 \times 1 - 2 = 0$$

$$n = 2 \quad 2n - 2 = 2 \times 2 - 2 = 2$$

$$n = 3 \quad 2n - 2 = 2 \times 3 - 2 = 4$$

$$n = 4 \quad 2n - 2 = 2 \times 4 - 2 = 6$$

Finding the nth term formula

The nth term formula links the position of a number in the sequence (n) to the term itself.

For example:

Sequence = 5, 8, 11, 12...

- Difference between each term = 3
- Number before the sequence starts = first term – difference between each term = 2
- nth term formula = $3n + 2$

For the matchsticks pattern above

Sequence = 7, 12, 17...

- Difference between each term = 5
- Number before the sequence starts = first term – difference between each term = 2
- nth term formula = $5n + 2$

To continue the sequence:

$$n = 4 \quad 5n + 2 = 5 \times 4 + 2 = 22$$

$$n = 5 \quad 5n + 2 = 5 \times 5 + 2 = 27$$

$$n = 6 \quad 5n + 2 = 5 \times 6 + 2 = 32$$