

GCSE Maths: Using the nth term (Higher): answers

GCSE Maths - Sequences and nth Term - Higher - Lesson 11.5

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch11-sequences/higher/using-the-nth-term/

Exercise 11E Using the nth term Non-calculator

1 The nth term of a sequence is $3n + 1$. Is each number a term of the sequence? If it is, say which term.

(a) 31

Answer: Yes, it is the 10th term

(b) 50

Answer: No

(c) 100

Answer: Yes, it is the 33rd term

(d) 151

Answer: Yes, it is the 50th term

2 Is each number a term of the sequence given? Show how you decide.

(a) Is 100 in 7, 11, 15, 19, ...

Answer: No

(b) Is 99 in 3, 9, 15, 21, ...

Answer: Yes, it is the 17th term

(c) Is 61 in 2, 5, 8, 11, ...

Answer: No

(d) Is 87 in 10, 15, 20, 25, ...

Answer: No

3 The nth term of a sequence is $20 - 3n$. Is each number a term of the sequence?

(a) -10

Answer: Yes, it is the 10th term

(b) -11

Answer: No

(c) 2

Answer: Yes, it is the 6th term

(d) 0

Answer: No

4 Find the first term of each sequence that is greater than the given number.

- (a) nth term $7n - 4$; greater than 100

Answer: 101 (the 15th term)

- (b) nth term $4n + 1$; greater than 250

Answer: 253 (the 63rd term)

- (c) nth term $9n + 2$; greater than 500

Answer: 506 (the 56th term)

- (d) nth term $2n + 5$; greater than 1000

Answer: 1001 (the 498th term)

5 The nth term of each sequence is given. Find the first term that is less than 0.

- (a) nth term $50 - 3n$

Answer: -1 (the 17th term)

- (b) nth term $42 - 5n$

Answer: -3 (the 9th term)

- (c) nth term $100 - 7n$

Answer: -5 (the 15th term)

6 Here are the first three patterns made from matchsticks.



- (a) Find the nth term.

Answer: $3n + 1$

- (b) How many matchsticks are needed for pattern 50?

Answer: 151 matchsticks

7 Here are the first three patterns of triangles made from matchsticks.



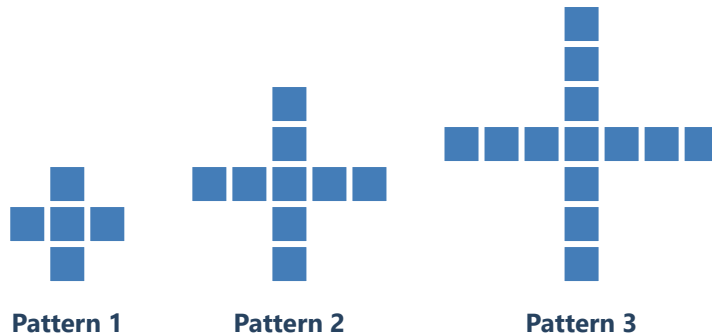
- (a) Find the nth term.

Answer: $2n + 1$

- (b) Which pattern uses exactly 71 matchsticks?

Answer: Pattern 35

8 Here are the first three tile patterns.



- (a) Find the n th term.

Answer: $4n + 1$

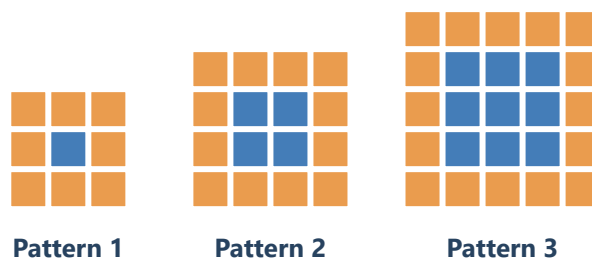
- (b) How many tiles are in pattern 20?

Answer: 81 tiles

- (c) Which pattern has 101 tiles?

Answer: Pattern 25

- 9 A square pond is surrounded by a border of paving slabs. Here are the first three patterns, with the pond in blue and the slabs in orange.



- (a) Find the n th term for the number of slabs.

Answer: $4n + 4$

- (b) How many slabs are needed to go round a pond that is 25 slabs wide (pattern 25)?

Answer: 104 orange tiles

- 10 A taxi company charges £3 plus £2 for each mile. The cost, in pounds, of a journey of n miles is $2n + 3$. Could a journey cost exactly the amount below? If so, how many miles was it?

- (a) £47

Answer: Yes, it is the 22nd term

- (b) £50

Answer: No

- 11 Tables are pushed together in a row. A row of n tables seats $4n + 2$ people. A club wants every seat to be taken. Could it be done with exactly this many people? If so, how many tables?

- (a) 100 people

Answer: No

- (b) 102 people

Answer: Yes, it is the 25th term

- 12 The n th term of a sequence is $11n + 5$. Find the largest term of the sequence that is less than 300.

Answer: 291 (the 26th term)

- 13 The n th term of a sequence is $6n - 2$. Explain why none of the terms is a multiple of 3.

Answer: Every term is 1 less than a multiple of 3 ($6n$ is a multiple of 3, and subtracting 2 leaves remainder 1).

- 14 Find the n th term of each arithmetic sequence from the two terms given.

- (a) The 3rd term is 11 and the 7th term is 27

Answer: $4n - 1$

- (b) The 2nd term is 5 and the 6th term is 21

Answer: $4n - 3$

- (c) The 4th term is 20 and the 9th term is 5

Answer: $-3n + 32$

- (d) The 5th term is 12 and the 8th term is 21

Answer: $3n - 3$

- 15 For each pair of sequences, find the position where they have the same term, or show that there is no such position.

- (a) $5n + 3$ and $8n - 12$

Answer: Position 5, where both terms are 28

- (b) $4n + 1$ and $6n - 5$

Answer: Position 3, where both terms are 13

- (c) $3n + 7$ and $5n + 2$

Answer: No

- 16 The n th term of a sequence is $2n + 1$. Explain why every term is an odd number. Hence show that no pattern of triangles made from matchsticks (3, 5, 7, 9, ... matchsticks) can use exactly 100 matchsticks.

Answer: $2n$ is even, so $2n + 1$ is odd. 100 is even, so it cannot be a term.