

GCSE Maths: Quadratic sequences (Higher): answers

GCSE Maths - Sequences and nth Term - Higher - Lesson 11.8

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/quadratic-sequences/

Exercise 11H Quadratic sequences Non-calculator

1 Find the nth term of each quadratic sequence.

(a) 3, 8, 15, 24, 35, ...

Answer: $n^2 + 2n$

(b) 5, 8, 13, 20, 29, ...

Answer: $n^2 + 4$

(c) 2, 8, 16, 26, 38, ...

Answer: $n^2 + 3n - 2$

(d) 5, 7, 11, 17, 25, ...

Answer: $n^2 - n + 5$

(e) 6, 13, 22, 33, 46, ...

Answer: $n^2 + 4n + 1$

(f) 0, 3, 8, 15, 24, ...

Answer: $n^2 - 1$

2 Find the nth term of each quadratic sequence.

(a) 6, 15, 28, 45, 66, ...

Answer: $2n^2 + 3n + 1$

(b) 6, 14, 28, 48, 74, ...

Answer: $3n^2 - n + 4$

(c) 1, 13, 33, 61, 97, ...

Answer: $4n^2 - 3$

(d) 7, 18, 33, 52, 75, ...

Answer: $2n^2 + 5n$

(e) 6, 23, 50, 87, 134, ...

Answer: $5n^2 + 2n - 1$

(f) 4, 13, 28, 49, 76, ...

Answer: $3n^2 + 1$

3 Find the n th term of each sequence. The second difference is negative, or a is a fraction.

(a) 12, 19, 24, 27, 28, ...

Answer: $-n^2 + 10n + 3$

(b) 18, 12, 2, -12, -30, ...

Answer: $-2n^2 + 20$

(c) 1, 3, 6, 10, 15, ...

Answer: $\frac{1}{2}n^2 + \frac{1}{2}n$

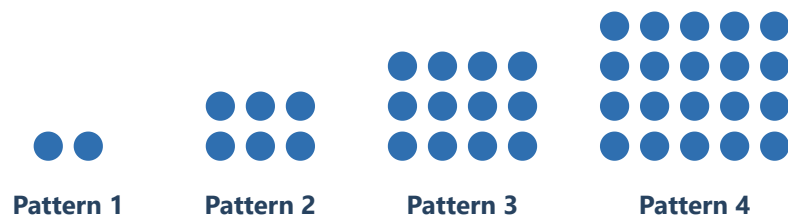
(d) 3, 6, 10, 15, 21, ...

Answer: $\frac{1}{2}n^2 + \frac{3}{2}n + 1$

(e) 13, 18, 17, 10, -3, ...

Answer: $-3n^2 + 14n + 2$

4 Here are the first four patterns of dots.



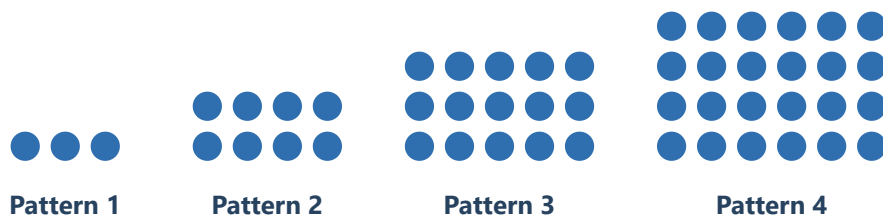
(a) Find the n th term for the number of dots.

Answer: $n^2 + n$

(b) How many dots are in pattern 15?

Answer: 240 dots

5 Here are the first four patterns of dots.



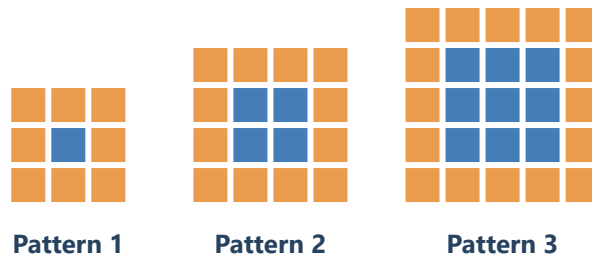
(a) Find the n th term.

Answer: $n^2 + 2n$

(b) Which pattern has exactly 80 dots?

Answer: Pattern 8

- 6 A square pond (blue) is surrounded by a path (orange). The pictures show the first three patterns. The total number of tiles, blue and orange together, is counted.



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

Answer: $n^2 + 4n + 4$

- (b) How many tiles are there in total in pattern 12?

Answer: 196 tiles (blue and orange together)

- 7 For each quadratic sequence, find the n th term and then the term asked for.

- (a) 4, 10, 20, 34, 52, ... Find the 10th term.

Answer: n th term = $2n^2 + 2$; 10th term = 202

- (b) 2, 8, 18, 32, 50, ... Find the 12th term.

Answer: n th term = $2n^2$; 12th term = 288

- (c) 0, 3, 8, 15, 24, ... Find the 20th term.

Answer: n th term = $n^2 - 1$; 20th term = 399

- 8 Is each number a term of the sequence with the given n th term? If so, say which term.

- (a) $n^2 + 3$: is 52 a term?

Answer: Yes, it is the 7th term

- (b) $n^2 + 3$: is 50 a term?

Answer: No

- (c) $n^2 + 2n$: is 80 a term?

Answer: Yes, it is the 8th term

- (d) $2n^2 + 1$: is 99 a term?

Answer: Yes, it is the 7th term

- (e) $n^2 + 2n$: is 79 a term?

Answer: No

- (f) $3n^2 - 2$: is 73 a term?

Answer: Yes, it is the 5th term

- 9 Sam says the n th term of 2, 6, 12, 20, ... is $4n - 2$. Show that Sam is wrong and find the correct n th term.

Answer: Sam is wrong. The n th term is $n^2 + n$.

10 Show that the n th term of the sequence 2, 5, 10, 17, 26, ... is $n^2 + 1$.

Answer: Shown: $n^2 + 1$ gives 2, 5, 10, 17, 26.

11 The n th term of a sequence is $n^2 + n$. Show that every term of the sequence is an even number.

Answer: $n^2 + n = n(n + 1)$. One of n and $n + 1$ is even, so the product is even.

12 Show that the difference between the $(n + 1)$ th square number and the n th square number is $2n + 1$.

Answer: $(n + 1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1$

13 The n th term of a sequence is $n^2 - 4n + 7$. Work out the first five terms. Which is the smallest term?

Answer: 4, 3, 4, 7, 12; the smallest term is 3 (the 2nd term)

14 The first four terms of a quadratic sequence are 5, 12, 23, 38.

(a) Find the n th term.

Answer: $2n^2 + n + 2$

(b) Is 500 a term of this sequence? Show how you decide.

Answer: No