



Quadratic sequences

About 50 minutes No calculator 44 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

A1 Needed today [2 marks] **A2** Last lesson [2 marks]

Find the first term of the sequence 10, 19, 28, 37, ... that is greater than 248.

Answer

A geometric sequence has positive terms. Its 3rd term is 12 and its 5th term is 48. Find its 2nd term.

Answer

A3 Key Stage 3 [2 marks] **A4** Key Stage 3 [2 marks]

Write 420 g : 0.18 kg as a ratio in its simplest form.

Answer

How long does it take to travel 100 km at 40 km/h? Give your answer in hours and minutes.

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Find the n th term of the sequence 6, 13, 24, 39, 58, ...

Hint Halve the second difference to get the number in front of n^2 . Subtract that many n^2 from each term, then find the linear rule for what is left.

B1 Find the n th term of the sequence 4, 9, 20, 37, 60, ... [3 marks]

Answer

EXAMPLE 2

The n th term of a sequence is $n^2 + 2n - 5$. Which term is equal to 115?

Hint Set the n th term equal to 115, rearrange to equal 0 and factorise. A position cannot be negative.

B2 The n th term of a sequence is $n^2 + 5n - 2$. Which term is equal to 124? [3 marks]

Answer

C Practice

C1 Show that 5, 9, 15, 23, 33, ... is a quadratic sequence, and work out the next term. [2 marks]

Answer

C2 Find the n th term of the sequence 14, 17, 22, 29, ... [2 marks]

Answer

C3 Find the n th term of the sequence 8, 32, 72, 128, ... [2 marks]

Answer

C4 Is 200 a term of the sequence with n th term $2n^2 - 2$? You must show your working. [2 marks]

C5 The n th term of a sequence is $n^2 + 8n$. Find the position of the first term that is greater than 300. [2 marks]

Answer

C6 The first three terms of a quadratic sequence are 5, 13, 27. Work out the 6th term. You must show your working. [3 marks]

Answer

D Exam-style questions

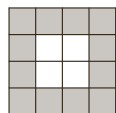
D1 Here are the first five terms of a sequence: 15, 18, 23, 30, 39. Leo says, "The n th term is $3n + 12$, because the first difference is 3." [3 marks]

Explain why Leo is wrong. Find the correct n th term.

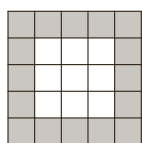
- D2** The diagram shows the first three patterns in a sequence. Pattern n is a square of $n \times n$ white tiles with a border of grey tiles all the way round it.



Pattern 1



Pattern 2



Pattern 3

- (a) Find an expression, in terms of n , for the total number of tiles in pattern n . [2 marks]

Answer

- (b) Which is the first pattern with more white tiles than grey tiles? You must show your working. [3 marks]

Answer

- (c) One pattern uses 400 tiles in total. How many of them are grey? [2 marks]

Answer

Total for D2: 7 marks

- D3** A quadratic sequence has n th term $2n^2 + bn + c$. Its first term is 7 and its second term is 16. Work out the 5th term of the sequence. You must show your working. [4 marks]

Answer

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Sequence A has n th term $n^2 + 10$. Sequence B has n th term $7n$. For how many values of n is the n th term of B greater than the n th term of A? [3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write out the first six terms of each sequence and compare them.
- Hint 2** The terms are equal when $n^2 + 10 = 7n$, which is $n^2 - 7n + 10 = 0$.
- Hint 3** $(n - 2)(n - 5) = 0$. B is bigger only between $n = 2$ and $n = 5$, which is $n = 3$ and $n = 4$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can show a sequence is quadratic and find its n th term. ☐ ☐ ☐

I can use an n th term to find a term, a position, or show a number is not a term. ☐ ☐ ☐

I can find a quadratic rule from a pattern or from given terms. ☐ ☐ ☐