

Y9 Maths Knowledge Organiser Topic 7: Sequences

<p>What must I be able to do?</p> <p>You may need to revise the following:</p> <ul style="list-style-type: none"> • Year 8 Topic 5: Sequences <p>Recap content:</p> <ul style="list-style-type: none"> □ Generate sequences given the nth term <ul style="list-style-type: none"> ➤ Mathswatch 37, 102 (GCSE) □ Find the nth term of a linear sequence <ul style="list-style-type: none"> ➤ Mathswatch 103 (GCSE) □ Find the nth term from practical problems involving sequences <ul style="list-style-type: none"> ➤ Mathswatch 103 (GCSE) 	<p>Key vocabulary</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Arithmetic sequence</td> <td style="padding: 5px;">A sequence made by <u>adding</u> (or subtracting) the <u>same amount</u> each time. The amount added each time is called the <u>difference</u>.</td> </tr> <tr> <td style="padding: 5px;">Fibonacci sequence</td> <td style="padding: 5px;">A sequence starting with 0 and 1 where each term in the sequence is the <u>sum of the 2 terms before it</u>.</td> </tr> </table>	Arithmetic sequence	A sequence made by <u>adding</u> (or subtracting) the <u>same amount</u> each time. The amount added each time is called the <u>difference</u> .	Fibonacci sequence	A sequence starting with 0 and 1 where each term in the sequence is the <u>sum of the 2 terms before it</u> .
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Fibonacci sequence

The classic Fibonacci sequence starts 0, 1, 1, 2, 3, 5, 8, 13, 21 ...

After the first 2 terms, the next one is the sum of the 2 previous terms. So the next term would be $13 + 21 = 34$.

Exam style question

The first term of a sequence is 12.

Other terms of the sequence are found by using the rule "double the previous term and subtract 3"

(a) Work out the second term and the third term of this sequence.

Answer: $12 \times 2 - 3 = 21$. $21 \times 2 - 3 = 39$

Here are the first three terms of an arithmetic sequence.

7 4 1

(b) Find an expression, in terms of n, for the nth term of this sequence.

Answer: The sequence goes down in 3s, so must be related to the $-3x$ table and starts with $-3n$.

Sequence 7 4 1
 $-3x$ table $+10$ $+10$ $+10$
 -3 -6 -9 Always plus 10 so the nth term is $-3n + 10$

The nth term of a different arithmetic sequence is given by the expression $2n + 5$

(c) (i) Find the 15th term of the sequence.

Answer: $n = 15$, so $2 \times 15 + 5 = 35$

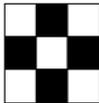
(ii) Is 87 a term of this sequence? Give a reason for your answer.

Answer: $2n + 5 = 87$
 $2n = 82$
 $n = 41$ Yes it is in the sequence as n is an integer.

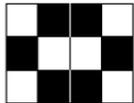
Unusual questions

A sequence of patterns uses black squares and white squares.

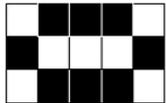
Here are the first three patterns.



Pattern 1



Pattern 2



Pattern 3

a) Write an expression for the number of black squares in Pattern n.

Answer: The black squares go in the sequence

4, 6, 8, ...

This goes up by 2 each time. So the nth term is related to the $2x$ table and starts with $2n$.

Sequence 4, 6, 8
 $2x$ table $+2$ $+2$ $+2$
 2 4 6

Always plus 2 so the nth term is $2n + 2$

b) Will the number of black squares always be even? Give a reason for your answer

Answer: As the sequence of black squares starts with 4 it starts with an even number. If I add 2 to an even number it will always make another even number so, yes the number of black squares is always even.