Hillcrest Mathematics Knowledge Organiser

53 - SEQUENCES

Finding the nth Term of a Linear Sequence

This method works for linear sequences — ones with a common difference (where the terms increase or decrease by the same amount each time). Linear sequences are also known as arithmetic sequences.

EXAMPLE: Find an expression for the nth term of the sequence that starts 5, 8, 11, 14, ...

n:	1	2	3	4
term:	5	8	11	14
		+3	+3	+3
3n:	3	6	9	12
		+2	+2	+2	+2
term:	5	8	11	14

The common difference is 3, so '3n' is in the formula.

You have to + 2 to get to the term.

So the expression for the nth term is 3n + 2

1) Find the common difference — this tells you what to multiply n by. So here, 3 gives '3n'.
2) Work out what to add or subtract. So for n = 1, '3n' is 3 so add 2 to get to the term (5).
3) Put both bits together. So you get 3n + 2.

Always check your expression by putting the first few values of n back in, e.g. putting n = 1 into 3n + 2 gives 5, n = 2 gives 8, etc. which is the original sequence you were given — hooray!

Finding the nth Term of a Quadratic Sequence

A quadratic sequence has an n^2 term — the difference between the terms changes as you go through the sequence, but the difference between the differences is the same each time.

EXAMPLE: Find an expression for the nth term of the sequence that starts 10, 14, 20, 28...

n:	1	2	3	4
term:	10	14	20	28
		+4	+6	+8
			+2	+2
term:	10	14	20	28
n^2:	1	4	9	16
term − n^2:	9	10	11	12

So the expression will contain an n^2 term.

The expression for this linear sequence is n + 8

So the expression for the nth term is $n^2 + n + 8$

1) Find the difference between each pair of terms.
2) The difference is changing, so work out the difference between the differences.
3) Divide this value by 2 — this gives the coefficient of the n^2 term (here it's 2 ÷ 2 = 1).
4) Subtract the n^2 term from each term in the sequence. This will give you a linear sequence.
5) Find the rule for the nth term of the linear sequence (see above) and add this on to the n^2 term.

Nth term of a Quadratic Sequences is Higher only

Other Types of sequences: Some sequences are generated by doing something with the previous term(s) for example you may need to add the previous 2 terms together to get the next term. 1, 1, 2, 3, 5, 8... (1 + 1 = **2**) (1 + 2 = **3**) (2 + 3 = **5**) etc This is the Fibonacci sequence.

Linked Prior Topics

Solving equations, basic sequences, finding the term to term rule, writing sequences given the rule term to term rule, writing a sequence given the nth term rule.

Vocabulary

Linear sequence
Quadratic sequence
Nth term
Difference

Linked Future Topics

Using sequences to solve problems.