Quadratic Sequences

The simplest quadratic sequence is the list of square numbers and has the nth term of n^2

1, 4, 9, 16, 25, ...

These sequences have a different amount between each term but the difference between these, known as the second difference, is constant.

e.g. for the triangular numbers

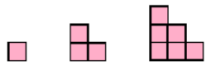
Sequence	1	3	6	10	15	21
1st difference		+2	+3	+4	+5	+6
2nd difference			+1	+1	+1	+1

The second difference is always double the amount of n^2 in the nth term i.e. if you need to find the nth term you start by halving the second difference and using that as the coefficient of n^2.

Other sequences

Fibonacci Sequence
1, 1, 2, 3, 5, 8 ...
Each term is the sum of the previous two terms

Triangular Numbers – look at the formation



1, 3, 6, 10, 15 ...

Square Numbers – look at the formation

1, 4, 9, 16...

Sequences are the repetition of a patten

Finding the nth term

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This is the 4 times table → 4, 8, 12, 16, 20....

4n

This has the same constant difference – but is 3 more than the original sequence

7, 11, 15, 19, 22

4n + 3

This is the constant difference between the terms in the sequence

This is the comparison (difference) between the original and new sequence

Nth term of a quadratic sequence

- Find the coefficient of n^2
- Multiply the value of n^2 for each term by this coefficient and subtract from the original sequence
- Find the nth term of the remaining linear sequence.

e.g. Find the nth term of the sequence 5, 7, 11, 17, 25, ...

Sequence	5	7	11	17	25
1st difference		+2	+4	+6	+8
2nd difference			+2	+2	+2

Not a linear sequence as the 1st difference is not constant.

Not a geometric sequence as there is not a constant ratio (7 ÷ 5 = 1.4 but 11 ÷ 7 = 1.57...)

As the second difference is 2, half of this gives us one lot of n^2

n	1	2	3	4	5
Sequence	5	7	11	17	25
n^2	1	4	9	16	25
Sequence minus n^2	4	3	2	1	0

The nth term of 4, 3, 2, 1, 0, ... is: $-n + 5$

This part is a linear sequence with a constant difference of -1 so we use a normal method for finding the nth term: see Position to Term Rules (nth term)

Therefore the nth term of the quadratic sequence is: $n^2 - n + 5$

Arithmetic/ Geometric sequences

Arithmetic Sequences change by a common difference. This is found by addition or subtraction between terms

Geometric Sequences change by a common ratio. This is found my multiplication/ division between terms.

Term to term rule – how you get from one term (number in the sequence) to the next term.

Position to term rule – take the rule and substitute in a position to find a term. E.g. Multiply the position number by 3 and then add 2.