

What do I need to be able to do?

- By the end of this unit you should be able to:
- Generate a sequence from term to term or position to term rules
 - Recognise arithmetic sequences and find the n th term
 - Recognise geometric sequences and other sequences that arise

Keywords

- Sequence:** items or numbers put in a pre-decided order
Term: a single number or variable
Position: the place something is located
Linear: the difference between terms increases or decreases (+ or -) by a constant value each time
Non-linear: the difference between terms increases or decreases in different amounts, or by x or \div
Difference: the gap between two terms
Arithmetic: a sequence where the difference between the terms is constant
Geometric: a sequence where each term is found by multiplying the previous one by a fixed non zero number

Linear and Non Linear Sequences

Linear Sequences – increase by addition or subtraction and the same amount each time

Non-linear Sequences – do not increase by a constant amount – quadratic, geometric and Fibonacci

- Do not plot as straight lines when modelled graphically
- The differences between terms can be found by addition, subtraction, multiplication or division

Fibonacci Sequence – look out for this type of sequence

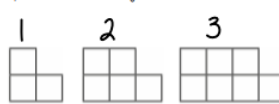
0 1 1 2 3 5 8 ...

Each term is the sum of the previous two terms



Sequence in a table and graphically

Position: the place in the sequence



Term: the number or variable (the number of squares in each image)

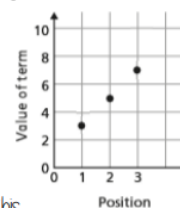
In a table

Position	1	2	3
Term	3	5	7

+2 +2

"The term in position 3 has 7 squares"

Graphically



Because the terms increase by the same addition each time this is **linear** – as seen in the graph

Sequences from algebraic rules

This is substitution

$$3n + 7$$

This will be linear - note the single power of n . The values increase at a constant rate

$$2n - 5$$

eg
 1st term = $2(1) - 5 = -3$
 2nd term = $2(2) - 5 = -1$
 100th term = $2(100) - 5 = 195$

$$3n^2 + 7$$

This is not linear as there is a power for n

Substitute the number of the term you are looking for in place of 'n'

Checking for a term in a sequence

Form an equation

Is 201 in the sequence $3n - 4$?

Algebraic rule $\rightarrow 3n - 4 = 201$ ← Term to check

Solving this will find the position of the term in the sequence. ONLY an integer solution can be in the sequence.

Complex algebraic rules

Misconceptions and comparisons

$$2n^2$$

2 times whatever n squared is

eg
 1st term = $2 \times 1^2 = 2$
 2nd term = $2 \times 2^2 = 8$
 100th term = $2 \times 100^2 = 2000$

$$(2n)^2$$

2 times n then square the answer

eg
 1st term = $(2 \times 1)^2 = 4$
 2nd term = $(2 \times 2)^2 = 16$
 100th term = $(2 \times 100)^2 = 40000$

$$n(n + 5)$$

eg
 1st term = $1(1 + 5) = 6$
 2nd term = $2(2 + 5) = 14$
 100th term = $100(100 + 5) = 10500$

You don't need to expand the expression

H Finding the algebraic rule

This is the 4 times table $\rightarrow 4, 8, 12, 16, 20, \dots$

$$4n$$

7, 11, 15, 19, 22

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

$$4n + 3$$

This is the constant difference between the terms in the sequence

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