

YEAR 7 — ALGEBRAIC THINKING

Sequences

@whisto_maths



What do I need to be able to do?

By the end of this unit you should be able to:

- Describe and continue both linear and non-linear sequences
- Explain term rules for linear sequence
- Find missing terms in a linear sequence

Keywords

Sequence: items or numbers put in a pre-decided order

Term: a single number or variable

Position: the place something is located

Rule: instructions that relate two variables

Linear: the difference between terms increases or decreases by the same value each time

Non-linear: the difference between terms increases or decreases in different amounts

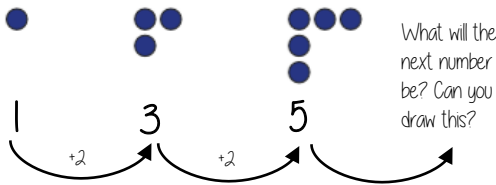
Difference: the gap between two terms

Arithmetic: a sequence where the difference between the terms is constant

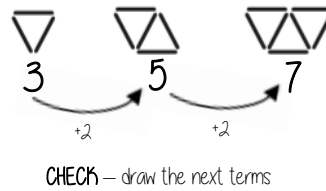
Geometric: a sequence where each term is found by multiplying the previous one by a fixed non zero number

Describe and continue a sequence diagrammatically

Count the number of circles or lines in each image



Predict and check terms



Predictions:

Look at your pattern and consider how it will increase.

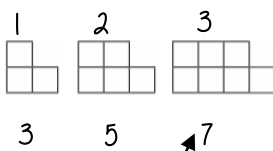
e.g How many lines in pattern 6?

Prediction - 13

If it is increasing by 2 each time - in 3 more patterns there will be 6 more lines

Sequence in a table and graphically

Position: the place in the sequence

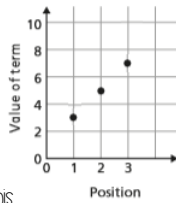


Term: the number or variable (the number of squares in each image)

Position	1	2	3
Term	3	5	7

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

Graphically



"The term in position 3 has 7 squares"



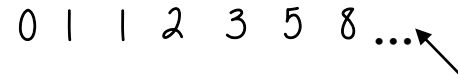
Linear and Non Linear Sequences

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



Each term is the sum of the previous two terms

Continue Linear Sequences

7, 11, 15, 19...

How do I know this is a linear sequence?

It increases by adding 4 to each term

How many terms do I need to make this conclusion?

At least 4 terms - two terms only shows one difference not if this difference is constant (a common difference)

How do I continue the sequence?

You continue to repeat the same difference through the next positions in the sequence

Continue non-linear Sequences

1, 2, 4, 8, 16 ...

How do I know this is a non-linear sequence?

It increases by multiplying the previous term by 2 - this is a geometric sequence because the constant is multiply by 2

How many terms do I need to make this conclusion?

At least 4 terms - two terms only shows one difference not if this difference is constant (a common difference)

How do I continue the sequence?

You continue to repeat the same difference through the next positions in the sequence

Explain term-to-term rule

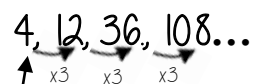
How you get from term to term

Try to explain this in full sentences not just with mathematical notation

Use key maths language - doubles, halves, multiply by two, add four to the previous term etc

To explain a whole sequence you need to include a term to begin at ...

The next term is found by tripling the previous term
The sequence begins at 4



First term

YEAR 7 — ALGEBRAIC THINKING...

Algebraic notation

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

- Be able to use inverse operations and "operation families".
- Be able to substitute into single and two step function machines.
- Find functions from expressions.
- Form sequences from expressions.
- Represent functions graphically.

Keywords

Function: a relationship that instructs how to get from an input to an output.

Input: the number/ symbol put into a function.

Output: the number/ expression that comes out of a function.

Operation: a mathematical process.

Inverse: the operation that undoes what was done by the previous operation. (The opposite operation)

Commutative: the order of the operations do not matter.

Substitute: replace one variable with a number or new variable.

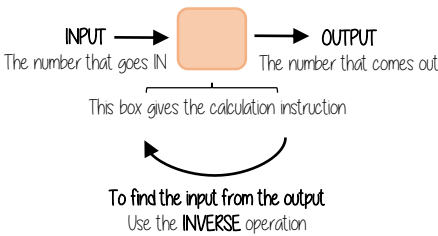
Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

Evaluate: work out.

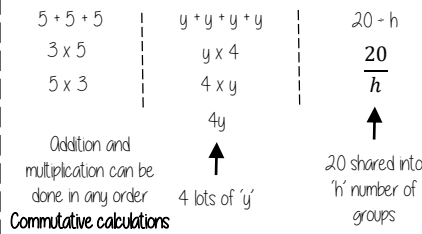
Linear: the difference between terms increases or decreases by the same value each time.

Sequence: items or numbers put in a pre-decided order.

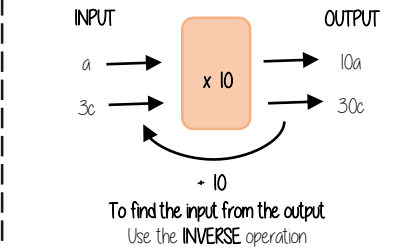
Single function machines



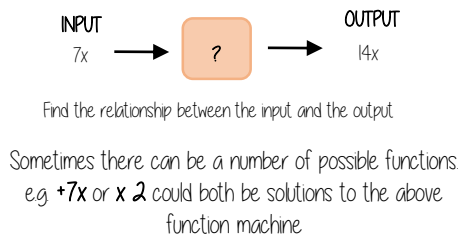
Using letters to represent numbers



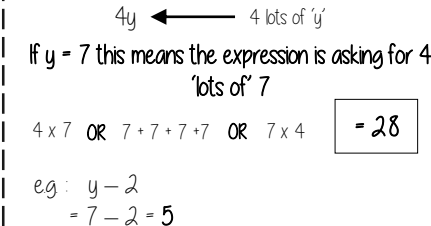
Single function machines (algebra)



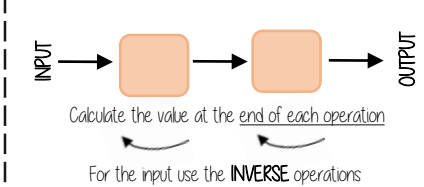
Find functions from expressions



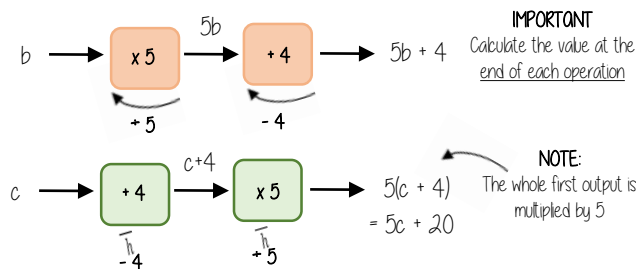
Substitution into expressions



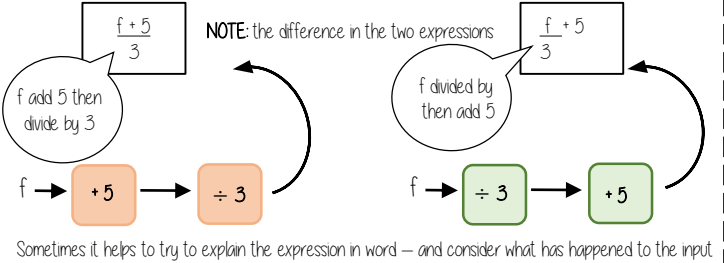
Two step function machines



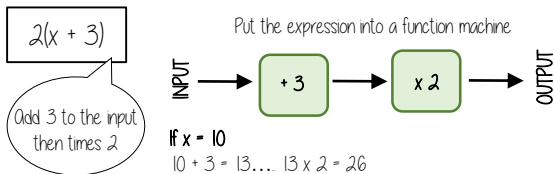
Two step function machines (algebra)



Find functions from expressions



Substitution into an expression



Representing functions graphically

Take the function and generate a sequence $2(x + 3)$



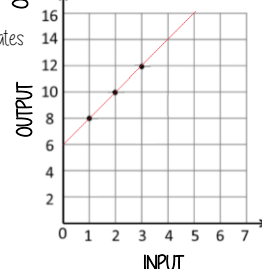
To represent graphically the input becomes x co-ordinates and the output becomes y co-ordinates

$$y = 2(x + 3)$$

INPUT (x)	1	2	3
OUTPUT (y)	8	10	12

This becomes a co-ordinate pair (2, 10) to plot on a graph

Not all graphs will be linear only those with an integer value for x. Powers and fractions generate differently shaped graphs.



NOTE: Because this is a linear graph you can predict other values

Forming a sequence

INPUT	1	2	3
OUTPUT	8	10	12

The substitution is the 'input' value. The OUTPUT becomes the sequence.