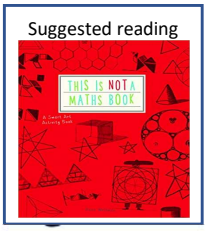
Waingels Maths

Year 7 – Algebraic Thinking

Algebraic Notation

Suggested reading



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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

INPUT → ? → OUTPUT

The number that goes IN — The number that comes out

This box gives the calculation instruction

To find the input from the output
Use the **INVERSE** operation

Using letters to represent numbers

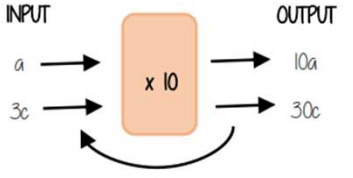
5 + 5 + 5	y + y + y + y	20 - h
3 x 5	y x 4	$\frac{20}{h}$
5 x 3	4 x y	
	4y	

Addition and multiplication can be done in any order
Commutative calculations

4y: 4 lots of 'y'

$\frac{20}{h}$: 20 shared into 'h' number of groups

Single function machines (algebra)



To find the input from the output
Use the **INVERSE** operation

Find functions from expressions

INPUT 7x → ? → OUTPUT 14x

Find the relationship between the input and the output

Sometimes there can be a number of possible functions. e.g. **+7x** or **x 2** could both be solutions to the above function machine

Substitution into expressions

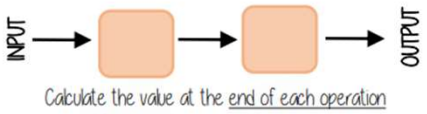
4y ← 4 lots of 'y'

If y = 7 this means the expression is asking for 4 'lots of' 7

4 x 7 **OR** 7 + 7 + 7 + 7 **OR** 7 x 4 = 28

e.g. $y - 2$
$= 7 - 2 = 5$

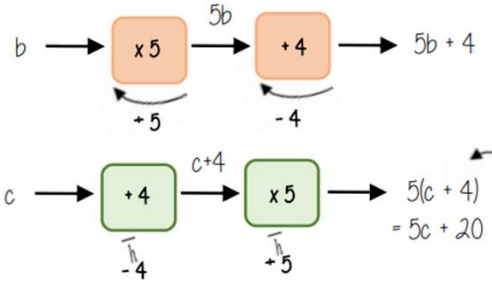
Two step function machines



Calculate the value at the end of each operation

For the input use the **INVERSE** operations

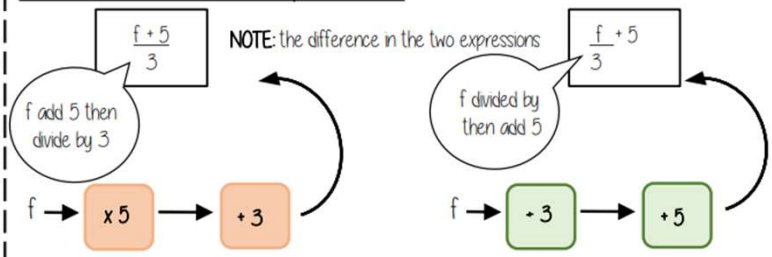
Two step function machines (algebra)



IMPORTANT
Calculate the value at the end of each operation

NOTE:
The whole first output is multiplied by 5

Find functions from expressions



Sometimes it helps to try to explain the expression in word – and consider what has happened to the input

Substitution into an expression

2(x + 3)

Add 3 to the input then times 2

Put the expression into a function machine

INPUT → + 3 → x 2 → OUTPUT

If x = 10
10 + 3 = 13... 13 x 2 = 26

Forming a sequence

2(x + 3)

INPUT	1	2	3
OUTPUT	8	10	12

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

Representing functions graphically

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

INPUT → + 3 → x 2 → OUTPUT

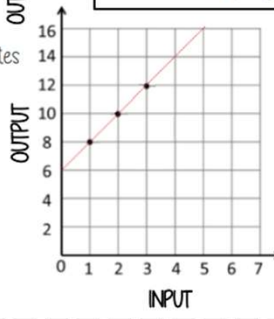
To represent graphically the input becomes x co-ordinates and the output becomes y co-ordinates

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