Term 1: Equations & Inequalities Part 1

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'

20 shared into 'h' number of groups

Single function machines (algebra)

INPUT → [x 10] → OUTPUT

a → 10a
3c → 30c

÷ 10

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

INPUT → [ ] → [ ] → OUTPUT

Calculate the value at the end of each operation

For the input use the **INVERSE** operations

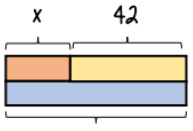
Solve one step equations (+/-)

There is more to this than just spotting the answer

$x + 42 = 59$

$x + 42 = 59$
$42 + x = 59$

$59 - x = 42$
$59 - 42 = x$



Don't forget you know how to use function machines

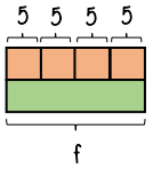
x → [+ 42] → 59
-42

Solve one step equations (x/÷)

$\frac{f}{4} = 5$

$f \div 4 = 5$
$f \div 5 = 4$

$5 \times 4 = f$
$4 \times 5 = f$



Don't forget you know how to use function machines

5 → [x 4] → f
÷ 4

Like and unlike terms

Like terms are those whose variables are he same

♡ and 3♡ are **like** terms
the variable is the same

☆ 3♡ are **unlike** terms
the variables are NOT the same

Examples and non-examples

Like terms	Un-like terms
y, 7y	y, 7x
$2x^2$, x^2	$2x^2$, $2c^2$
ab, 10ba	ab, 10a
5, -2	5, -2t

Note here ab and ba are commutative operations, so are still like terms

Equivalence

Check equivalence by substitution
e.g. m= 10

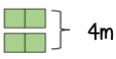
5m	2 x 2m	7m – 3m
5 x 10	2 x (2x 10)	(7x 10) – (3x 10)
= 50	= 2 x 20	= 70 – 30
	= 40	= 40

Equivalent expressions

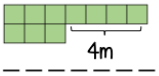
Repeat this with various values for m to check

5m

2 x 2m



7m – 3m

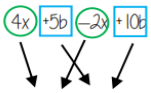


Collecting like terms ≡ symbol

The ≡ symbol means equivalent to
It is used to identify equivalent expressions

Collecting like terms
Only **like terms** can be combined

$4x + 5b - 2x + 10b$



$2x + 15b$

Common misconceptions

$2x + 3x^2 + 4x \equiv 6x + 3x^2$

Although they both have the x variable x2 and x terms are un-like terms so can not be collected