

Algebraic Notation

What do I need to be able to do?

Find the input, function and output of single and double function machines

Use diagrams and letters to generalise number operations and with function machines (one and two-step)

Find the function machine given a simple expression

Find the function machine given a two-step expression

Substitute values into one and two-step expressions

Evaluate algebraic expressions with directed number

Generate sequences given an algebraic rule

Represent one- and two-step functions graphically (inc. table of values)

Keywords & definitions:

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.

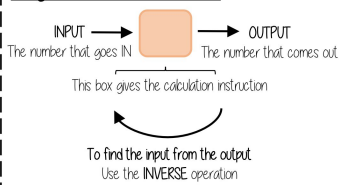
Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

Evaluate: work out

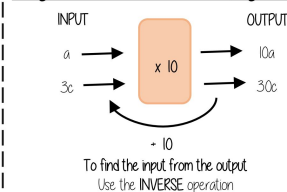
Linear: the difference between terms increases or decreases by the same value each time

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

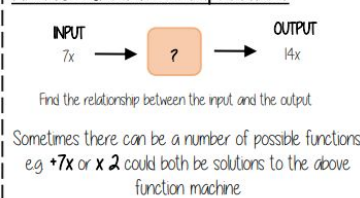
Single function machines



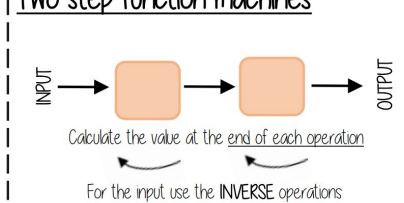
Single function machines (algebra)



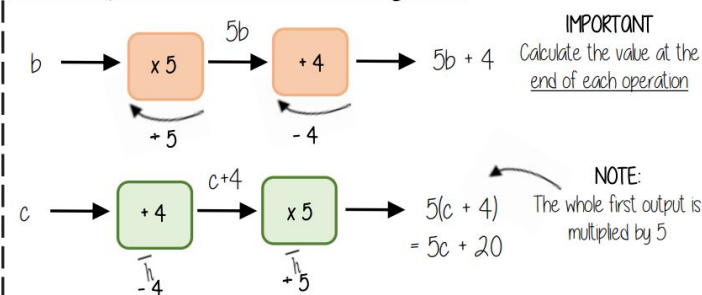
Find functions from expressions



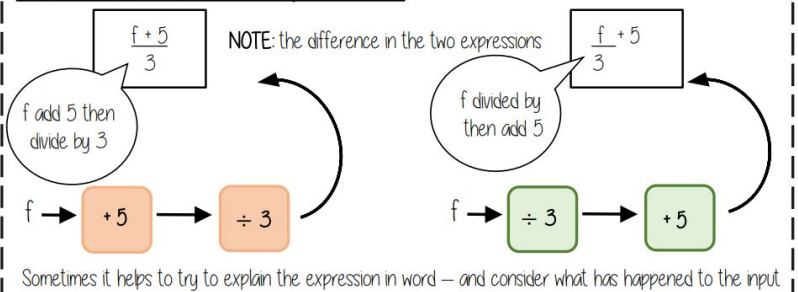
Two step function machines



Two step function machines (algebra)



Find functions from expressions



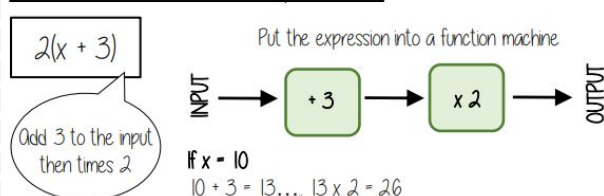
Evaluate Algebraic Expressions with Directed Number

Substitute $x = -2$ and $y = 8$ into each expression.

xy	$-2 \times 8 = -16$
$x + y$	$-2 + 8 = 6$

$y + x$	$8 + -2 = 6$
$x - y$	$-2 - 8 = -10$
$y - x$	$8 - -2 = 10$

Substitution into an expression



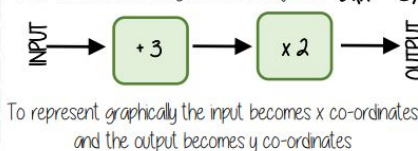
Forming a sequence

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 $2(x + 3)$

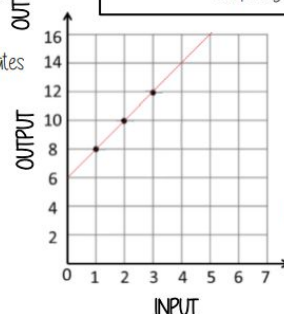


$y = 2(x + 3)$

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

Directed Number

What do I need to be able to do?

Understand and use representations of directed numbers

Order directed numbers using lines and appropriate symbols

Perform calculations that cross zero

Add directed numbers

Subtract directed numbers

Multiplication of directed numbers

Multiplication and division of directed numbers

Use a calculator for directed number calculations

Keywords & definitions:

Subtract: taking away one number from another.

Negative: a value less than zero.

Opposite: the same value with a different sign (e.g. 3 & -3)

Commutative: changing the order of the operations does not change the result

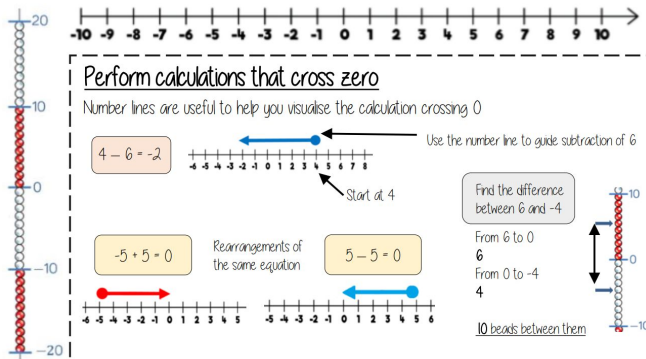
Product: multiply terms

Inverse: the opposite function

Square root: a square root of a number is a number when multiplied by itself gives the value ($\sqrt{\quad}$)

Square: a term multiplied by itself.

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

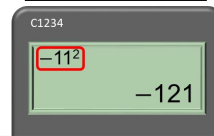


Using a calculator with Directed Numbers

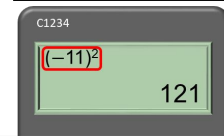
Mo and Dexter are trying to work out the square of -11 using a calculator.

Always put negatives in brackets!

Mo's calculator



Dexter's calculator



Dexter is correct.

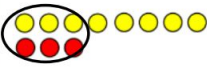
Add directed numbers

● = -1
● = 1
Representations

$$2 + -4 = -2$$

Zero pair (-1 + 1 = 0)
Two "1" left
= 2

$$8 + -3 = 5$$



Partitioning

$$8 + -3 = 5$$

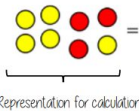
$$5 + 3 + -3 = 5$$

Partition the value to create a zero pair calculation

Generalisation
+ - = -

Subtract directed numbers

● = -1
● = 1
Representations



$$2 - 1 = 1$$

"Subtract" - means take away or remove

$$2 - -1 = 3$$



Start with the representation of 2

$$2 - -3 = 5$$



Generalisation
- - = +

Multiply/Divide directed numbers



Two representations of the same calculation

$$2 \times -3 = -6$$

Negative, Negative calculation

$$-2 \times -3$$

This is the negative of 2×-3



$$-2 \times -3 = 6$$

Divisions are the inverse operations

Ordering Directed Numbers

Remember that negative numbers are always smaller than positive numbers!

$$1) 4.5 > -4.5$$

$$2) 0.05 > -0.05$$

$$3) -\frac{1}{5} < \frac{1}{5}$$

$$4) \frac{1}{5} < -\frac{1}{5}$$

$$5) -\frac{1}{5} > -\frac{1}{2}$$

$$6) -0.25 < -0.2$$

$$7) -3 < -(-3)$$

$$-\frac{1}{2}$$

$$-0.2$$

$$-(-3)$$

Retrieval Quiz

Answers