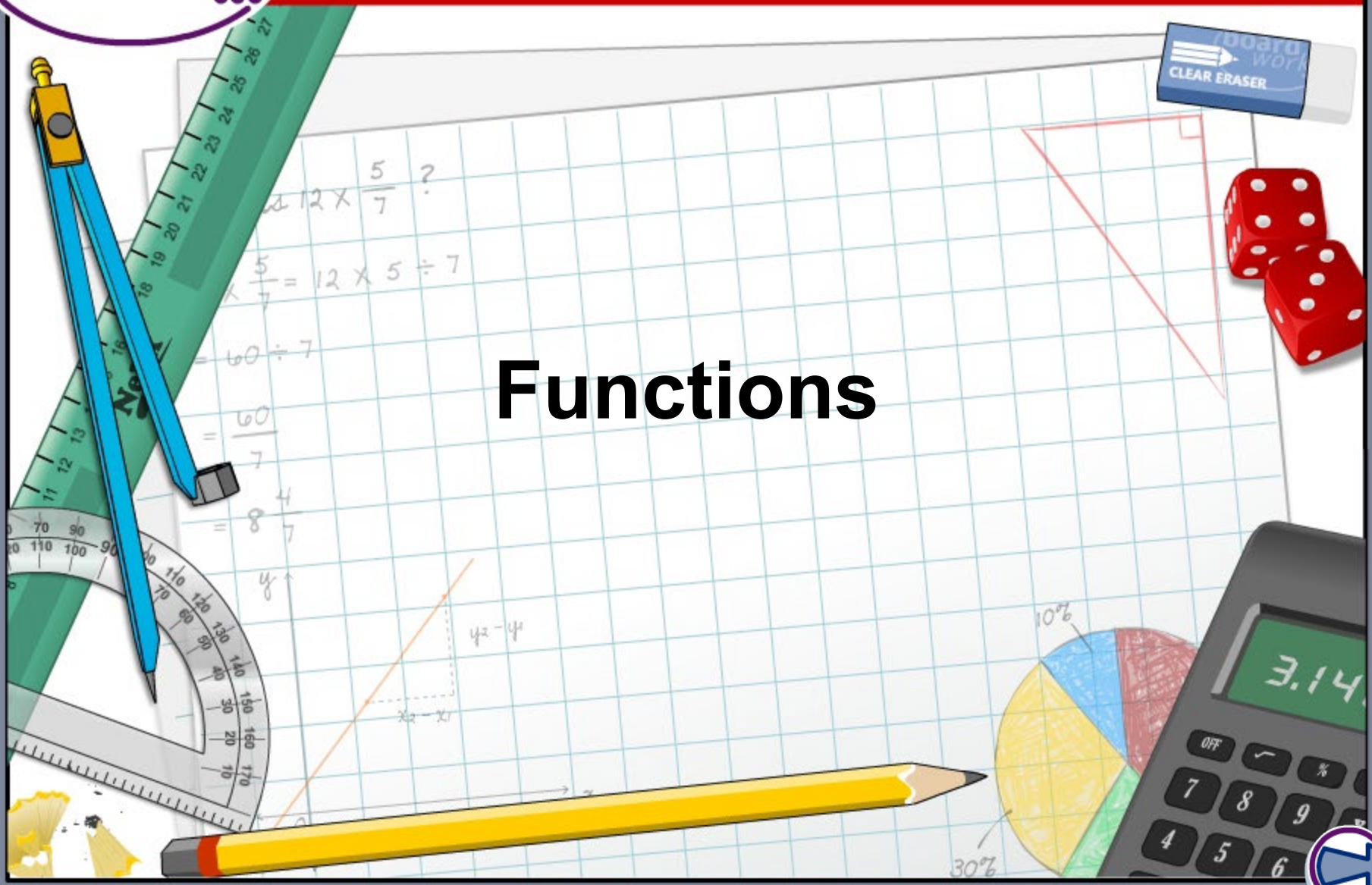


Functions

Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Introducing functions

What is a function?

A **function** is a rule, or set of operations, that converts an **input** number, x, into exactly one **output** number, y.

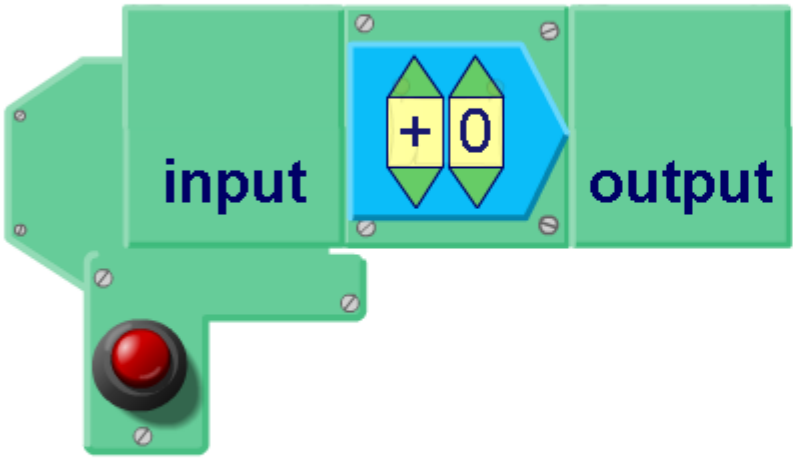
A function diagram shows how the operations performed on the input produces an output:

A function can be written as an **equation**.
For example, $y = 3x + 2$.

A function can also be written with a **mapping arrow**.
For example, $x \rightarrow 3x + 2$.

Writing functions using algebra

Use the controls to set the functions and press the red button to apply the function.



Number of machines: 1 2

Functions and coordinates

The x-coordinate and the y-coordinate in a coordinate pair can be linked by a function.

What do these coordinate pairs have in common:

(1, 3), (4, 6), (–2, 0), (0, 2), (–1, 1) and (3.5, 5.5)?

In each pair, the y-coordinate is **2 more** than the x-coordinate.

These coordinates are linked by the function:

$$y = x + 2$$

We can draw a graph of the function $y = x + 2$ by plotting points that obey this function.

Functions and tables

Given a function, we can find coordinate points that obey the function by constructing a **table of values**.

Suppose we want to plot points that obey the function:

$$y = x + 2$$

We can use a table as follows:

x	–2	–1	0	1	2	3	4
$y = x + 2$	0	1	2	3	4	5	6

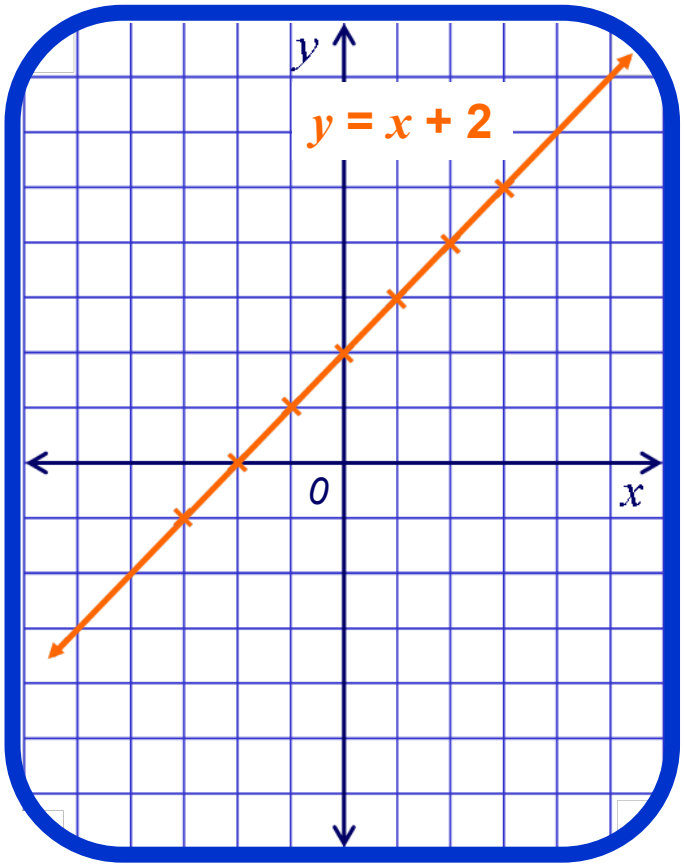
(–2, 0) (–1, 1) (0, 2) (1, 3) (2, 4) (3, 5) (4, 6)

Functions and graphs

To draw a graph of $y = x + 2$:

1) Complete a table of values:

x	–3	–2	–1	0	1	2	3
$y = x + 2$	–1	0	1	2	3	4	5



2) Plot the points on a coordinate grid.

3) Draw a line through the points.

4) Label the line.

5) Check that other points on the line fit the rule.

Plotting a graph I

Plot the graph of $y = x^2 + 2$ for values of x between –3 and 3.

We can use a table of values to generate coordinates that lie on the graph as follows:

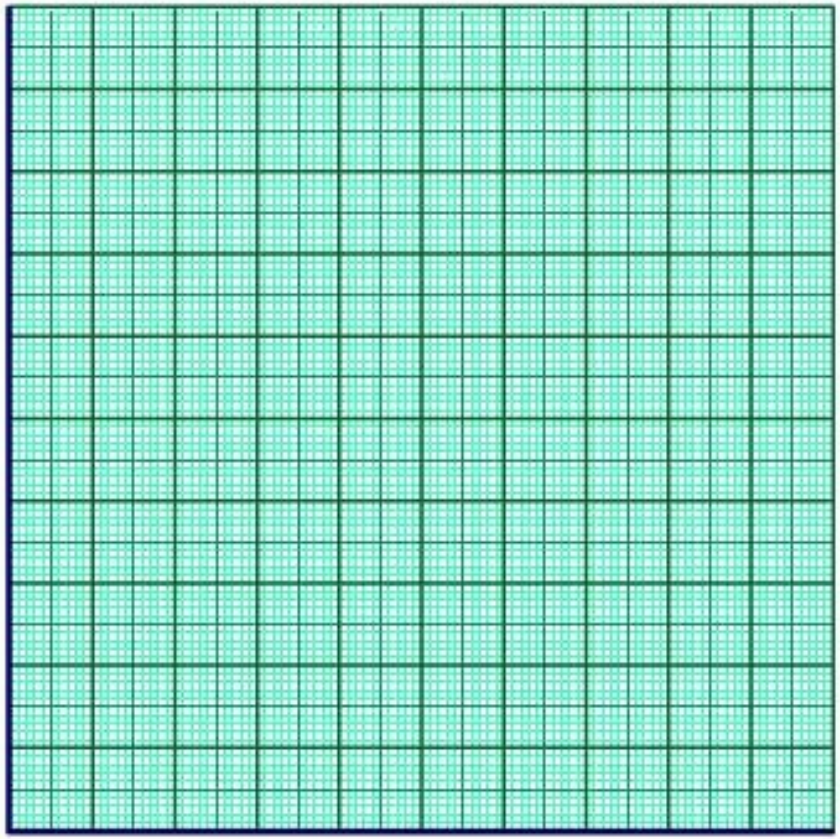
x	–3	–2	–1	0	1	2	3
$y = x^2 + 2$	11	6	3	2	3	6	11

(–3, 11) (–2, 6) (–1, 3) (0, 2) (1, 3) (2, 6) (3, 11)

Plotting a graph II

Use the data in the table below to plot the graph.

x	$y = x^2 + 2$	y
–3	$y = (-3)^2 + 2$	11
–2	$y = (-2)^2 + 2$	6
–1	$y = (-1)^2 + 2$	3
0	$y = (0)^2 + 2$	2
1	$y = (1)^2 + 2$	3
2	$y = (2)^2 + 2$	6
3	$y = (3)^2 + 2$	11

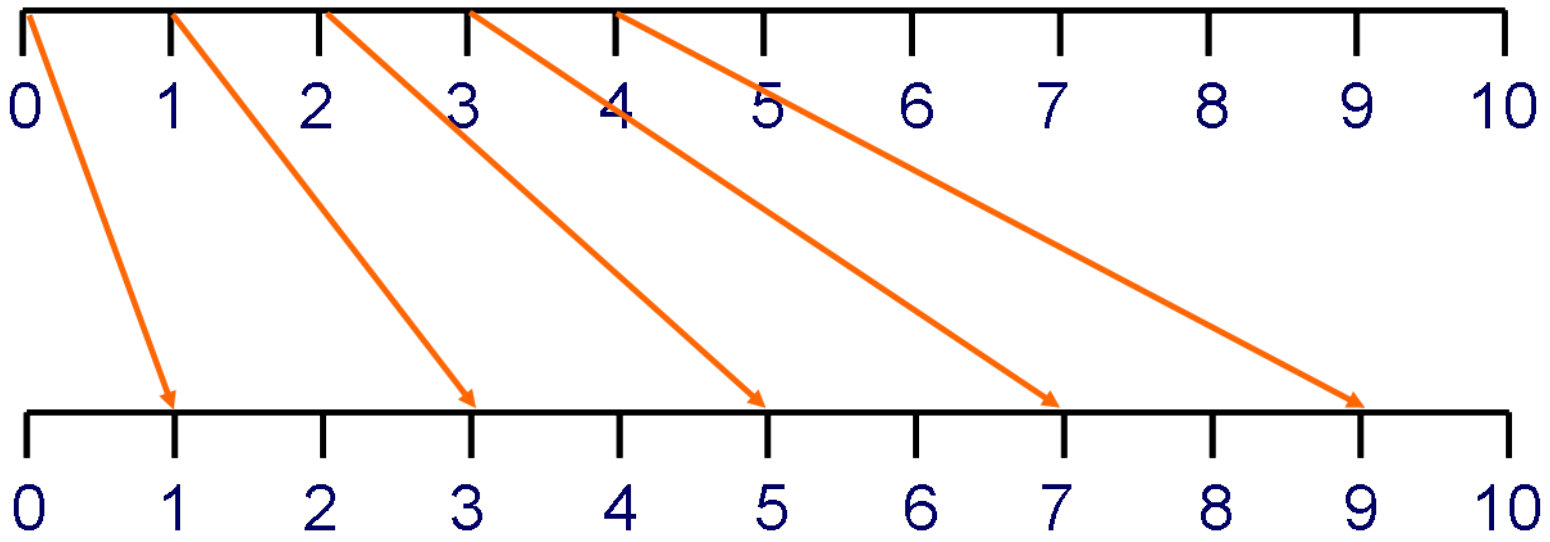


Mapping diagrams

We can show functions using mapping diagrams.

For example, we can draw a mapping diagram of $x \rightarrow 2x + 1$.

Inputs along the top can be mapped to outputs along the bottom.



Types of mapping diagrams

Mapping functions

$x \to x + c$

$x \to mx$

$x \to x$

Press the types of function to find out more about how to map each type and what we can learn from mapping functions.

Match the functions

$2x - 3 = y$

$5x - 3$

$5(3 + x) = y$

$x - 2 = y$

$\frac{x + 3}{2}$

x	y
2	25
3	30
4	35
5	40

x	y
4	5
5	7
6	9
7	11

x	y
2	1
3	2
4	3
5	4

Multiply the variable x by 5. Subtract 3.

Add 3 to the variable x. Divide by 2.