# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All

## Writing Functions and Inverse Functions



Download ActivInspire, PowerPoint and Teacher Notes from:

https://spiremaths.co.uk/inversefunctions/

| OBJECTIVE(S): | Find the inverse of a function given by two operations on a number (one multiply by, the other add/subtract) in either order. Also to be able to write, for example x2 + 3 as 2x + 3. |
|---|---|
| DESCRIPTION and OVERVIEW: | 1. Given x2 +3 as two consecutive operations on the number two, find the corresponding two operations that reverse this process. Verify it works with all other numbers.<br>2. Animation (gif) of this process including finding the inverse (term introduced).<br>3. Another inverse example for 10 through +10 and x7 showing intermediate steps.<br>4. Five examples to solve (steps shown) starting with 10. Answers given.<br>5. Example x8 +7 for x to give 8x + 7, and +3 x7 to give 7(x + 3) explained via gifs.<br>6. Five examples with answers for this process.<br>7. Five more examples with answers.<br>8. Reversing the process, starting with e.g. 5(x – 5) find the two operations: here -5 x5 as first, then a different way x5 -25. Two more with only one obvious (i.e. non-fractional) possibility.<br>9. Same as previous page. |
| EQUIPMENT: | One photocopiable master. |

# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All
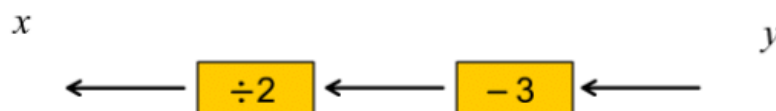
**IWB/PowerPoint Screens (most build up to finish like this)**

## Function 1

**Here is a pair of operations acting on x:**

$x$        $y$

2 ⟶ [× 2] ⟶ [+ 3] ⟶
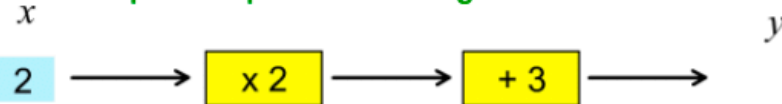
You want to find a pair of operations that will reverse this process so that it takes the y input and changes it back to 2.

$x$        $y$

⟵ [÷ 2] ⟵ [− 3] ⟵

What should go into each orange box?
Check that your entries also work if you start with another number like 10, or 5, or -2.

Click Orange boxes to Show/Hide Answers

## Function 2

**Watch how the operations work on x, then y**

$x$        $y$

[  ] ⟶ [× 2] ⟶ [+ 3] ⟶

$x$        $y$

⟵ [÷ 2] ⟵ [− 3] ⟵
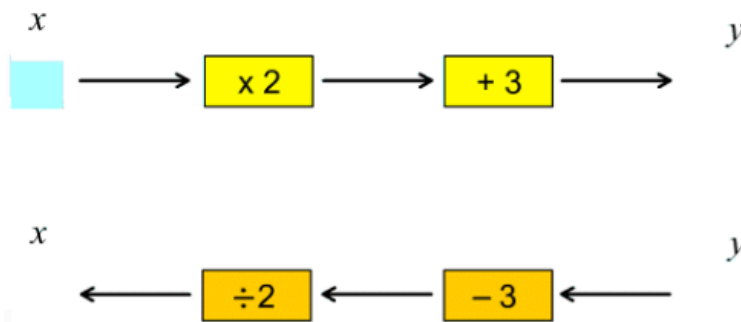
The second function undoes the effect of the first. It is the inverse of the first function.

What do you notice?

Click the blue box to Watch/Hide the animation Then click pink rectangle

# SPIRE MATHS

*Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All*

## Inverse Functions

### Find the inverse function:

$x \longrightarrow \boxed{+10} \longrightarrow \boxed{\times 7} \longrightarrow y$
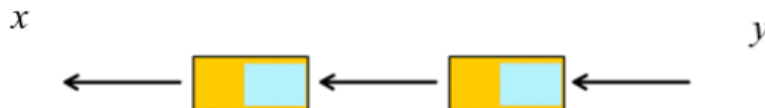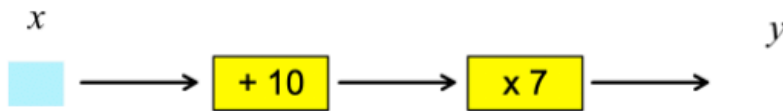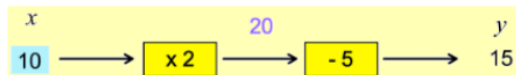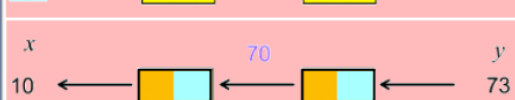
$x \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow y$

Show Answer

## Finding inverse functions

### What operation and number goes into each of the orange/blue boxes?

$x \quad\quad 70 \quad\quad y$
$10 \longrightarrow \boxed{\times 7} \longrightarrow \boxed{+3} \longrightarrow 73$

$x \quad\quad 70 \quad\quad y$
$10 \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow 73$

$x \quad\quad 5 \quad\quad y$
$10 \longrightarrow \boxed{-5} \longrightarrow \boxed{\times 2} \longrightarrow 10$

$x \quad\quad 5 \quad\quad y$
$10 \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow 10$

$x \quad\quad 90 \quad\quad y$
$10 \longrightarrow \boxed{\times 9} \longrightarrow \boxed{+4} \longrightarrow 94$

$x \quad\quad 90 \quad\quad y$
$10 \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow 94$

$x \quad\quad 20 \quad\quad y$
$10 \longrightarrow \boxed{\times 2} \longrightarrow \boxed{-5} \longrightarrow 15$

$x \quad\quad 20 \quad\quad y$
$10 \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow 15$

$x \quad\quad 19 \quad\quad y$
$10 \longrightarrow \boxed{+9} \longrightarrow \boxed{\times 7} \longrightarrow 133$

$x \quad\quad 19 \quad\quad y$
$10 \longleftarrow \boxed{\;} \longleftarrow \boxed{\;} \longleftarrow 133$

Click orange rectangles
to Show/Hide answers.

# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All

## Writing functions 1

### How do you think the functions below should be written?

$$x \longrightarrow \boxed{\times 8} \longrightarrow \boxed{+ 7} \longrightarrow \quad y$$

$$x \longrightarrow \boxed{\times 8} \xrightarrow{8x} \boxed{+ 7} \longrightarrow 8x + 7 \quad y$$

$$x \longrightarrow \boxed{+ 3} \longrightarrow \boxed{\times 7} \longrightarrow \quad y$$

$$x \longrightarrow \boxed{+ 3} \xrightarrow{x + 3} \boxed{\times 7} \longrightarrow 7(x + 3) \quad y$$
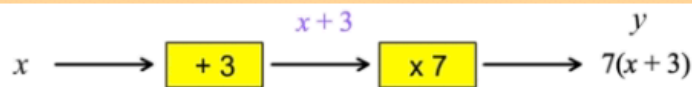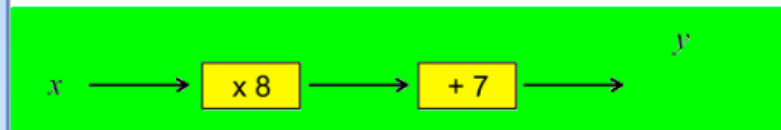
Show/Hide Answer 1

Show/Hide Answer 2

What do you notice?

## Writing functions 2

### How do you think the functions below should be written?

$$x \longrightarrow \boxed{\times 9} \longrightarrow \boxed{- 2} \longrightarrow 9x - 2 \quad y$$

$$x \longrightarrow \boxed{- 7} \longrightarrow \boxed{\times 6} \longrightarrow 6(x - 7) \quad y$$

$$x \longrightarrow \boxed{\times 4} \longrightarrow \boxed{+ 7} \longrightarrow 4x + 7 \quad y$$

$$x \longrightarrow \boxed{- 9} \longrightarrow \boxed{\times 3} \longrightarrow 3(x - 9) \quad y$$

$$x \longrightarrow \boxed{\times 4} \longrightarrow \boxed{+ 5} \longrightarrow 4x + 5 \quad y$$

Click blue rectangles to
Show/Hide answers.

# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All

## Writing functions 3

### How do you think the functions below should be written?

$x \longrightarrow \boxed{+\ 4} \longrightarrow \boxed{\times\ 3} \longrightarrow$ $y$ $3(x+4)$

$x \longrightarrow \boxed{+\ 8} \longrightarrow \boxed{\times\ 3} \longrightarrow$ $y$ $3(x+8)$

$x \longrightarrow \boxed{\times\ 9} \longrightarrow \boxed{+\ 3} \longrightarrow$ $y$ $9x+3$

$x \longrightarrow \boxed{+\ 8} \longrightarrow \boxed{\times\ 9} \longrightarrow$ $y$ $9(x+8)$

$x \longrightarrow \boxed{\times\ 6} \longrightarrow \boxed{+\ 3} \longrightarrow$ $y$ $6x+3$

Click blue rectangles to
Show/Hide answers.

## Writing functions 4

### Solve these by placing an operation and number into each of the empty boxes.

$x \longrightarrow 5(x-5)$

$x \longrightarrow \boxed{-\ 5} \longrightarrow \boxed{\times\ 5} \longrightarrow y$

$x \longrightarrow 5(x-5)$    A different way

$x \longrightarrow \boxed{\times\ 5} \longrightarrow \boxed{-\ 25} \longrightarrow y$

$x \longrightarrow 9x-4$

$x \longrightarrow \boxed{\times\ 9} \longrightarrow \boxed{-\ 4} \longrightarrow y$

$x \longrightarrow 8x+6$

$x \longrightarrow \boxed{\times\ 8} \longrightarrow \boxed{+\ 6} \longrightarrow y$

Are there different ways to write
the bottom two functions?

Click blue rectangles to
Show/Hide answers.

# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All

## Writing functions 5

**Solve these by placing an operation and number into each of the empty boxes.**

$x \longrightarrow 4x + 4$

$x \longrightarrow \boxed{\times\ 4} \longrightarrow \boxed{+\ 4} \longrightarrow y$

$x \longrightarrow 4x + 4$     A different way

$x \longrightarrow \boxed{+\ 1} \longrightarrow \boxed{\times\ 4} \longrightarrow y$

$x \longrightarrow 2(x - 7)$

$x \longrightarrow \boxed{-\ 7} \longrightarrow \boxed{\times\ 2} \longrightarrow y$

$x \longrightarrow 6x + 5$

$x \longrightarrow \boxed{\times\ 6} \longrightarrow \boxed{+\ 5} \longrightarrow y$

Are there different ways to write the bottom two functions?

Click blue rectangles to Show/Hide answers.

# SPIRE MATHS

Stimulating, Practical, Interesting, Relevant, Enjoyable Maths For All

## Inverse Functions Worksheet 1

Input, x → ☐ → ☐ → Output, y

☐ ← ☐ ← ☐ ← ☐

Input, x → ☐ → ☐ → Output, y

☐ ← ☐ ← ☐ ← ☐

Input, x → ☐ → ☐ → Output, y

☐ ← ☐ ← ☐ ← ☐

Input, x → ☐ → ☐ → Output, y

☐ ← ☐ ← ☐ ← ☐