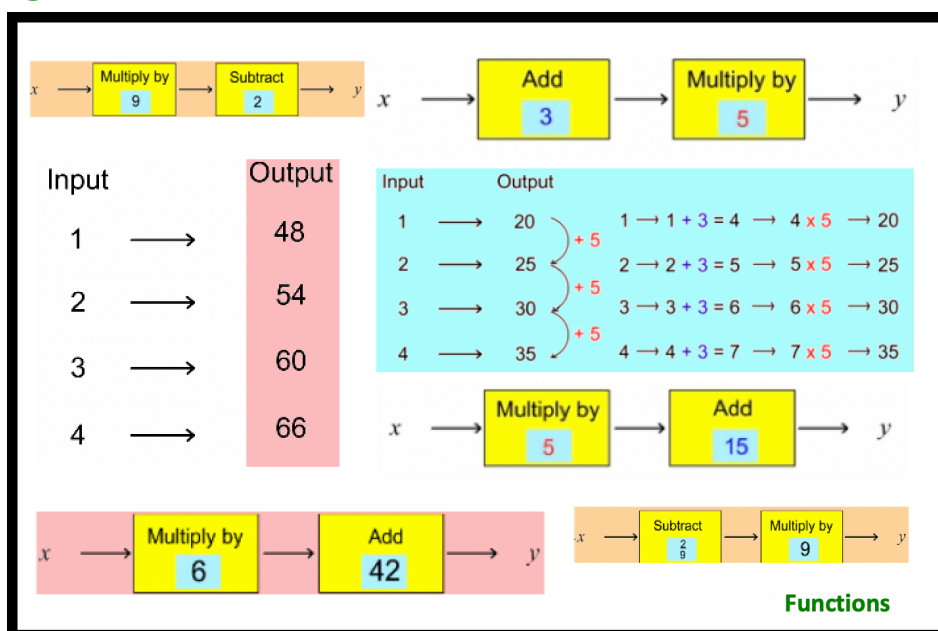


SPIRE MATHS

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

Functions



Download ActivInspire, PowerPoint and Teacher Notes from: <https://spiremaths.co.uk/functions/>

<p>OBJECTIVE(S):</p> <p>DESCRIPTION and OVERVIEW:</p> <p>EQUIPMENT:</p>	<p>Input – Output tables for two operations to understand how they determine the regular increment and the initial zero value (as a precursor to gradient-intercept work of straight lines..</p> <ol style="list-style-type: none"> Evaluate 4 inputs (not in order) for $x5$ then -4. What do you notice? Animated work through of answer. Repeat for inputs 1 to 4 for $x8$ then -7. Answers shown. Ask what do you notice (outputs differ by 8 and they are 8 times table less 1). Five questions for inputs 1 to 4. Solutions shown. Find the two operations (from Add, Subtract and Multiply) for inputs 1 to 4 and outputs 8, 10, 12 and 14. Two answers given: $+3, x2$; and $x2 + 6$. Repeat with outputs 1, 8, 15, 22. Two answers: $x7 + 6$; and $-6/7 x6$. You may decide not to focus particularly on fraction answers. Five given output questions. Each has two answers: first set are multiply then add/subtract all integers only; second set are add/subtract then multiply; and some are fractions or decimal. Solve inputs 1 to 4, outputs 20, 25, 30 and 35. Two animations show $x5 + 15$ and then $+3 x5$. Question to establish that $5x + 15 = 5(x + 3)$. Review to show that this is always case, but sometimes fractions make it harder to see the second solution. Note also that in these cases, with inputs separated by 1, the increase gives the multiply value and input 0 gives the add/subtract value (the gradient and the intercept). <p>Photocopiable master containing a template for pupils to work with input and output values and 'two operation machines'.</p>
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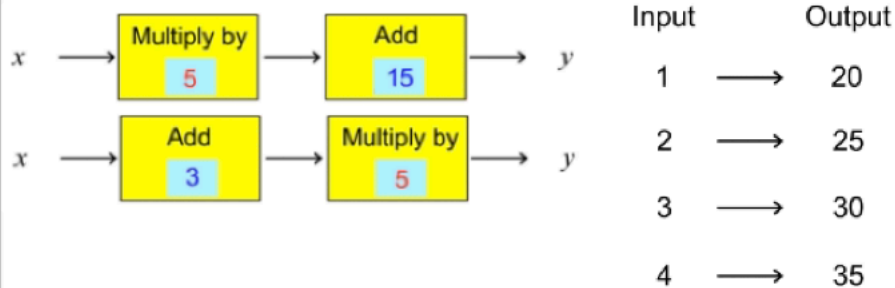
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IWB/PowerPoint Screens (most build up to finish like this)

A More Open Approach

Both these double machines produce the same output



1. Is this always possible for any similar regular increases as shown?
2. What else can you find out?

[Go to Results page](#)

Function Machines 1

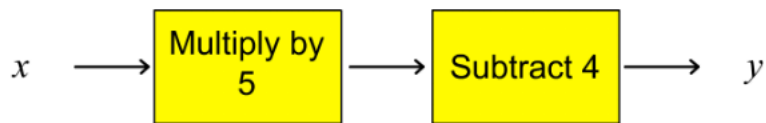
The next pages offer a more guided approach

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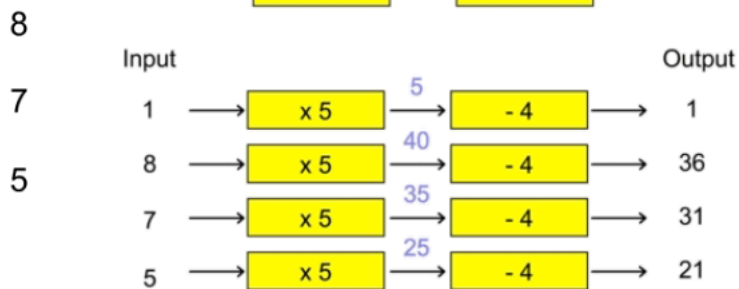
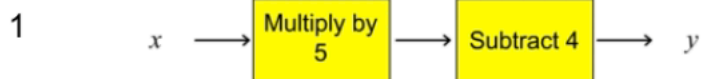
Function Machines 1

Evaluate:



Input

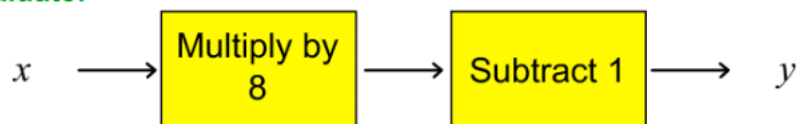
Output



Show Answer

Function Machines 2

Evaluate:



Input

Output

1 \rightarrow 7

2 \rightarrow 15

3 \rightarrow 23

4 \rightarrow 31

x	1	2	3	4
y	7	15	23	31

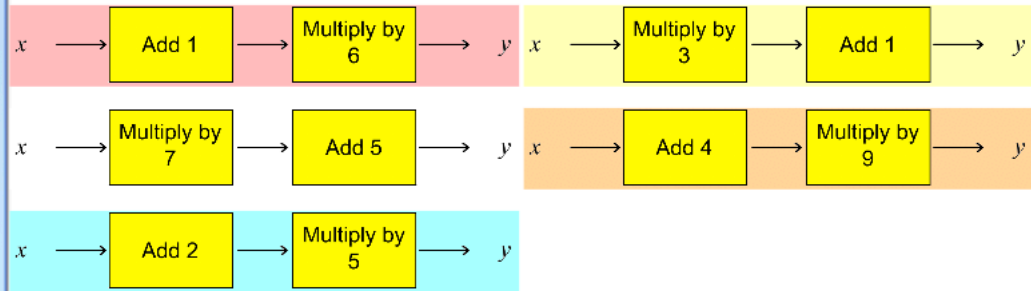
What do you notice about the outputs?

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Function Machines 2

Evaluate:

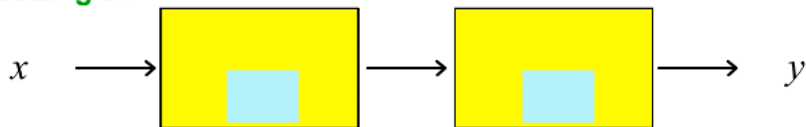


Input	Output	Output	Output	Output	Output
1	12	12	15	4	45
2	18	19	20	7	54
3	24	26	25	10	63
4	30	33	30	13	72

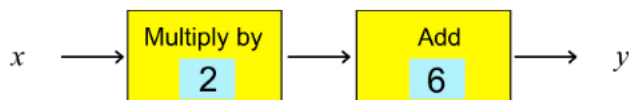
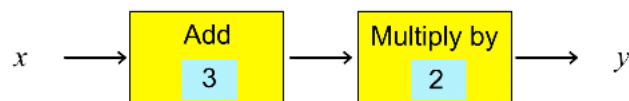
Show Answer

Finding functions

What operation goes into the yellow box, what number in the blue rectangle?



Input	Output
1	8
2	10
3	12
4	14



- Multiply by
- Add
- Subtract

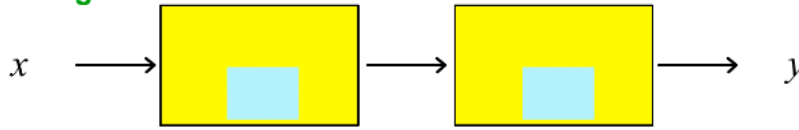
Show Answer

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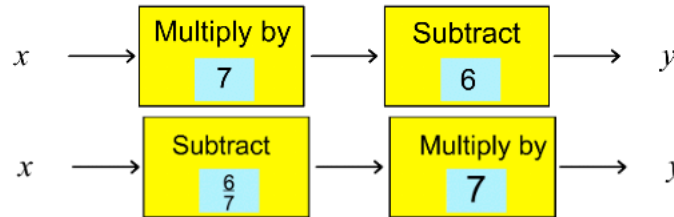
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Finding functions

What operation goes into the yellow box, what number in the blue rectangle?



Input	Output
1	1
2	8
3	15
4	22



- Multiply by
- Add
- Subtract

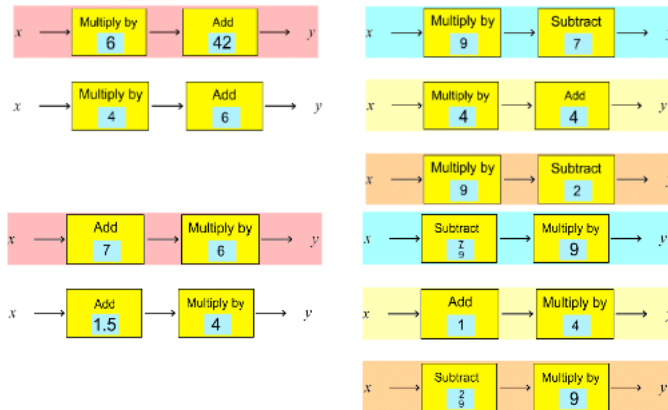
Show Answer

Finding functions

Solve these in at least one way. Do you think there is always a second solution?

Input	Output
1	48
2	54
3	60
4	66

Output	Output	Output
2	8	7
11	12	16
20	16	25
29	20	34



Hide Answers

Show Answers 1

Show Answers 2

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Finding functions

Work out the two solutions then watch.

Input	Output
1	20
2	25
3	30
4	35

$x \rightarrow$ **Multiply by 5** \rightarrow **Add 15** $\rightarrow y$

Input	Output	Calculation
1	20	$1 \rightarrow 1 \times 5 = 5 \rightarrow 5 + 15 \rightarrow 20$
2	25	$2 \rightarrow 2 \times 5 = 10 \rightarrow 10 + 15 \rightarrow 25$
3	30	$3 \rightarrow 3 \times 5 = 15 \rightarrow 15 + 15 \rightarrow 30$
4	35	$4 \rightarrow 4 \times 5 = 20 \rightarrow 20 + 15 \rightarrow 35$

$x \rightarrow$ **Add 3** \rightarrow **Multiply by 5** $\rightarrow y$

Input	Output	Calculation
1	20	$1 \rightarrow 1 + 3 = 4 \rightarrow 4 \times 5 \rightarrow 20$
2	25	$2 \rightarrow 2 + 3 = 5 \rightarrow 5 \times 5 \rightarrow 25$
3	30	$3 \rightarrow 3 + 3 = 6 \rightarrow 6 \times 5 \rightarrow 30$
4	35	$4 \rightarrow 4 + 3 = 7 \rightarrow 7 \times 5 \rightarrow 35$

When is it easier to find 2 solutions?

Review

1. What have you learned about how the inputs and outputs match?
2. What are the key points for your learning?



Input	Output
1	7
2	15
3	23
4	31

x	1	2	3	4
y	7	15	23	31

Gradient = 8
Intercept = -1

Multiply number = difference between consecutive inputs (when going up in ones)

Add or Subtract number = what happens if input is 0

Whole result of a Multiply first then Add or Subtract is like times tables values moved up or down by Add or Subtract value

Add or Subtract then Multiply will also give solution, but Add or Subtract number might be a fraction

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Functions Worksheet

