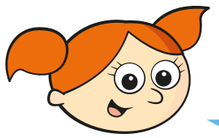
Find a rule – one step

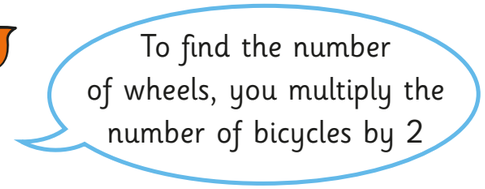
1 Whitney makes a pattern of triangles using sticks.

Complete the table below.

Number of triangles	1	2	3	4	5	10	
Number of sticks							90

2 Complete the tables.





a)

Number of bicycles	1	2	5			16
Number of wheels	2			18	24	

b)

Number of ants	1	2	5			16
Number of legs		12		18	24	

Explain how to find the number of legs.

_____

_____

3 Calculate the outputs for the function machines below.

a) input 50 → + 5 → output

b) input 50 → – 7 → output

c) input 50 → × 2 → output

d) input 50 → ÷ 10 → output

4 Calculate the inputs for the function machines.

a) input → + 9 → output 45

b) input → – 2 → output 21

c) input → × 10 → output 350

d) input → ÷ 3 → output 9

5 Write the missing functions in the function machines.

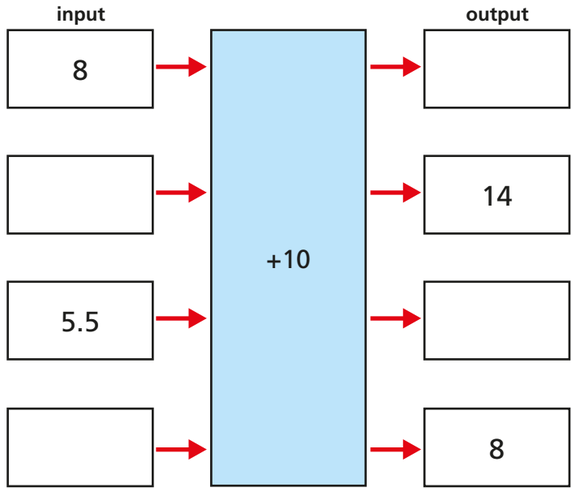
a)

input		output
2		10
5		25
10		50

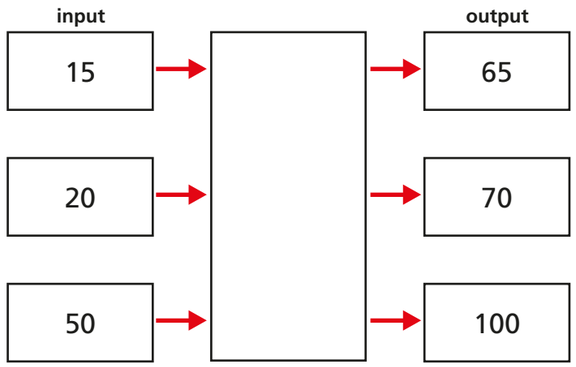
b)

input		output
8		15
0		7
–3		4

6 Calculate the missing inputs and outputs for the function machine.



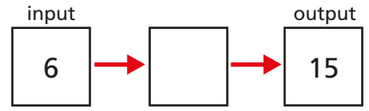
7 Look at the function machine.

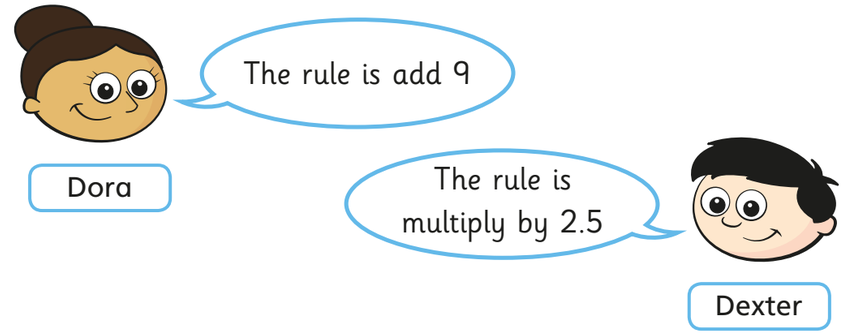


a) What is the output, if the input is zero?

b) What is the input, if the output is zero?

8 Here is a function machine.



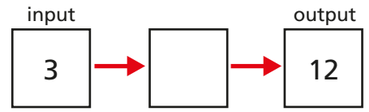


Who do you agree with? _____

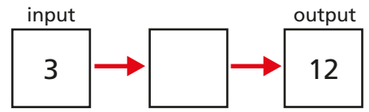
Explain your answer.

9 In a function machine, if the input is 3 and the output is 12, what could the function be?

Write two different functions and complete the table of outputs for each function.



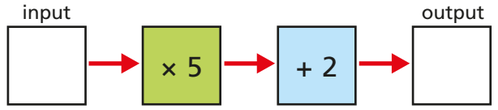
Input	3	4	5	10	20	100
Output	12					



Input	3	4	5	10	20	100
Output	12					

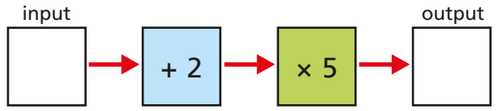
Find a rule – two step

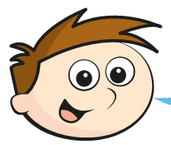
1 Use the function machine to complete the table.



Input	1	2	3	5	10	50
Output						

2 Here is the same function machine with the steps in the reverse order.





Teddy

The outputs will be the same.

The outputs will be different.

Jack

Explain to a partner who you think is correct.

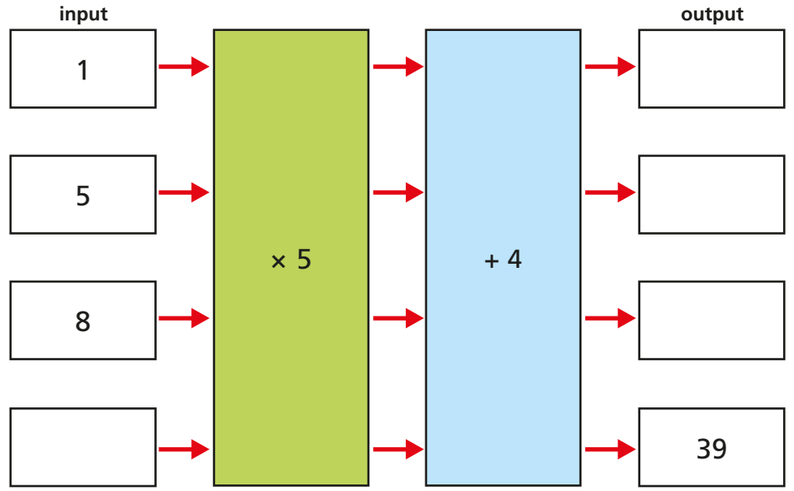
Use the function machine to complete the table.

Input	1	2	3	5	10	50
Output						

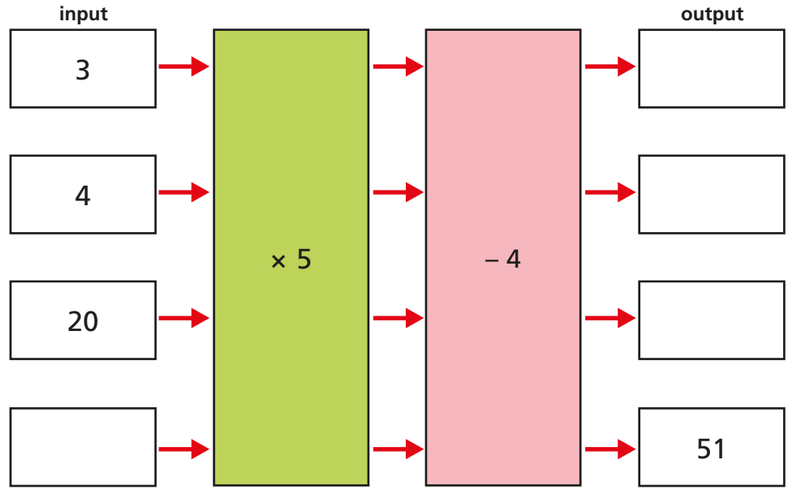
Who is correct? _____

3 Work out the missing outputs and inputs.

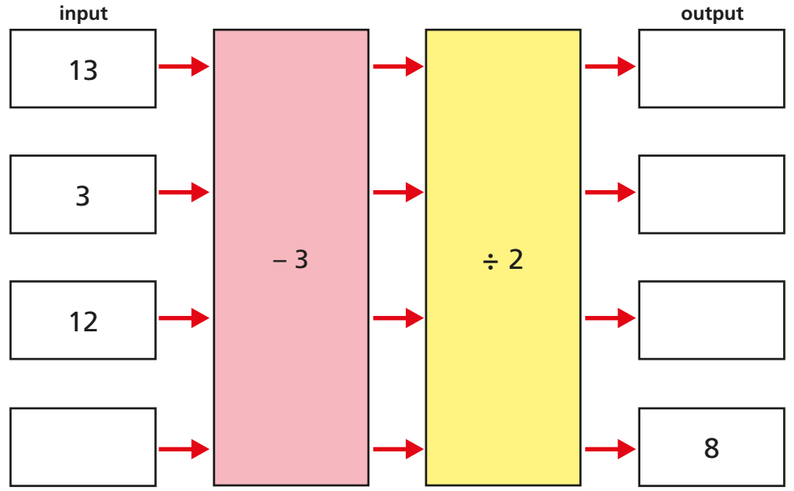
a)



b)

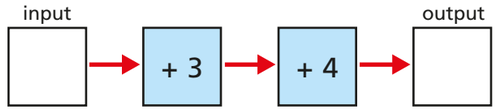


c)

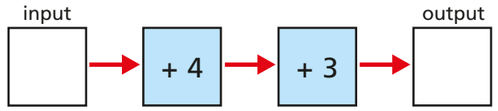


4 Tick the pairs of function machines that will give the same outputs for a given input.

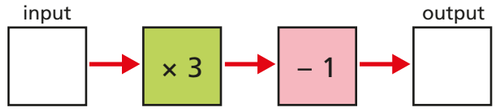
a)



☐



b)



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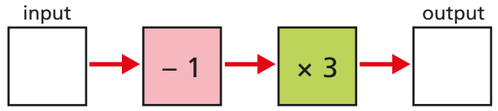
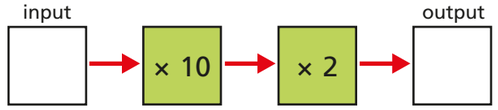
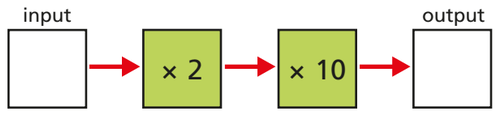


c)



☐



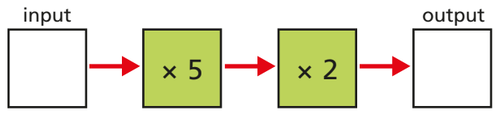
Explain your reasoning to a partner.

5 Here are some 2-step function machines.

For each machine, write a single step that would give the same output.

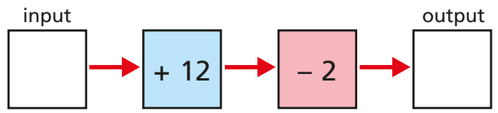
Check your answers by inputting values.

a)



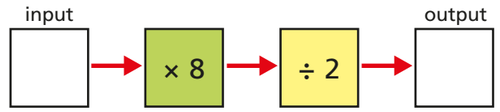
_____

b)



_____

c)

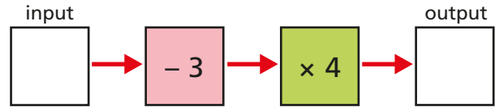


_____

Can all 2-step function machines be written as a 1-step function machine?

Talk about it with a partner.

6 Here is a function machine.



a) Complete the table.

Input	10	3		
Output			40	280

b) Rosie puts a number into the machine and she gets out the same number.

Work out Rosie's number.

7 Mr Hall and Mrs Rose order some photos online.

a) Mr Hall orders 16 photos.

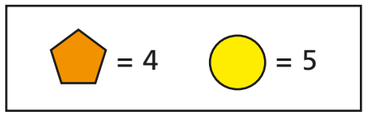
How much does he pay?

b) Mrs Rose pays £6.05

How many photos did she order?

Substitution

1



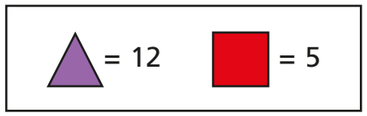
Use the given facts to work out the calculations.

a) 

b) 

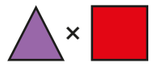
c) 

2



Use the given facts to work out the calculations.

a) 

b) 

c) Create your own calculation that will be equal to 22

3 If $x = 5$, write the values of the expressions in the corresponding grid.

The first one has been done for you.

$3x$	x^2	$2x - 5$
$4x + 2$	$\frac{x}{2}$	$2(x + 1)$
$7x$	$x + 9$	$x - 7$

15		

4 If $a = 10$ and $b = 6$, work out the values of the expressions.

a) $a + b =$ ☐

b) $a - b =$ ☐

c) $2a =$ ☐

d) $2a + b =$ ☐

e) $3a - 17 =$ ☐

f) $2(a - b) =$ ☐

5 If $m = \frac{4}{5}$ and $k = 0.1$, work out the value of $m + 2k$

6

Mo

It does not matter what p and q are, $p + q$ and $q + p$ will always give the same answer.

Do you agree with Mo? _____

Explain your answer.

_____

_____

_____

7

$m = 7 \quad n = 5$

Write >, < or = to compare the expressions.

a) $2m$ ◯ 10

b) $n - 1$ ◯ 5

c) $2n + m$ ◯ $2m + n$

d) $7n$ ◯ $5m$

8

$a = 10$

Write the expressions in order, starting with the smallest value.

$5a$	$a + 5$	$\frac{a}{5}$	a^2

_____ _____ _____

9

$a = 15$

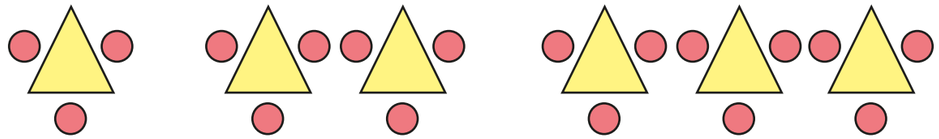
Write three different algebraic expressions that give a value of 40

10 Complete the table.

x	$5x$	$5x - 1$
2		
10		
12		
	25	
		34
		99

Formulae

1 Scott builds a pattern using triangles and circles.



a) Draw the next diagram in the pattern.

b) Scott records the number of triangles and circles in a table.

Complete the table.

Number of triangles	1	2	3	4	5
Number of circles	3				

c) c = number of circles and t = number of triangles

Circle the formula that describes the pattern.

$c = t + 3$ | $c = 3t$ | $t = 3c$ | $t = 3 + c$

d) How many circles will there be with 10 triangles?

Show your working.

2 **a)** Complete the table.

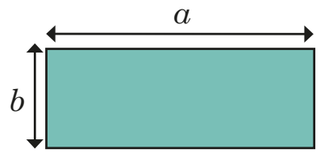
Number of weeks	1	2	3	5	10
Number of days	7				

b) Complete the formula to show the relationship between days (d) and weeks (w).

$d =$ ☐ w

c) How many days are there in 32 weeks?

3 **a)** Write a formula for the area and perimeter of the rectangle.



area = _____

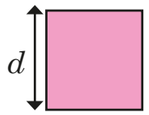
perimeter = _____

b) Work out the area and perimeter of the rectangle if a = 17 cm and b = 8 cm

Show your workings.

area = ☐ perimeter = ☐

4 **a)** Write a formula for the area and perimeter of the square.



area = _____

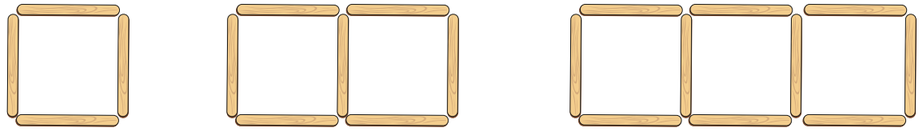
perimeter = _____

b) Work out the area and perimeter of the square if d = 8.5 cm

Show your workings.

area = ☐ perimeter = ☐

5 Dora makes a square pattern using lolly sticks.

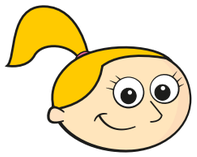


She records the number of squares and sticks in a table.

a) Continue the pattern and complete the table.

Number of squares, s	1	2	3	4	5
Number of lolly sticks, l	4	7			

b)



Eva

You need 35 lolly sticks to make 10 squares. I multiplied the number needed for 2 squares by 5

Show that Eva is wrong.

How many sticks are needed to make 10 squares?

c) Circle the formula that describes the pattern.

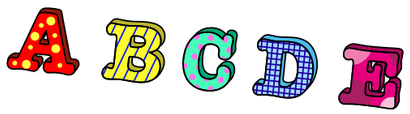
$l = 3s + 1$ $l = 4s + 1$ $l = 3(s + 1)$

6 Here are a dog walker's prices.

a) How much does the dog walker charge for a 2-hour job?

b) Write a formula to show the cost (c) for (h) hours.

7 The Wooden Letter Company sells wooden letters for £2 each, plus £1.50 for delivery of each order.



a) Whitney places an order for the letters to spell out her name.

How much does it cost?

£

b) Write a formula to show the cost (c) for the number of letters (n).

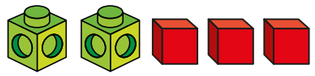
Forming expressions

1 Tommy uses multilink cubes to represent an unknown number and base ten ones to represent 1

 = x = 1

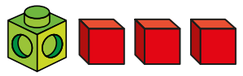
Write algebraic expressions to describe the sets of cubes.

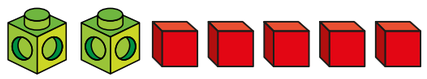
The first one has been done for you.

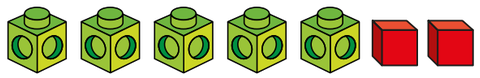
a)  $2x + 3$

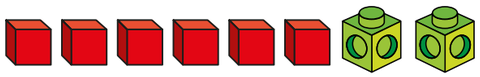
b) 

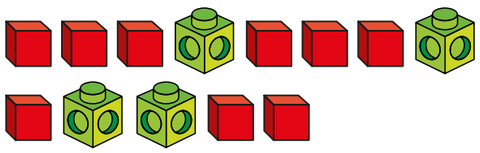
c) 

d) 

e) 

f) 

g) 

h) 

2 Use Tommy's method to represent these expressions.

a) $x + 2$

b) $2x$

c) $3x + 1$

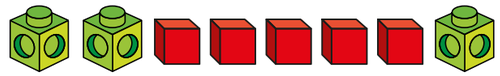
d) $x + 6$

Compare answers with a partner.

3 Use cubes to help you simplify the following expressions.

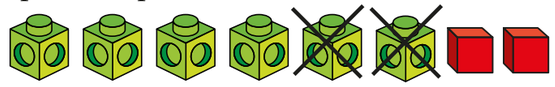
The first one has been done for you.

a) $2y + 5 + y$

 $3y + 5$

b) $3a + 2 + a + a$

c) $6p + 2 - 2p$



d) $m + 4 + 3m - 3$

4 Complete the function machines.

a)

input		output
2	→	6
7	→	11
y	→	

b)

input		output
2	→	4
5	→	10
y	→	

c)

input		output
6	→	3
12	→	9
y	→	

d)

input		output
30	→	3
50	→	5
y	→	

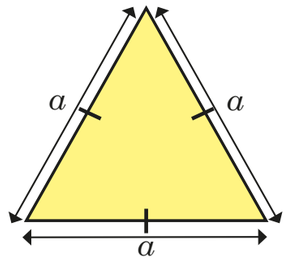
5 Match each statement to the equivalent algebraic expression.

Write the missing statements.

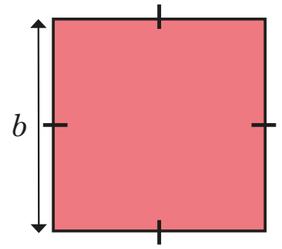
5 more than y	$2y$
y less than 5	$y - 5$
y multiplied by 5	$5 - y$
y divided by 5	$y + 5$
double y	$5y$
	y^2
	$\frac{y}{5}$

6 Write an algebraic expression to represent the perimeter of each shape.

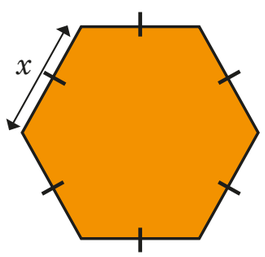
a)



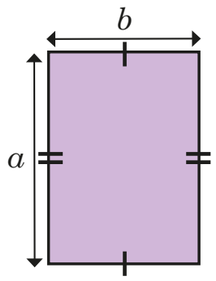
b)



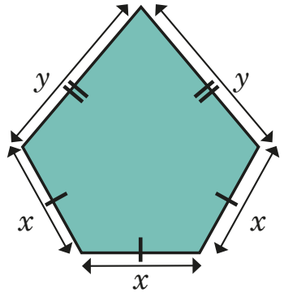
c)



d)



e)



7 Complete the bar models.

a)

a	a

b)

b	b	10

c)

c			

d)

$d + 5$		
		5