

Using a rule 1

- 1 Richard has x pet guinea pigs. Luis has 2 more than Richard. Ambika has 3 times as many as Luis.

a) Complete the rule for how many pets Luis has.

x	2
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Number of Luis's pets

If Richard has x guinea pigs, Luis has guinea pigs.

b) Draw a bar model to represent how many guinea pigs Ambika has.

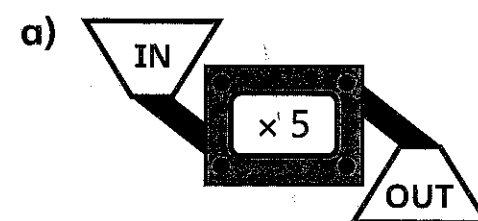
c) Calculate the number of guinea pigs for Ambika, if Richard has 3 guinea pigs.

Ambika has guinea pigs.

d) Complete the table.

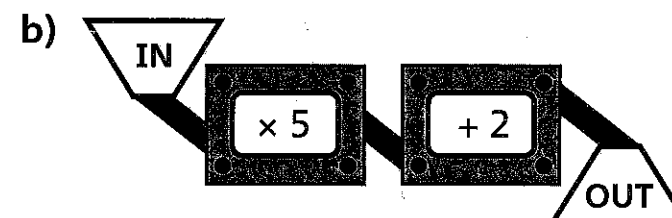
	Number of guinea pigs				
Richard	1	2	5	10	20
Luis	3				
Ambika	9				

2 Complete the table of inputs and outputs from each function machine.



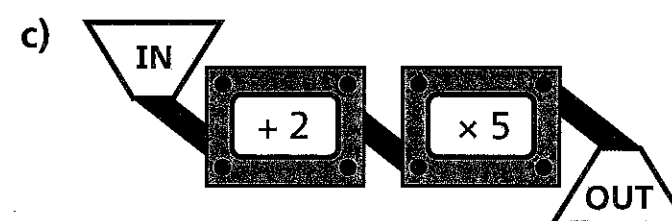
Input	1	2	3	5	10
Output					

If the input is a , the output is _____



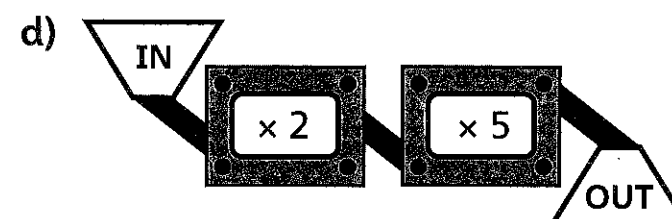
Input	1	2	3	5	10
Output					

If the input is b , the output is _____



Input	1	2			
Output					

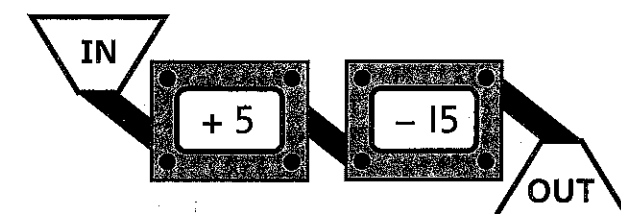
If the input is b , the output is _____



Input					
Output					

If the input is b , the output is _____

3 Max says: 'This is just the same as having a machine with one function of -10 .'



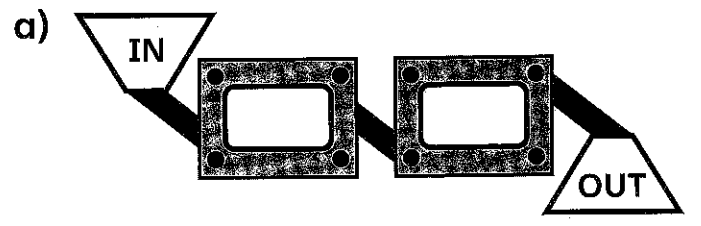
Do you agree? Compare the outputs in the table.

Input	1	2	5	100	1,000	a
Output for -10						
Output for $+5 - 15$						

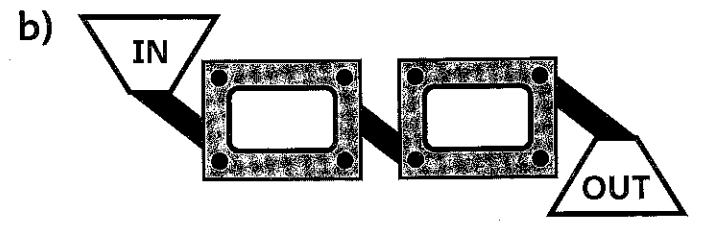
4 Kate is investigating two function machines. She inputs 10 and the output is 100. What could the functions be?

CHALLENGE

Explore different possibilities. Create a table of outputs.



Input	10				x
Output	100				



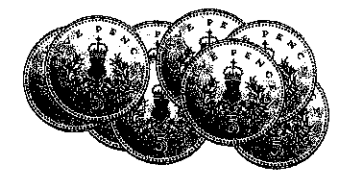
Input	10				x
Output	100				

Reflect

Emma has the rule $3x + 2$. She wants to find the value when x is 100. Emma says: 'I will just find the output for 10, then multiply by 10.' Does this method work? Explore and explain.

Using a rule 2

1 Reena has a pile of 5 pence coins.



a) Write the rule for the total value when the number of coins is n .

There are n 5 pence coins. The total value = pence.

b) Complete the table for different values of n .

Number of coins	Reena's total value
4	$5p \times 4 =$ <input type="text"/> p
5	
10	
30	
50	

2 To hire a squash court costs 20 pence per minute.

a) Write the rule for hiring the court for n minutes.

b) Complete the table.

Time in minutes	Cost
n	$20 \text{ p} \times n =$ <input type="text"/> n
10	<input type="text"/> $\times 10 =$ <input type="text"/>
30	
60	
120	

3 Calculate the result for different values of x by completing the table.

	$x + 30$	$30 - x$	$30x$
$x = 5$			
$x = 10$			
$x = 30$			
$x = 0$			

4 Aki has to substitute $x = 7$ into $10x + 5$.



I can work this out by finding $7 + 5$ first, then multiplying by 10.

Does this work?
Explore and explain.

5 Explain how to choose values of y for the following rule, so that the result is a multiple of 10.

$100 - 5y$



6 Substitute different values for y into the expression $10y - y$.

When $y = 1$, $10y - y =$.

When $y =$, $10y - y =$.

When .

When .

When .

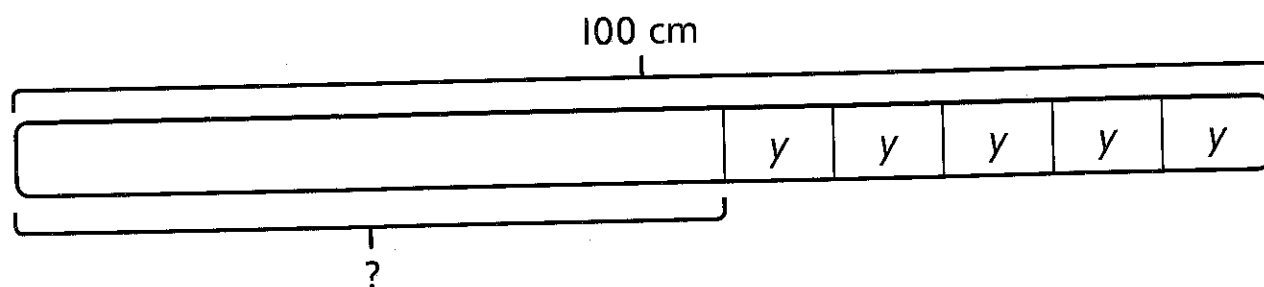
What do you notice? Explain using words and diagrams.

Reflect

Substitute different values for y in the rule $4 + 2y$. Explain why all the results are even.

Using a rule ③

- 1 a) Toshi cuts 5 equal lengths from 100 cm of ribbon. Each length is y cm.
Write the rule for the length of ribbon he has left.



- b) How much ribbon is left if $y = 12$ cm?

There is cm of ribbon left.

- 2 Amelia stacks n blocks onto the base.

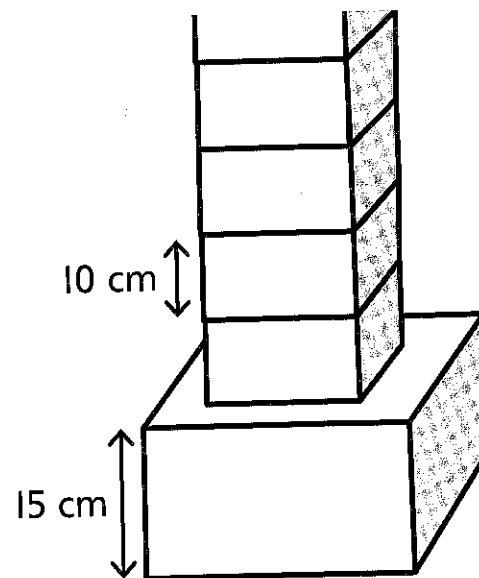
- a) Write an expression for the total height of a tower with n blocks.

The total height is + n .

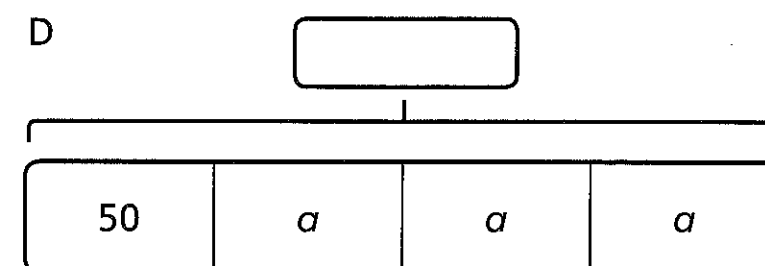
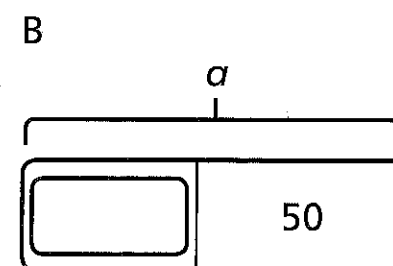
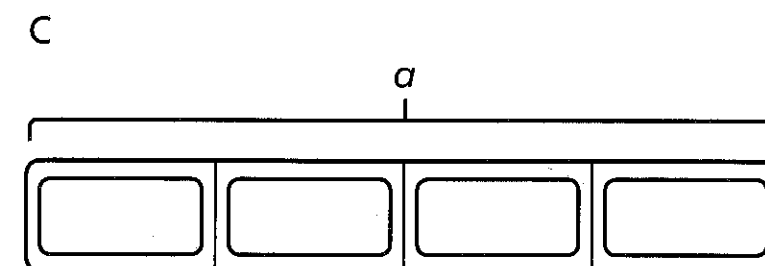
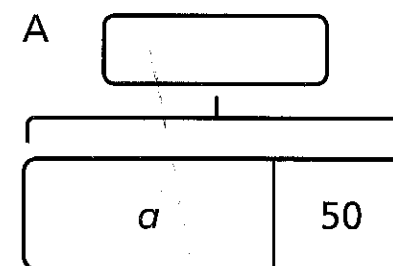
- b) Calculate the total height when $n = 8$.

$$\boxed{} + \boxed{} \times \boxed{} = \boxed{} + \boxed{}$$

The height is cm.



- 3 a) Write the expression in the box for each diagram.



- b) Now substitute the value of 75 for a in each expression.

What is the value of the expression for each diagram?

A =

B =

C =

D =

- 4 Match each expression with the equivalent meaning.

5 less than y

y more than 20

double y

$5 - y$

$y + 2$

$20 + y$

$2y$

$y \times y$

$y - 5$

5 Complete the table.

CHALLENGE

	Write an expression for each ?.	Substitute $n = 110$ into each expression. Calculate the value of ?.

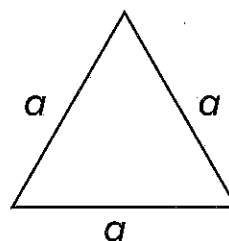
Reflect

What is the value of $25 - 2y$ when y equals 3?
Draw a bar model to explain.

Formulae

1 Write an expression for the perimeter of each shape. Then calculate the perimeter by substituting $a = 4$ cm and $b = 5$ cm.

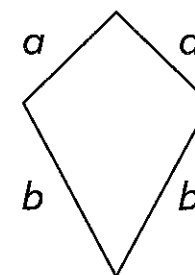
a)



Formula: $3a$

Perimeter = cm

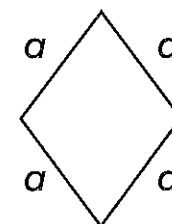
c)



Formula:

Perimeter = cm

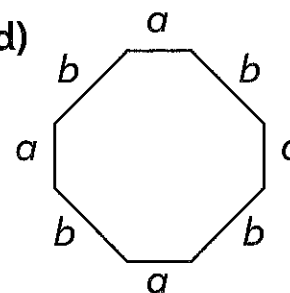
b)



Formula:

Perimeter = cm

d)



Formula:

Perimeter = cm

2 A formula to calculate the number of inches in z feet is $12z$.

How many inches tall is each tower?

Tower A: 100 feet = inches

Tower B: 200 feet = inches

Tower C: 150 feet = inches

- 3 A scientist uses the formula $\text{distance} = s \times t$ to calculate the distance a rocket has travelled.

s stands for the speed in mph.

t stands for the time in hours.

Calculate the distance travelled when the rocket has been moving at a speed of 200 mph for 2 days.

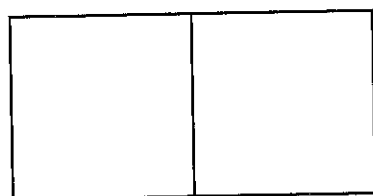
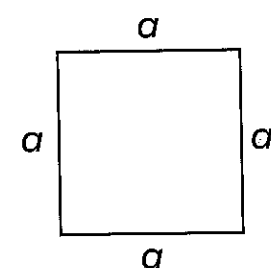
Speed is measured in miles per hour (mph).



Blank area for writing the answer to Question 3.

The rocket has travelled miles.

- 4 Max joins two of these squares together to make a new shape. What is the perimeter of the new shape?



The perimeter of the square is $4a$, so the perimeter of my new shape is $8a$.

Max



Blank area for writing the answer to Question 4.

CHALLENGE

- 5 Look at these calculation patterns.

Complete the formula to show the pattern using algebra.

A $99 + 2 = 100 + 1$

$99 + 3 = 100 + 2$

$99 + 4 = 100 + \square$

$99 + 5 = 100 + \square$

$99 + a = 100 + \square$

B $99 \times 1 = 100 \times 1 - 1$

$99 \times 2 = 100 \times 2 - 2$

$99 \times 3 = 100 \times 3 - \square$

$99 \times 4 = 100 \times \square - \square$

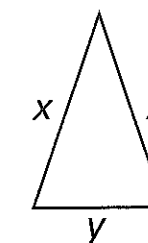
$99 \times b = 100 \times \square - \square$

Explain each pattern using words. Are both patterns always true?

Blank area for writing the explanation for Question 5.

Reflect

Write a formula to show how to calculate the perimeter when $x = 10$ and $y = 8$.



Blank area for writing the formula for Question 5.

Solving equations 1

- 1 a) Substitute different values for a to find a solution to the equation.

$$a + 150 = \boxed{}$$

If a is:	Then $a + 150$ is:
100	
200	

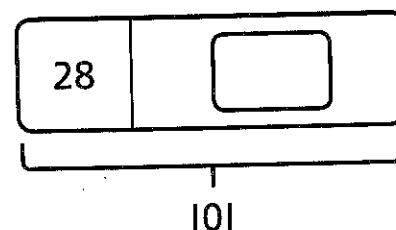
- b) Substitute different values for b to solve the equation.

$$\boxed{} = 150 - b$$

If b is:	Then $150 - b$ is:
10	
20	
50	

- c) Complete the bar model to represent the equation, then solve it.

$$28 + c = 101$$



$$c = \boxed{}$$

- 2 a) Ambika measured out some flour. She added 50 g of butter, then the mass of these ingredients was $\frac{1}{2}$ kg. Represent the mass of flour as m , write an equation and solve.

- b) Andy had a bag of raisins. He added 25 g to his pancake. That left 250 g in the bag. Represent the original mass of the bag as s , write and solve an equation.

- 3 Solve each equation.

a) $x - 10 = 300$

b) $300 = 10y$

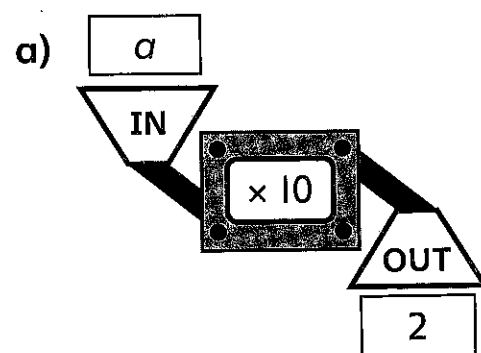
c) $z \div 10 = 300$

- 4 To solve $36 - f = 16$, Luis said: 'I worked out $16 + 36$, because I used the inverse.'

Is he correct? Show your reasoning using a diagram.

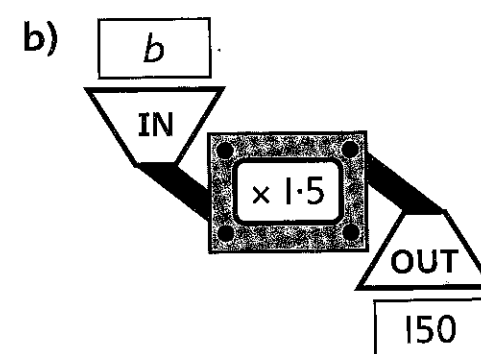
5 Write and solve an equation for each function machine.

CHALLENGE



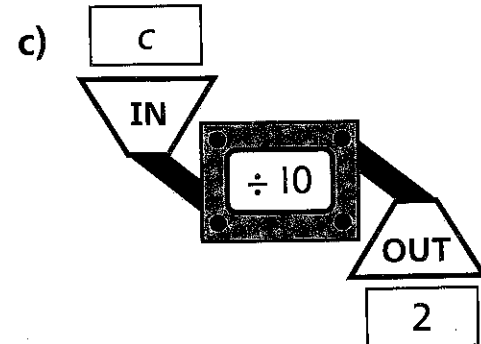
Equation: $10a =$

Solution: $a =$



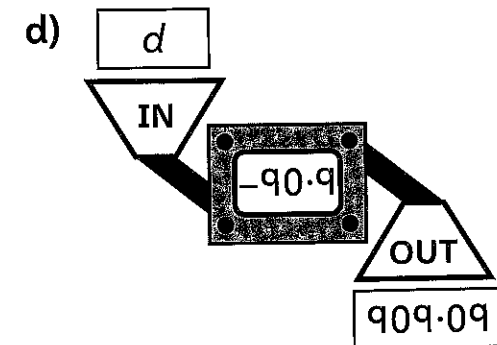
Equation: _____

Solution: _____



Equation: _____

Solution: _____



Equation: _____

Solution: _____

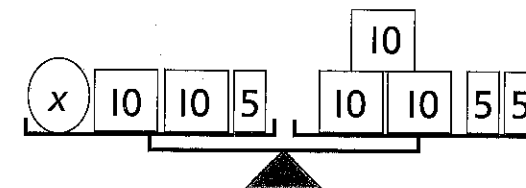
Reflect

Explain two methods to solve $200 = y + 75$.

Solving equations 2

1 Complete and solve the equations.

a)

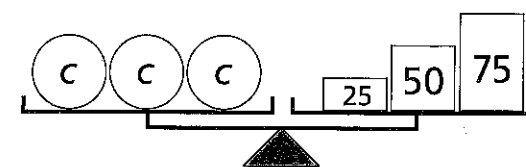


$x + 25 = 40$

Subtract from each scale.

$x =$

b)

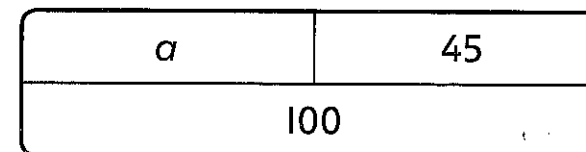


$3c =$

each side by

$c =$

c)



$a + 45 = 100$

$100 - 45 =$

$a =$

d)

