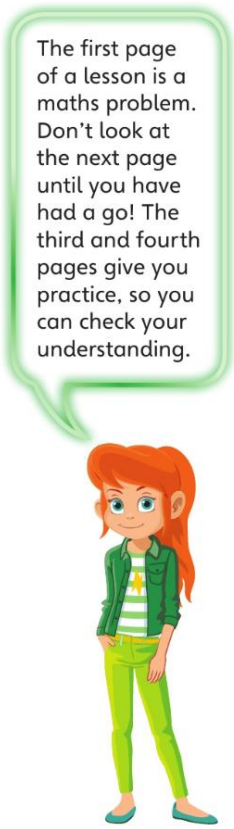
Contents



Lesson 1

Finding a rule

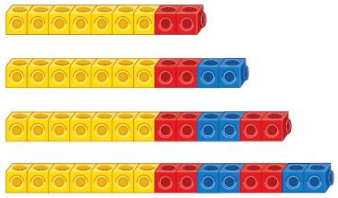
Discover

1 **a)** More pairs of geese land. What is the rule for the number of geese on the lake?

b) Is Richard correct?

Share

a)



$7 + 2 = 9$ $\quad 7 + 1 \times 2 = 9$

$7 + 2 + 2 = 11$ $\quad 7 + 2 \times 2 = 11$

$7 + 2 + 2 + 2 = 13$ $\quad 7 + 3 \times 2 = 13$

$7 + 2 + 2 + 2 + 2 = 15$ $\quad 7 + 4 \times 2 = 15$

Geese at the start	7	7	7	7	7
More pairs fly in	1	2	3	100	n
Total geese	$7 + 1 \times 2$	$7 + 2 \times 2$	$7 + 3 \times 2$	$7 + 100 \times 2$	$7 + n \times 2$

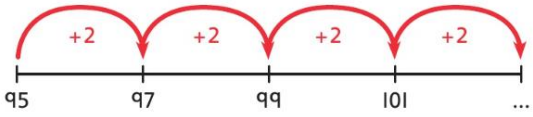
If n more pairs land on the lake, there will be $7 + n \times 2$ geese in total.

The letter n is used here as the letter x would look like the multiplication sign. I wonder if that is confusing in algebra.

You can write $2n$ instead of $2 \times n$ or $n \times 2$.

This rule can be written $7 + 2n$.

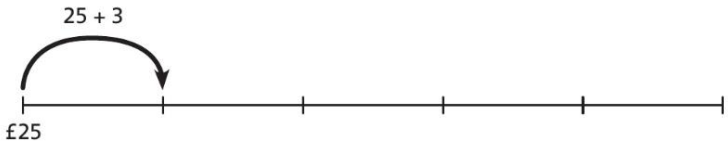
b) No, Richard is not correct because there will never be exactly 100 geese. The rule adds on a multiple of 2 to 7, so the answer will always be an odd number.



Lesson 1

Finding a rule

1 **a)** Olivia has £25 in the bank. Each week she saves £3. Complete the table.



Week	1	2	3	5	10	11
Total savings	28					

b) Complete the rule for how much Olivia has saved after *y* weeks.

After *y* weeks, Olivia has ☐ + ☐ × ☐ pounds.

2 Max has £50 in the bank. Each week he spends £4 on a comic.

Complete the table and the rule.

Week	1	2	3	5	10	*n*
Money left						

After *n* weeks, he has ☐ ◯ ☐ × ☐ pounds left.

3 Here is a growing pattern of triangles made from sticks.

Complete the table.

Number of triangles	1	2	3	4	5	10	100
Number of sticks used							

Write the rule for the number of sticks needed to make *n* triangles.

To make 1 triangle, ☐ sticks are used.

To make 2 triangles, ☐ sticks are used.

To make 3 triangles, ☐ sticks are used.

To make *n* triangles, _____ sticks are used.

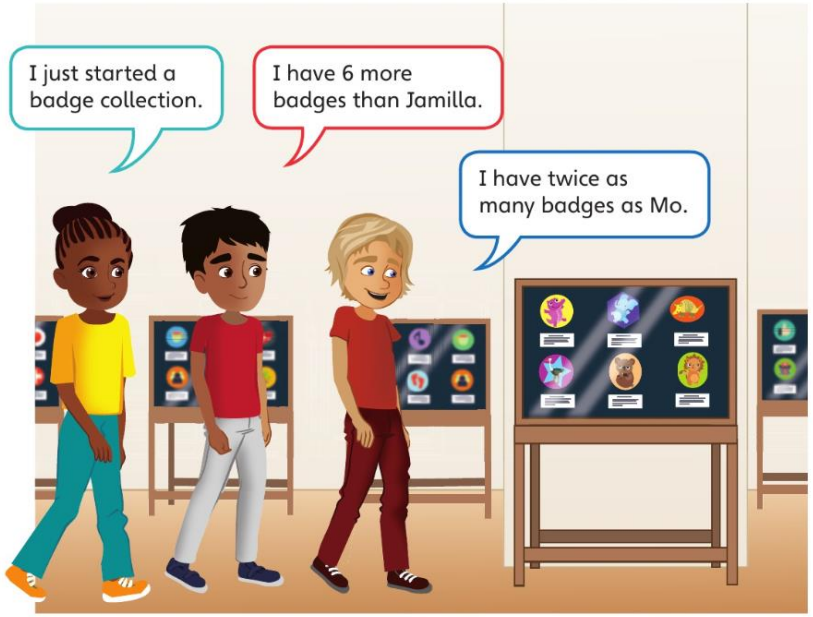
4 Ebo makes this pattern of houses. What is the rule for the number of sticks needed for a pattern with *g* houses?

For *g* houses, you need _____ sticks.

Lesson 2

Using a rule 1

Discover



1 a) If Jamilla has x badges, how can the number of badges that Mo and Danny have be represented?

b) How many badges do Mo and Danny have if Jamilla has 4 badges?

Share

a) Jamilla has x number of badges. Mo has 6 more badges than Jamilla.
We can write that Mo has $x + 6$ badges.

Number of Mo's badges

x	6

$x + 6$

Danny has twice as many badges so I think we can write that he has $2x$.

I do not think that is right. Danny has twice as many badges as Mo, **not** Jamilla, so it is not $2x$. I will show it with a bar model.

Number of Danny's badges

x	6	x	6

$(x + 6) \times 2$

We can write that Danny has $(x + 6) \times 2$ badges.

b) Jamilla has 4 badges, so $x = 4$.

Number of Mo's badges

4	6

$4 + 6 = 10$

Number of Danny's badges

4	6	4	6

$(4 + 6) \times 2 = 20$

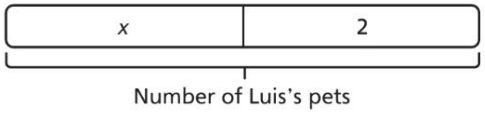
If Jamilla has 4 badges, Mo has 10 badges and Danny has 20 badges.

Lesson 2

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.



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.

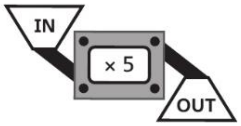
Ambika has ☐ guinea pigs.

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.

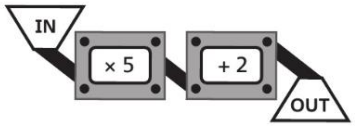
a)



Input	1	2	3	5	10
Output					

If the input is a, the output is _____

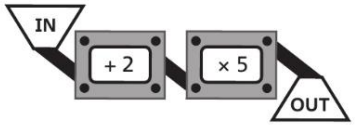
b)



Input	1	2	3	5	10
Output					

If the input is b, the output is _____

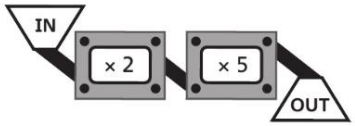
c)



Input	1	2			
Output					

If the input is b, the output is _____

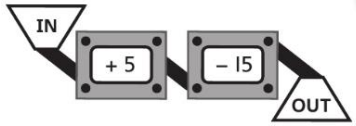
d)



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.

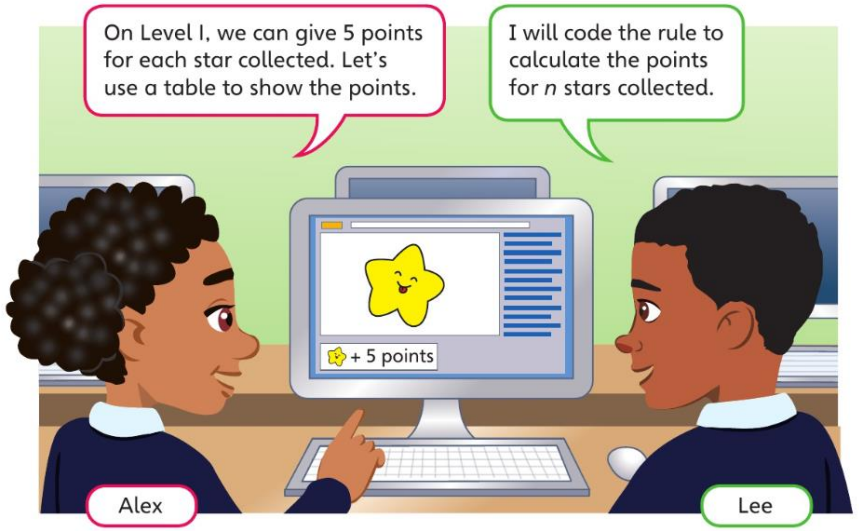
Input	1	2	5	100	1,000	a
Output for – 10						
Output for + 5 – 15						

_____

Lesson 3

Using a rule 2

Discover



1 **a)** Complete the table.

Write the rule for n stars.

How many points will you have for Level 1 if the value of n is 13?

b) What happens to the score if the value of n increases by 10 to 23?

Number of ★	Points for Level 1
1	
2	
3	
4	
n	

Share

When $5 \times n$ is written as $5n$, it is called an **expression**.

When a specific value is given for n, you **substitute** the value for n into the rule. So here you substitute 13 for n.

a)

Number of ★	Points for Level 1
1	$5 \times 1 = 5$
2	$5 \times 2 = 10$
3	$5 \times 3 = 15$
4	$5 \times 4 = 20$
n	$5n$

If the value of n is 13, that means 13 stars have been collected.

The rule is $5n$ which means $5 \times n$ or $n \times 5$.

When $n = 13$, $5n = 5 \times 13$.

$5 \times 13 = 65$

If the value of n is 13, you will have 65 points.

b) Now $n = 23$.

Method 1

Work out 5×23.

$5 \times 20 = 100$

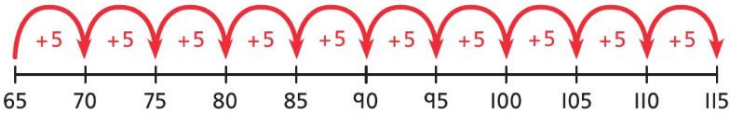
$5 \times 3 = 15$

If $n = 23$, you will have 115 points.

Method 2

If n increases by 10, that means 10 more stars have been collected. So the number of points will increase by 10×5.

If $n = 23$, the score will be $65 + 50 = 115$ points.



Lesson 3

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 × 4 = ☐ 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 p × n = ☐ n
10	☐ × 10 = ☐
30	
60	

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 $10x + 5$.

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.

$100 - 5y$

_____

_____

_____

_____

Lesson 4

Solving equations 1

Discover

1 **a)** What is the mystery weight?

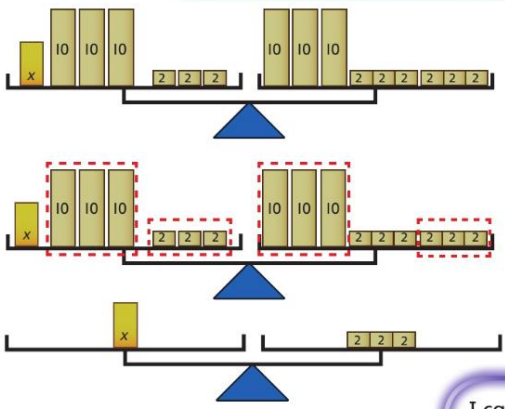
Explain how knowing this helps you solve the equation $x + 36 = 42$.

b) Solve the equation $36 + x = 42$.

Share

I drew the scales and then crossed out one weight from each side at the same time. It is like solving an equation.

a)



$x + 36 = 42$

Subtract 36 from each scale.

$x = 6$

The mystery weight is 6 kg.

Finding the mystery weight means you can replace x with 6 to solve the equation.

I can check my answer. $6 + 36 = 42$. Correct!

b)

36	x
42	

$36 + x = 42$

I drew a bar model. It shows me that 36 and the unknown (x) added together make 42.

To find the missing number, subtract 36 from 42.

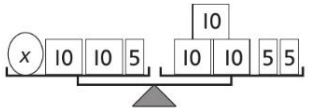
$x = 42 - 36$, so $x = 6$.

Lesson 4

Solving equations 1

1 Complete and solve the equations.

a)

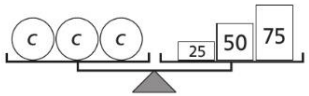


$x + 25 = 40$

Subtract ☐ from each scale.

$x =$ ☐

b)



$3c =$ ☐

◯ each side by ☐

$c =$ ☐

c)

a	45
100	

$a + 45 = 100$

$100 - 45 =$ ☐

$a =$ ☐

d)

d	d	d	d	d
150				

2 Match each model with the correct equation, then solve.

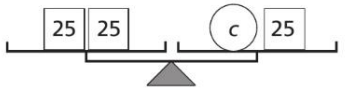
a)

c	
50	25

b)

c	c	c	c	c
25				

c)



$25 = 5c$

$c =$ ☐

$25 + c = 50$

$c =$ ☐

$c - 25 =$ ☐

$c =$ ☐

3 Solve each equation.

a) $40 - f = 37$ ☐

b) $g + 37{\cdot}5 = 40$ ☐

c) $400 = h + 37$ ☐

d) $4{,}000 - i = 3{,}750$ ☐

e) $4{\cdot}4 = 40{\cdot}4 - j$ ☐

f) $4k = 4$ ☐