

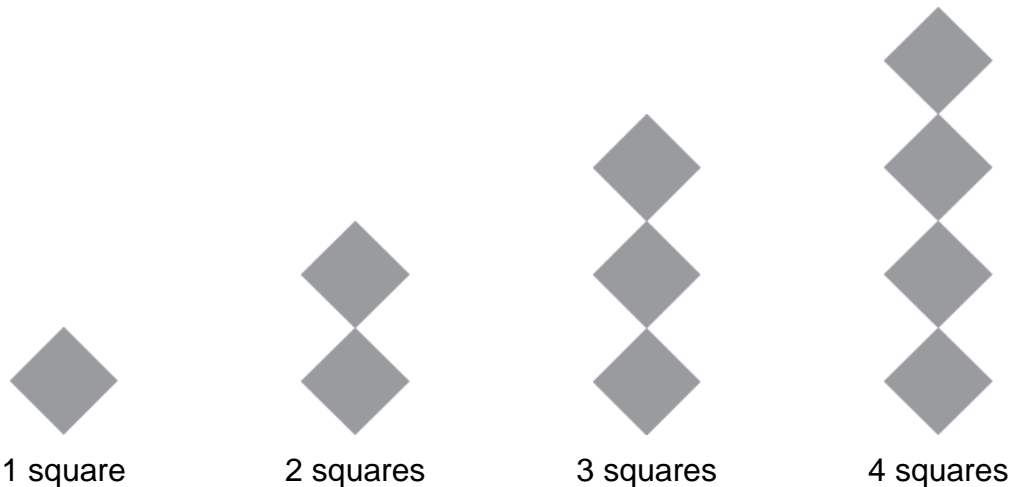
Lesson 1: Investigating Changes in Perimeter

You will investigate how the perimeter of a pattern changes as squares are added.

These squares are exactly the same size. Each square is 1 centimeter long.



Use these squares to make this pattern.



The two quantities that you will investigate are:

The number of squares

The perimeter of the pattern

You will investigate how the perimeter of the pattern changes as the number of squares in the pattern increases.

1. Complete this table for a pattern that grows as shown above:

Table 1

Number of squares	1	2	3	4	5	6	7	8	9
Perimeter (cm)	4	8	12						

2. When the number of squares increases by one, how does the perimeter of the pattern change?

Lesson 2: Expressing Changes in Perimeter

The perimeter is equal to 4 times the number of squares.

Perimeter

=

4 times the number of
squares

You can write this relationship as a math sentence:

Let the letter n represents the number of squares in the pattern.

Let the letter P represents the perimeter of the pattern.

P

=

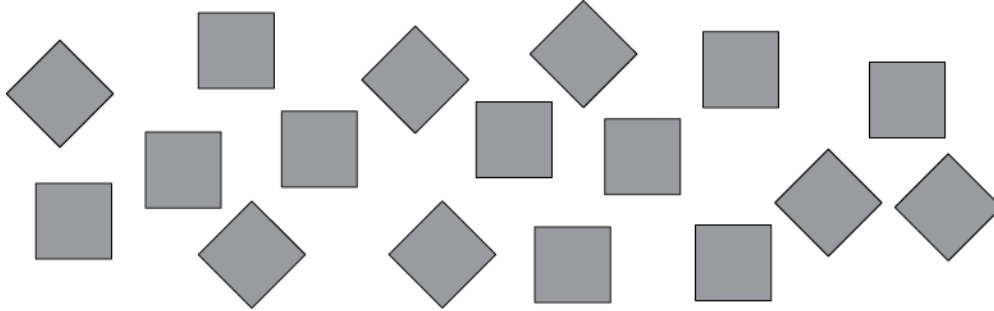
$4 \times n$

1. What is the perimeter of the pattern when there are 13 squares?
2. What is the perimeter of the pattern when there are 12 squares?
3. The perimeter of one of these patterns is 44 centimeters. How many squares are in this pattern?
4. In the math sentence $P = 4 \times n$, what is the value of P when n is equal to 20?
5. In the math sentence $P = 4 \times n$, what is the value of n when P is equal to 40?
6. In the math sentence $P = 4 \times n$, what is the value of P when n is equal to 0?
7. In the math sentence $P = 4 \times n$, what is the value of n when P is equal to 0?
8. In the math sentence $P = 4 \times n$, what do the letters n and P represent?
9. Solve the math sentence $96 = 4 \times n$ for the value of n that makes the math sentence true.
10. a. Solve the math sentence $80 = 4 \times n$ for the value of n that makes the math sentence true.
b. Interpret the math sentence $80 = 4 \times n$ in terms of the pattern of squares.

Lesson 3: Investigating Changes in Perimeter again

You will investigate how the perimeter of the pattern changes as the number of steps in the pattern increases.

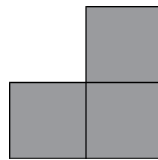
These squares are exactly the same size. Each square is 1 centimeter long.



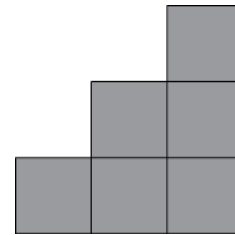
You can use these squares to make this pattern.



1 step



2 steps



3 steps

The two quantities that you will investigate are:

Number of steps

Perimeter

Let's investigate how the perimeter of the pattern changes as the number of steps increases.

1. What is the perimeter of a 1 step pattern in centimeters?
2. What is the perimeter of a 2 step pattern in centimeters?
3. What is the perimeter of a 3 step pattern in centimeters?
4. Draw a pattern with 4 steps. What is the perimeter of this pattern?
5. Draw a pattern with 5 steps. What is the perimeter of this pattern?
6. Complete this table for a pattern that grows in this way:

Table 2

Number of steps	1	2	3	4	5	6	7	8	9
Perimeter (cm)									

7. When the number of steps increases by one, how does the perimeter of the pattern change?

Lesson 4: Expressing relationships in a math sentence

The perimeter is equal to-----.

Perimeter

=

----- times the number of
steps

Let the letter s represents the number of steps in the pattern.

Let the letter P represents the perimeter of the pattern.

You can write this as a math sentence:

P

=

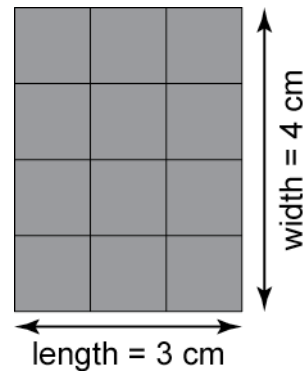
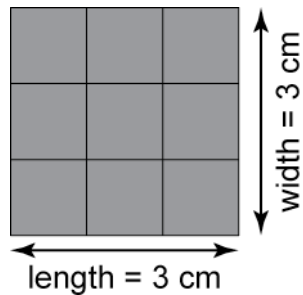
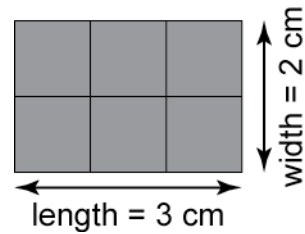
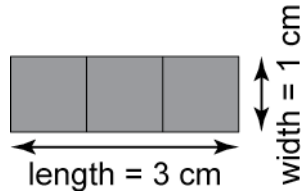
1. What does the letter s represent in this math sentence?
2. What does the letter P represent in this math sentence?
3. What is the perimeter of a pattern with 13 steps?
4. What is the perimeter of a pattern with 12 steps?
5. The perimeter of one of these patterns is 44 centimeters. How many steps are in this pattern?
6. What is the value of P when s is equal to 20?
7. What is the value of s when P is equal to 40?
8. What is the value of P when s is equal to 0?
9. What is the value of s when P is equal to 0?
10. Solve the math sentence $96 = 4 \times s$ for the value of s that makes the math sentence true.

Lesson 5: Exploring changes in width and area of a rectangle when its length is kept the same

Look carefully at these rectangles.

The length of each rectangle is 3 centimeters.

The widths of the rectangles are different.



1. On a sheet of centimeter square paper draw five different rectangles that have length of 3 centimeters.
2. Label the length and the width of each rectangle.
3. Find the area of each rectangle.
4. Complete this table by filling in the area of each rectangle. The length of each rectangle is 3 centimeters.

Table 2

The length of each rectangle is 3 centimeters

Width of rectangle (cm)	1	2	3	4	5	6	7	8	9
Area (cm ²)	3	6	9						

5. As the width of one of these rectangles increases by 1 centimeter, how does the area of the rectangle increase?

Lesson 6: Expressing relationships in a math sentence

Area of a rectangle with length 3 centimeters	=	----- times the width
--	---	-----------------------

Let the letter A represent the area of the rectangle.

Let the letter W represent the width of the rectangle.

You can write this relationship as a math sentence:

A	=	-----
-----	---	-------

The area is equal to-----.

Use this math sentence to answer the following questions:

1. What is the area of the rectangle when the width of the rectangle is 12 centimeters?
2. What is the area of the rectangle when the width of the rectangle is 15 centimeters?
3. The area of one of these rectangles is 33 centimeters. What is the width of this rectangle?
4. What is the value of A when the value of w is equal to 30 centimeters?
5. What is the value of w when the value of A is equal to 15 square centimeters?
6. What is the value of A when w is equal to 0 centimeters?
7. What is the value of w when A is equal to 0 square centimeters?
8. What does the letter w represent in this math sentence?
9. What does the letter A represent in this math sentence?

Lesson 7: Exploring changes in length and width of a rectangle when its perimeter is kept the same

You will investigate changes in length and width of a rectangle when its perimeter is kept the same.

1. On a sheet of centimeter square paper draw five different rectangles that have a perimeter of 20 centimeters.
2. Label the length and the width of each rectangle.
3. Complete this table by filling in widths of the rectangles with a perimeter of 20 centimeters:

Length of rectangle (centimeters)	1	2	3	4	5	6	7	8	9
--------------------------------------	---	---	---	---	---	---	---	---	---

Width of rectangle

4. Let the letter L represent the length of a rectangle.
Let the letter W represent the width of a rectangle.
Use the letters L and W to express the relationship between the length and width of rectangles with a perimeter of 20 centimeters.
5. Imagine that one of these rectangles (perimeter = 20 cm) has a length of 9.5 centimeters. What is the width of this rectangle?
6. How many different rectangles have a perimeter of 20 centimeters?
7. Terrance investigated the lengths and width of rectangles with a perimeter of 30 centimeters and wrote this formula to express the relationship between the length, L , and Width, W of the rectangles.

$$2 \times L + 2 \times W = 30$$

- a. Explain what Terrance's formula means in words.
- b. Explain why Terrance's formula is correct.
- c. Use Terrance's formula to find the value of W when L is 13 centimeters:

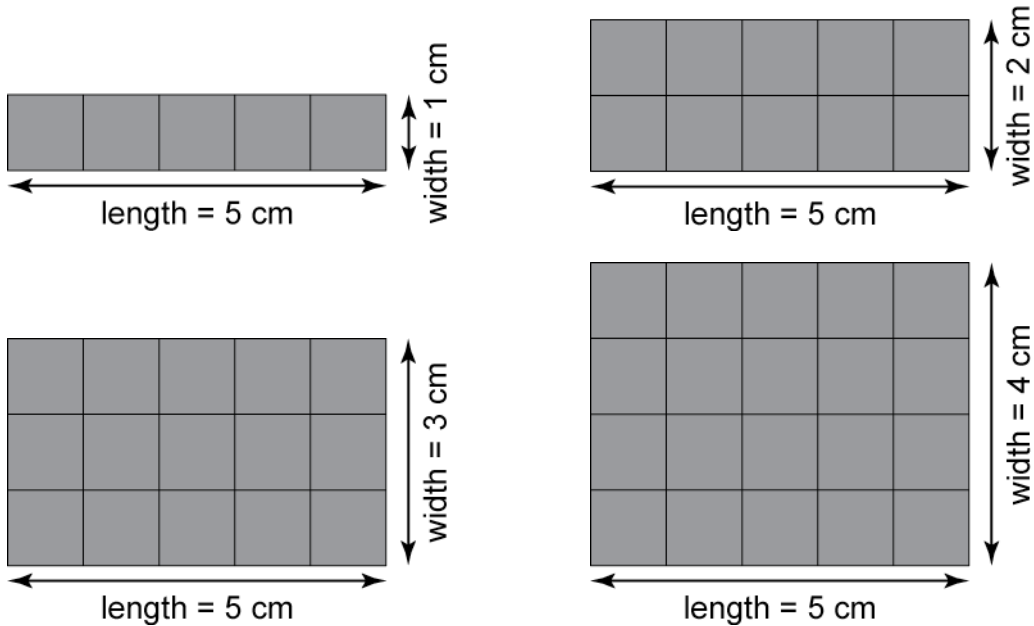
$$2 \times L + 2 \times W = 30$$

Lesson 8: Formative assessment

Look carefully at these rectangles.

The length of each rectangle is 5 centimeters.

The widths of the rectangles are different.



- Complete this table by filling in the area of each rectangle. Each rectangle has a length of 5 centimeters:

Table 1

The length of each rectangle is 5 centimeters

Width of rectangle, w , (cm)	1	2	3	4	5	6	7	8	9
Area (cm^2), A ,	5								

Let A represent the area of the rectangle. Let w represent the width of the rectangle.

- Write a math sentence to express the relationship between the area and the width of a rectangle with length of 5 centimeters.
- Use your math sentence to find the area of a rectangle that has a length of 5 centimeters and a width of 7 centimeters.
- Use your math sentence to find the width of a rectangle with a length of 5 centimeters and an area of 135 square centimeters.

Lesson 9: Investigating changes between units

1. On a sheet of centimeter square paper draw five different straight lines.
2. Measure each line using a centimeter ruler.
3. Complete this table by filling in the lengths of the lines in centimeters and in millimeters:

Table 3

Length of line in centimeters	1	2	3	4	5	6	7	8	9
-------------------------------	---	---	---	---	---	---	---	---	---

Length of line in millimeters									
-------------------------------	--	--	--	--	--	--	--	--	--

Let the letter c represent the length of a line in centimeters.

Let the letter m represent the length of a line in millimeters.


4. Use the letters c and m to express the relationship between centimeters and millimeters.
5. Imagine that one of these lines has a length of 25 centimeters. What is the length of this line in millimeters?
6. Najee investigated the relationship between distances measured in inches and in feet and wrote this formula to express the relationship between length in inches, i , and length in feet, f .

$$i = 12 \times f$$


- a. Explain what Najee's formula means in words.
- b. Explain why Najee's formula is correct.
- c. Use Najee's formula to find the value of f when i is 150 inches:

$$i = 12 \times f$$

Lesson 10: Working with different kinds of math sentences

1. In the math sentence below,  represents the same number:

$$\text{hexagon} + \text{hexagon} + \text{hexagon} = 8 + 1$$

What value of  will make this number sentence true?

Let's work with math sentences!



2. The letter b represents a number. What value of b will make this number sentence true?

$$3 \times b = 12$$

3. What number should you put in the blank box to make this number sentence true?

$$4 + 8 = \square + 7$$

4. The letter x represents a number. What value of x will make this number sentence true?

$$x - 7 = 13$$

5. The letter b represents a number. What value of b will make this number sentence true?

$$4 \times b = 2$$

6. The letter x represents a number. What value of x will make this number sentence true?

$$x - 7 = 0$$

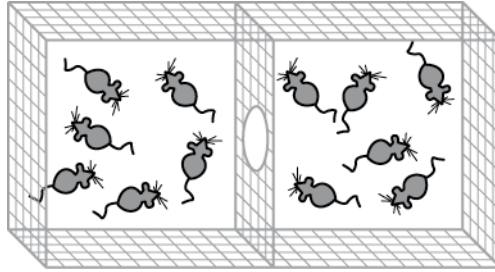
Lesson 11: Investigating mice in a cage

A woman has 12 male mice.

Here is a picture of her two-room mouse cage.

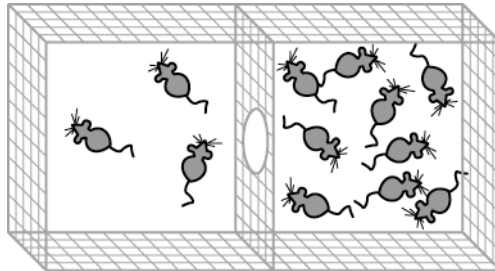
A mouse can jump through the hole into the other room of the cage.

Picture 1:



1. Look at the picture above (Picture 1):
 - a. How many mice are in the left cage?
 - b. How many mice are in the right cage?
2. Look at the picture below (Picture 2):
 - a. How many mice are in the left cage?
 - b. How many mice are in the right cage?

Picture 2:



3. Complete the table below to show the numbers of mice that could be in each room of cage.

Number of mice in the left room of the cage	0	1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	---	---	----	----	----

Number of mice in the right room of the cage

4. When the number of mice in the left room of the cage increases by one, how does the number of mice in the right room of the cage change?
5. Let the number of mice in the left room of the cage be L and the number of mice in the right room of the cage be R . Write a math sentence to express the relationship between L and R .
6. What is the value of R when the value of L is 12?
7. What is the value of R when the value of L is 0?
8. What is the value of L when the value of R is 7?
9. What is the value of L when the value of R is 5?
10. In this math sentence what do the letters L and R represent?

Lesson 12: Rectangles with perimeter 12 centimeters

1. On a sheet of centimeter square paper draw five different rectangles that have a perimeter of 12 centimeters.
2. Label the length and the width of each rectangle.
3. Complete this table by filling in the length and the widths of the rectangles with perimeter 12 centimeters:

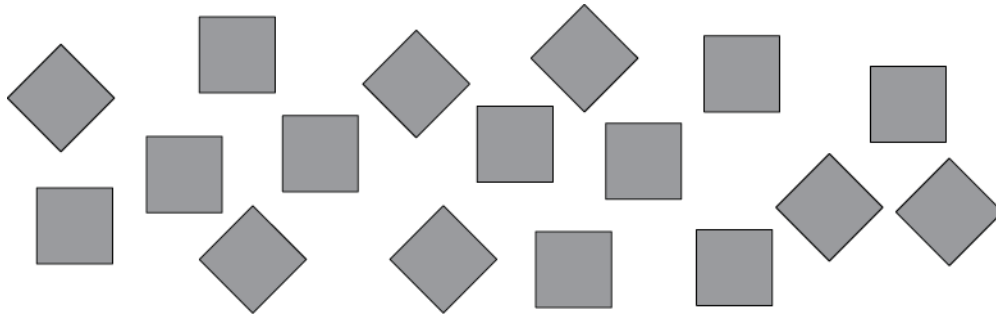
Length of rectangle, L (centimeters)	1	2	3	4	5
---	---	---	---	---	---

Width of rectangle, W

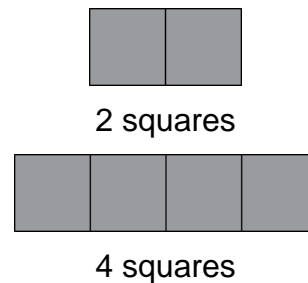
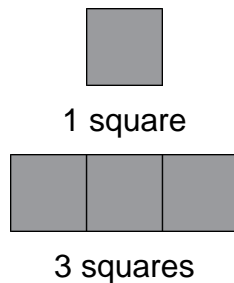
4. Let the letter L represent the length of a rectangle.
Let the letter W represent the width of a rectangle.
Use the letters L and W to write a math sentence that shows the relationship between length and width of a rectangle with a perimeter of 12 centimeters.
5. Imagine that one of these rectangles (perimeter = 12 cm) has a length of 2.5 centimeters. What is the width of this rectangle?
6. Imagine that one of these rectangles (perimeter = 12 cm) has a width of 3 centimeters. What is the length of this rectangle?

Lesson 13: End of unit assessment

These squares are exactly the same size. Each side is 1 centimeter long.



Use these squares to make this pattern.



The two quantities that you will investigate are:

The number of squares

The perimeter of the pattern


You will investigate how the perimeter changes as the number of squares in the pattern increases.

1. Complete this table for a pattern that grows as shown above:


Table 1

Number of squares	1	2	3	4	5	6	7	8	9
Perimeter (cm)	4	6	8						

- As the number of squares increase one by one, how does the perimeter of the pattern change?
- Let the letter S represent the number of squares. Let the letter P represent the perimeter. Write a math sentence to express the relationship between S and P .

4. In this math sentence  represents the same number:

$$\text{hexagon} + \text{hexagon} + \text{hexagon} = 8 + \text{hexagon}$$

What value of  will make this number sentence true?

5. The letter b represents a number. What value of b will make this number sentence true?

$$5 \times b = 25$$

6. What number should you put in the blank box to make this number sentence true?

$$5 + 8 = \square + 7$$

7. The letter x represents a number. What value of x will make this number sentence true?

$$x - 7 = 3$$

8. The letter b represents a number. What value of b will make this number sentence true?

$$4 \times b = 36$$

9. The letter x represents a number. What value of x will make this number sentence true?

$$x - 9 = 0$$