

9.1

Student book pages 376-382

Writing a Pattern Rule

GOAL

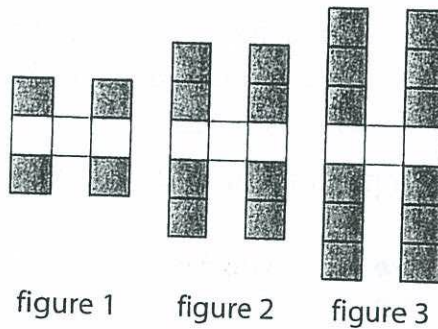
Use a variable to write a pattern rule.

You will need

- coloured square tiles



Use these steps to write a pattern rule that tells the number of tiles in any figure in the pattern.



Step 1: Copy the pattern using coloured tiles.

Step 2: Complete a table of values showing each part of the pattern.

Figure number	Number of grey tiles	Number of white tiles	Total number of tiles
1	4	3	7
2		3	
3			

$\left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} + 4$
 $\left. \begin{array}{l} \text{ } \\ \text{ } \end{array} \right\} + \underline{\hspace{2cm}}$

Hint

The total number of tiles increases by 4 each time. Multiply the figure number by 4. Then look at the number of grey tiles. What do you notice?

Step 3: Look at the tile pattern. Circle the part of the pattern that changes.

number of white tiles number of grey tiles

Look at the numbers in the table.

How are the number of grey tiles and the figure number related?

Math words

variable

a quantity that varies, or changes
A variable is often represented by a letter, such as n .

algebraic expression

an expression that includes 1 or more variables
It may also include numbers and operation signs.

Step 4: Represent the figure number by a **variable** (n).

Write an **algebraic expression** that tells the number of grey tiles in figure n .

$$\underline{\hspace{2cm}} \times n$$

Step 5: Look at the pattern and table again. The number of _____ tiles is the same in each figure.

Step 6: Write an expression that tells the total number of tiles (grey tiles + white tiles) in figure n .

$$\underline{\hspace{2cm}} \times n + \underline{\hspace{2cm}}$$

Step 7: This expression you wrote is a pattern rule. Does it give the correct number of tiles when $n = 1, 2$, and 3 ? _____

Use the pattern rule to complete the table below.

Figure number	Number of grey tiles	Number of white tiles	Total number of tiles
4	16	3	19
5		3	
6			

Reflecting

- ▶ You have described the same pattern using a model, a table of values, words, and an algebraic expression. Which method do you prefer? Why?

- ▶ The expression $2 \times n + 5$ represents a pattern. Which part of the expression describes the part of the pattern that changes in each figure n ?

Which part describes the part that stays the same?





figure 1



figure 2



figure 3

Hint

The *number of grey tiles* is a multiple of the *figure number*. To determine the multiplier, look at the increase in the *total number of tiles* each time.

Checking

2. a) **Circle** the part of the pattern that is different in each figure.

number of grey tiles number of white tiles

- b) Complete a table of values for the pattern.

Figure number	1	2	3
Number of grey tiles	2		
Number of white tiles	1		
Total number of tiles	3		

- c) How are the number of grey tiles and the figure number related?

- d) Write an algebraic expression that tells the number of grey tiles in figure n . _____
- e) Write an algebraic expression that tells the total number of tiles (grey tiles + white tiles) in figure n .
_____ + _____

Practising

5. Kyle and Tynessa coloured the same pattern of tiles differently.

- a) This is how Tynessa coloured the pattern.



figure 1



figure 2

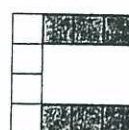


figure 3

Write a pattern rule using an algebraic expression based on Tynessa's colouring.

First, complete the table of values on the next page.

Figure number	Number of black tiles	Number of white tiles	Total number of tiles
1			
2			
3			

Circle the part of the pattern that is different in each figure.

number of black tiles number of white tiles

How are the number of black tiles and the figure number related?

Write an expression that tells the number of black tiles in figure n . _____

How many white tiles are in figure n ? _____

Write a pattern rule to represent the total number of tiles in figure n .

$$T = \text{_____} + \text{_____}$$

total number of tiles number of black tiles number of white tiles

b) This is how Kyle coloured the pattern.



figure 1



figure 2

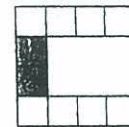


figure 3

Kyle's pattern rule is $T = (n + 1) + (n + 1) + 2$.

Tynessa's pattern rule is $T = \text{_____} \times n + \text{_____}$.

Why must Kyle's and Tynessa's pattern rules be the same, even though their algebraic expressions are different?

Hint

Compare the total number of tiles in each figure in Tynessa's pattern and Kyle's pattern.

