

The Function Game: Can You Guess the Secret?

Copy the input and output numbers for each secret given by your teacher. Write your guess for what is happening to the input number to create the output number for each table in the space below.

A.

INPUT	OUTPUT

My Guess:

D.

INPUT	OUTPUT

My Guess:

B.

INPUT	OUTPUT

My Guess:

E.

INPUT	OUTPUT

My Guess:

C.

INPUT	OUTPUT

My Guess:

F.

INPUT	OUTPUT

My Guess:



THE SECRET CALCULATORS

Numbers were entered into calculators. Try to find the *secret* and figure out what was done to the number put in the calculator (the input) to get the number that came out of the calculator (the output).

<u>input</u>	<u>output</u>

the secret in words:

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

the secret in symbols:

For this next task, you know the secret rule for the calculator. Can you find input and output numbers and write the rule in symbols? Try it! You can use the calculator to help you.

<u>input</u>	<u>output</u>

the secret in words:

*add 5 to a number to find
a new number*

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

*multiply a number by 5
and add 1 to find a new
number*

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

*decrease a number by 1
to find a new number*

the secret in symbols:

<u>input</u>	<u>output</u>

the secret in words:

*multiply a number by 3
and subtract 1 to find
a new number*

the secret in symbols:



THE SECRET CALCULATORS *Teacher Key*

Numbers were entered into calculators. Try to find the *secret* and figure out what was done to the number put in the calculator (the input) to get the number that came out of the calculator (the output).

<u>input</u>	<u>output</u>

the secret in words:

add 8 to an input number to make an output number

the secret in symbols:

$$y = x + 8$$

<u>input</u>	<u>output</u>

the secret in words:

double the input number and add 5 to make the output number

the secret in symbols:

$$y = 2x + 5$$

<u>input</u>	<u>output</u>

the secret in words:

subtract 2 from an input number to find an output number

the secret in symbols:

$$y = x - 2$$

<u>input</u>	<u>output</u>

the secret in words:

multiply the input by 2 and then add 6 for an output number

the secret in symbols:

$$y = 2x + 6 \text{ or}$$

$$y = 2(x + 3)$$

For this next task, you know the secret rule for the calculator. Can you find input and output numbers and write the rule in symbols? Try it! You can use the calculator to help you. *Answers to the input output tables will vary.*

<u>input</u>	<u>output</u>

the secret in words:

*add 5 to a number to find
a new number*

the secret in symbols:

$$y = x + 5$$

<u>input</u>	<u>output</u>

the secret in words:

*multiply a number by 5
and add 1 to find a new
number*

the secret in symbols:

$$y = 5x + 1$$

<u>input</u>	<u>output</u>

the secret in words:

*decrease a number by 1
to find a new number*

the secret in symbols:

$$y = x - 1$$

<u>input</u>	<u>output</u>

the secret in words:

*multiply a number by 3
and subtract 1 to find
a new number*

the secret in symbols:

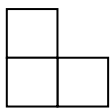
$$y = 3x - 1$$

Tile Patterns

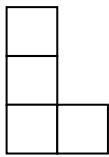
Activity 1

Directions: Use the square tiles to construct the next design in the pattern. Use two colors to show which part of the design remains the same each time and which part is changing. Discuss ideas with your team and then sketch the next two pictures. Work with your team to answer the questions below.

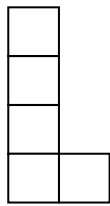
FIRST PATTERN DESIGN



Pattern one



Pattern two



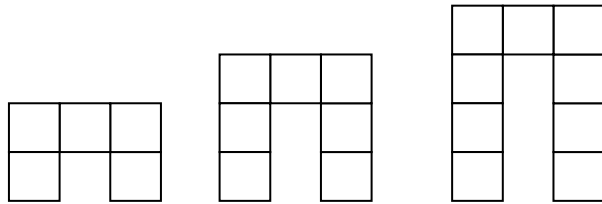
Pattern three

Pattern four

Pattern five

1. How is the pattern changing and how will the ninth pattern look?
2. How would you explain to someone how to build any pattern number?
3. What part of the pattern is *constant*?
4. What part of the pattern is *changing or variable*?
5. Write a rule using algebraic notation to describe how to build any pattern. Let n represent the number of the pattern and let a represent the amount of tiles. Test your rule with the patterns you have drawn.

SECOND PATTERN DESIGN



Pattern one Pattern two pattern three pattern four pattern five

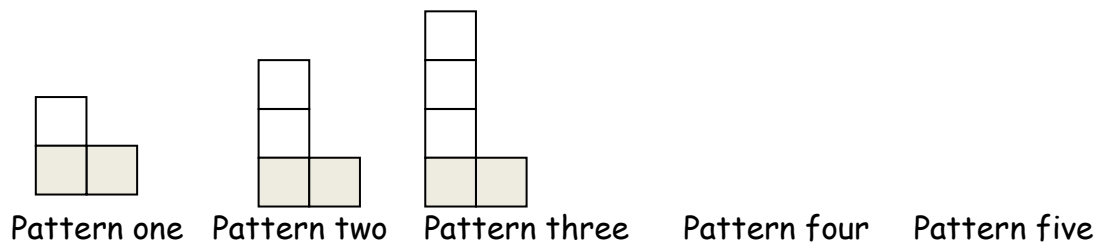
1. How is the pattern changing and how will the ninth pattern look?
2. How would you explain to someone how to build any pattern number?
3. What part of the pattern is *constant*?
4. What part of the pattern is *changing or variable*?
5. Write a rule using algebraic notation to describe how to build any pattern. Let n represent the number of the pattern and let a represent the amount of tiles. Test your rule with the patterns you have drawn.

Tile Patterns ANSWER KEY

Activity 1

Directions: Use the square tiles to construct the next design in the pattern. Use two colors to show which part of the design remains the same each time and which part is changing. Discuss ideas with your team and then sketch the next two pictures. Work with your team to answer the questions below.

FIRST PATTERN DESIGN *accept reasonable responses*



1. How is the pattern changing and how will the ninth pattern look?

Each new pattern has one more tile; the ninth will have eleven tiles: two on the bottom and nine stacked on top of the left bottom one

2. How would you explain to someone how to build any pattern number?

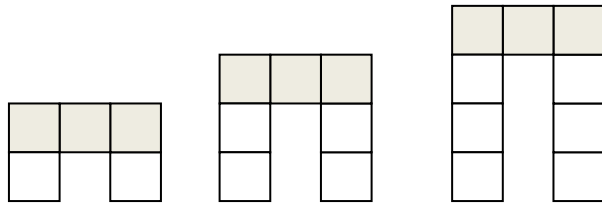
The first tower is one more than the pattern number and then put one tile next to the first tower.

3. What part of the pattern is *constant*? *the bottom two tiles are constant*

4. What part of the pattern is *changing or variable*? *the number of tiles on top of the two on the bottom*

5. Write a rule using algebraic notation to describe how to build any pattern. Let n represent the number of the pattern and let a represent the amount of tiles. Test your rule with the patterns you have drawn. $a = n + 2$

SECOND PATTERN DESIGN *accept reasonable responses*



Pattern one Pattern two pattern three pattern four pattern five

1. How is the pattern changing and how will the ninth pattern look?

The "legs" of the bridge are growing; each new pattern has two more than the one before; the ninth pattern will have three across the top and each leg will be made of nine tiles for a total of 21 tiles.

2. How would you explain to someone how to build any pattern number?

Start at the top and place three tiles, add 2 legs that are equal to the number of the pattern. If the pattern number is four, you add eight tiles.

3. What part of the pattern is *constant*? *the three tiles across the top*

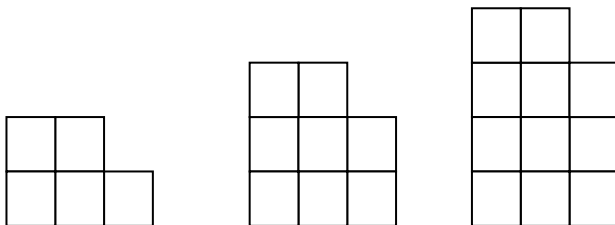
4. What part of the pattern is *changing or variable*? *The number of tiles on each "leg"*

5. Write a rule using algebraic notation to describe how to build any pattern. Let n represent the number of the pattern and let a represent the amount of tiles. Test your rule with the patterns you have drawn. $a = 2n + 3$

Tile Patterns

Activity 2

Study the first three tile patterns and then sketch a picture of the fourth and fifth patterns.



pattern one pattern two pattern three pattern four pattern five

Complete the following table with information from the five designs above:

Pattern number (n)	Variable amount	Amount constant	Total amount (a)
1			
2			
3			
4			
5			

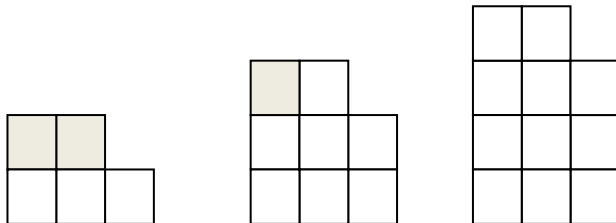
What do you notice about the relationship between the pattern number and the variable or changing amount?

Describe how you could predict the total amount of tiles in the tenth pattern.

Using n for the pattern number and a for the total amount of tiles, write a rule that you could use to find the total amount of tiles in any pattern number. Compare your answer with classmates.

Study the first three tile patterns and then sketch a picture of the fourth and fifth patterns.

ACCEPT REASONABLE RESPONSES



pattern one pattern two pattern three pattern four pattern five

Complete the following table with information from the five designs above:

Pattern number (n)	Variable amount	Amount constant	Total amount (a)
1	3	2	5
2	6	2	8
3	9	2	11
4	12	2	14
5	15	2	17

What do you notice about the relationship between the pattern number and the variable or changing amount?

The variable amount is three times the pattern number

Describe how you could predict the total amount of tiles in the tenth pattern.

Multiply three times ten and then add the constant of 2 for a total of 32

Using ***n*** for the pattern number and ***a*** for the total amount of tiles, write a rule that you could use to find the total amount of tiles in any pattern number.

Compare your answer with classmates.

$$a = 3n + 2$$