

# Find the Hidden Rule

## Introduction

You have seen how a rule can be used to relate one variable to another. The goal of this activity is to use a table of inputs and outputs to find a rule.

The calculator will make up rules using any one of the four operations (addition, subtraction, multiplication or division). Examples of these kinds of rules are shown below.

$$y = x + 5$$

$$d = t - 5$$

$$n = 5p$$

$$q = \frac{x}{5}$$

Your job is to investigate a rule by choosing numbers to substitute for one variable. The calculator will apply the hidden rule and give you the value of the other variable. After repeatedly entering numbers and observing outputs, you should be able to guess the hidden rule.

For example, could you write correct rule if you were given the table below?

X	F1		
0	-4		
1	-3		
2	-2		
3	-1		
4	0		
5	1		
6	2		
7	3		
8	4		
9	5		

To write a rule, we first have to answer the question: how do the numbers in the second column relate to the numbers in the first column? Look carefully, you can see that a number in the second column is always 4 less than the corresponding number in the first column.

Now pick two variables, like  $a$  and  $b$ . If the first column contains values of the variable  $a$ , and the second column contains values of variable  $b$ , then a correct rule would be:

$$b = a - 4$$

In other words, the output  $b$  is equal to the input  $a$  minus 4.

It is a good idea to check our new formula against the values in the table. For instance,  $-4 = 0 - 4$  and  $-3 = 1 - 4$  are checks of the first two rows of the table.

Turn on the HP 39gs and press the APLET key. Look for the HP aplet **HIDDEN RULE** (you may have to scroll). See your teacher if you don't have the aplet. Once you have **HIDDEN RULE**, highlight it and press the START menu key. Read the starting note and press the VIEWS key. Choose **Rule 1** and a table will appear. Investigate rule 1 by typing as many different numbers as you need to in order to see how column two relates to column one.

### Exercises

1a) Describe how each number in column two relates to the corresponding number in column one.

1b) Write an equation using two variables to express the rule.

Press the VIEWS key and choose **Rule 2**.

2a) Describe how each number in column two relates to the corresponding number in column one.

2b) Write an equation using two variables to express the rule.

Press the VIEWS key and choose **Rule 3**.

3a) Describe how each number in column two relates to the corresponding number in column one.

3b) Write an equation using two variables to express the rule.

The next rule involves two operations. For example, in the rule  $y = 3x + 2$ , the input value is multiplied by 3 and 2 is added to the result to find the output.

Press the VIEWS key and choose **Rule 4**.

4a) Describe how each number in column two relates to the corresponding number in column one.

4b) Write an equation using two variables to express the rule.

The last rule also uses two operations. Press the VIEWS key and choose **Rule 5**.

5a) Describe how each number in column two relates to the corresponding number in column one.

5b) Write an equation using two variables to express the rule.