

## Determining the Rule

**STRAND:** Patterns, Functions, Algebra

**STRAND CONCEPT:** Patterns, Relations, and Functions

**SOL** 4.15, 5.18

### Remediation Plan Summary

Students will determine a rule to describe the relationship between the input and output numbers in a table. Creating input and output tables is a precursor to middle school concepts related to additive and multiplicative relationships between two quantities.

### Common Misconceptions

- Students may determine a pattern by only looking at the relationship between one pair of values. Students may confuse additive and multiplicative relationships between two quantities.

### Materials

- Displayable Patterns Table for Introductory Activity
- Displayable “Guess My Rule Round One” table
- Student copies of “Guess My Rule”
- Displayable Reflection/ Exit Ticket Activity
  - Teacher may opt to provide students with individual copies of the Reflection/ Exit Ticket

### Introductory Activity

Present the following patterns, one at a time, to the students, and have them identify the missing number and explain why that number fits the pattern.

PATTERNS						
<b>Example One:</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>?</b>	<b>25</b>	<b>30</b>
<b>Example Two :</b>	<b>?</b>	<b>11</b>	<b>9</b>	<b>7</b>	<b>5</b>	<b>3</b>
<b>Example Three:</b>	<b>80</b>	<b>40</b>	<b>20</b>	<b>10</b>	<b>?</b>	<b>?</b>

**Plan for Instruction**

- Teacher displays “Guess My Rule Round One” shown below.

Guess My Rule Round 1!	
Input	Output

- Lead the class in playing a game of “Guess My Rule.” Ask students to select a number to put in the input column in the table.
- Using a predetermined, unstated rule (e.g., multiply the input number by 2; add 7 to the input number), write the appropriate “output” number in the table.
- Continue soliciting input numbers from the students and writing the appropriate output numbers according to the secret rule until the students think they know what the rule is. (Students may choose very large numbers at first, but they should come to realize that smaller numbers make the pattern easier to identify.)
- At that point, supply a number for the input column, and let the students determine the appropriate output number. A correct output number will prove that they have figured out the rule. (Students may guess the rule incorrectly if they guess too quickly or if they attend to only one pair of input-output numbers. For example, if the first input number is 5 and the output number is 10, students may guess that the rule is to add 5 to any input number, when the real rule is to multiply the input number by 2. When that happens, simply say, “That is not *my* rule,” and write the correct output number.)
- Have students verbalize the rule, e.g., “To get the output number, multiply the input number by 2.” Do not allow the rule to be verbalized until most, if not all, of the students are able to give a correct output number for any given input number.
- Have the students devise a variable expression to represent the rule they have discovered, e.g.  $2 \times n$  or  $n + n$ . Write the variable expression for the rule in the last cell in the table.

*AR Remediation Plan – Patterns, Relations, and Functions*

- Repeat the above activity as many times as you deem necessary, using a different rule each time. Another good example is, “Add 6 to the input number.” Multi-step rules can be given for a challenge, e.g., “Multiply the input number by 2 and subtract 5 to get the output number.”
- Distribute the “Guess My Rule Recording Sheet” handouts, and have students work in pairs to play the game, taking turns as the player who creates the rule.
  - Upon the end of each round – the winner must share the strategy used to determine the rule.

***Pulling It All Together (Reflection)***

## **Reflection/ Exit Ticket**

Jay and Marissa played a game of “Guess My Rule.” When they finished the game, some water was spilled on their table, and all of the numbers written in their table washed away. Jay remembered what the rule was, but neither of them could remember the numbers they wrote.

Fill in the input and output columns of the following table with some numbers that might have been used in their game, using the rule expressed in the last cell.

<b>Input</b>	<b>Output</b>
<b><math>n</math></b>	<b><math>n - 3</math></b>

When you play the “Guess My Rule” game and you are the one who must guess the rule that is being used, how do you do it? Explain your strategy for figuring out the rule.

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

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