

CORD Applied Mathematics
Unit 24 – Patterns and Functions

Developed by: Rachel Bishop – Lakewood Career Academy
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Date: June 2011

Short Description: *Students will create function machines that take an input number, and follow a rule to find an output number. Once students have created their machines students will visit each other's machines, feed in inputs, and use the outputs to find the rule used.*

Function Machines

Lesson Objectives Students will determine a rule based on an input output table.
Students will determine if a rule is a function.

Pre-requisite Skills Students can set up a data table. Students can translate a written or verbalized rule into an expression

New Vocabulary Input
Output
Function

Materials Cardboard Boxes
Markers
Scissors.

Math Standards:

A1.3.A *Determine whether a relationship is a function and identify the domain, range, roots, and independent and dependent variables.*

A1.3.B *Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.*

Reading Standards:

2.1 *Demonstrate evidence of reading comprehension.*

2.1.5 *Apply comprehension-monitoring strategies for informational and technical materials, complex narratives, and expositions; synthesize ideas from selections to make predictions and inferences.*

2.1.6 *Apply comprehension-monitoring strategies for informational and technical materials, complex narratives, and expositions: monitor for meaning, create mental images, and generate and answer questions.*

3.1 *Read to learn new information.*

Writing Standards:

1.2 *Use style appropriate to the audience and purpose; use voice, word choice, and sentence fluency for intended style and audience*

2.2 *Write for different purposes, such as telling stories, presenting analytical responses to literature, persuading, conveying technical information, completing a team project, and explaining concepts and procedures.*

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Leadership and Employability Skills

Manage Time and Resources

Teamwork

Appropriate Language and Attitude

Work Ethic

Participation

Set-up information

Create an example function machine. The function machine should be made by taking a box. Set the box sideways and cut one opening in the top of the box. Label this input. Cut one opening in the bottom of the box. Label this output. On the inside of the box write a function rule. Example (output = input \times 5 – 2).

Lab organization

1. Ask for one student volunteer to work the function machine. This student will sit behind the box. All other students need to choose a number to input into the machine. They should write "input" and their number on a slip of paper, then one by one go up and put their number into the function machine. The student inside the function machine follows the rule prescribed and writes on the paper "output" and the output number.
2. After students have each put their number through the machine, collect everyone's data in a data table on the board or overhead.
3. Ask students to predict the rule that was used to get from the input to output. If they need to they can put more numbers through the machine to confirm their rule.
4. Divide students into pairs or small groups. Have each group of students create their own function machine. Provide boxes, scissors, markers, etc. Each function machine should be given a name so that students can distinguish between them.
5. After students have completed their function machines, challenge them to go around visit the other function machines and try to guess the rules used. One member from each group will have to stay behind and work the function machine so you will need to switch roles half way through. This activity could be a contest. The group to correctly determine the most rules would be the winner.

Timeline required)

20 minutes Introduction and visiting first function machine

10 minutes Creating class data table and determining rule

20 minutes Pairs of students create their own function machine

20 minutes 2 – 10 minute sections – students visit each others function machines and attempt to determine rule.

10 minutes Rules revealed and winner announced.

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Assessment of student learning

This lab is designed as an intro to the concept of functions. Since this is the first time students are using this idea they should not be graded on their success but just on completion.

The lab could be used as a formative assessment for:

- Translating words to expressions
- Setting up a data table

Summary of learning (to be finished after student completes lab)

After students have completed the activity do a compare and contrast. As a class discuss: “*What did all the function machines have in common? What was different?*”

Students should then be given the formal definition of a function either through notes given by the teacher or through reading from the text.

Optional activities:

As a follow up activity brainstorm examples of real life function machines and what the inputs and outputs are. Examples:

<u>Function</u>	<u>Input</u>	<u>Output</u>
Soda Machine	coins	drink
CD player	CD	song
ATM	Debit Card	Cash

For another extension create another machine with a rule that is not a function. For example “*flip a coin – if heads: input $\times (+10)$ if tails: input $\times (-10)$.*” Compare rules that are functions and rules that are not functions.

Career Applications

<https://wa-appliedmath.org/>

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Function Machines

Group Members: _____

INSTRUCTIONS:

Your challenge...

1. Build a function machine
2. Find the rule of a function machine using only the inputs and outputs.

Instructions:

1. Choose a rule for your function machine. Your rule should have two to three steps.
Write your rule in words and as an equation.

Rule (words) _____

Rule (equation) *output* = _____

Keep your rule a secret

2. Create a function machine for your rule. Your machine must include:
 - a. A name for your function
 - b. An input slot
 - c. An output slot
 - d. Your rule (written on the inside)
3. Visit your classmates function machines.
 - a. Keep a table of your inputs and outputs for each machine
 - b. Take turns with your partner(s) so that you each have a chance to work the function machine and each have a change to visit the other machines.
4. When the time is up meet up with your partner(s) and look over your table for each machine. Write the rule that you think is being used to get from the input to the output for each machine.

What is a Function:

Real life examples of functions (with inputs and outputs):

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Data Collection Sheet:

Function Name:	
Input (x)	Output (y)
Rule:	

Function Name:	
Input (x)	Output (y)
Rule:	

Function Name:	
Input (x)	Output (y)
Rule:	

Function Name:	
Input (x)	Output (y)
Rule:	

Function Name:	
Input (x)	Output (y)
Rule:	

Function Name:	
Input (x)	Output (y)
Rule:	

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