

Algebra/Geometry Institute Summer 2005

Lesson Plan 2: Linear Functions

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Grade Level: 5th

Linear Functions

1 Teaching objective(s)

- The students will recognize, create, extend, and apply patterns in relationship to functions.
- The students will complete a function based on a given rule.

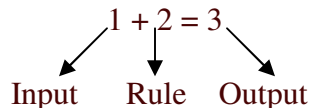
2 Instructional Activities

Set Induction

- Tell the students, “Today we will be briefly reviewing patterns and extending those a step further by studying functions.” Ask, “Someone please remind us of the definition of a pattern.” Give time for discussion of patterns.
- “If I said, the function of your calculator is to compute numbers entered, I’m telling you the calculator’s job. What is the function of the remote control?” (Discuss - to change the channel on the television. You put in which channel you would like to watch, and then the T.V. displays that channel on the screen.) “What’s the function of the telephone?” (Discuss – to communicate. You dial the numbers and it connects you with the person you would like to speak to.) Have students give examples of other objects or things we use everyday that have a function.

Presentation

- Tell the students, “Now that we know what a function is, we are going to relate them to numbers. On the overhead I have the numbers 1-4 listed in a column called input (overhead sheet attached). My rule says “add 2”, so to each number in my input column I am going to add 2. So, $1+2=3$; $2+2=4$; $3+2=5$; $4+2=6$. Notice that I completed the same job, which was adding two, to find each sum. In this case we already knew the rule, so finding out what should go in the output column was pretty simple. Think about entering this problem into an adding machine. The rule, which in this case is adding 2, is inside the machine. So if I entered the number one in the machine, and plus two is inside, it should give out the answer 3. This whole process is an example of a function.”



- Tell the students, “So we can say that a function is the relationship between two sets (which are my input and output) in which each element of the input is matched with exactly one element of the output. In the first row we had an input of one and an output of 3. The element that they share is plus 2.”
- Describe the function table to the students. “The table that I have entered my numbers on is called a function table. It helps to show the relationship between the input and the output.”
- Put up function table 2. Tell the students, “Suppose I had a table that looked like this. It has some numbers in the input column and some in the output column. But, there are a few empty blanks, and notice that my rule is left empty. Our job is to figure out the rule.” Talk students through the process of filling in the missing values and the rule in function table 2.
- Have the students practice filling out a function table by creating their own inputs, outputs, and rules. “On one of the function tables I have given you, create a table that has some input numbers and some output numbers, but leave the rule empty. Trade papers with someone in your group and see if they can guess what your rule is.” Allow students time to figure out each other’s rule.
- Before moving on to the next activity, go over the definitions of the vocabulary you are using. “Let’s review the new vocabulary words that we have learned today.”
 - **function** – the relationship between two sets (input & output) in which each element of the input is matched with exactly one element of the output
 - **input** – what you enter in
 - **output** - the answer that comes out
 - **function table** - a table used for organizing inputs and outputs
- Now that the students are familiar with these terms, begin the function machine activity. You can have the function machine ready to use, or allow the students to create them.

Directions for building the function machine:

1. Put a box on its side, and cur out two slots in the bottom. The slots need to be a little bigger than the size of the index card or slips of paper that your are using.
2. Label the top slot “Input” and the bottom slot “Output.” Be sure to label the slots on the inside of the box, too.

- Allow each group or pair of students to have a function machine box, index cards, markers, and a function table.

Directions for using the function machine:

1. Decide which student will be the input person, and which student will be the output person. (If you're working with groups larger than two, just divide the group into two sections, one for input and the other for output.)
 2. Have the input student write a number on an index card (example: 2) and put it through the input (top) slot. This student also needs to write their number on a function table.
 3. Have the output student determine a rule (example: plus 6). The output student applies the rule, writes the output on the opposite side of the card, and slides the correct number (8) through the output (bottom) slot.
 4. Have the input student write the output they are given in the correct column on their table.
 5. Have students repeat the same process. After students have filled in several rows on their table, they can figure out the rule. The output student verifies whether the rule is the one they applied.
- You can allow the students to use any operation in this game. Depending on their level, you may want to limit input numbers to those that are easily factored or divided for multiplication and division.

Technology Extension

- If the students have access to the internet, the following website is an online interactive game that is very similar to the activity in this lesson.
<http://www.shodor.org/interactivate/activities/fm/index.html>

3 Materials and Resources

- Overhead projector
- Cardboard boxes
- Scissors
- Markers
- Pencils
- Index cards
- Copy of function table
- "Cyberchase". Educational Broadcasting Corporation. 2003.
<http://pbskids.org/cyberchase/parentsteachers/lessonplans/lesson12.html>
- Bassarear, Tom. Mathematics for Elementary School Teachers. Houghton Mifflin Company, 1997.

4 Assessment

- The teacher should observe the students as they complete their function tables. See that each student can identify the input, output, and the constant of the table.
- Students are able to check each other as they work in groups while completing the function machine. Their partner will tell them if they got their rule correct or not. The teacher can evaluate this activity by collecting their function tables and checking their answers.

Function Table 1

Input	Output
1	
2	
3	
4	
Rule: Add 2	

Function Table 2

Input	Output
2	0
4	
6	4
	6
Rule:	