

Functions from Tables

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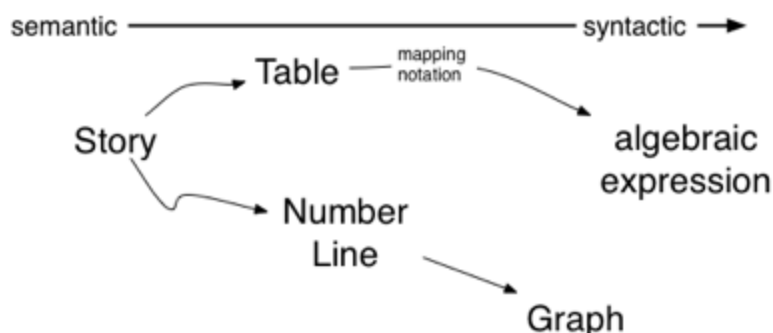
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Summary	Students work with a function, beginning with a table and then a formula, to generate ordered pairs that follow the rule of the function.
Goals	1. To move away from the convention of always starting from a story or narrative. This has to do with the general shift from semantically driven problem solving toward syntactically driven problem solving. The table is seen as a sparser representation than the narrative. The formula is even more removed from a narrative.
Materials	Overheads, White Board or Chart Paper, Handouts
Keywords	Full Class Discussion Interpretation of Algebraic Expressions Interpretation of Tables Linear Functions Production of Stories Production of Tables Small Group Work

Activity Plan:

1. Representing the Two Options as Patterns [Whole Class]

Remember: we're trying to work with sparser representations [see figure]. This has implications for how this lesson is presented to the students.



Using a blank overhead slide (Page 1) or whiteboard, begin a table that has a column for dollars and a column for money. Tell students that there is a rule to get from the amount of days to the amount of money, but we don't yet know what that rule is. All of the values in the number of days (d) follow the same rule to reach the amount of money (m). Begin with the first set of values. Don't spend time trying to contextualize the problem in a story narrative.

Days (d)	Money (m)
7	30

Ask children to guess what the rule might be to get from the amount of days to the amount of money. Possible guesses may be: add 23, multiply by 3 and add 9, multiply by 2 and add 16, multiply by 4 and add 2, or others. Entertain students' guesses and notate them on the board; these will be tested against the next set of values.

After soliciting a few responses, provide the next set of values:

Days (d)	Money (m)
7	30
2	10

Once again, solicit students' guesses as to what the rule might be. Remind them that the same rule applies to any number of days, for all the values in the table. Test out some of the rules students suggested when only one set of values (7, 30) was given. Do these rules work for the new set of values?

In the ensuing discussion, provide first a set of values for a large input (100), and then a set of values for an input of zero:

Days (d)	Money (m)
7	30
2	10
100	402
0	2

The use of the larger input (100) may highlight the multiplicative part of the function for some students. Once again, as students put forth ideas as to what the rule is, test them out with the other sets of values. If students do not suggest it, ask them what number you could multiply by 100 to get near 402. As the class talks about what the function is, notate it on the board and test it on the last set of values (0,2).

It may be helpful to use the mapping notation (suggested on the overhead of Page 3) as a complement to the table. But make sure to acknowledge that multiplication **changes days into dollars**. This is essential for discouraging the view that multiplication here acts simply as repeated addition.

2. Handout (Page 2): Generating values for the function [Group Work]

Students work individually or in pairs to generate more values that follow the function: $d \times 4 + 2$.

3. Discussion of Handout (Page 2): Possible values

If applicable, ask a few students to volunteer values that work for the function; or, move on to the questions on the bottom of the handout.

How much money will you have after 20 days?

After how many days will you have \$42?

Write these answers down on the table you began at the beginning of class.

Write in a new set of values, $(4,20)$, on the table, as shown in the bottom row here:

100	402
0	2
20	82
10	42
4	20

Ask students what they think about these values. Do they work? Does it follow the rule? If not, what could you change so that it does work?

If time allows, ask students to make up a story that follows this rule involving days and money.

4. Homework (Page 4)

Students work on a very similar problem that focuses on the algebraic notation.

Name: _____ Date: _____

Fill in the table below.

Use this rule: $d \times 4 + 2$	
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Days (d)	$d \times 4$	$d \times 4 + 2$	Money (m)	
7			30	
2			10	
100			402	
0			2	
				You may use the back of the paper to write down more values!

How much money will you have after 20 days? _____
Explain.

After how many days will you have \$42? _____
Explain.

How much money will you have after r days? _____

$$d \xrightarrow{\times 4} \quad \xrightarrow{+ 2}$$

Overhead and Homework

(Page 4)

Name: _____ Date: _____

Fill in the table below.

Use this rule: $d \times 3 + 5$	
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Days (d)	$d \times 3$	$d \times 3 + 5$	Money (m)	
7			26	
2			11	
100			305	
0			5	
				Use the back of your paper to write down more values!

How much money will you have after 20 days? _____
Explain.

After how many days will you have \$35? _____
Explain.

How much money will you have after z days? _____