

## Using Recursion in Models and Decision Making: Relationships in Data

### IV.A Student Activity Sheet 2: Recursion and Linear Functions

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1. Coen decides to take a job with a company that sells magazine subscriptions. He is paid \$20 to start selling and then earns \$1.50 for each subscription he sells. Fill in the following table, showing the amount of money ( $M$ ) Coen earns for selling  $n$  subscriptions. Use the process column to note what is happening in each line.

$n$	Process	$M_n$
0		$M_0 =$
		$M_1 =$
		$M_2 =$
		$M_3 =$
		$M_4 =$

2. Write a recursive rule for the amount of money Coen can earn selling magazine subscriptions.
3. **REFLECTION:** The rule in Question 2 defines a term ( $M_{n+1}$ ) with respect to the term that precedes it ( $M_n$ ). Write a rule that defines a term ( $M_n$ ) with respect to the term that precedes it ( $M_{n-1}$ )? How is this rule similar to and different from the rule you wrote in Question 2?
4. Write an explicit function rule for the  $n$ th term in the sequence describing the amount of money Coen can earn. Describe any domain restrictions in your rule. How is this rule related to the rules you wrote in Question 2?

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5. Use sequence notation to enter the data from your table in Question 1 in a graphing calculator, if your calculator has this capability. Limit your lists to 50 entries each. How do you expect the scatterplot of your data to look? Justify your reasoning.
6. How much does Coen earn if he sells 100 magazine subscriptions? Which rule did you use to answer this question? Why did you choose that rule?
7. Coen is trying to earn enough money to buy a new MP3 player. He needs \$225 to cover the cost and tax on the MP3 player. How many magazine subscriptions does Coen need to sell to buy his new MP3 player? Justify your answer. Which rule did you use to answer this question? Why did you choose that rule?
8. Your phone service allows you to add international long distance to your phone. The cost is a \$5 flat fee each month and 3¢ a minute for calls made. Write a recursive rule describing your monthly cost for international calls. Then write a function rule for the  $n$  minutes of calls made in a month.
9. **REFLECTION**
  - How are recursive rules different from explicit function rules for modeling linear data?
  - How are they the same?
  - When are recursive rules more useful than function rules?
  - When are function rules more useful?
10. **EXTENSION:** Think of a situation that can be described by a linear function. Model the situation using a recursive rule and a function rule. Write a question that is better answered using the recursive rule and give the solution.