These instructions illustrate how to use the file `examples.xls`. This file has examples from the article:

Battista, Michael T. Borrow and Caroline Van Auken (1998). Using spreadsheets to promote algebraic thinking. *Teaching Children Mathematics,4,* 470-478.

Download `examples.xls`

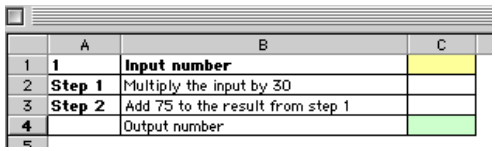
Using spreadsheets to promote algebraic thinking

The purpose of this activity is to create spreadsheets that would help students to develop an algebraic approach to some problems. We will create spreadsheets that perform repeated calculations. Through this activity, we expect students to reflect, decompose and analyze a numerical procedure.

Number Shifters

A *number shifter* will be a rule or set of rules that performs certain calculation. It takes an input number, and after a certain sequence of steps, returns an output number.

First, we'll create a number shifter that calculates long-distance charges. The rate is 30 cents per minute, plus 75 cents per call. So, this number shifter will take an input number (the number of minutes), multiply it by 30, and add 75 to the result.



	A	B	C
1	**1**	**Input number**	
2	**Step 1**	Multiply the input by 30	
3	**Step 2**	Add 75 to the result from step 1	
4		Output number	

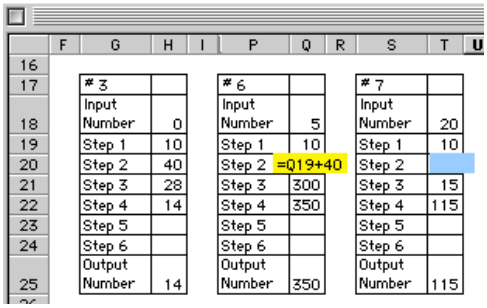
We need to write in cell C2 the formula that will multiply the number in cell C1 by 30, and in cell C3 we will write a formula that adds 75 to the result in cell C2. Once we've done this, we can change at will the input number to get different outputs.

Now we will experiment with other number shifters, e.g. what happens if we invert the order of the operations, what happens if we make longer rules (with more steps). To do this, click on the tab labeled "1" on the file `examples.xls`. We can see the formulas in the worksheet labeled "1 (formulas)."

Now we will try to find what input number is needed to get a given output, following given rules (Missing Input Problems Activity Sheet, fig. 6, p. 475 in Battista & Van Auken, 1998). Click on the tab labeled "2."

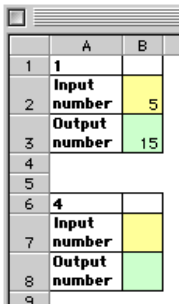
Mystery Number Shifters

In this number shifters the steps are not described (don't peek at the formulas!). In problems 1–3, the student has to find the rule, but the results of all steps are visible. In problems 4–6, the result from a step is concealed, but not the formula. In problems 7–9, the result and the formula for a step are not known. In all cases, the student has to find the rule. He or she will need to explore what happens to different input numbers.



	# 3		# 6		# 7	
	Input Number	0	Input Number	5	Input Number	20
	Step 1	10	Step 1	10	Step 1	10
	Step 2	40	Step 2	=Q19+40	Step 2	
	Step 3	28	Step 3	300	Step 3	15
	Step 4	14	Step 4	350	Step 4	115
	Step 5		Step 5		Step 5	
	Step 6		Step 6		Step 6	
	Output Number	14	Output Number	350	Output Number	115

In the worksheet labeled "3," the number shifters are *condensed*, the rules are not separated in steps. Try to find the rule for the first three. Invent one or two condensed number shifters, and ask a partner to find the rule. Now trade places, and try to find the rule invented by your partner.



	A	B
1	**1**	
2	**Input number**	5
3	**Output number**	15
4		
5		
6	**4**	
7	**Input number**	
8	**Output number**	

References

Battista, Michael T. Borrow and Caroline Van Auken (1998). Using spreadsheets to promote algebraic thinking. *Teaching Children Mathematics,4,* 470-478.