Checking Simplification on the Calculator

Checking to see if you have the right answer to a "Simplify the expression" problem is not as straightforward as other checking procedures. The problem is, there are two things that need to happen for an expression to be simplified correctly:

- The new expression must be as simple as possible
- The new expression must be *equivalent* to the original expression.

The first one is almost impossible to check. The more of them you do, the more you get enough experience to know whether there is more to do or not.

Equivalent expressions evaluate to the same output value *for every* number that you plug into them. To completely check to make sure two expressions are equivalent, you'd have to plug in *every* number to see!

Question: How can you plug in every number that exists? Answer: You can't, so you let the calculator help you check many input numbers quickly!

For example, let's say we are trying to simplify the expression $6 - 4(3x - 2)$. Two students will try to simplify the expression, and we'll check which one did it correctly! The following illustrates the two student's work:

Student One	Student Two
$6 - 4(3x - 2)$	$6 - 4(3x - 2)$
$= 2(3x - 2)$	$= 6 - 12x + 8$
$= 6x - 4$	$= 14 - 12x$

First we'll check student one. Press the $\boxed{Y=}$ button, then type the expression $6 - 4(3x - 2)$ into Y_1, and student one's final answer, $6x - 4$, into Y_2. Now, press $\boxed{\text{2ND}}$-$\boxed{\text{TBLSET}}$ to put the TblStart at 0, and the ΔTbl at 1. Also, make sure Indpnt is set to "AUTO". Now, press $\boxed{\text{2ND}}$-$\boxed{\text{TABLE}}$ to see the following:

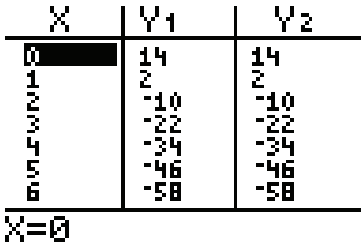
X	Y1	Y2
0	14	-4
1	2	2
2	-10	8
3	-22	14
4	-34	20
5	-46	26
6	-58	32

X=0

Since the values aren't the same for each of the Ys, we know there is a mistake in the simplification. We can continue to try to find which step the mistake is in:

To check the step from the first line to the second line, leave the original expression in Y_1, but put $2(3x-2)$ into Y_2. If these come out to the same values, then we know the mistake doesn't come from this step. Pressing 2ND - TABLE again, we get the same thing we did before! This is the step where there is a mistake!

Before we try to analyze where student one went wrong, let's check student two. Put student two's final expression into Y_2 and look at the table:



Both expressions come out the same for all the x-values listed in the table, so we will assume the expressions are equivalent. Now we see what student one did wrong. They did the subtraction $6-4$ before distributing the 4 over the $(3x-2)$. Since multiplication comes before subtraction, this was the error.