Math 121: Standard Addition Algorithm FORM A
Spring 2011

We defined addition as: "combining two groups of known sizes together, and counting the things in the resulting large group." Our job is to explain why the standard addition algorithm is equivalent to counting a giant pile of things.

The definition of addition says that addition is really not much more than "counting." We will show that the algorithm is equivalent to "counting," but just in a very organized way. Recall that, to even write a number in base ten, you need to have counted the number of "blocks" before you can determine what numerals to write (e.g. 123 means 1 group of one-hundred, 2 groups of ten, and 3 singles). In some sense, the addition algorithm takes advantage of the fact that the two summands have already been "pre-counted."

The standard addition algorithm, then, merely continues the process of creating a base ten numeral. For each place value, we simply count the number of blocks/rods/flats/etc. that are there. If we get ten of any place value, we regroup into the next larger place value and wait to count it until later (this is "carrying").

The standard addition algorithm, then, is merely combining the two groups together, but doing so by combining the place values one at a time. The algorithm then counts the number of blocks, but it does so by place value; so in the rods column, it counts the blocks "10 at a time" (and similarly with other place values. By the principle of conservation, rearranging the blocks in this manner does not change the quantity. Therefore, the standard algorithm is simply combining (in a very particular way) and counting (in a very particular way), and so it fits the definition of addition. Therefore, this algorithm is actually doing addition, and must therefore give the correct answer to addition problems.