

## Math 121: Standard Addition Algorithm FORM B 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 standard algorithm for addition works because you are working by place values. First, you add up the ones place (the blocks). If you have more than ten blocks, you need to regroup (or “carry”) a one to the tens/rods column and write down the remaining amount below the two addends. Otherwise, you simply write the sum below ones digits of the two addends.

Next, you do the same for the tens/rods column. You add up the tens places in each of the two numbers, but you now need to remember if you “carried” anything from the ones place. If so, you add that carried one, too. Otherwise, you don’t. You then repeat the same process as the ones place: if you get a sum that is at least ten, you carry. Otherwise, you don’t.

Next, you repeat the same process that we did on the tens/rods column on the hundreds/flats, thousands/cubes, and all of the other columns. The process is exactly the same.

Finally, if you need to carry a one on the left-most digit, you need to create a new place value that did not exist in either of the two addends (for instance, there will be a thousands place in the answer to  $777 + 542$  even though there is no thousands place in either of the two addends). This new place value can only have the digit 1 written in it, because the largest sum you would need to consider would be  $9 + 9 = 18$  (or maybe  $9 + 9 + 1 = 19$  if you had carried in the step before). So you can never get 20, so you will only carry the one.