ADDITION AND SUBTRACTION IN BASE 10

The most basic model for addition is combining piles of objects. We can model 3 + 5 by making a pile of 3 and a pile of 5, then shoving them together to get 8.

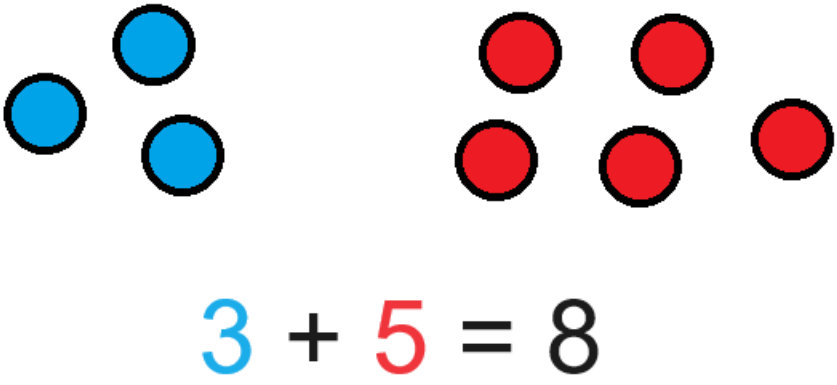

Figure 1: 3 + 5 using colored counters

When we move up to larger numbers, the concept is the same. If we use base 10 blocks, we can handle larger numbers.

Addition in Base 10

Consider **247 + 154**.

First, represent the numbers:

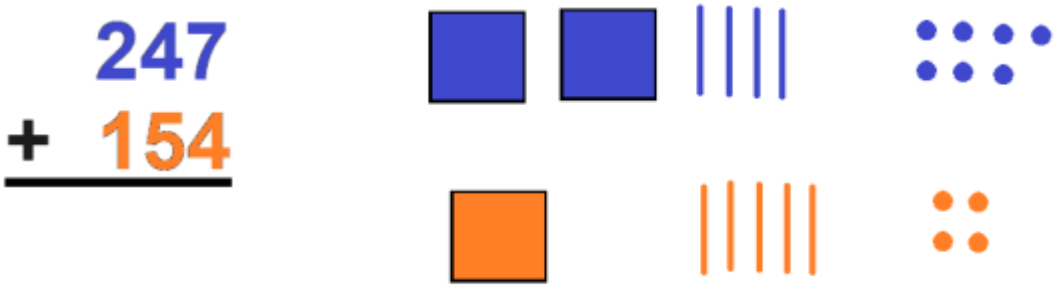

Figure 2: 247 + 154 represented with Base 10 blocks

Then, start adding, beginning with the units. We have a total of 11 units. We regroup sets of 10 into the next size block. 10 units = 1 long. So we “carry” a long and keep a unit.

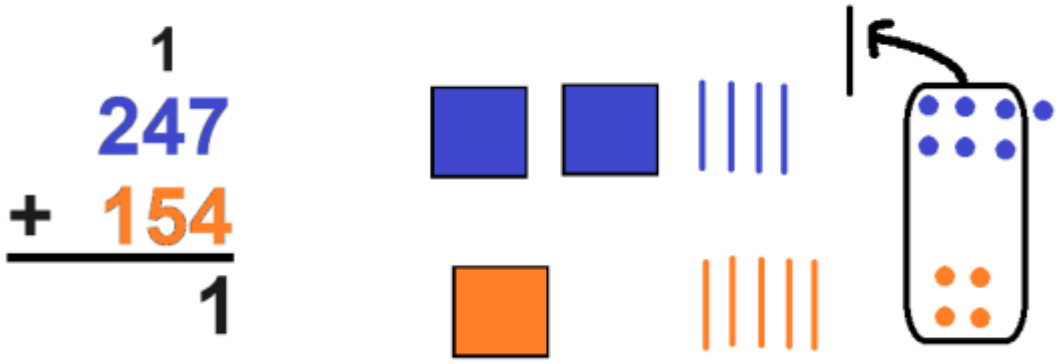

Figure 3: Adding Units

Now we add our longs. We have 4 + 5 + 1, or 10. Again, regroup sets of 10 into the next size. 10 longs = 1 flat. So “carry” a flat and keep 0 longs.

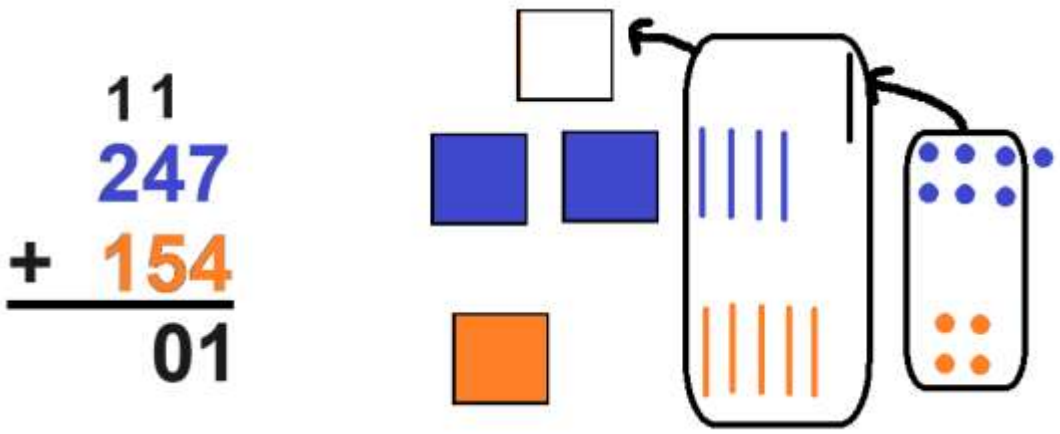

Figure 4: Adding longs

Finally, add our flats. We have 2 + 1 + 1, or 4 flats. This is less than 10 so we don't need to regroup.

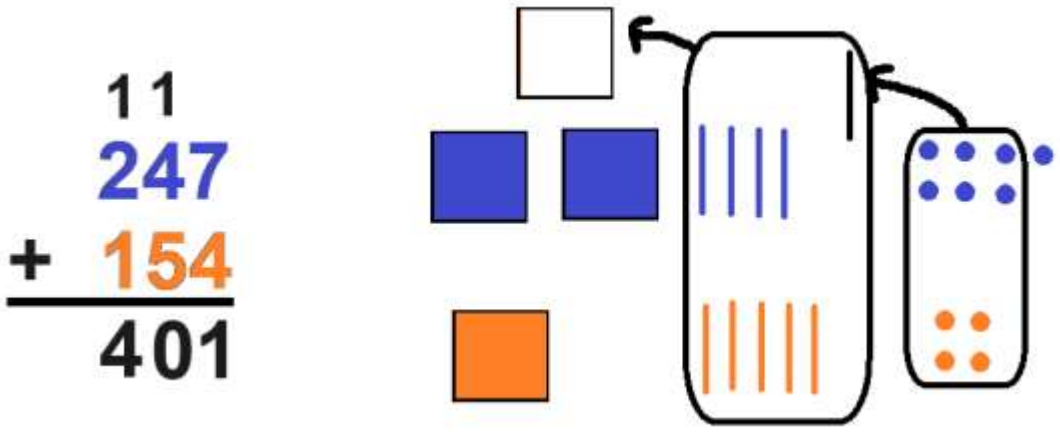

Figure 5: Adding flats

The process is the same, even if there are more place values. In the model, we group sets of 10 and trade up for the next size block. When we write down the problem, this trade up is what we carry, and we write down the number of blocks after the regrouping.

Subtraction in Base 10

The most basic model for subtraction is **take away**. We have a certain number of objects, we take away a different number, and the amount that's left is our answer.

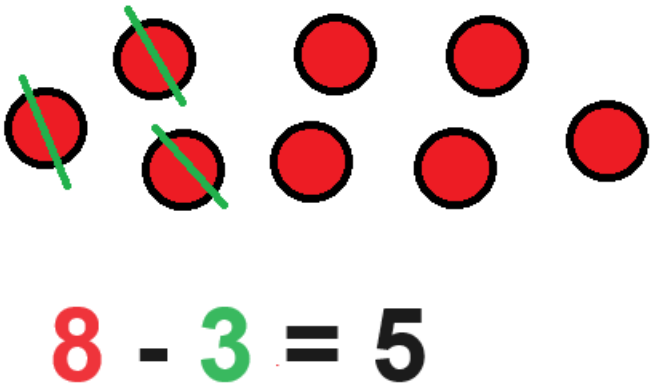

Figure 6: 8 - 3 = 5

The model for larger numbers is similar. We take away the second number, regrouping base ten blocks to a lower number if needed.

Consider **243 – 154.**

First, represent the top number with base 10 blocks.

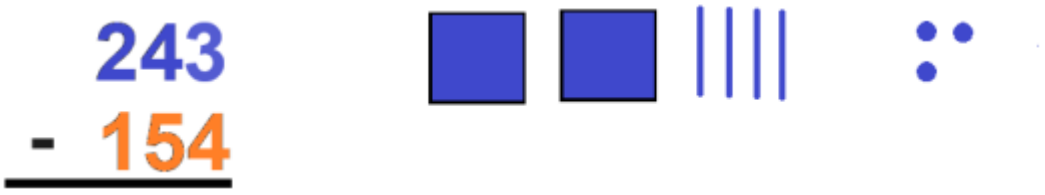

Figure 7: 243-154. Represent 243 in Base 10 blocks

Next, start with units. We want to take away 4 units, but we only have 3. So we "borrow" a long (regrouping) and break it into 10 units. Now we have 13 units. 13 – 4 = 9.

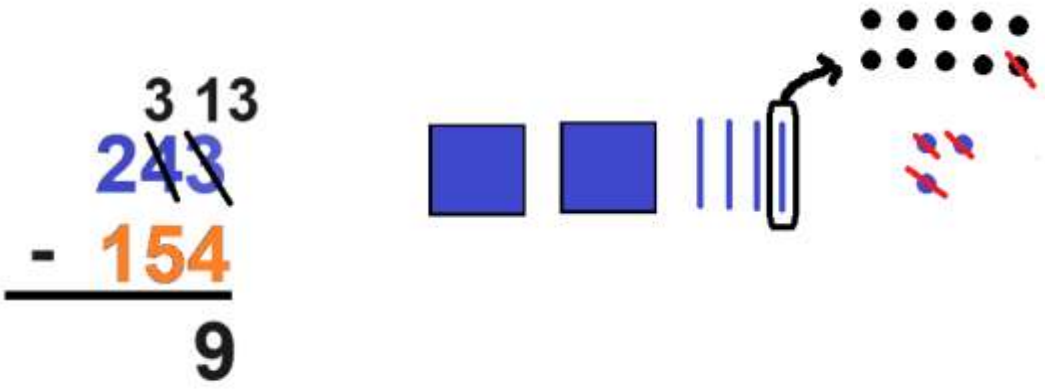

Figure 8: Regrouping and subtracting units

Now we have 3 longs and we want to take away 5. There's not enough, so we regroup again. Trade in one flat for 10 longs. We now have 13 longs. 13 – 5 = 8.

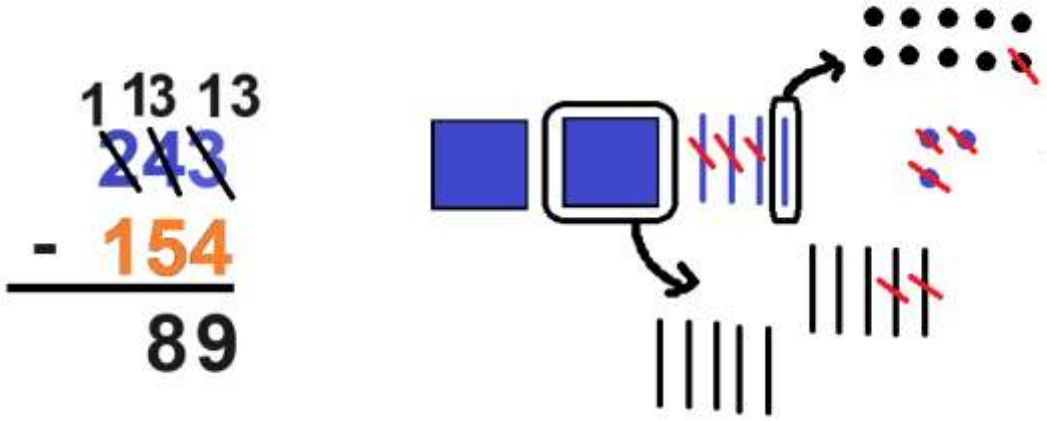

Figure 9: Regrouping and subtracting longs

Finally, we want to take away one long. We have one, so we subtract and have none left.

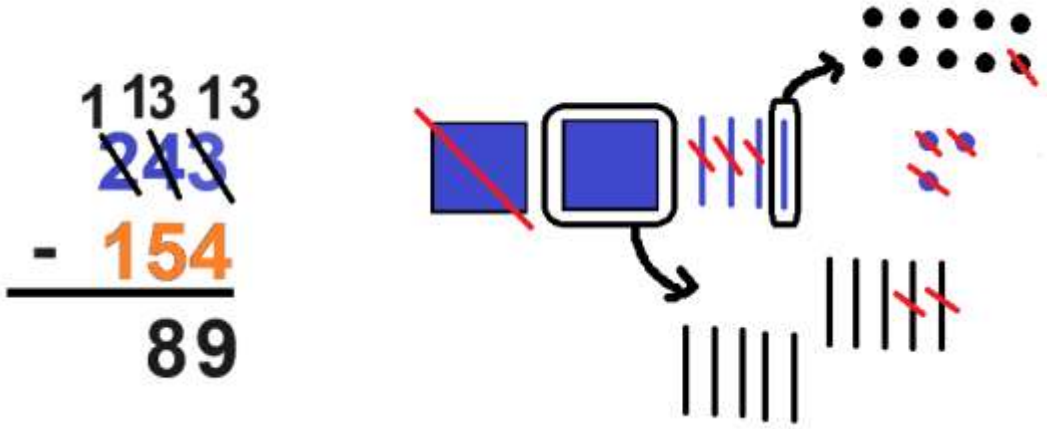

Figure 10: Subtracting flats

Of course, you would do a lot of examples with models before expecting students to be able to do them on their own. The goal is eventually to be able to do without the model, but the model builds conceptual understanding of what's really going on when we regroup ("borrow" or "carry"). If you forget how to use the algorithm, you can still figure it out if you have the model and conceptual understanding as a foundation.