2.NBT Three composing/decomposing problems

Alignments to Content Standards: 2.NBT.A.1

Task

Some students are working with base-ten blocks.

a. Nina has 3 hundreds, 8 tens, and 23 ones. How many ones would this be?

b. Lamar wants to make the number 261. He has plenty of hundreds blocks and ones blocks to work with, but only 4 tens blocks. His friend Jose said,

You can still make 261 with the blocks you have.

Explain how he can.

c. Find at least three different ways to make 124 using hundreds, tens and ones.

IM Commentary

The purpose of this task is to help students understand composing and decomposing ones, tens, and hundreds. This task is meant to be used in an instructional setting and would only be appropriate to use if students actually have base-ten blocks on hand. The last two tasks full engage the notion of composing and decomposing as needed for algorithms for addition and subtraction. Both parts require persistence, as in the

Standard for Mathematical Practice 1. After seeing the first two tasks, students have the ideas needed to start listing possibilities in the third task. The idea of exchanging a ten for ten ones and a hundred for ten tens is needed in order to complete the task. To see an annotated version of this and other Illustrative Mathematics tasks as well as other Common Core aligned resources, visit Achieve the Core.

Solution

a. While some students might try to simply add, others will recognize that 23 ones is 2 tens and 3 ones. When we combine the 2 tens with the 8 tens we already have we get 10 tens, which is one hundred. So we have 3 hundreds and another hundred and three ones, which is 403.

b. Lamar could use ten ones for each ten-block which he was missing. So instead of 2 hundreds, 6 tens and 1 one as he wanted, he can start with the 2 hundreds and 4 tens which he has and then use two sets of ten ones instead of the two more needed tens. Those make 20 ones, which we add to the 1 one needed to get 21 ones. Collecting all of these we get 2 hundreds, 4 tens and 21 ones. There are many possible solutions – for example using 2 hundreds, 3 tens and 31 ones – but the one given is the most likely.

c. The list of all ways using 1 hundred is:

- 1 hundred, 2 tens, 4 ones.
- 1 hundred, 1 ten, 14 ones
- 1 hundred, 0 tens, 24 ones.

The list of all ways not using any hundreds is:

- 12 tens, 4 ones.
- 11 tens, 14 ones
- 10 tens, 24 ones
- 9 tens, 34 ones
- 8 tens, 44 ones
- 7 tens, 54 ones
- 6 tens, 64 ones
- 5 tens, 74 ones
- 4 tens, 84 ones
- 3 tens, 94 ones
- 2 tens, 104 ones

- 1 tens, 114 ones
- 124 ones.

To know the list is complete as we make it, we can start with the standard way, namely 1 hundred, 2 tens, and 4 ones, and exchange tens for ones one at a time to get the first list. Then we exchange the hundred for 10 tens, to get a total of 12 tens along with 4 ones. Once again, we can exchange tens for 10 ones step by step in order to get the second list. Because we cannot use two or more hundreds, these two lists contain all possibilities.