

Three Composing/Decomposing Problems

Sample task from achievethecore.org

Task by Illustrative Mathematics, annotation by Student Achievement Partners

GRADE LEVEL Second

IN THE STANDARDS 2.NBT.A.1

WHAT WE LIKE ABOUT THIS TASK

Mathematically:

- Attends to all three components of the place value system: base-ten units, bundling/unbundling, and positional notation (2.NBT.A).
- Relates concrete quantities and abstract symbols (MP.2)

In the classroom:

- Prompts students to share their developing thinking and understanding
- Uses concrete representations to make the mathematics explicit
- Allows the teacher to check for understanding throughout students' work

MAKING THE SHIFTS¹



Focus

Belongs to the major work² of second grade



Coherence

Develops foundations for multi-digit operations



Rigor³

Conceptual Understanding: primary in this task

Procedural Skill and Fluency: not targeted in this task

Application: not targeted in this task

¹For more information read [Shifts for Mathematics](#).

²For more information, see [Focus in Grade Two](#).

³Tasks will often target only one aspect of rigor.

ADDITIONAL THOUGHTS

Standard 2.NBT.A.1 begins, “**understand** that the three digits of a three-digit number represent amounts of hundreds, tens, and ones...” Words like *understand*, *explain*, *represent*, *interpret*, and *recognize* should alert the reader that the expectation for that standard or cluster involves understanding.

For more insight into the progression of place value understanding from grades K–5, read pages 1–11 of the progression document, *K–5 Number and Operations in Base Ten*, available at www.achievethecore.org/progressions.

When using manipulatives, it is important for the concrete objects to represent the mathematics faithfully. In this case, the blocks faithfully represent the sizes of the base ten units and the way they recursively bundle/unbundle into one another. However, the blocks do not represent the positional notation of the place value system. Nor do they represent the linear sizes of numbers in the hundreds or thousands. Second, it is important always to connect manipulatives to written symbols and methods. In this case, students connect the base ten blocks to written numerals.

For more information on best practices with manipulatives, read page 19 of the Publishers' Criteria, available at www.achievethecore.org/publisherscriteria.

For a direct link, go to: <http://www.achievethecore.org/page/613/three-composing-decomposing-problems-task>

Illustrative Mathematics

2.NBT Three composing/decomposing problems

Alignment 1: 2.NBT.A.1

Not yet tagged

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 can make 124 using hundreds, tens and ones.

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.

Solution: 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.

