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 (MP2).

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.

This task was designed to include specific features that support access for all students and align to best practice for English Language Learner (ELL) instruction. Go here to learn more about the research behind these supports. This lesson aligns to ELL best practice in the following ways:

- Provides opportunities for students to practice and refine their use of mathematical language.
- Allows for whole class, small group, and paired discussion for the purpose of practicing with mathematical concepts and language.
- Elicits evidence of student thinking both verbally and in written form.
- Includes a mathematical routine that reflects best practices to supporting English Language Learners in accessing mathematical concepts.
- Offers the opportunity for students to act out the problem when the task features complex real-world situations.

MAKING THE SHIFTS[1]

Focus	Belongs to the Major Work[2] of second grade	
Coherence	Develops foundations for multi-digit operations	
Rigor[3]	Conceptual Understanding: primary in this task	
	Procedural Skill and Fluency: not targeted in this task	
	Application: not targeted in this task	

[1]For more information read Shifts for Mathematics.
[2]For more information, see Focus in Grade Two.
[3]Tasks will often target only one aspect of Rigor.

To use this task during instruction, engage students in the Decide and Defend Instructional Routine for Part B. This routine prompts students to interpret a hypothetical student's statement, decide if it is correct, draft a defense of their decision, share the defense with the class, and reflect on their learning.

Ask students to interpret Jose's statement. Provide individual think time, partner processing time, and public recording of the meaning of the conversation between Lamar and Jose. Individual think time is an opportunity for teachers to check in with individual students to see if anyone needs support or clarification of the directions.

Have students individually, and then with partners, annotate their work with color, visuals, and words in order to make sense of it (for example, composing and decomposing the hundreds and tens place) and decide if they agree or disagree with Jose's statement. Partners work together to draft a defense that will make their stance clear to their classmates.

While partners share their defense in the full group, students consider each other's arguments. Choose what ideas to explore with particular attention to place value, equivalent quantities, and composing/decomposing numbers.

Facilitate a reflection process that allows students to identify new mathematical understandings about place value and articulate aspects of constructing viable arguments. Create a public record of the reflections generated in the room for future reference.

LANGUAGE DEVELOPMENT

Ensure students have ample opportunities in instruction to read, write, speak, listen, and understand the mathematical concepts that are represented by the following terms and concepts:

- Base ten
- Hundreds
- Tens
- Ones
- Blocks
- Plenty
- Explain

Students should engage with these terms and concepts in the context of mathematical learning, not as a separate vocabulary study. Students should have access to multi-modal representations of these terms and concepts, including: pictures, diagrams, written explanations, gestures, and sharing of non-examples. These representations will encourage precise language, while prioritizing students' articulation of concepts. These terms and concepts should be reinforced in teacher instruction, classroom discussion, and student work.

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, *Number and Operations in Base Ten, K–5*, 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.

2.NBT Three composing/decomposing problems

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.

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, 12 tens and 1 one as he wanted, he can start with the 2 hundreds and 3 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, 1 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 the 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, 124 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.