2:3 Fluency within 100 (Add/Subtract)

Teacher Notes

Central math concepts

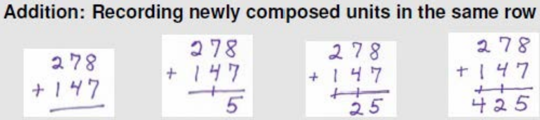
Task 2:3 focuses on fluency in adding and subtracting within 100 (CCSS 2.NBT.B.5). Because such problems are a special case of adding and subtracting within 1000,[†] it is worth discussing first the three-digit methods that students use in grade 2. For three-digit problems, students in grade 2 learn to use an efficient, accurate, and generalizable strategy that can develop further to meet the procedural expectations in grade 3 and grade 4. For example, pages 9 and 10 of the *Progression* document show two calculation methods for three-digit addition. Images of these methods are presented below.

Addition: Recording newly composed units in separate rows

278 +147	278 +147 300	278 +147 300 110	278 +147 300 110 15 425

The computation shown proceeds from left to right, but could have gone from right to left. Working from left to right has two advantages: Many students prefer it because they read from left to right; working first with the largest units yields a closer approximation earlier.

Addition: Recording newly composed units in the same row



	Add the ones, 8 + 7, and record these 15 ones with 1 on the line in the tens column and 5 below in the ones place.	Add the tens, 7 + 4 + 1, and record these 12 tens with 1 on the line in the hundreds column and 2 below in the tens place.	Add the hundreds, 2 + 1 + 1, and record these 4 hundreds below in the hundreds column.

Digits representing newly composed units are placed below the addends, on the line. This placement has several advantages. Each two-digit partial sum (e.g., "15") is written with the digits close to each other, suggesting their origin. In "adding from the top down," usually sums of larger digits are computed first, and the easy-to-add "1" is added to that sum, freeing students from holding an altered digit in memory. The original numbers are not changed by adding numbers to the first addend; three multi-digit numbers (the addends and the total) can be seen clearly. It is easier to write teen numbers in their usual order (e.g., as 1 then 5) rather than "write the 5 and carry the 1" (write 5, then 1).

The *Progression* document notes that "The first written method is a helping step variation that generalizes to all numbers in base ten but becomes impractical because of writing so many zeros. Students can move from this method to the second method (or another compact method) by seeing how the steps of the two methods are related. Some students might make this transition in Grade 2, some in Grade 3, but all need to make it by Grade 4 where fluency requires a more compact method."

2:3 Write the sums and differences.

36 + 45	72 − 17	64 + 27	82 − 55

Answer

81, 55, 91, 27.

Click here for a student-facing version of the task.

Refer to the Standards

2.NBT.B.5; MP.6, MP.7. Standards codes refer to www.corestandards.org. One purpose of the codes is that they may allow a task to shed light on the Standards cited for that task. Conversely, reading the cited Standards may suggest opportunities to extend a task or draw out its implications. Finally, Standards codes may also assist with locating relevant sections in curriculum materials, including materials aligned to comparable standards.

Aspect(s) of rigor:

Procedural skill and fluency

Additional notes on the design of the task

The task does not require students to show their work, but looking at students' steps can show where they may have made a careless mistake.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like 2:3? Locate 2-3 similar tasks in that unit. How are the tasks similar to each other, and to 2:3? In what specific ways do they differ from 2:3?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like 2:3 help students converge toward grade-level thinking about the important mathematics in the task? What factors would you consider in choosing when to use such a task in the unit?*

To return to the case of two-digit addition, the *Progression* document notes that after working with three-digit sums, "the type of problems required for fluency in Grade 2 seem easy, e.g., 28 + 47 requires only composing a new ten from ones. This is now easier to do without drawings: one just records the new ten before it is added to the other tens or adds it to them mentally." Similarly, for subtraction, after working with three-digit differences requiring two, one, and no decompositions, "the objectives for fluency at this grade are easy: focusing within 100 just on the two cases of one decomposition (e.g., 73 - 28) or no decomposition (e.g., 78 - 23) without drawings." Thus, treating two-digit problems as a special case of three-digit problems is not only mathematically accurate, but also helpful to students.

Conversely, as noted on pages 9 and 10 of the *Progression* document, "Spending a long time on subtraction within 100 can stimulate students to count on or count down, [both of which] are considerably more difficult with numbers above 100." To be sure, "If [counting-on and adding-on methods] arise from students, they should be discussed. But the major focus for addition within 1000 needs to be on methods such as those [shown in the two images] that are simpler for students and lead toward fluency (e.g., [as in the first image]) or are sufficient for fluency (e.g., [as in the second image])."

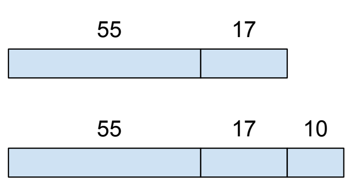
Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: place value concepts; and single-digit sums and differences.

Extending the task

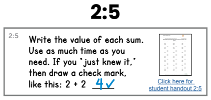
How might students drive the conversation further?

- Checking differences by adding can offer additional procedural practice and reinforce the relationship between addition and subtraction (*C* - *A* is the unknown factor in *A* + ☐= *C*).
- Students could compare the results 72 - 17 = 55 and 82 - 55 = 27. Do these two results make sense together? (See the figure for one approach to discussing this question.)

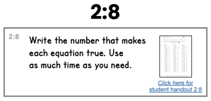


Related Math Milestones tasks

2:5



2:8

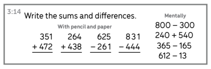


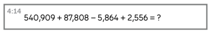
Tasks **2:5 Sums of Single-Digit Numbers** and **2:8 Fluency within the Addition Table** involve the single-digit sums and related differences upon which multi-digit addition and subtraction methods are built. Several of the word problems in grade 2 involve two-digit sums and differences (see the Map of Addition and Subtraction Situations in K–2 Math Milestones).

† Common Core Standards Writing Team. (2015, March 6). *Progressions for the Common Core State Standards in Mathematics (draft). Grades K–5, Number and Operations in Base Ten.* Tucson, AZ: Institute for Mathematics and Education, University of Arizona, p. 9.

* Math Milestones™ tasks are not designed for summative assessment. Used formatively, the tasks can reveal and promote student thinking.

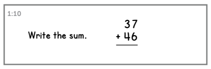
3:14 **4:14**

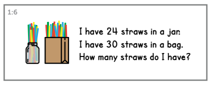


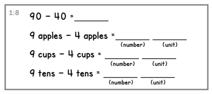


In later grades, task **3:14 Fluency within 1000 (Add/Subtract)** continues the fluency progression for multi-digit addition and subtraction, and task **4:14 Fluency with Multi-Digit Sums and Differences** marks the culmination of this progression.

1:10 **1:6** **1:8**







In earlier grades, tasks **1:10 Two-Digit Addition** and **1:6 Two Groups of Straws** involve the sum of two two-digit numbers. Task **1:8 Subtracting Units** involves subtracting with place value units of tens.

Anticipating and responding to student thinking about the task

Imagine how students might think about the task, and what you might see and hear while they work.

On this page, you can write your thoughts on the following questions.

Solution Paths

- What solution paths might you expect to see?
- What representations might you see? What correspondences between those representations might be noticed by students (or be worth pointing out to students) and discussed by them?
- What misconceptions or partial understandings might be revealed as students work on the task? How could you respond to these positively and productively?

Language

- What might you expect to hear from students engaged with the task? What does that language reveal about their mathematical thinking, and how might you respond to different ways of thinking?
- If students are using early English or using multiple languages in an integrated communication system, how might you help their classmates see those mathematical ideas as valuable?
- Even when using nascent language, students are thinking and communicating their thinking. What might it look like to respond positively and productively to the mathematics in their thinking before giving feedback on the language used?

Identity, Agency, and Belonging

- How can you engage students' interests, experiences, or funds of knowledge?
- How can you build students' self-confidence as learners, thinkers, and doers of mathematics?
- What choices are there for a student to make in the task? How can you build students' agency to the point where they notice and make these choices to solve problems?
- How might one use feedback to build student agency? Where might there be opportunities to build students' self-confidence?