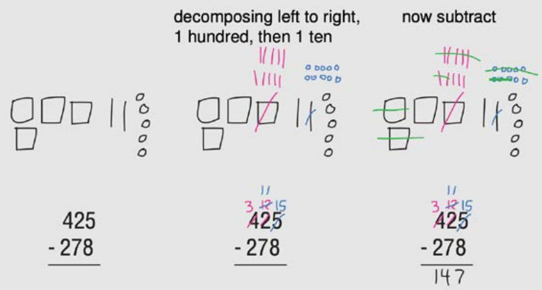
2:7 Subtraction Regrouping

Teacher Notes

Central math concepts

The *Progression* document† (p. 10) illustrates a student-friendly approach to subtracting using an example of a problem that involves two decompositions (see figure). In this method, all of the necessary decomposing is done first, and then the subtractions are carried out at each place. (The figure also includes student drawings, which are not part of the method itself but rather show the meaning of the individual decomposition steps.)

Subtraction: Decomposing where needed first



All necessary decomposing is done first, then the subtractions are carried out. This highlights the two major steps involved and can help to inhibit the common error of subtracting a smaller digit on the top from a larger digit. Decomposing and subtracting can start from the left (as shown) or the right.

The technique of place-value decomposition reduces calculating a multi-digit difference to a sequence of calculations at each place. Therefore, fluency in calculating multi-digit differences (CCSS 3.NBT.A.2, 4.NBT.B.4) rests on fluency within the addition table (CCSS 2.OA.B.2).

Decomposing as necessary at each place removes the difficulty of not having enough ones, tens, or hundreds to subtract from. Crucially, these decomposition steps conserve the value of the number being subtracted from. Thus, when students decompose place value units to calculate a difference, they maintain the value of the number being subtracted from, even as they transform a difficult problem into an easier one. Something similar happens in later grades when students replace the problem $\frac{1}{2} - \frac{1}{3}$ by the equivalent but easier problem $\frac{3}{6} - \frac{2}{6}$, or when students replace the problem 0.28 ÷ 0.04 by the equivalent but easier problem 28 ÷ 4. Transforming a problem to make it easier to solve is one of the most powerful mathematical practices of all.

Relevant prior knowledge

The following mathematics knowledge may be activated, extended, and deepened while students work on the task: place value to hundreds; and subtracting within the addition table.

2:7 (1) Write the number that makes the statement true.

6 hundreds + 3 tens + 4 ones
= 5 hundreds + _____ tens + 4 ones.

(2) How do you know your statement is true?

(3) Look for connections between your statement and this subtraction problem. What connections can you see?

$$\begin{array}{r} \overset{5\ 13}{\cancel{6}\cancel{3}4} \\ -\,482 \\ \hline 152 \end{array}$$

Answer

(1) 13. **(2)** Answers will vary, but reasoning should be based on the idea that 6 hundreds equals 5 hundreds and 10 tens; for example, 6 hundreds is the same as 5 hundreds + 10 tens, so 6 hundreds + 3 tens + 4 ones is the same as 5 hundreds + 10 tens + 3 tens + 4 ones, leading to the answer for part (1). **(3)** Answers will vary. Possible connections between the statement and the subtraction problem could include that the number being subtracted from is 634, which is 6 hundreds + 3 tens + 4 ones; and that according to the strikeouts and small numerals, one of the hundreds in 634 has been decomposed into 10 tens, making 13 tens, as in the statement. Answers to parts (2) and (3) could be supported with drawings or manipulatives.

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

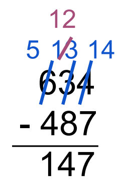
Refer to the Standards

2.NBT.B.7, 2.NBT.B; MP.1, MP.2, 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.

Extending the task

How might students drive the conversation further?

- Students could look for connections between the problem shown in the figure and the statement that 6 hundreds + 3 tens + 4 ones = 5 hundreds + 12 tens + 14 ones.
- Students could brainstorm the most common careless errors ("bugs") a student might make when subtracting numbers. Then students could formulate a tip for avoiding or finding and correcting these errors.



Related Math Milestones tasks

2:2

2:2 (1) True or false?
(a) 2 hundreds + 3 ones > 5 tens + 9 ones
(b) 9 tens + 2 hundreds + 4 ones < 924
(c) 456 < 5 hundreds

(2) Write the number that makes each statement true.
(a) 7 ones + 5 hundreds = _____
(b) 14 tens = _____
(c) 90 + 300 + 4 = _____

2:10

2:10 Check the subtraction by adding.
946 − 678 = 268

2:8

2:8 Write the number that makes each equation true. Use as much time as you need.
Click here for student handout 2:8

Task **2:2 Place Value to Hundreds** concentrates on place value concepts for three-digit numbers. Task **2:10 Three-Digit Addition/Subtraction** involves checking a three-digit difference by calculating a sum. Task **2:8 Fluency within the Addition Table** includes subtractions of the type that occur in each place when calculating a multi-digit difference.

3:14

3:14 Write the sums and differences.
With pencil and paper: 351 + 472, 264 + 438, 625 − 261, 831 − 444
Mentally: 800 − 300, 240 + 540, 365 − 165, 612 − 13

4:14

4:14 540,909 + 87,808 − 5,864 + 2,556 = ?

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

K:13

K:13 Write or say the missing numbers.
3 + 1 = _____ 2 + 3 = _____
5 + 0 = _____ 2 − 2 = _____
4 − 3 = _____ 5 − 3 = _____

1:10

1:10 Write the sum. 37 + 46

1:8

1:8 90 − 40 = _____
9 apples − 4 apples = _____ (number) _____ (unit)
9 cups − 4 cups = _____ (number) _____ (unit)
9 tens − 4 tens = _____ (number) _____ (unit)

1:9

1:9 Write the missing numbers.
4 + 5 = _____ 7 − 4 = _____
10 − 8 = _____ 2 + 6 = _____
4 + _____ = 10 7 + _____ = 10

1:11

1:11 Write the missing numbers. Tell how you got the answers.
8 + 5 = _____ 8 − _____ = 2
13 − 4 = _____ _____ − 5 = 4
7 + 4 = 10 + _____ 6 + _____ = 12

In earlier grades, task **K:13 Fluency within Five** includes subtractions with units of ones. Task **1:10 Two-Digit Addition** is a procedural task involving a sum of two two-digit numbers. Task **1:8 Subtracting Units** portrays a two-digit subtraction problem as a matter of subtracting two single-digit numbers of tens units. Sums of single-digit numbers and related differences are involved in tasks **1:9 Fluency within Ten** and **1:11 Using Properties and Relationships**.

Aspect(s) of rigor:

Concepts, Procedural skill and fluency

Additional notes on the design of the task

Connecting the steps of the subtraction procedure to the statement of equality is intended to promote sense-making about the procedure.

Curriculum connection

1. In which unit of your curriculum would you expect to find tasks like 2:7? Locate 2–3 similar tasks in that unit. How are the tasks you found similar to each other, and to 2:7? In what specific ways do they differ from 2:7?
2. Thinking about the curriculum unit you identified, at what point in the unit might a task like 2:7 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?*

† 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.

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

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Teacher Notes

Math Milestones™

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?