ACHIEVE THE CORE

Multi-Digit Addition and Subtraction Using the Standard Algorithm

4.NBT.B.4 Fluency Mini-Assessment by Student Achievement Partners

OVERVIEW

This mini-assessment is designed to illustrate the standard 4.NBT.B.4, which sets an expectation for fluently adding and subtracting multi-digit whole numbers using the standard algorithm. This mini-assessment is designed for teachers to use either in the classroom, for self-learning, or in professional development settings to:

- Evaluate students' progress toward the skills described by 4.NBT.B.4 in order to prepare to teach this material or to check for fluency near the end of the grade;
- Gain a better understanding of assessing fluency with adding and subtracting multi-digit whole numbers; and
- Illustrate CCSS-aligned assessment problems.

MAKING THE SHIFTS

This mini-assessment attends to **focus** as it addresses multi-digit addition and subtraction, which is major work of fourth grade.[1] It addresses **coherence** across grades because adding and subtracting multi-digit whole numbers sets the stage for multi-digit decimal operations. Standard 4.NBT.B.4 and this mini-assessment target *procedural skill and fluency*, one of the three elements of **rigor**.

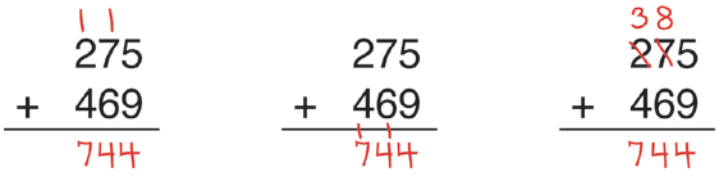
A CLOSER LOOK

Standard 4.NBT.B.4 is a prime example of how "[t]he Standards are not written at uniform grain size" (K–8 Publishers' Criteria, Spring 2013, p. 18). One cannot address this standard in a single day, lesson, or unit. It will take significant classroom time throughout grade 4 to ensure all students master this standard.

> **4.NBT.B.4.**
> Fluently add and subtract multi-digit whole numbers using the standard algorithm.

The standard calls for fluency using the standard algorithm. Standard algorithms for addition and subtraction are based on decomposing numbers written in base-ten notation. This reduces addition or subtraction of two multi-digit whole numbers to a collection of single-digit computations of place-value units.[2] In order to add 275 + 469 in the example below, 275 can be decomposed into 2 hundreds, 7 tens, and 5 ones. Similarly, 469 can be decomposed into 4 hundreds, 6 tens, and 9 ones. Then ones can be added with ones, tens with tens, and hundreds with hundreds.[3] Although some students might use drawings for larger addends, visual models are not representative of fluency.

Showing regrouping in the standard algorithm for addition:

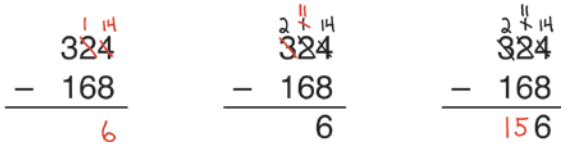


[1] For more on the Major Work of the grade, see achievethecore.org/emphases.
[2] For more on the standard algorithm, read page 3 of the progression document, K–5, Number and Operations in Base Ten.
[3] CCSSM, 1.NBT.C.4, p. 16.

For a direct link, go to: http://achievethecore.org/page/1155/multi-digit-addition-and-subtraction-mini-assessment-detail-pg

For subtraction, students need to evaluate whether ungrouping and regrouping is necessary. Students may either treat each place value column separately and ungroup and subtract before moving on or they may check all potential ungroupings first and then perform all the subtractions.

Showing ungrouping and regrouping in the standard algorithm for subtraction:



Students have been building understanding of addition and subtraction since kindergarten and first grade. In fourth grade, they work towards employing the standard algorithm to perform fast and accurate multi-digit addition and subtraction. Students who leave grade 4 without meeting standard 4.NBT.B.4 (performing these calculations fluently) are likely to have trouble with addition and subtraction of multi-digit decimals (6.NS.B.3).

This mini-assessment includes a variety of addition and subtraction problems ranging from 3-digit to 6-digit numbers. There are some problems that require regrouping or ungrouping and others assess if students can correctly regroup and notate.

Elementary-grade students build up a repertoire of computation algorithms as well as computation strategies (see text box)[4]. For some computations, the standard algorithm is efficient; for other computations, opportunistic strategies are best. For example, the difference 612 – 13 is easy to find by using a mental strategy (such as subtracting 12 then subtracting 1 more, or simply reasoning that the answer will be one less than 600). On the other hand, the difference 661 – 237 may be easier to find using the standard algorithm. Problem 4 (5,096 – 2,999) is an example of one that may be best performed mentally or on paper using an opportunistic strategy. For this mini-assessment, examples of opportunistic strategies appear on page 4.

Computation Algorithm: A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly.

Computation Strategy: Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another.

[4] Definitions originally appear in the Glossary of the Common Core State Standards for Mathematics, http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf#page=85.

Name:_____ Date:_____

1. $\begin{array}{r} 7{,}816 \\ +\ 5{,}436 \\ \hline \end{array}$	2. $\begin{array}{r} 987{,}654 \\ -\ 765{,}213 \\ \hline \end{array}$
3. What is the sum of 531,421 and 468,579?	4. Subtract 2,999 from 5,096.
5. $\begin{array}{r} 3{,}020 \\ -\ 687 \\ \hline \end{array}$	6. Compute: 43,274 + 51,568 – 3,260.

Note for strategies: The Standards expect students to do all of these problems with the standard algorithm; however, in specific cases (#4) a student may use a computation strategy to mentally subtract 3,000 and then add 1 to the answer.

1.

$$\begin{array}{r} 7,816 \\ +\ 5,436 \\ \hline 13,252 \end{array}$$

13,252

2.

$$\begin{array}{r} 987,654 \\ -\ 765,213 \\ \hline 222,441 \end{array}$$

222,441

3.

What is the sum of 531,421 and 468,579?

531421 + 468579 = 1,000,000

1,000,000

4.

Subtract 2,999 from 5,096.

almost 3,000 < take away

2096 + 1

2,097

5.

$$\begin{array}{r} 3,020 \\ -\ 687 \\ \hline 2,333 \end{array}$$

2,333

6.

Compute: 43,274 + 51,568 – 3,260.

43,274 + 51,568 = 94,842

94,842 − 3,260 = 91,582

91,582