

COMPUTATION AND ALGEBRAIC THINKING (GRADE 2)  
COMPUTATION (GRADES 3-5)

# ADDING AND SUBTRACTING FLUENTLY

described by Ryan Flessner and Courtney Flessner

Often, fluency in arithmetic is understood to mean that students can use the standard American algorithms to achieve correct answers quickly. Unfortunately, simply mastering the steps of the standard American algorithms does not ensure that students have a deep understanding of the concepts of multi-digit addition and subtraction. The standards in this strand allow students to build conceptual understandings in a variety of ways prior to learning and mastering the standard American algorithms. While the expectation for learning this algorithm remains, the standards in this progression allow students to understand why the algorithms work by first constructing concrete understandings, moving to strategies that connect to understandings of place value and the properties of operations, and then to mastering the standard American algorithms.

## GRADE 2

### Add and subtract fluently within 100. (2.CA.1)

#### Unpacking the Standard

Fluency in addition and subtraction requires students to demonstrate flexibility, efficiency, and accuracy when solving problems. Second graders are expected to build on knowledge they learned in first grade (i.e., counting on, making tens, knowledge of addition and subtraction facts within 20) as problems increase in complexity.

#### Considerations for Lessons and Assessment

This video explores ways that students can utilize tools such as base ten blocks and number lines to conceptualize addition and subtraction within 100. In order to assess understanding, formal and informal assessments should ask students to utilize strategies to add and subtract within 100; however, assessments must have the dual purpose of confirming that students can explain the strategies they use. This video examines ways teachers can ensure students exhibit both correct answers and correct thinking.

## GRADE 3

### Fluently add and subtract whole numbers within 1,000 using strategies and algorithms based on place value, properties of operations, and relationships between addition and subtraction. (3.C.1)

#### Unpacking the Standard

Building on concepts explored in second grade, this video highlights the move to larger numbers (up to and within 1,000) and more abstract strategies and notation systems in third grade. Properties of operations (commutative, associative, distributive) are introduced, and students are encouraged to use what they know about addition problems to solve subtraction problems (and vice versa). It should be noted that the standard

American algorithms for addition and subtraction are not included in the third-grade standard. While they may be utilized by third-grade students who are ready to engage with these algorithms conceptually, they should not be expected of all third-grade students or taught as whole class lessons as this is the expectation for fourth grade.

### Considerations for Lessons and Assessment

Strategies and algorithms explored in this video include more efficient uses of base 10 blocks and number lines as well as an introduction to the pull down method, the partial sums/differences algorithms, arrow language, and number sentence strings. Informal and formal assessments should ensure that students' fluency (flexibility, efficiency, and accuracy) move developmentally from the concrete to the more abstract as students progress throughout their third-grade year.

## GRADE 4

### Add and subtract multi-digit whole numbers fluently using a standard algorithmic approach. (4.C.1)

#### Unpacking the Standard

Fourth grade is when students should master the standard American algorithms in addition and subtraction. However, it is expected that students' prior understandings from previous grades are used as the starting point in fourth grade.

#### Considerations for Lessons and Assessment

Strengths exhibited through the use of base ten blocks, number lines, and strategies based in place value or the properties of operations (explored in prior grades) are the foundation upon which fourth grade teachers should build. This video shows how connecting these ideas to the standard American algorithm will ensure that fourth graders build conceptual understandings that allow them to achieve correct answers while thinking deeply about the mathematics involved. Assessments in fourth grade should encourage students to communicate the ways they are connecting what they know to new ideas they are exploring.

## GRADE 5

### Add, subtract, multiply, and divide decimals to hundredths, using models or drawings and strategies based on place value or the properties of operations. Describe the strategy and explain the reasoning. (5.C.8)

#### Unpacking the Standard

In fifth grade, students will expand their understandings of addition and subtraction by engaging with numbers containing decimals and reviewing the properties of operations (commutative, associative, distributive) introduced in third grade.

#### Considerations for Lessons and Assessment

This video explains that by stressing place value understandings and properties of operations, this standard encourages educators to return to less abstract tools and notation systems (base ten blocks, number lines, pull down method, partial sums/differences, arrow language, number sentence strings) instead of simply applying the standard American algorithms to numbers with decimals (which should be mastered by the end of sixth grade). As in prior grades, formal and informal assessments in fifth grade should ensure that students demonstrate both correct answers and correct thinking.

## ADDITIONAL RESOURCES

Carpenter, T.P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (2014). *Children's mathematics: Cognitively guided instruction* (2nd ed.). Heinemann.  
 Chapin, S. H., & Johnson, A. (2006). *Math matters: Understanding the math you teach, grades K-8* (2nd ed.). Math Solutions Publications.  
 Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and middle school mathematics: Teaching developmentally* (10th ed.). Pearson.  
 Partnership for Inquiry Learning (n.d.). <http://partnershipforinquirylearning.org>.

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