

Core Content

Cluster Title: Use place value understanding and properties of operations to perform multi-digit arithmetic. (Note: A range of algorithms may be used.)

Standard 2: Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

MASTERY Patterns of Reasoning:

Conceptual:

Students must have a conceptual understanding of the topics listed in the standard (place value, properties of operations, relationship between addition and subtraction) before they can become fluent. Therefore, these understandings are explained in the Background Knowledge section below.

Procedural:

Students can use multiple strategies and algorithms fluently to add and subtract within 1,000.

Students can use place value understanding to fluently add and subtract within 1,000.

Students can use understanding of the associative, commutative, and identity properties of addition to fluently add within 1,000.

Students can use understanding of the inverse relationship between addition and subtraction to fluently add and subtract within 1,000.

Representational:

Model addition and subtraction to 1,000 using manipulatives (e.g., place value blocks) to develop fluency.

Represent addition and subtraction (e.g., on hundreds charts, number lines, bar models) to develop fluency.

Supports for Teachers

Critical Background Knowledge

Conceptual:

- Students will understand place value to 1,000.
- Students will understand vertical and horizontal forms of addition and subtraction.
- Students will understand order of operations without using parentheses.
- Students will understand the associative and commutative properties of addition.
- Students will understand the inverse relationship of addition and subtraction.
- Students will understand the additive and subtractive identity properties ($n + 0 = n$, $n - 0 = n$).

Procedural:

- Students can use understanding of addition fluently to add and subtract within 100.
- Students can apply understanding of models for addition and subtraction to solve problems within 100.
- Students can use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation.
- Students can use understanding of place value and the properties of operations to add and subtract within 100.
- Students can select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

Representational:

- Students can use manipulatives such as place value blocks to model addition and subtraction.
- Students can use hundreds charts and number lines to add and subtract within 100.

Academic Vocabulary and Notation

compare, digits, expanded form, order, place value, standard form, word form, addends, sum, commutative (order) property of addition, identity (zero) property of addition, associative property of addition (grouping), fact family, difference, round, estimate, equation

Instructional Strategies Used	Resources Used
<p>Note: Teachers must recognize that fluency requires using mathematical procedures flexibly, accurately, efficiently, and appropriately and is developed over time through conceptual understanding, using numbers in context, and learning and practicing appropriate procedures.</p> <p>Pose problems such as the following:</p> <p>McKenna had collected 456 pennies. Her friend, Reagan, wanted to start her own collection. McKenna gave her 199 pennies. How many pennies did McKenna have left?</p> <p>Have students solve the problem using whatever strategy they choose, including the traditional algorithm. Have them share their strategies. Strategies may include adding up ($199 + 1 = 200$, $200 + 200 = 400$, $400 + 56 = 456$, therefore $1 + 200 + 56 = 257$ pennies), compensating ($200 + 200 = 400$, $400 + 56 = 456$, $200 + 56 = 256$ plus 1 (from 199 to 200) equals 257), subtracting to count down ($456 - 56 = 400$, $400 - 200 = 200$, $200 - 1 = 199$ so $56 + 200 + 1 = 257$), or adding by tens or hundreds ($199 + 1 = 200$, 200, 300 (100 more), 400 (100 more) 410, 420, 430, 440, 450, 456 (that's 6 more) so $1 + 100 + 100 + 50$ (5 tens) + 6 = 257). If students have used other strategies, have them share and explain.</p>	<p>http://nlvm.usu.edu/en/nav/topic_t_1.html</p> <ul style="list-style-type: none"> - Basic blocks addition and subtraction - Hundreds chart - Number line arithmetic <p>Murphy, Stuart. <i>Earth Day Hooray! (MathStart 3)</i>. HarperCollins, 2004.</p> <p>Murphy, Stuart. <i>Shark Swimathon (MathStart 3)</i>. HarperCollins, 2000.</p> <p>Lopresti, Angeline Sparagna. <i>A Place for Zero: A Math Adventure</i>. Charlesbridge, 2003.</p> <p>http://www.amblesideprimary.com/ambleweb/mentalmaths/pyramid.html</p> <p>http://www.math.pppst.com/subtraction.html (Scroll down to the PowerPoint "Subtraction by Adding." Be sure to add contexts to the numbers.)</p>

<p>Strategies like those above use place value, properties of operations, and the relationship between addition and subtraction.</p> <p>Repeat with many other problems. Have students practice using problems in context (word problems). It is not necessary for students to use the traditional algorithm to become fluent in addition and subtraction, though that algorithm should be taught at some point.</p>	
<p>Assessment Tasks Used</p>	
<p>Skill-Based Task: $236 + 147$</p> $\begin{array}{r} 236 \\ +147 \\ \hline \end{array}$ <p>$236 - 147$</p> $\begin{array}{r} 236 \\ - 147 \\ \hline \end{array}$	<p>Problem Task: There are 236 pieces of candy and my mom bought 147 more. How many do I have in all?</p> <p>I had 236 pieces of candy and I gave away 147 to my friend. How many do I have left?</p> <p>Have students share their reasoning and strategies.</p>