Grade 3 Mathematics, Quarter 1, Unit 1.1

Solving Addition and Subtraction Problems Within 1,000

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<th>Overview</th>
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<td>Number of instruction days: 7-9 (1 day = 90 minutes)</td>
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**Content to Be Learned**

- Add and subtract within 1,000 using understanding of place value and properties of operations.
- Add and subtract within 1,000 using the relationship between addition and subtraction.
- Round whole numbers to the nearest 10 or 100 using understanding of place value.
- Represent and solve word problems involving multi-digit numbers.

**Mathematical Practices to Be Integrated**

4. Model with mathematics.
   - Simplify a complex problem and identify quantities and relationships.
   - Explain a solution strategy with a diagram (including a number line).
   - Verify that the answer is reasonable.

6. Attend to precision.
   - Use clear math language in your explanation.
   - Explain thinking in a way in which peers can understand and relate.
   - Find a more efficient way to get a solution.

**Essential Questions**

- How can you use your understanding of place value to round whole numbers to the nearest 10 or 100?
- How can you use addition to help you solve a subtraction problem?
- How can you use place value and properties of operations to add and subtract within 1,000?
## Standards

### Common Core State Standards for Mathematical Content

| Number and Operations in Base Ten | 3.NBT
|----------------------------------|---
| **** Use place value understanding and properties of operations to perform multi-digit arithmetic.****[^4] |  |

[^4]: A range of algorithms may be used.

3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

### Operations and Algebraic Thinking

| Operations and Algebraic Thinking | 3.OA
|----------------------------------|---

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.[^3]

[^3]: This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

### Common Core State Standards for Mathematical Practice

1. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Clarifying the Standards

Prior Learning

Grade 2 students fluently added and subtracted within 20 using mental strategies, and fluently added and subtracted within 100. Students in Grade 2 performed operations on numbers to 1,000, but fluency was not yet expected.

Current Learning

By the end of grade 3, students fluently add and subtract within 1,000 using a variety of strategies and algorithms. A student demonstrates fluency through accuracy, efficiency, and flexibility. This fluency expectation is a necessary building block to critical learning areas in Grade 3. Third-graders also use their place value understanding to round numbers to the nearest 10 or 100. This is new learning at this grade level. Students must understand that when moving to the right across the places in a number, the digits represent smaller units.

Future Learning

In subsequent grades, students will add and subtract fractions and develop understanding of and fluency in multiplication and division involving whole numbers and fractions.

Additional Findings

A Research Companion to Principles and Standards for School Mathematics notes that “the language of problems that involve comparing quantities is difficult for children at first, partly because the structure in English lumps together two kinds of information: who has more and how much more . . . The language of comparisons is difficult because in many cases, one of the quantities is not present or is unknown in the situation physically. (p. 69)

According to Adding It Up, solving multistep problems is challenging for many students. The book suggests simplifying such problems by using smaller numbers, simplified phrasing, and support with manipulatives. (p.183)
Principles and Standards for School Mathematics suggests that “teachers should help students recognize that solving one kind of problem is related to solving another kind”; furthermore, “recognizing the inverse relationship between addition and subtraction can allow students to be flexible in using strategies to solve problems.” (p. 83)

### Assessment

When constructing an end-of-unit assessment, be aware that the assessment should measure your students’ understanding of the big ideas indicated within the standards. The CCSS for Mathematical Content and the CCSS for Mathematical Practice should be considered when designing assessments. Standards-based mathematics assessment items should vary in difficulty, content, and type. The assessment should comprise a mix of items, which could include multiple choice items, short and extended response items, and performance-based tasks. When creating your assessment, you should be mindful when an item could be differentiated to address the needs of students in your class.

The mathematical concepts below are not a prioritized list of assessment items, and your assessment is not limited to these concepts. However, care should be given to assess the skills the students have developed within this unit. The assessment should provide you with credible evidence as to your students’ attainment of the mathematics within the unit.

- Add and subtract within 1,000 using a variety strategies and algorithms.
- Apply properties of operations when solving problems.
- Round whole numbers to the nearest 10 or 100 using place value understanding.
- Solve one and two step story problems involving multi-digit numbers.

### Instruction

#### Learning Objectives

Students will be able to:

- Add and subtract within 1000 using understanding of place value and properties of operations.
- Round whole numbers to the nearest 10 or 100.
- Solve one and two step story problems involving multi-digit numbers.
- Demonstrate understanding of the concepts and skills learned in this unit.
Resources

enVision Math Grade 3, Pearson Education, Inc., 2009

- Topic 1: Teacher Edition, Numeration
- Topic 2: Teacher Edition, Adding Whole Numbers
- Topic 3: Teacher Edition, Subtraction Number Sense
- Topic 4: Teacher Edition, Subtracting Whole Numbers to Solve Problems

Resource Masters
Student Pages


- Implementing Investigations in Grade 3 – Implementation Guide
- Unit 1 Teacher Edition, Trading Stickers, Counting Coins
- Unit 8 Teacher Edition, How Many Hundreds? How Many Miles?

Teacher Resources Binder

Also see Section I, Supplemental Materials

EnVision:

- Lesson 1-5A Understanding Number Lines
- Lesson 1-5B Counting on the Number Line
- Lesson 2-7A Adding with an Expanded Algorithm
- Lesson 4-1A Making Sense of Addition and Subtraction Equations
- Lesson 4-3A Subtracting with an Expanded Algorithm

Pearson Success Net, www.pearsonsuccesstnet.com

Investigations (TERC), http://investigations.terc.edu/index.cfm

Exam View Assessment Suite

Note: The district resources may contain content that goes beyond the standards addressed in this unit. See the Planning for Effective Instructional Design and Delivery and Assessment for ample resources to refer to when planning your unit and individual lessons.

Materials

Base-ten blocks, connecting cubes, hundreds charts, number lines
**Instructional Considerations**

**Key Vocabulary**

- Place value
- subtraction
- Round
- difference
- Addition
- strategies/properties
- sum
- equation
- commutative property of addition
- balance
- associative property of addition
- expanded algorithm
- equal
- number line

**Planning for Effective Instructional Design and Delivery**

As you plan for instruction throughout the year, you will notice many resource choices within each unit. It may not be necessary to use all components of the materials when planning for instruction. The materials may support core instruction, opportunities for practice, scaffolding and differentiation. This purposeful planning will ensure alignment to the standards in each unit.

In Unit 1.1, the focus is on adding and subtracting within 1000 using a variety of strategies and algorithms. This is not new to this grade level. As stated in the PARCC Model Content Frameworks, students in grade 2 were adding and subtracting within 1000, just not fluently. During grade 3, the students finalize this fluency using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. Fluency is defined as fast and accurate. Connecting computational methods to the standard algorithm will support the students in grade 4 when they learn the standard algorithm.

See Table 1 in the CCSS document, Common addition and subtraction situations. It is imperative that students have experience throughout the year solving all problem types.

During this unit, students also round numbers to the nearest 10 or 100. Students are expected to use their place value understanding to reason about the answers they get when rounding. This goes beyond a memorized “rule” or procedure for rounding. Model and encourage the use of tools such as the number line and hundreds chart to support student understanding.

The number line is a model that is used as a tool to build conceptual understanding of many standards. Accessible on the North Carolina Common Core Instructional Support Tools website [http://www.ncpublicschools.org/acre/standards/] are helpful resources, including the draft PDF “Graphic
Organizers” which provides models and explanations of effective use of the number line. It is important to begin using the number line in this unit, as it will be used throughout the year with whole numbers, fractions, and data.

In grades 1 and 2, students added and subtracted within 20 using specific strategies (see 1.OA.6) such as counting on; making ten; using the relationship between addition and subtraction; and creating equivalent but easier or known sums. These same strategies are adapted and used when solving problems involving larger numbers in grade 3. At this grade level, students explore addition and subtraction strategies, using at least one strategy efficiently. Addition (and subtraction) strategies that students explore may involve breaking numbers apart by place value (for example: 76 + 37: 70 + 30 = 100, 6 + 7 =13, 100 + 13 = 113). An alternate strategy involves adding (or subtracting) one number in parts, where students decompose only one of the addends (for example: 476 + 123: 476 + 100 = 576, 576 + 20 = 596, 596 + 3 = 599). Using a model, such as the open number line or a bar diagram, students can show and explain their strategies to each other. Modeling with place value blocks also helps students to conceptualize the process.

When students add and subtract multiples of ten and 100, they notice patterns in the answers, for example: 163-10 = 153, 163-20=143, 163-30=133…. Students should practice mental math to solve problems such as: What number is 50 less than 542? What number is 200 more than 542? Investigations activities such as Capture 5, Capture from 300-600, Close to 100 and Close to 1000 provide opportunities for students to practice their fluency with adding and subtracting.

Estimating sums and differences will help students determine if their solution is reasonable. Students use their place value understanding to round numbers to the nearest 10 or 100.

Ten-Minute Math Activities offer students support and practice throughout the year. These activities are described in Implementing Investigations at Grade 3, p. 24-38. Each activity can be modified to address targeted content and skills.

Incorporate Ten Minute Math Activities, the Problem of the Day, and the Daily Spiral Review that are aligned to The Common Core State Standards for Mathematics. EnVision Center Activities and Investigations Activities offer additional practice for student learning and support small group differentiated instruction.

Use teacher created common tasks as formative assessments to monitor student progress and understanding of critical content and essential questions. Use data from formal and informal assessments to guide your instruction and planning.

For planning considerations, read through the teacher editions for suggestions about scaffolding techniques, using additional examples, and differentiated instruction as suggested by the envision and Investigations resources (particularly the Algebra Connections and Teacher Notes sections)