

► Grade 2 Topic 13: More Addition, Subtraction, and Length

Big Conceptual Idea: [K-5 Progression on Measurement and Data \(Measurement Part\)](#) (pp. 2-4, 12-15)

Prior to instruction, view the *Topic 13 Professional Development Video* located in Pearson Realize online. Read the *Teacher's Edition (TE): Cluster Overview/Math Background* (pp. 759A-759E), the *Topic Planner* (pp.759I-759J), the *Topic Performance Assessments* (pp. 797-798A), and all 5 lessons.

<p>Mathematical Background: Read Cluster Overview (TE, pp. 759A-759E)</p>	<p>Topic Essential Question: How can you add and subtract lengths?</p> <p><i>Reference Answering the Topic Essential Question (TE, pp. 795-796) for key elements of answers to the Essential Question.</i></p>
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The lesson map for this topic is as follows:

13-1	13-2	13-3	13-4	13-5	Assessment
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3 A/D/E days used strategically throughout the topic.

Instructional note:

The big idea of Topic 13 focuses on using measurement in addition and subtraction situations involving lengths. Focus instruction on Nevada Academic Content Standards (NVACS, 2010) cluster 2.MD.B.

2.MD.B Relate addition and subtraction to length.

5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.
6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

In this topic, students will develop understanding of addition situations as totals and subtraction situations as comparisons of lengths. For example, students will measure the distance around objects, laying the foundation for perimeter. The work of this topic applies learning from throughout second grade. In Topics 3-5, second grade students developed understanding of addition and subtraction strategies within 100, including use of open number lines. In Topic 7, students developed understanding of addition and subtraction situations in word problems, applying the addition and subtraction strategies from earlier topics. These situations included *Add To*, *Take From*, *Put Together/Take Apart*, and *Compare* problem types (Reference CCSS, p. 88, Table 1. Common addition and subtraction situations.) Finally, in Topic 12, students developed measurement concepts in length using customary and metric units.

As students work with operations involving lengths, they will use a number line diagram to represent their thinking. These diagrams are different from open number lines, as they contain consecutive whole units that are already marked. Important understandings when working with number line diagrams, as articulated in the Progression Documents are below:

“to use a number line diagram to understand number and number operations, students need to understand that number line diagrams have specific conventions: the use of a single position to represent a whole number and the use of marks to indicate those positions. They need to understand that a number line diagram is like a ruler in that consecutive whole numbers are 1 unit apart, thus they need to consider the distances between positions and segments when identifying missing numbers. These understandings underlie students’ successful use of number line diagrams. Students think of a number line diagram as a measurement model and use strategies relating to distance, proximity of numbers, and reference points” (CCSWT, 2012, p. 14).

In this topic, students use estimation as an effective way to think about the numbers and their meaning. However, estimation is also difficult for students. Focus estimation opportunities on building student understanding of the concept of *about*. Rather than asking students to provide a specific number, start working with estimation by using these prompts from *Teaching Student-Centered Mathematics*:

- *More or less than ___? Will it be more or less than 10 footprints?*
- *Closer to ___ or to ___? Is the bar closer to 10 cubes or closer to 50 cubes?*
- *About ___? Use one of these numbers: 5, 10, 15, 20, 25, 30, 35, 40, About how many footprints wide is the hallway?*
(Van de Walle, Karp, Lovin, & Bay-Williams, 2014, p.121)

Topic 13

**More Addition,
Subtraction, and
Length**

Number of
lessons: **5**

A/D/E: 3 days

NVACS Focus:
MD.B

Total Days: ~8

[2nd Grade Curriculum
Pacing Framework:
Balanced Calendar](#)

Math Practice 5: Use appropriate tools

Focus on opportunities for students to develop MP.5 behaviors. This is the focus of the Math Practices and Problem Solving lesson 13-5. Reference the Teacher’s Edition (pp. F27-F27A) and the *Nevada Academic Content Standards for Mathematical Practice*.

Note: The purpose of the curriculum guides is for additional considerations. Therefore, not all components may have additional notes included in this guide.

Essential Academic Vocabulary Use these words consistently during instruction.											
New Academic Vocabulary: (First time explicitly taught)	Review Academic Vocabulary: (Vocabulary explicitly taught in prior grades or topics)										
number line diagram	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><i>estimate</i></td> <td style="width: 50%; border: none;"><i>nearest inch</i></td> </tr> <tr> <td style="border: none;"><i>inch, in.</i></td> <td style="border: none;"><i>centimeter, cm</i></td> </tr> <tr> <td style="border: none;"><i>foot, ft.</i></td> <td style="border: none;"><i>nearest centimeter</i></td> </tr> <tr> <td style="border: none;"><i>yard, yd.</i></td> <td style="border: none;"><i>meter, m</i></td> </tr> <tr> <td style="border: none;"><i>height</i></td> <td></td> </tr> </table>	<i>estimate</i>	<i>nearest inch</i>	<i>inch, in.</i>	<i>centimeter, cm</i>	<i>foot, ft.</i>	<i>nearest centimeter</i>	<i>yard, yd.</i>	<i>meter, m</i>	<i>height</i>	
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<i>yard, yd.</i>	<i>meter, m</i>										
<i>height</i>											

Additional terminology that students may need support with:

***Collaborative Team Conversations (CTC)**

Consider using **one** of the following as part of the formative assessment process at the lesson level to **collect student work** to analyze for **evidence of mathematical understanding**:

Guiding question: “Are students developing conceptual understanding that measurements can be added and subtracted in the same way as other whole numbers?”

Lesson	Evidence	Look for
13-2	<i>Solve & Share</i> (student work samples)	Focus CTC around the big idea: <ul style="list-style-type: none"> • student strategies and models • making sense of word problems involving length • accurate measurements
13-2	<i>Quick Check</i> (digital platform) items 3, 4 and 5	Focus CTC around data analysis and collection of student workspace (scratch paper). Printable version available under “Teacher Resources”.

Learning Cycle Assessments (summative)	Topic Assessments SE pp. 795-798	Use <i>Scoring Guide</i> TE pp. 795-798
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Standards listed in **bold** indicate a focus of the lesson.

NVACS (Content and Practices)	Mathematical Development of the Big Idea	Instructional Clarifications & Considerations
Lesson 13-1: Add and Subtract With Measurements		
2.MD.B.5 MP.2 MP.4 MP.6	Access Prior Learning: Throughout second grade, students have developed addition and subtraction strategies. In Topic 12, second grade students measured lengths of objects, added to find total lengths and subtracted to compare lengths of objects. Developing the Big Idea: In this lesson, students are <i>developing</i> understanding of adding and subtracting length measurements and that the answer should include the unit of measurement.	Topic Opener: Consider limiting the <i>Topic Opener</i> to discussion of the <i>Topic Essential Question</i> (TE, p. 759), <i>Review What You Know</i> (TE, p. 760), and <i>Vocabulary Review Activity</i> (TE, p. 760) only. Post the essential question and student strategies on your math focus wall. Solve & Share: In this lesson, students explore the distance around shapes. Look for opportunities for students to make real-world connections to the concept of perimeter. During problem solving, child-watch for students who measure all four sides of the rectangle, and those who measure only two sides because they understand that opposite sides of a rectangle are equal lengths. Reference Jess’s Work in <i>Analyze Student Work</i> (TE, p. 761) for an example of this understanding. Measurement of the perimeter of rectangles also offers students practice with their doubles facts. During the share, focus the conversation on students’ choice of operation (how they knew this was an addition situation) as this directly connects to the question presented in the Visual Learning animation: <i>How do you know when to add or subtract when solving problems involving measurements?</i> <p style="text-align: center;"><i>-continues on next page-</i></p>

		<p>Visual Learning: Prior to interacting with the animation, ask students to solve the problem presented: <i>The book is 9 inches long and 6 inches wide. What is the distance around the front cover of the book?</i> Child-watch for students who understand that only length and width are needed to solve the problem. Also, provide students an opportunity to solve the second problem presented (<i>How much longer is the teacher's arm than the child's arm? Will you add or subtract to solve this problem?!</i>) by stopping the animation once the data table is displayed.</p> <p>Independent Practice/Math Practices and Problem Solving: As previously indicated, students do NOT need to do all of the problems in their Student Edition. However, ALL students NEED to have opportunities to solve problems at varying DOK levels. The <i>Independent Practice</i> page offers problems that support procedural skill and fluency. The <i>Math Practices and Problem Solving</i> page offers problems that support application. The <i>Quick Check</i> items (marked with a pink check) offer both opportunities. Have students complete these items first and continue on to other items as appropriate.</p>
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Lesson 13-2: Find Unknown Measurements

<p>2.MD.B.5 2.OA.A.1</p> <p>MP.1 MP.2 MP.3 MP.4</p>	<p>Access Prior Learning: Throughout second grade, students have developed addition and subtraction strategies. In Topic 12, second grade students measured lengths of objects, added to find total lengths and subtracted to compare lengths of objects.</p> <p>Developing the Big Idea: In this lesson, students are <i>developing</i> understanding of adding and subtracting length measurements using pictures and equations to solve word problems.</p>	<p>In the <i>Visual Learning</i> animation, students are asked to estimate, "Will the number of inches Tim jumped be more or less than 24?" Estimation is an effective way to get students to think about the numbers and their meaning. Reference the Instructional Note at the beginning of this document for additional information regarding estimation in measurement.</p> <p>Visual Learning: The <i>Visual Learning</i> animation presents a <i>Compare Smaller Unknown</i> problem (NVACS, 2010, p.88). Common addition and subtraction situations.) Have students use their whiteboards and markers to record estimates and their strategy for solving the problem as they interact with the animation and engage in class discussion. After completing the animation, have students compare their answer to their estimate and respond to, "Does your answer make sense?" Engage students in a discussion of <i>why</i> estimates are helpful when problem solving.</p> <p>*CTC: <i>Solve & Share</i> (student work samples) *CTC: <i>Quick Check</i> (digital platform)</p>
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Lesson 13-3: Continue To Find Unknown Measurements

<p>2.MD.B.5 2.OA.A.1</p> <p>MP.1 MP.3 MP.4 MP.6</p>	<p>Access Prior Learning: In lessons 13-1 and 13-2, second grade students added and subtracted measurements to solve problems.</p> <p>Developing the Big Idea: In this lesson, students are <i>developing</i> understanding of adding and subtracting length measurements using pictures and equations to solve word problems.</p>	<p>Solve & Share: This problem is a <i>Take From Change Unknown</i> problem (NVACS, 2010, p. 88). The context of a piece of ribbon lends itself to representation through a number line. Child-watch for students who use a subtraction equation and count back to solve the problem; and for students who write an addition equation and add up to solve the problem. Selecting and sequencing the share to include these different approaches will support student understanding of the inverse relationship between addition and subtraction. It will also offer students an entry point into the strategies presented in the Visual Learning.</p> <p>Visual Learning: The problem in the Visual Learning mirrors the <i>Solve & Share</i>. Prior to interacting with the animation, ask students to solve the problem and challenge them to write both an addition and subtraction equation to represent the situation.</p> <p>In guided practice, continue to emphasize the importance of MP.1 in making sense of problems. Reference Error Intervention Note: Item 2 for how to respond to students who scan the problem for numbers and solve the problem inaccurately.</p> <p>Independent Practice/Math Practices and Problem Solving: Item 8 presents students with a problem involving two units of measurement: feet and inches. After students have had the opportunity to solve this problem independently, engage them in a discussion around how MP.1 behaviors were important to their success in accurately solving the problem.</p>
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Lesson 13-4: Add And Subtract On A Number Line		
<p>2.MD.B.6</p> <p>MP.2 MP.3 MP.4 MP.5 MP.7</p>	<p>Access Prior Learning: In lessons 13-2 and 13-3, second grade students added and subtracted measurements to solve problems.</p> <p>Developing the Big Idea: In this lesson, students are <i>developing</i> understanding of adding and subtracting length measurements using a number line diagram. Students represent addition or subtraction as line segments above the number line.</p>	<p>According to the Progression Documents, students need to understand the following number line conventions: <i>“the use of a single position to represent a whole number and the use of marks to indicate those positions. They need to understand that a number line diagram is like a ruler in that consecutive whole numbers are 1 unit apart, thus they need to consider the distances between positions and segments when identifying missing numbers. These understandings underlie students’ successful use of number line diagrams.”</i> (CCSWT, 2012, p. 14)</p> <p>Solve & Share: This problem is an <i>Add To Result Unknown</i> problem (NVACS, 2010, p. 88). The context of walking blocks helps students as they represent addition and subtraction of lengths on a number line diagram. Engage students in a brief discussion of how this number line looks different from an <i>open</i> number line. Listen for students who are able to connect their understanding of measurement tools, such as rulers, to the number line diagram in the <i>Solve & Share</i>.</p> <p>Visual Learning: Prior to interaction with the animation, have students solve the <i>Compare Smaller Unknown</i> problem presented in the animation on their whiteboards (NVACS, 2010, p. 88). Students should begin with an estimation. Reference the estimation note in Lesson 13-2. Child-watch for students who successfully make sense of the relationships between the numbers and accurately estimate that Tim’s jump will be less than 24 inches. The process of estimation engages students in MP.1 Make Sense of Problems and Persevere In Solving Them behaviors. After completing the animation, have students compare their answer to their estimate and respond to, “Does your answer make sense?” Engage students in a discussion of <i>why</i> estimates are helpful when problem solving.</p> <p>The use of a question mark (?) to represent the unknown supports students’ algebraic thinking.</p> <p>Assess and Differentiate: The Intervention Activity, “Yardstick Number Line” utilizes a yardstick as a number line model for students to use when solving problems (TE, p. 783A). This tool may be helpful for all students and will facilitate connections between number line diagrams and tools of measurement.</p>
Lesson 13-5: Math Practices And Problem Solving: Use Appropriate Tools		
<p>2.MD.B.5 2.MD.B.6 2.OA.A.1</p> <p>MP.1 MP.3 MP.4 MP.5 MP.6 MP.8</p>	<p>Access Prior Learning: In Topic 3, second grade students focused on MP. 5 Use Appropriate Tools Strategically behaviors.</p> <p>Securing the Big Idea: In this lesson, students are <i>securing</i> understanding of MP.5 Use Appropriate Tools Strategically behaviors in the context of second grade.</p>	<p>Students focused on Math Practice 5: Use Appropriate Tools Strategically in Topic 3. Reference the <i>Math Practices and Problem Solving Handbook</i> for suggestions for developing, connecting and assessing MP.5 (TE. pp. F27-F27A). Also, consider having students self-reflect on their understanding of this math practice using the Self-Assessment Tool (Teaching Tool 65). Self-reflection engages students in metacognition and encourages a growth mindset in mathematics.</p> <p>MP. 5 Behaviors:</p> <ul style="list-style-type: none"> • Identifies available tools • Thinks about correct tools to use without prompting • Uses tools correctly and accurately • Knows when to use a particular tool • Decides if the results obtained using a tool make sense <p>Solve & Share: Child-watch for MP.5 behaviors, specifically looking for students who select an appropriate measuring tool and unit; and for students who use the tool correctly. Students may apply their ability to estimate when they reflect on whether the results of their measurements make sense. Also, child-watch for students who connect their understanding of part-part-whole relationships when solving the problem. These students will correctly identify the difference between the two lines. Conversely, some students may show a misconception or misunderstanding of the problem, as seen in Kerri’s Work as shown in <i>Analyze Student Work</i> (TE, p. 785). During the share, focus the conversation on students’ application of the MP.5 behaviors listed above.</p> <p>Visual Learning: Prior to interaction with the animation, give students time to make an estimate (<i>Will Sara be more or less than 56 feet from the goal?</i>), select a tool and solve the <i>Take From Result Unknown</i> problem presented (NVACS, 2010, p. 88). Child-watch for students who misinterpret the situation, and estimate that Sara will be more than 56 feet from the goal. Unprompted, these students are likely to add $56 + 24$ to solve the problem. The use of drawings or role-playing may support these students in clarifying their understanding of the context of the problem.</p>

References

- Common Core Standards Writing Team. (2011, June 20). *Progressions for the Common Core State Standards in Mathematics (draft). K-3 Categorical Data; Grades 2-5, Measurement Data*. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.
- Council of Chief State School Officers. (2010). *The Nevada Academic Content Standards*. Retrieved from http://www.doe.nv.gov/uploadedFiles/nde.doe.nv.gov/content/Standards_Instructional_Support/Nevada_Academic_Standards/Math_Documents/mathstandards.pdf.
- Van de Walle, J., Karp, K., Lovin, L., & Bay-Williams, J. (2014). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades Pre-K-2* (2nd ed.). Boston, MA: Pearson.

Number Line Difference Game

Materials:

- Number Line Diagram (Teaching Tool 38, one per player laminated or in a page protector)
- Wet erase pen (one per player)
- Number Tiles in a cup or bag: Digits 0-9

Players: 2+

Object of the game: To find the largest difference in each round.

Directions:

1. Place the number tiles, digits 0-9 in a cup or bag.
2. Each player draws 4 tiles and builds two 2-digit numbers: a minuend (larger number) and a subtrahend (smaller number).
3. Players use the number line diagram (Teaching Tools 38) to represent and solve the subtraction problem. Players explain their strategy and check each other's work for accuracy.
4. The player with the largest difference earns a point. In the event of a tie, players draw one more tile to subtract from their difference.
5. Players return the tiles to the cup or bag and repeat. Play ends after 3 rounds.
6. The player with the most points wins.