

## ► 3<sup>rd</sup> Grade Topic 8: Use Strategies and Properties to Add and Subtract

### Big Conceptual Idea: [Numbers and Operations in Base Ten, K-5](#) (p. 12)

Prior to instruction, view the *Topic 8 Professional Development Video* located in Pearson Realize online. Read the *Teacher's Edition (TE): Cluster Overview/Math Background* (pp. 401A-401F), the *Topic Planner* (pp.401I-401K), all 9 lessons, and the *Topic Assessments* (pp. 469-470A).

<b>Mathematical Background:</b> Read Topic 8 Cluster Overview/Math Background (pp. 401A-401F)	<b>Topic Essential Question:</b> How can sums and differences be estimated and found mentally?  <i>Reference Answering the Topic Essential Question (TE, pp. 465-466) for key elements of answers to the Essential Question.</i>
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**Topic 8**

*Use Strategies and Properties to Add and Subtract*

Number of lessons: 9

A/D/E: 2 days

**NVACS Focus:**  
NBT.A

**Total Days: ~11**

The lesson map for this Topic is as follows:

8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Assessment
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2 A/D/E days used strategically throughout the topic.

#### Instructional note:

Topics 8, 9 and 10 comprise a cluster on understanding place-value and the properties of operations to perform multi-digit operations. Topic 8 focuses on the properties of operations for addition: Commutative (Order) Property, Associative (Grouping) Property and Additive Identity Property of 0 (Zero). *Note: The Additive Identity Property for 0 ( $3+0=3$ ) is different than The Multiplicative Identify Property for 1 ( $3 \times 1 = 3$ ) and unless explicitly discussed and compared may cause confusion for some children.*

In this topic, students will use place value to estimate. Estimation strategies include rounding and using landmark and benchmark numbers to find “close to” sums and differences. Students often confuse rounding and estimating. The enVision glossary defines rounding as, “To replace a number with a number that tells about how much or how many to the nearest ten, hundred, thousand, and so on. Example: 42 rounded to the nearest 10 is 40” (p. G7). The enVision glossary defines estimating as, “To give an approximate number or answer” (p. G3).

Rounding is one type of estimation. Other computational estimation strategies include front-end methods and compatible numbers (Van de Walle, Karp, & Bay-Williams, 2016). To estimate the sum using rounding strategies  $423 + 695$  may round to  $400 + 700$ . This estimate results in a sum of 1,100. Some children may round to 420 and 690 resulting in an underestimate. Some may even choose a compatible number strategy such as mentally combining 410 with the 690 the “make another 100” strategy. As long as students can justify their reasoning, accept ‘close to’ estimates.

Strategies for computational estimation should be chosen carefully. Rounding is not always the most accurate strategy for estimation because adding after rounding allows errors to accumulate. For example, I might estimate  $444 + 649$  as  $400 + 600 = 1,000$ , despite the sum being closer to 1,100. The purpose of these strategies is to get children in the “ballpark” or in a range for the answer so they can reason, make sense and reflect when working on problems.

Third graders are expected work with place values to 10,000. In second grade students, “Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones...” (NVACS, 2010, 2.NBT.A.1), and “Read and write numbers to 1000 using base-ten numeral, number names, and expanded form” (NVACS, 2010, 2.NBT.A.3)”. In fourth grade students, “Generalize place value understanding for multi-digit whole numbers” (NVACS, 2010, 4.NBT.A.). Note that, “Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000” (NVACS, 2010, p. 29). This objective was added to bridge the gap from the 2<sup>nd</sup> to the 4<sup>th</sup> grade standards. Throughout this topic look for opportunities to review place value concepts from second grade and extend these to working with numbers up to ten-thousand. Consider altering numbers in problems to provide these opportunities. Lessons 8-3, 8-6, and 8-7 focus on using place value understanding to round and estimate.

#### Focus Math Practice 4: 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,

[3<sup>rd</sup> Grade Curriculum Pacing Framework:](#)  
[Balanced Calendar](#)

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 (NVACS, 2010, p. 7).

To help students work towards security, encourage them to use multiple models and reflect on whether the results make sense. Problem solving lesson 8-9 is designed to reinforce this mathematical practice. See also the following resource: Reference Teacher’s Edition (TE, pp. F24 - F24A).

**Potential Misconception(s)**

Students might confuse the addition and multiplication properties of operations for addition. For example, the Additive Identity Property of Zero ( $5 + 0=5$ ,  $a + 0=a$ ) and the Multiplicative Identity Property of One ( $5 \times 1=5$  or  $a \times 1= a$ ) are easily confused for students with limited conceptual understanding. See the *Properties of Operations Table* for additional information (NVACS, 2010, p. 90).

Students will benefit from testing these properties to build conceptual understanding. Is this rule always true? Can you find an exception to the rule? Consider creating a class developed anchor chart to collect examples of these properties.

For students struggling to understand the *Commutative Property of Addition*, consider extending lesson 8-2. Include work with the patterns in the addition table by using the table to show the symmetrical nature of the table. The included image is from the book *Uncomplicating Algebra* (Small, 2014) and shows the symmetry along the diagonal for  $4 + 3 = 7$  and  $3 + 4 = 7$ , as well as,  $3 + 7 = 10$  and  $7 + 3 = 10$  (Commutative Property).

**Looking Ahead:**

On the Topic Performance Assessment, students will round numbers, estimate and justify their solutions to equations, and demonstrate a pattern on the addition table based on a context. Facilitate the development of problem solving thinking habits. Provide opportunities for problem solving prior to working on the Topic Performance Assessment. When grading student work, accept responses that are mathematically reasonable even if they are not suggested in the Teacher’s Edition.

**Meaningful Fluency Practice & Assessment:**

The following game can help students develop the mental math strategies that will support attaining NVACS standard 3.NBT.A.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” (NVACS, 2010, p. 24). Consider rotating days so that students still have the opportunity to engage in meaningful practice of multiplication facts. There is a [Pre/Post Addition/Subtraction Assessment available on the C & I, K-5 Mathematics website in resources for Academic Parent-Teacher Teams \(APTT\)](#).

Rolling for 500: Estimation

See the directions for this game at the end of this document.

<b>Essential Academic Vocabulary</b> Use these words consistently during instruction.	
<b>New Academic Vocabulary:</b> (First time explicitly taught)	<b>Review Academic Vocabulary:</b> (Vocabulary explicitly taught in prior grades or topics)
Associative (Grouping) Property of Addition Commutative (Order) Property of Addition Identity (Zero) Property of Addition Compatible numbers	<i>round</i> <i>place value</i> <i>inverse operations</i> <i>multiples</i> <i>difference</i> <i>sum</i> <i>equation</i>

*Additional terminology that students may need support with: about, mental math, generalize, related*

**\*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 questions:** "Are students developing conceptual understanding of the properties of addition in order to solve addition problems?"  
 "Are student estimating whole numbers based on reasoning?"

Lesson	Evidence	Look for
8-2	<b>Math Practices and Problem Solving</b> (student work samples) Item 23	Focus CTC around the big idea: <ul style="list-style-type: none"> <li>• student strategies and models.</li> <li>• student use of reasoning to analyze the relationship between addition and subtraction.</li> <li>• student use part/part/whole understanding when subtracting or adding.</li> </ul>
8-3	<b>Quick Check</b> (digital platform) Items 1, 4, and 5	Focus CTC around data analysis and collection of student workspace (scratch paper). Printable version available under "Teacher Resources". <ul style="list-style-type: none"> <li>• rounding whole numbers based on reasonableness.</li> </ul>

Learning Cycle Assessments (summative)	<b>Topic Assessments</b> SE pp. 465-470	Use <i>Scoring Guide</i> TE pp. 465-470A
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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
<b>Lesson 8-1: Addition Properties</b>		
<p><b>3.NBT.A.2</b></p> <p>MP.1 MP.3 <b>MP.4</b> MP.7 MP.8</p>	<p><b>Access Prior Learning:</b> In Grade 2 students learned to add within 1,000 using models or strategies.</p> <p><b>Securing the Big Idea:</b> Students are <i>securing</i> understanding of addition as problems that involve joining, part-part whole, or comparing. Students are also <i>securing</i> understanding of the Associative, Commutative, and Identity Properties of Addition.</p>	<p><b>Topic Opener:</b> Introduce the <i>Topic Essential Question</i>, "How can sums and differences be estimated and found mentally?" (TE, p. 401). Consider making this an anchor chart in your classroom and allowing students to add strategies to the chart throughout the topic.</p> <p>You might also consider having students complete the <i>Review What You Know</i> prior to beginning instruction on Topic 8 so that you can respond to student instructional needs using the <i>Item Analysis for Diagnosis and Intervention</i> prior to beginning the topic (TE, p. 402-404).</p> <p>Consider introducing vocabulary as students encounter terminology in the lessons rather than introducing all terms at the beginning of the lesson. Add vocabulary to math word wall if possible.</p> <p><b>Solve &amp; Share:</b> Watch for students that are able to identify that there are the same number of buttons on both sides without having to compute. Pose questions to these students to evaluate if they have an understanding of the Commutative Property of Addition.</p> <p>Watch for students that try to multiply the 3 addends. Facilitate discussion to identify that this is not a multiplicative situation. Is this repeated addition? Are we skip counting?</p> <p>After students share their solution methods and reasoning, consider asking students why this is an addition situation and not a multiplication situation (e.g. we are not joining <i>equal</i> groups to find a total). Consider discussing the <i>Look Back!</i> prompt so that the <i>Visual Learning Animation</i> can be used to confirm, clarify or correct student understanding.</p> <p><b>Visual Learning:</b> After the Identity (Zero) Property of Addition has been introduced, consider comparing and contrasting the Additive Identity Property of 0 (Zero) and the Multiplicative Identity Property of 1 (versus the Multiplicative Zero Property), in order to confront common misconceptions regarding the properties. For more information on the differences read the <i>Instructional note</i> at the beginning of this topic.</p> <p>Consider discussing the <i>Convince Me!</i> to support students' development of MP. 4 "<i>Model with math.</i>"</p> <p><b>Assess and Differentiate:</b> If time permits, teach students how to play the game <i>Tic Tac Toe</i> (TE, p. 409A). All students should have the opportunity to play this game.</p> <p style="text-align: right;"><i>-continues on next page-</i></p>

		Consider the <i>Intervention Activity</i> for students who need additional support with the Commutative and Associative Properties (TE, p. 409A).
<b>Lesson 8-2: Algebra-Addition Patterns</b>		
<p><b>3.OA.CD.9</b></p> <p>MP.7 MP.8</p>	<p><b>Access Prior Learning:</b> In Grade 2, students used the addition table to identify patterns in addition facts and work with even and odd numbers. In Grade 3, Topic 4, students explored patterns with even and odd numbers using a multiplication table.</p> <p><b>Securing the Big Idea:</b> Students are <i>securing</i> their understanding of patterns in the addition table with even and odd numbers and properties of addition.</p>	<p><b>Solve &amp; Share:</b> In lesson 5-2, students compared and contrasted the addition and multiplication tables. Students have the opportunity to connect these ideas to foundations of mathematical argumentation, justification and proof.</p> <p>The <i>Solve &amp; Share</i> enables students to play with numbers and identify patterns and rules that are not immediately apparent. This helps children understand what mathematics truly is and what it involves.</p> <p><b>Visual Learning:</b> Consider having students use colored tiles to build the patterns during the video (01:27).</p> <p>If after viewing the <i>Visual Learning Animation</i> students still seem unsure about patterns for even and odd numbers with addition, consider viewing the <i>Another Look!</i> video.</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b> <i>Quick Check</i> item 3 asks students to recognize that the shaded numbers illustrate the Commutative Property of Addition. For more information on using the addition table to illustrate the addition properties read the <i>Instructional note</i> at the beginning of this topic.</p> <p><b>Assess and Differentiate:</b> If time permits, you may consider replacing the <i>Problem-Solving Reading Mat</i> with the game <i>Tic Tac Toe</i> (TE, p. 409A) or the <i>Fluency Practice Activity</i> (TE, p. 459).</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with exploring the patterns when adding two even numbers, two odd numbers or an even and an odd number (TE, p. 415A).</p>
<b>Lesson 8-3: Round Whole Numbers</b>		
<p><b>3.NBT.A.1</b></p> <p>MP.1 MP.3 MP.6</p>	<p><b>Access Prior Learning:</b> In Grade 2, Topic 9, students learned how to compare 3-digit numbers using place value and a number line.</p> <p><b>Developing the Big Idea:</b> Students <i>develop</i> understanding of place value to 10,000 and use place value to round using the language of "about" to signify approximation.</p>	<p><b>Possible 2-day lesson to review place value to the 1,000 and introduce to the 10,000.</b> The <i>Instructional note</i> at the beginning of this topic describes the importance of these lessons.</p> <p><b>Day 1:</b></p> <p><b>Solve &amp; Share:</b> Consider building a class anchor chart to collect various strategies for finding approximations or 'close to' numbers.</p> <p>Students who struggle with place value understanding might benefit from the number line model.</p> <p><b>Convince Me:</b> Consider assigning and discussing the <i>Convince Me!</i> to provide students the opportunity to reason with reasonable numbers based off of place value clues.</p> <p>After <i>Convince Me!</i> consider introducing place-value to the ten-thousands place by posting the place values and asking students what patterns they notice (e.g. the "ones" and "tens" from the one's period repeats into the thousands period).</p> <p>Pose numbers to have students practice rounding to the 1,000 and 10,000 place values. Ensure that students are justifying their rounding decisions rather than following a rule without understanding.</p> <p><b>Day 2:</b></p> <p><b>Solve &amp; Share:</b> Consider revisiting the original <i>Solve &amp; Share</i> and ask students to solve again, with 1,728 stickers.</p> <p><b>Visual Learning:</b> Consider watching the <i>Another Look!</i> video in place of the <i>Visual Learning Animation</i> and as a class round using the numbers 4,896 (e.g. rounding to hundreds is 4,900, round to thousands is 5,000) and 9,982 (e.g. rounding to hundreds is 10,000 rounding to thousands is 10,000).</p> <p>Strengthen students' number sense by discussing why when rounding 9,982 to both the hundreds and thousands place we end up 10,000. Consider providing time for students to use dice to roll 4 digit numbers, with a partner, that they practice rounding to both the hundred's and thousand's place values.</p> <p style="text-align: right;"><i>-continues on next page-</i></p>

		<p>This is a good opportunity to discuss various ways to estimate, including rounding, front-end and compatible numbers.</p> <p><b>Assess and Differentiate:</b> If time permits, you may consider replacing the <i>Math and Science Activity</i> with the game <i>Tic Tac Toe</i> (TE, p. 409A) or the <i>Fluency Practice Activity</i> (TE, p. 459).</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with using a number line as a tool to round to 10 (TE, p. 421A).</p>
<b>Lesson 8-4: Mental Math-Addition</b>		
<p><b>3.NBT.A.2</b></p> <p>MP.1 MP.3 <b>MP.4</b> MP.5 MP.6 MP.7</p>	<p><b>Access Prior Learning:</b> In Grade 2, students learned to decompose and then recomposing numbers into 'friendly numbers' as a strategy for simplifying an addition problem and finding the solution mentally.</p> <p><b>Developing the Big Idea:</b> Students further <i>develop</i> an understanding that there is more than one strategy for working with mental math, including using place value understandings.</p>	<p><b>Solve &amp; Share:</b> To encourage students to use mental math strategies, consider removing writing tools, instead, have students describe their solution strategy while their partner represents this thinking in their book, a whiteboard or in math journals.</p> <p>As students share their strategies and reasoning, consider charting the different mental math strategies students create. Highlight a few strategies that are the most efficient given the numbers in the problem.</p> <p><b>Visual Learning:</b> If the strategies in the <i>Visual Learning Animation</i> are not already on the chart created, add these mental math methods to the poster. If they are already there, explicitly connect those in the <i>Visual Learning Animation</i> to the student's strategy. Ask students, "How using friendly numbers (multiplies of 10), makes solving problems easier?"</p> <p>Consider assigning the <i>Convince Me!</i> to give students the opportunity to practice the methods introduced in the <i>Visual Learning Animation</i> and support students' development of MP. 4, <i>Model with Mathematics</i>.</p> <p><b>Assess and Differentiate:</b> If time permits, teach students how to play "Clip and Cover" (TE, p. 427A). All students should have the opportunity to play this game.</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with using place value parts to add (TE, p. 427A). Connect this work to students using expanded notation to connect partial sums.</p>
<b>Lesson 8-5: Mental Math-Subtraction</b>		
<p><b>3.NBT.A.2</b></p> <p>MP.1 MP.3 <b>MP.4</b> MP.7 MP.8</p>	<p><b>Access Prior Learning:</b> In 2<sup>nd</sup> grade students worked with compensation as a strategy. In the previous lesson, students developed understanding of mental math strategies for addition with decomposition and compensation.</p> <p><b>Developing the Big Idea:</b> Students further <i>develop</i> an understanding that there is more than one way to do mental math including compensation with subtraction.</p>	<p><b>Instructional Note:</b> To help students understand how compensation works with subtraction, consider investigating constant difference using the number line model. For example, the difference between two individuals' birth years will be the same as the difference between these two individuals' ages. Also, the "hop" on a number line can be slid up or down a number line to a benchmark number.</p> <p><b>Solve &amp; Share:</b> To encourage students to use mental math strategies, consider removing writing tools, instead, students to describe their solution strategy while their partner represents this thinking in their book, mathematics journal or on a whiteboard.</p> <p>As students share their strategies and reasoning, consider making a poster of the different mental math strategies students use.</p> <p><b>Visual Learning:</b> Add the mental math methods introduced in the <i>Visual Learning Animation</i> to the poster of mental math strategies. Ask students, "How does using place value to solve subtraction problems make mental math easier?"</p> <p><b>Assess and Differentiate:</b> If time permits, you may consider replacing the <i>Problem Solving Reading Mat</i> with the game <i>Tic Tac Toe</i> (TE, p. 409A), <i>Clip and Cover</i> (TE, p. 427A), or the <i>Fluency Practice Activity</i> (TE, p. 459).</p> <p>Instead of using the <i>Intervention Activity</i> for students whom need additional support, work with the idea of 'constant difference' and modeling this first on a number line and later applying this idea to compensation.</p>

Lesson 8-6: Estimate Sums		
<p><b>3.NBT.A.2</b></p> <p>MP.2 MP.3 MP.4 MP.6</p>	<p><b>Access Prior Learning:</b> In 2<sup>nd</sup> grade, students worked with compatible numbers. In previous lessons in this topic, students have worked with rounding numbers and developed mental math strategies for addition.</p> <p><b>Developing the Big Idea:</b> This lesson <i>develops</i> students' understanding of the purpose of estimation and strategies for estimating with addition using compatible numbers.</p>	<p><b>Solve &amp; Share:</b> After the <i>Solve &amp; Share</i> ask students what estimation strategies they used (e.g. rounding is one strategy for estimation). Ask, "How does estimating sums help us?"</p> <p>Watch for students that solve for an exact number and support by asking the <i>Ask Guiding Questions as Needed</i> (TE, p. 435) prompts. Consider providing number lines to support conceptual understanding (Teaching Tool 7). Have students share their reasoning with the class. Students benefit from both successful strategies and the discussion of common misconceptions.</p> <p><b>Convince Me:</b> Consider having students partner talk the <i>Convince Me!</i>. Discuss as a whole group as this supports students development of using number sense to estimate.</p> <p><b>Assess and Differentiate:</b> If time permits, teach students how to play <i>Clip and Cover</i> (TE, p. 439A). All students should have the opportunity to play this game.</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with using estimation strategies such as rounding or compatible numbers (TE, p. 439A).</p>
Lesson 8-7: Estimate Differences		
<p><b>3.NBT.A.2</b></p> <p>MP.1 MP.2 MP.4 MP.8</p>	<p><b>Access Prior Learning:</b> In previous lessons in this topic, students have worked with rounding numbers and developed mental math strategies for subtraction.</p> <p><b>Developing the Big Idea:</b> This lesson <i>develops</i> students' understanding of the purpose of estimation and strategies for estimating with subtraction.</p>	<p><b>Solve &amp; Share:</b> Watch for students that solve for an exact number and support by asking the <i>Ask Guiding Questions as Needed</i> (TE, p. 441) prompts. Consider also supporting students struggling to estimate by providing them with number lines (Teaching Tool 7).</p> <p>Consider discussing the <i>Look Back!</i> prompt to support students' development of estimation strategies.</p> <p><b>Visual Learning:</b> After viewing the <i>Visual Learning Animation</i>, consider asking students if there is another way to estimate the difference. This is an opportunity to build understanding that there are multiple ways to estimate (e.g. rounding, front-end, compatible numbers). Students might round 493 to the hundreds place because it is so close to 500, while they could round 126 to the nearest tens place. Rounding the numbers to different place values to make an easier estimate applies to <i>Quick Check</i> item 22.</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b> <i>Quick Check</i> item 22 aligns to <i>Visual Learning Animation</i>. An emphasis of this lesson has been on estimates giving different answers. Therefore, remember to accept student work that is mathematically reasonable.</p> <p><b>Assess and Differentiate:</b> If time permits, teach students how to play <i>Teamwork</i> (TE, p. 445A). All students should have the opportunity to play this game.</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with estimating differences using rounding (TE, p. 455A).</p>
Lesson 8-8: Relate Addition and Subtraction		
<p><b>3.NBT.A.2</b></p> <p>MP.2 MP.3 MP.4</p>	<p><b>Access Prior Learning:</b> In Grade 2, students developed understanding of addition and subtraction as inverse operations.</p> <p>In previous lessons, students have solved addition and subtraction problems using mental math and estimation strategies. In Topic 4, students learned about the inverse relationship between multiplication and division.</p> <p><b>Developing the Big Idea:</b> This lesson <i>develops the</i> understanding of addition and subtraction as inverse operations.</p>	<p><b>Solve &amp; Share:</b> Watch for students who select numbers and operations without reasoning. For these students return to the context of the problem, focus on understanding the question and developing a problem solving plan, rather than focusing on a solution and consider replacing the numbers with the word "some" to help the students understand the context.</p> <p>Ask students that finish first, how they could prove their solutions are correct. Consider having students that are able to successfully check share their strategy so that as a class you can discuss why we can check a subtraction problem with addition (e.g. their inverse relationship).</p> <p><b>Independent Practice/Math Practices and Problem Solving:</b> Consider assigning item 10 for distributed practice of telling time using an analog clock.</p> <p><b>Assess and Differentiate:</b> If time permits, you may consider replacing the <i>Problem Solving Reading Mat</i> with the game <i>Tic Tac Toe</i> (TE, p. 409A), <i>Clip and Cover</i> (TE, p. 427A; 439A), <i>Teamwork</i> (TE, p. 445A), or the <i>Fluency Practice Activity</i> (TE, p. 459).</p> <p>Consider the <i>Intervention Activity</i> for students who need additional practice using the inverse operation to check answers (TE, p.277A).</p>

Lesson 8-9: Math Practices and Problem Solving- Model with Math		
<p><b>3.NBT.A.2</b></p> <p><b>MP.4</b></p> <p>MP.1</p> <p>MP.2</p> <p>MP.3</p> <p>MP.5</p>	<p><b>Access Prior Learning:</b> In Topic 2 students focused on MP.4 to solve multi-step problems. Throughout Topic 8 students have modeled the math with number lines, bar diagrams, and equations.</p> <p><b>Developing the Big Idea:</b> In this lesson, students further <i>develop</i> their understanding of MP. 4 “<i>Model with Mathematics</i>” by using bar diagrams and equations to represent problems that are more complex.</p>	<p>This lesson provides an opportunity to focus on the thinking habits and display the behaviors associated with Math Practice 4, “<i>Model with math.</i>” Refer to the <i>Math Practices and Problem Solving Handbook</i> (TE, p. F24-F24A, F29) for suggestions on how to develop, connect and assess this Math Practice. Also, reference the handbook in the Student Edition (SE, p. F24).</p> <p><b>Solve &amp; Share:</b> Consider reintroducing MP. 4 (SE p. F24) before introducing the <i>Solve &amp; Share</i>. After introducing, the <i>Solve &amp; Share</i> identify what the problem is asking (e.g., how many total minnows are in the pond?). Consider asking how this problem is similar to the last <i>Solve &amp; Share</i> (e.g. comparing quantities). Consider then asking students how they could model this problem (e.g. bar diagrams, number line, equations).</p> <p>You might also consider using the time where students are working on the <i>Solve &amp; Share</i> as an opportunity to child-watch for behaviors associated with MP.4 that are listed in the <i>Math Practices and Problem Solving Handbook</i> (TE p. 24A). After discussing student solution methods and reasoning, have students self-score for the behaviors associated with this math practice.</p> <p><b>Convince Me:</b> Consider assigning the <i>Convince Me!</i> as it provides an opportunity for students to reason when it is appropriate to use a bar diagram.</p> <p><b>Assess and Differentiate:</b> If time permits, teach students how to play <i>Teamwork</i> (TE, p. 457A) as this relates the mathematics developed in this topic to a real world context.</p> <p>Consider the <i>Intervention Activity</i> for students who need additional support with adding using a bar diagram (TE, p. 457A).</p>

### References

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# Rolling for 500

**Grade Level:** 3-5

**Number of Players:** 2-4

**Materials Needed:**

- a die
- a game piece for each player
- game board

**Object of the Game:**

The first player to reach or cross the **Finish** wins the game.

**Directions:**

Each player places their marker on the **Start** square of the shared game board.

Player 1 rolls the die. Match the number rolled to the table on the game board to determine how many spaces to move forward or backward. Player 1 moves their marker.

Players take turns rolling the die and using the table to determine spaces moved.

The first player to reach or cross the **Finish** line wins the game.

Players cannot move below zero and wait at the start space for a positive roll.

Two players can be on the same space on the gameboard at the same time.

**Optional:**

When playing the estimation version, players can state out loud what their exact space would be and how close they are to the space they move onto to. Which space is the closest and why?

**Guiding Questions:**

What do you know?

Where do you think you will begin?

Where are you stuck? What is confusing? What are you wondering about?

What are you going to try?

What did you think about to come to your answer?

**Differentiation:**

Two versions of the game can be used for grades 3-5. **Rolling for 500** gives practice with place value strategies to add and subtract numbers up to 500. **Rolling for 500 estimation** gives practice with place value strategies for addition and subtraction and also requires comparative reasoning in order to properly place the gameboard marker.

**Game Trajectory:**

**Pre K-K:** Counting along a number line to 20

**K-2:** Addition and subtraction to get to 50

**3-5:** Rolling for 500 or Rolling for 500 estimation version

**5-6:** Rolling for 5

**Clean up Checklist for Game Bag:**

Die

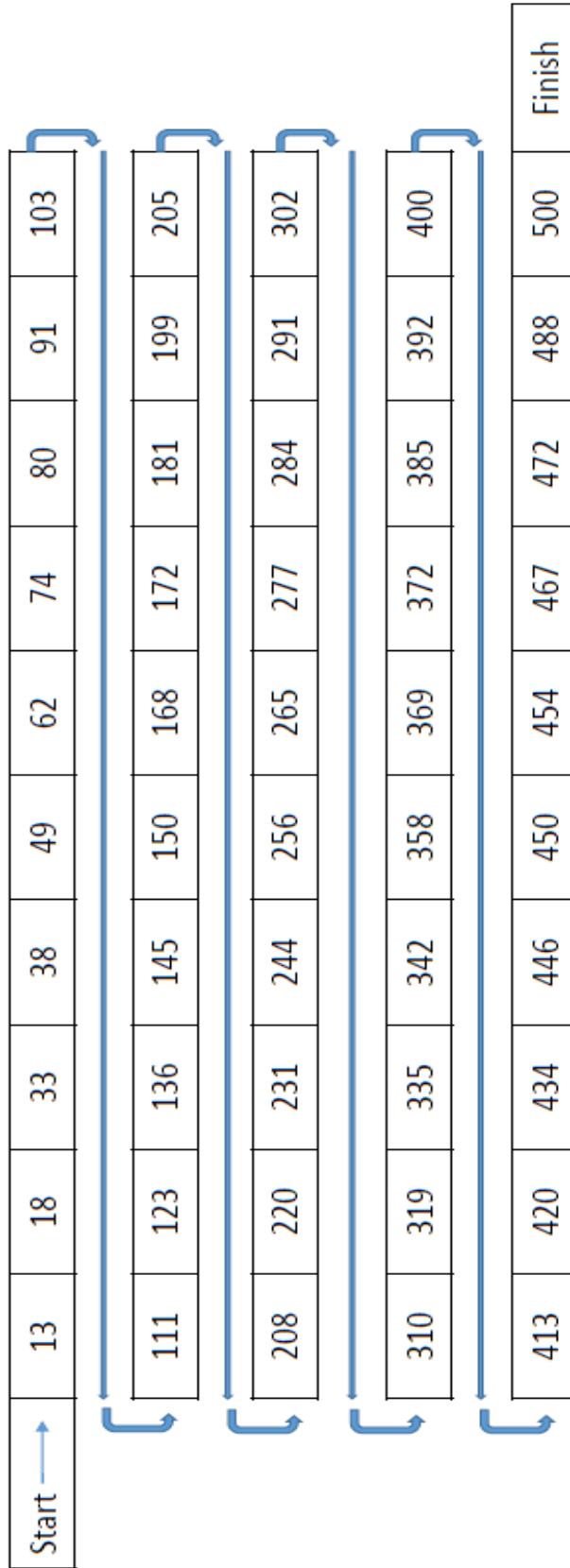
Game piece markers

Game boards



# Rolling for 500

Roll	Spaces
1	add 30
2	subtract 20
3	add 50
4	subtract 60
5	add 80
6	add 10



Rolling for 500 Estimation Game Board

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