

► Grade 5 Topic 2: Add and Subtract Decimals to Hundredths; lesson 13-2 concepts

Big Conceptual Idea: [Numbers and Operations in Base Ten](#) (pp. 18-21)

Prior to instruction, view the *Topic 2 Professional Development Video* located in *Pearson Realize online*. Read the *Teacher's Edition (TE): Cluster Overview/Math Background* (pp. 55A-55F), the *Topic Planner* (pp. 55I-55J), all 7 lessons, and the *Topic Assessments* (pp. 107-108A).

<p>Mathematical Background: Read Topics 2-6 Cluster Overview/Math Background (TE, pp. 55A-55F)</p>	<p>Topic Essential Question: How can sums and differences of decimals be estimated? What are the standard procedures for adding and subtracting decimals? How can sums and differences be found mentally?</p> <p><i>Reference Answering the Topic Essential Questions (TE, pp. 105-106) for key elements of answers to the Essential Questions.</i></p>
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The lesson map for this topic is as follows:

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

Instructional Note:

Topics 2 through 6 address ideas in the Nevada Academic Content Standards (NVACS) cluster 5.NBT.B (2010). Topic 2 focuses specifically on standard 5.NBT.B.7, addition and subtraction with decimals to hundredths with an emphasis on "...using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used" (NVACS, 2010). Students have prior experience working with decimals and understanding the place value system. Students will use models and properties to extend knowledge of these concepts and build a conceptual understanding of decimal addition and subtraction. This work will also help students to strengthen their understanding of place value.

It is not necessary to wait for students to fully develop place-value understandings before giving them opportunities to solve problems with two-and three-digit numbers. When such problems arise in interesting contexts, students can often invent ways to solve them that incorporate and deepen their understanding of place value, especially when students have the opportunities to discuss and explain their invented strategies and approaches (National Council of Teachers of Mathematics, 2000, p.83).

Estimation plays a very important role in building understanding of decimal computation. It is tempting to begin instruction of addition and subtraction with decimals by focusing on the procedural rule of lining up the decimals and then performing the calculation. However, beginning with specific rules can deny students the opportunity to build a firm understanding of the connections between a digit's place and a digit's place value when computing with decimals. Instead, begin with estimation and encourage the use of multiple tools and models. Students gain practice determining the relative quantity created by adding and subtracting decimals using tools and models to support and explain their thinking. Van de Walle, Karp, Lovin, and Bay-Williams (2014) note, many students who are taught to focus on poorly understood rules for decimal computation do not even consider the actual values of the numbers, much less estimate, "**Students should become adept at estimating decimal computations well before they learn to compute with pencil and paper**" (p. 270). Topic 2 will allow students the time to build a conceptual understanding of computing with decimals by asking them to use mental math, estimation and models to add and subtract decimals before applying standard algorithms.

A caution on developing the meaning of addition and subtraction with decimals through keyword strategy instruction. Keyword strategy instruction is defined as assigning a mathematical operation to certain words such as; total, in all, remain, and left. Karp, Bush, and Dougherty (2014) state that, "reducing the meaning of an entire problem to a simple scan for key words has inherent challenges" (p. 21). Those challenges being:

- Using keywords often encourages student to strip numbers from the problem and use them to perform a computation outside of the context, which often times is misleading when working at the depth required by Smarter Balanced Assessment Consortium (SBAC- claims 1, 2, 3 and 4).
- Many keywords are common English words that can be used in many different ways thus denoting several different operations.

Justification for including 13-2 concepts: Concepts from Lesson 13-1 (order of operations) and 13-2 (evaluating expressions) can be embedded throughout Topic 2. Questions can be pulled explicitly from Lesson 13-2, or problems within Topic 2 can be manipulated (i.e. add a third term, change an operation, add grouping symbols) to include application of the concepts. Students are exposed to expressions with multiple grouping symbols in lesson 13-2 which include parenthesis, brackets and braces.

Topic 2
Add and Subtract Decimals and Lesson 13-2

Number of lessons: 7

A/D/E: 3 days

NVACS Focus:
NBT.B

Total days: ~10

[5th grade Curriculum](#)

[Pacing Framework:](#)

[Balanced Calendar](#)

Math Practice 4: Model with mathematics:

Focus on opportunities for students to develop *Mathematical Practice 4* behaviors as this is the focus of the Math Practices and Problem Solving, lesson 2-7. Reference the Teacher’s Edition (TE, pp. F24-F24A) and the NVACS (2010, p.7).

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)
	<i>compatible numbers</i> <i>associative property of addition</i> <i>commutative property of addition</i> <i>compensation</i> <i>decimal</i> <i>tenths</i> <i>hundredths</i>

Additional terminology that students may need support with: parentheses, brackets, braces

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 able to estimate sums and differences of decimals? Can they explain why their estimate is reasonable using place value understanding?”
 - “Are students applying understanding of place value to calculate sums and differences of decimals?”

Lesson	Evidence	Look for
2-2	<i>Math Practices and Problem Solving</i> (student work samples) Items 19 and 22	Focus CTC around the big idea: <ul style="list-style-type: none"> • reasoning based on place value understanding to justify estimates. • reasonable estimates for the context of a situation.
2-2	<i>Quick Check</i> (digital platform)	Focus CTC around data analysis and collection of student workspace (scratch paper). Printable version available under “Teacher Resources”.
2-6	<i>Math Practices and Problem Solving</i> (student work samples) Items 25 and 30	Focus CTC around the big idea: <ul style="list-style-type: none"> • student strategies and models used to add and subtract with decimals. • use of place value understanding to regroup.
2-6	<i>Quick Check</i> (digital platform)	Focus CTC around data analysis and collection of student workspace (scratch paper). Printable version available under “Teacher Resources”.

Learning Cycle Assessments (summative)	<i>Topic Performance Assessments</i> SE pp. 105-108	Use <i>Scoring Guide</i> TE pp. 106A-108A
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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 2-1: Mental Math		
5.NBT.B.7 MP.2 MP.3 MP.4 MP.6 MP.8	Access Prior Learning: In 4 th grade students used place value understanding and properties to add and subtract multi-digit whole numbers as well as 10 th and 100 th (4.NBT.B.4) (4.NF.C.5). Beginning of the Big Idea: Students will begin to extend their understanding of using properties to add and subtract whole numbers to include decimal values.	Solve and Share: This problem and lesson asks students to use mental math versus paper and pencil computation. Estimation will allow the use of whole number strategies to add and subtract with decimals. Once students have estimated a reasonable answer, they will be better able to apply properties and strategies learned through working with whole numbers (i.e. making wholes, tens, hundreds, friendly numbers). Look for students who use the Commutative and Associative Properties of Addition to facilitate a discussion. Draw out generalizations such as, “there are multiple ways to add and subtract with decimals”, “using the properties helps to make easier problems” and “whole number strategies will work with decimals”. The <i>Look Back!</i> will help students to think about their own strategies. Consider building on this question by asking which numbers were challenging to add mentally. <p style="text-align: right;"><i>-continues on next page-</i></p>

		<p>Visual Learning: Using properties to add and subtract decimal values is demonstrated. Ask students to make connections between their own ideas shared during the <i>Solve and Share</i> and those modeled in the <i>Visual Learning Bridge</i>. The compensation strategy is modeled in <i>Another Example</i>, in the Student Edition (SE, p. 61). Assign a few items from the <i>Guided Practice</i> page and then ask students to explain and name their strategies.</p> <p>Assess and Differentiate: The <i>Intervention Activity</i> focuses on the Associative Property. The <i>Homework and Practice</i> page demonstrates use of the Commutative Property and compensation. Students should try using multiple methods solve these problems mentally.</p>
Lesson 2-2: Estimate Sums and Differences		
<p>5.NBT.B.7 5.NBT.A.4</p> <p>MP.2 MP.6 MP.4</p>	<p>Access Prior Learning: Students added, subtracted and rounded multi-digit whole numbers in 4th grade (4.NBT.A.3) (4.NBT.B.4). Students rounded decimals during Topic 1.</p> <p>Developing the Big Idea: Students will practice using two estimation strategies; rounding and compatible numbers, to build conceptual understanding and lay the groundwork for procedural skill with adding and subtracting decimals.</p>	<p>Solve and Share: Students will need to notice the language that indicates estimation versus that which indicates finding an exact answer (e.g. about, close to etc.). Look for students using different estimation strategies and ask them to share their thinking. Using student strategies, facilitate a discussion about different methods of estimation and which answers are likely to be over and under the true solution. Methods may include front-end methods, rounding and compatible numbers (Van de Walle, et. al., 2014, pp. 197-198).</p> <p>Visual Learning: Two estimation strategies; rounding and using compatible numbers, are demonstrated. Students may need additional clarification about the differences between these two strategies. Consider revisiting the shared student strategies to make connections between student's work and new content. Students are given an opportunity to practice estimating in the <i>Guided Practice</i>. Trying both strategies for estimation on several problems will help students to understand that there is more than one way to estimate. It will also provide an opportunity for students to construct the understanding that one strategy might be more efficient than the other based on the numbers in the problem.</p> <p>Assess and Differentiate: If students are struggling with estimation, consider revisiting other estimation strategies including the rounding strategy. Students have experience with several estimation strategies from previous grades. The <i>Reteach</i> page uses a number line to model rounding a decimal.</p> <p>*CTC: <i>Math Practices and Problem Solving</i> (student work samples) Items 19 and 22 *CTC: <i>Quick Check</i> (digital platform)</p>
Lesson 2-3: Use Models to Add and Subtract Decimals		
<p>5.NBT.B.7</p> <p>MP.1 MP.3 MP.4 MP.5</p>	<p>Access Prior Learning: Students have worked with tools and models such as base ten blocks, number lines, place-value charts and grids in 4th grade and in previous lessons in Topic 1.</p> <p>Developing the Big Idea: Students will use tools and models to build a conceptual understanding of addition and subtraction with decimals.</p>	<p>Solve and Share: Estimating before solving will help students make sense of the problem and determine a reasonable answer. Encourage students to use tools and models to justify their solutions. Consider asking students to use a hundreds grid (Teaching Tool 8) to model the problem. Use their ideas to facilitate a discussion to draw out mathematical generalizations such as whole number strategies work with decimals and the importance of place value in determining the relative size (magnitude) of the solution. Including the <i>Look Back!</i> question in the discussion might help students to reach these big ideas. The idea that adding decimals means we may need to count past one grid can be confusing yet it represents the important understanding that decimals add to form whole numbers with pieces left over.</p> <p>Visual Learning: Grids are used to model the solution to an addition problem with decimals. The <i>Convince Me!</i> provides students an opportunity to reason with and demonstrate understanding about addition with decimals. Using hundreds grids to subtract decimals is modeled in <i>Another Example</i>. The <i>Guided and Independent Practice</i> has grids on items 8-11. Consider using these items first with students needing more practice, asking that they use the models to explain their solutions.</p> <p>Assess and Differentiate: The <i>Intervention Activity</i> gives students more practice with a concrete model (base ten blocks) while the <i>Reteach</i> and <i>On-Level Activities</i> use grids to model decimal addition and subtraction. Grid models are used in the <i>Homework and Practice</i> pages for students who need more practice with models to build a conceptual understanding of this content.</p>

Lesson 2-4: Add Decimals		
<p>5.NBT.B.7</p> <p>MP.2 MP.3 MP.4 MP.8</p>	<p>Access Prior Learning: In 4th grade students used place value understanding and properties to add multi-digit whole numbers (4.NBT.B.4). Students built an understanding of decimal place value during Topic 1.</p> <p>Developing the Big Idea: Students will combine their knowledge of multi-digit addition and decimal place value to build a conceptual understanding and procedural skill of multi-digit addition with decimals.</p>	<p>Solve and Share: Estimating before solving will help students make connections between this problem and what they already know about multi-digit addition and decimals. Look for students using whole number strategies to solve this problem. Facilitate a discussion about why those strategies work and the role of place value. How can we use the decimal point to be sure place values are aligned?</p> <p>Visual Learning: Students might recognize the algorithm demonstrated to add decimals from work in previous grade levels. Encourage students to identify what is similar and different about using this method to add whole numbers versus decimals. Regrouping from decimal places can be modeled using tools such as base ten blocks or grids.</p> <p>Assess and Differentiate: The grid model is used to show students how the pieces in decimals are joining to form new numbers. This understanding will help students to use algorithms correctly.</p>
Lesson 2-5: Subtract Decimals		
<p>5.NBT.B.7</p> <p>MP.1 MP.3 MP.4 MP.7 MP.8</p>	<p>Access Prior Learning: In 4th grade students subtracted multi-digit whole numbers (4.NBT.B.4). Students built an understanding of decimal place value in Topic 1.</p> <p>Developing the Big Idea: Students will use knowledge of adding decimals and subtracting multi-digit whole numbers to build a conceptual understanding and procedural skill to subtract decimals.</p>	<p>Solve and Share: Estimating before solving will help students to make connections between this problem and what they already know about multi-digit subtraction and decimals. Look for students using whole number strategies to solve this problem. Facilitate a discussion about why those strategies work and the role of place value. Ask, "How can we use the decimal point to be sure place values are aligned?"</p> <p>Visual Learning: Students might recognize the algorithm demonstrated to subtract decimals from their work in previous grade levels. Encourage students to identify what is similar and different about using this method to subtract whole numbers versus decimals. A part-part-whole bar diagram is used to model the relationships in this problem. Ask students to explain how this model represents the context of the problem. Encourage students to create a part-part-whole model of their own using either the <i>Solve and Share</i> or an item from the <i>Guided and Independent Practice</i> pages. Encourage students to make connections between this concrete representation and the algorithm demonstrated for subtracting decimals.</p> <p>Assess and Differentiate: More practice with tools and models such as base ten block, grids, and the part-part-whole bar diagram will help students to deepen their conceptual understanding of decimal subtraction. More examples of the part-part-whole representation are found on the <i>Homework and Practice</i> pages.</p>
Lesson 2-6: Add and Subtract Decimals		
<p>5.NBT.B.7</p> <p>MP.1 MP.2 MP.3 MP.4 MP.5 MP.7 MP.8</p>	<p>Access Prior Learning: In previous lessons students added and subtracted decimals.</p> <p>Securing the Big Idea: Students will build procedural skill for adding and subtracting decimals.</p>	<p>Solve and Share: Students can demonstrate conceptual understanding of this problem by modeling the context. Decimal Grids (Teaching Tool 8), as well as bar diagrams allow students to represent the context visually. Students can mathematically model the context of this problem using a numerical expression. Encourage students to attempt multiple models, find connections between different models and explain how their models represent the given context. Ask students how models can help them to make sense of math problems and remind them that they are demonstrating the thinking habits of MP.4 (Model with Mathematics).</p> <p>Visual Learning: One standard algorithm is demonstrated for addition with decimals. Extra attention is given to regrouping with decimals and how it connects to what students already know about regrouping with whole numbers. Remind students that they can estimate before calculating to make sense of the problem and check if their answer is reasonable. Students might also benefit from continuing to use models as they practice using standard algorithms to help tie conceptual understanding to procedural skill. Students demonstrating proficiency with a standard algorithm can move to the items on <i>Math Practices and Problem Solving</i> for more challenge (SE, p. 92).</p> <p>Assess and Differentiate: The <i>Relearn</i> page focuses student attention to regrouping using the U.S. Traditional standard algorithm to add decimals and whole numbers. <i>Homework and Practice</i> page 94 will offer more challenge for students proficient with standard algorithms for adding and subtracting decimals.</p> <p>*CTC: <i>Math Practices and Problem Solving</i> (student work samples) Items 25 and 30 *CTC: <i>Quick Check</i> (digital platform)</p>

Lesson 2-7: Model with Math		
<p>5.NBT.B.7</p> <p>MP.1 MP.2 MP.3 MP.4</p>	<p>Access Prior Learning: In previous lessons students added and subtracted decimals and used models to solve models.</p> <p>Securing the Big Idea: Students will apply knowledge of modeling addition and subtraction problems containing decimals in a real world context. Students will practice evaluating the reasonableness of their solution.</p>	<p>Solve and Share: Bar diagrams are given so that students can practice modeling a given context that includes decimals. There are multiple ways this multi-step problem can be represented and solved. Consider using student solutions to facilitate a conversation about how modeling multi-step problems can help to visualize relationships and determine the correct operations and strategies. Thinking Habits tied to MP.4 are listed on the Student Edition page and can be brought into the class conversation.</p> <p>Visual Learning: Students are applying strategies and using models practiced in previous lessons. Consider facilitating a discussion about how models are used to represent math problems. The <i>Convince Me!</i> gives students an opportunity to use estimation as a strategy to determine if their answer is reasonable.</p> <p>Assess and Differentiate: The <i>Intervention Activity</i>, <i>Reteach</i> page, and <i>Homework and Practice</i> page all offer more practice using bar diagrams and numerical expressions to model mathematical problems.</p>

References

- 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.
- Karp, K., Bush, S., & Dougherty, B. (2014). 13 rules that expire. *Teaching Children Mathematics*, 21(1), 18-25.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA.
- Van De Walle, J. A., Bay-Williams, J. M., Lovin, L. H., & Karp, K. S. (2014). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades 6-8* (2nd ed.). New York, NY: Pearson.

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