**The Number Strand: Outcome N4.8**

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| **Outcome** | **Indicators** | | | |
| N4.8 Demonstrate an understanding of addition and subtraction of decimals (limited to hundredths) by:   * using compatible numbers * estimating sums and differences * using mental math strategies * solving problems.   [C, ME, PS, R, V]  *In support of the K-12 Mathematics goals of Number Sense, Logical Thinking, Mathematical Attitude, and Spatial Sense.* | 1. Approximate sums and differences of decimals using estimation strategies. 2. Solve problems, including money problems, which involve addition and subtraction of decimals, limited to hundredths. 3. Determine the approximate solution of a problem not requiring an exact answer. 4. Estimate a sum or difference using compatible numbers. 5. Count back change for a purchase. 6. Explain the strategies used to determine a sum or difference. 7. Represent a sum or difference of two decimals concretely or pictorially, and record the solution for the sum or difference symbolically. | | | |
| **Learning Space:** [**Top**](#top) | | | | |
| This outcome builds directly upon the students learning about decimals in the previous outcome. Although the two outcomes flow directly into each other, it is important that the students have developed as deep understanding of decimal numbers before beginning to explore addition and subtraction of the decimal numbers.  Estimation and reasoning strategies play a large role in the students’ development of their understanding of these two operations on decimals. It is important for this outcome to be approached as an outcome that the students have the necessary tools to achieve through inquiry and sharing. The students should already have a strong understanding of addition and subtraction, place value, quantity and decimal numbers, which means that they should be able to co-construct strategies for determining sums and differences in this new context of decimal numbers. Concrete materials, visual representations, benchmarks, and relevant contexts are all key aspects to students successfully developing strategies and understandings pertaining to the sum and difference of decimal numbers. Students should be encouraged to hypothesize and test out ideas and approaches and to generalize the patterns that they encounter. Making connections between models and symbolic notation is crucial, and student strategies should be emphasized. Traditional algorithms may be presented when the students have developed a deep understanding, but such algorithms should not be expected to be followed. Instead, students could be asked to explain the reasoning behind the algorithms and how they relate to their own personal strategies. | | | | |
| Connections to topics and examples from other subject areas should be incorporated in both the mathematics classrooms and other subject areas. In their study of patterns and relations students can explore patterns that result from the addition and your subtraction of decimals. Similarly students can use data containing decimals and analyze such graphs to solve problems involving the addition and subtraction of decimals. | | | |
| **What Students Should…** [**Top**](#top) | | | |
| **Know**   * what it means to find a sum or difference. * the symbol “+” stands for addition. * the symbol “-“ stands for subtraction. | | **Understand**   * addition and subtraction of decimal numbers are the same operations as addition and subtraction of whole numbers. * estimation can be used to determine the position of the decimal point in a sum or difference of decimal numbers. * number composition and decomposition can be used to determine compatible numbers for estimates of sums and differences of decimal numbers. | **Be Able to Do**   * estimate the sum and difference of two decimal numbers. * model and determine the sum or difference of two decimal numbers. * solve problems involving the sum or difference of two decimal numbers or their estimate. * determine the change to be given in a particular situation. * identify when the problem does not require an exact value. |
| **Key Questions:** [**Top**](#top) | | | |
| * How are adding and subtracting decimal numbers like adding and subtracting whole numbers? * How can benchmarks help you determine an estimate for the sum or difference of two decimal numbers? * When might an estimate for the sum or differences of two decimal numbers be sufficient? * How can you determine the placement of the decimal point? | | | |

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| **Suggestions for assessment:** [**Top**](#top) |
| **Big Idea:**  Determining exact sums and differences of decimals.  **Suggestions for assessment tasks:**   1. Give the students a context that includes decimal values and ask the students to write a problem that involves the addition or subtraction of the decimal numbers. Have the students solve the resulting problem and explain their strategies. 2. Ask the students to compare the addition or subtraction of decimal numbers to the addition or subtraction of whole numbers (using examples). 3. Have the students explain how decomposition of numbers and place value are related to finding sum or difference of decimal numbers. 4. Provide the students with a sum or difference of two decimal numbers and ask them to represent that sum or difference.   **What to look for:**   * + See [*Adding and Subtracting Decimals*](file:///C:\Users\ru593\AppData\Local\Temp\Adding%20and%20Subtracting%20Decimals%20Rubric.doc)   *.*  **Big Idea:**  Determining estimates of sums and differences of decimals.  **Suggestions for assessment tasks:**   1. Have the students determine an estimate of a sum or difference of decimals and explain what benchmarks they used for the decimals and why. 2. Given a particular context with decimal values the student is asked to write and solve a problem that involves the estimation of a sum or difference of decimal numbers.   **What to look for:**   * + See [*Estimating Sums and Differences of Decimals Rubric*](file:///C:\Users\ru593\AppData\Local\Temp\Estimating%20Sums%20and%20Differences%20of%20Decimals%20Rubric.doc)*.* |

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| **Suggestions for instruction:** [**Top**](#top) |
| **Big Ideas:**  Determining exact sums and differences of decimals. Determining estimates of sums and differences of decimals.  **Suggestions for instructional activities:**   1. Because the students are already familiar with comparing decimals and with adding and subtracting of whole numbers, they can be challenged to make sense of adding and subtracting decimals by creating their own inquiry or exploration. For this type of learning experience, students should be allowed to choose to work alone or in small groups and the small groups and individuals should be provided opportunities to ask questions of each other and to share the emerging ideas, strategies, and stumbling blocks. To facilitate this type of learning, teachers need to prepare a working list of reflective, prompting, and clarification questions that can be used with individual students and groups as the need arises. This list would include questions such as: how have you been choosing your numbers, are there other possible situations to consider, how can estimates help you determine the reasonableness of your answer, how do you know where to put in decimal point, how might decomposition of the numbers help, and what would this look like if I used grid paper or base-ten materials? Some students may require more detailed direction, but first they should be encouraged to try to their own ideas and to compare their approach to that of other students, keeping in mind that there are always many ways to develop understanding. Often it is a student’s fear of failing and not their inability that will cause them to seek more direction from the teacher. In such cases, give minimal hints and recognize success by adding to the challenge. 2. When the students have completed their investigations, have them make presentations to the class regarding what they found, and what generalizations they have made. After all of the presentations, asked the students to write a journal entry in which they reflect upon what they discovered on their own and how it relates to the discoveries of their classmates. Allow time for further discussion and asking questions pertaining to specific strategies and ideas. 3. Encourage the students to come up with contexts and related problems in which the addition and subtraction, including estimates, of decimals would be used. Have the students generalize their strategies for determining what type of operation is needed in a context and whether it requires an estimate or actual sum or difference. |