**The Number Strand: Outcome N4.2**

[Learning Space](#ls) [What Students Should. . .](#wss) [Key Questions](#kq) [Assessment](#assessment) [Instruction](#instruction)

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| **Outcome** | **Indicators** |
| N4.2 Demonstrate an understanding of addition of whole numbers with answers to 10 000 and corresponding subtractions (limited to 3 and 4-digit numerals) by:   * using personal strategies for adding and subtracting * estimating sums and differences * solving problems involving addition and subtraction.   [C,CN, ME, PS, R]  *In support of the K-12 Mathematics goals of Number Sense, Logical Thinking and Mathematical Attitude* | 1. Explain why and how to keep track of digits that have the same place value when adding or subtracting numbers. 2. Describe a situation in which an estimate rather than an exact answer is sufficient. 3. Estimate sums and differences using different strategies (e.g., front-end estimation and compensation) 4. Explain the strategies used to determine a sum or difference. 5. Solve problems that involve addition and subtraction of two or more numbers. |
| **Learning Space:**  [**Top**](#top) | |
| In grade 3 mathematics, students focused on the addition and subtraction of 2- digit whole numbers developing strategies for finding sums and differences as well as estimates for sums and differences. These strategies should become the basis for the students’ development of their understanding of adding 3 and 4-digit whole numbers as the students actively work towards developing their skills.  It should be emphasized that the strategies, skills and understandings that the students are developing in achieving this outcome are merely extensions and broadenings of those strategies, skills and understandings that they have previously developed. Teachers need to be aware that students often view each new visit to any of the four operations as something totally different from their past learnings and will need to use questioning, discussion, and personal reflection strategies with students to ensure they see the existing connections  There are many opportunities to integrate this outcome with other subjects as there are many contexts in which students might be asked to or may be interested in exploring questions that result in the addition or subtraction of whole numbers. As well, this outcome can be related to the students’ learnings about interpreting bar graphs and understanding the addition and subtraction of decimals which also occur in grade 4. | |

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| **What Students Should…** [**Top**](#top) | | |
| **Know**   * the symbol for addition is “+”. | **Understand**   * the importance of place value in addition and subtraction * how to explain (make sense of) the strategies that they use to determine sums and differences * not all situations involving sums and differences an exact answer * adding or subtracting 3- and 4- digit numerals is not different from previous adding and subtracting that they have done and that it answers the same questions (e.g., what is the total, how much bigger is one number than another) * problems can be solved by either subtracting or adding – depending on the situation and the approach taken. | **Be Able to Do**   * determine the sum of 3- and 4-digit numbers. * determine the difference of 3- and 4-digit numbers * determine an estimate for a sum or difference of 3- or 4-digit numbers. |
| **Key Questions:** [**Top**](#top) | | |
| * What does it mean to add two numbers? * How does place value relate to adding? * How is adding of 3 and 4-digit numbers like adding smaller numbers? * How are addition and subtraction related to each other? | | |

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| **Suggestions for assessment:** [**Top**](#top) |
| **Big idea:**  Determining exact sums and differences.  **Suggestions for assessment tasks:**   1. Give the students two numbers to add (or subtract) and ask them to do the calculation and explain in words, pictures, and/or using concrete materials the strategies that were used. 2. Provide the students with concrete or pictorial representations of two numbers and then ask them to find either the sum or difference and to represent concretely or pictorially and then represent their thinking symbolically. 3. Provide the students with a representation of the process used to find a sum or difference and ask the students to explain the strategy that was used. 4. Provide the students with a calculation of a sum or difference and ask them to identify and correct an error made in the calculation. 5. Ask the students to find a sum or difference using their understanding of place value and to explain their reasoning. 6. Have the students prepare a report (video, written, oral…) to describe what they know about addition and subtraction including their strategies for determining sums and differences, the purpose of finding sums and differences, and how finding sums or differences with different types of numbers (1 digit, 2 digit, 3 digit, or 4 digit) are related. 7. In exit slips or a reflective journal, have the students record their understandings and questions that they have about the adding and subtracting of whole numbers. 8. Provide the students with two different solutions to a sum or difference and in pairs have the students discuss and compare the strategies used. 9. Provide the students with a context and ask them to create an addition or subtraction problem based in that context, solve the problem, and explain the meaning of the solution in the context.   **What to look for:**   * [F*inding Sums and Differences* Rubric.](file:///C:\Users\ru593\AppData\Local\Temp\Finding%20Sums%20and%20Differences%20Rubric.doc)   **Big idea:**  Determining estimates of sums and differences.  **Suggestions for assessment tasks:**   1. Give the students two different estimates for the same sum or difference and have them discuss the advantages and disadvantages of the different estimates. Ask the students to provide contexts in which each estimate might be more appropriate.    1. When asked to estimate the sum of 3568 and 289, two math students came up with alternate solutions shown below. Explain the estimation strategy used in both, and provide a situations in which you believe the particular estimation strategies would be appropriate.   *3568 + 289 is approximately 3600 + 300 or 3900 (it will be less than this)*  *3568 + 289 is approximately 3550 + 300 or 3850 (it will be less than this)* |

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| 1. Give the students a word problem involving the addition or subtraction of whole numbers and have them solve the problem. In the solving of the problem, have the students decide whether or not estimating the sum or difference would be appropriate and describe the strategies they use while solving the problem. 2. As a project, the students could be asked to research any topics (related to school or home interests). As part of their research, the students would identify a context in which an estimated sum needs to be determined and another context in which an estimated difference needs to be determined. The student would be responsible for putting these contexts into problems and then solving the problems. Finally, the student would be responsible for explaining why an estimate rather than an exact value is suitable for the contexts. This project could be assessed using a class-designed rubric and/or rating scales in which the originality of the topic researched, the relevance of the problems, the appropriateness of finding estimates rather than the exact value, and the accuracy of the calculations are considered. 3. Give the students a sum or difference and a worked solution using estimates. Ask the students to create a problem that involves the original values and that the worked solution would be appropriate for.   **What to look for:**   * See the [*Estimating Sums and Differences* Rubric](file:///C:\Users\ru593\AppData\Local\Temp\Estimating%20Sums%20and%20Differences%20Rubric.doc). * *In general:* Have the students keep a reflective journal in which they record their understandings of adding and subtracting whole numbers. Instead of providing the students with pre-designed prompts which can direct their thinking away from what they really need to reflect about, ask the students to treat it like writing and illustrating a story. If the students are still struggling with writing ideas, allow pairs or small groups to brainstorm ideas that they can chose from. |

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| **Suggestions for instruction:**  [**Top**](#top) |
| **Big Idea:**  Determining exact sums and differences.  **Suggestions for instructional activities:**   1. Begin with posing a mathematical problem such as: “How can I find the sum of these two numbers?” (e.g., 245 + 318). It is important to realize that the students should have the two main pre-requisite skills and understandings needed to solve this problem: an understanding of what adding is and an understanding of place value and how to use it to decompose and compose whole numbers. Allow time for the students to work on the problem individually, then in small groups, and finally ask the students to share their approaches, strategies, successes, failures, and questions with the whole class. Encourage the students to be inventive in their representations of the strategies that they are using, and ask them to try to represent any non-symbolic strategies in symbolic form as well. Repeat this activity with additional sums and differences, eventually asking the students to contribute to the selection of numbers, defining of contexts where the numbers could exist, and the asking of the problem. As the students engage with each new problem, challenge the students to reflect on patterns they are noticing and to work on hypothesizing and testing generalizations for determining sums and differences with three and four digit numbers. 2. As the students work through these problems, ask them to reflect on why place value is important to consider when finding sums and differences. Also ask the students to reflect on how they know their solutions are probably correct. Allow the students to share their strategies for determining estimates and ask them to reflect on whether an exact answer is always needed when finding a sum or difference.   **Big Idea:**  Determining estimates for sums and differences.  **Suggestions for instructional activities.**   1. With the students being new to whole numbers larger than 999 and less than 10 000, it is important to start with making sure that they understand what numbers are close to a given whole number. Have the students represent given whole numbers within a table (an extended hundred chart), on grid paper, on a number line, and/or concretely. Ask the students what numbers are close to the given numbers and which of those numbers they would find easier to do calculations with. Have the students compare the quantity visually and/or concretely between the actual whole number and their approximate value. Also have the students compare the estimate to the actual value. 2. Have the students brainstorm ideas of contexts in which they might use an estimated rather than actual whole number. Have the students describe those contexts and what they would consider to be an accurate enough estimate – to the nearest 10, 100, 500, or 50 – and why. 3. Have the students brainstorm ideas of contexts in which they might use an estimated sum or difference of whole numbers. Consider these contexts and have the students justify the accuracy they believe to be needed in the particular context. 4. Have the students explore determining an estimate for a sum and difference using a variety of representations and strategies for estimating, adding, and subtracting. Engage the students in discussions of regarding which estimates are closest, furthest, larger than, or smaller than the actual sum or difference and their reasoning for their claims. Encourage the students to not do the actual calculation as it defeats having estimated.   In general, incorporate finding sums and differences and estimates of sums and differences of whole numbers in a wide variety of contexts, and have the students regularly reflect upon the commonalities that exist when adding any type of number. Encourage the students to view this outcome’s learnings as an extension or new context for an old understanding because that is what it should be. To solidify their understanding of this outcome, students will likely need to revisit ideas from outcome N4.1 and put those ideas into the context of adding and subtracting whole numbers. The strategies and processes used to find sums and differences that the students develop and use must be connected to their understanding of whole numbers in general; rote memorization of rules, procedures, and key words in problems will not help the students develop the number sense necessary for continued success in mathematics. |