THEME: Unknown Numbers in Addition and Subtraction / Place Value Concepts

<u>OERATIONS AND ALGEBRAIC</u> (OA)

Represent and solve problem involving addition and subtraction

1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

Understand and apply properties of operations and the relationship between addition and subtraction.

1.OA.4 Understand subtraction as an unknown-addend problem. For example, subtract 10 − 8 by finding the number that makes 10 when added to 8.

Add and subtract within 20.

1.OA.5 Relate counting to addition and subtraction, e.g., by counting on 2 to add 2.

1.OA.6 Add and subtract within 20, demonstrating fluency with various strategies for addition and subtraction within 10. Strategies may include counting on; making ten, e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 + 14; decomposing a number leading to a ten, e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9; using the relationship between addition and subtraction, e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4; and creating equivalent but easier or known sums, e/g/, adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13.

Work with addition and subtraction

1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6; 7 = 8 -1; 5 + 2 = 2 + 5; 4 + 1 = 5 + 2.

1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations: 8 + __ = 11; 5 = __ - 3; 6 + 6 + __

NUMBER AND OPERATIONS IN BASE TEN (NBT)

Extend the counting sequence.

1.NBT.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

Understand place value.

1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: 10 can be thought of as a bundle of ten ones — called a "ten;" the numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones; and the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

Use place value understanding and properties of operations to add and subtract.

1.NBT.4 Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.

Commentary:
Students explore solutions to problems using materials such as counters and five and ten frames to model various situations. They develop understanding of each problem situation over time. Problems should include addition and subtraction examples in which the numbers range up to a total (sum) of 20.

As students solve problems with addition and subtraction, they are connecting the counting they did in kindergarten to adding and subtracting numbers. Work with models such as ten frames and linking cubes support the strategy of using ten as a benchmark to solve addition and subtraction problems within 20 by decomposing and composing addends. Experiences in the order of addends is reversed establishes a fundamental property (commutative) of addition and later multiplication. The order of the addends does not change the total (sum). Students explore and use patterns they see to begin to develop an understanding of important properties of addition and subtraction.

First grade students continue to explore and make sense out of number combinations to 20, beginning with extending counting strategies to a larger range of numbers. Through carefully planned experiences, more sophisticated strategies become apparent. For example, once students know doubles in addition, they can begin to work with examples that can be modeled using doubles plus 1 or 2 more (3 + 4 can be thought of as 3 + 3 + 1). Students should have many opportunities to model, draw conclusions, and share their thinking in order to deeply understand and make use of these strategies. Questions posed by the teacher can help students to move from concrete models and pictures to equations and using strategies to practice basic facts.

It is critical that students understand that the equal sign (=) represents a relationship and not an action. Reading "=" as *same as* rather than *equals* is one way to reinforce this important concept.

Students extend the range of counting numbers and focusing on the pattern evident in written numerals. This is the foundation for thinking about place value and the meaning of the digits in a numeral. Students are expected to read and write numerals to 120.

Commentary:
Students think of whole numbers in terms of the value of the value of the digits (tens and ones) and recognize that the digit in the tens place represent that many groups of 10, and a digit in the ones place represent that many ones.

As students explore the meaning of place value with numbers from 11 to 19 as a group of 10 and some ones, they experience the structure of mathematics. Place value is the foundation for all future work with whole numbers and decimal numbers. The use of concrete models and pictorial models and explicitly connecting them to symbolic notation is fundamental to developing conceptual understanding.

Students begin to utilize or consider 10 ones as a group or unit called a ten. Rather than seeing 10 individual cubes, they can link those cubes and make a group of 1 ten.

Once students show an understanding of place value for tens and ones, they begin to compare two numbers by determining the number of tens and the number of ones in each number. After experiences with comparing using concrete materials, including ten frames and place value charts, students move to the hundreds chart and number lines. Students generalize that the number with the most tens is greater. If the number of tens is the same, the number with more ones is greater. Comparative language including greater than, more than, less than, fewer than, equal to, and same as is developed. When students become facile with using appropriate vocabulary, the mathematical symbols should be introduced.

Once a deep understanding of place value concepts has been established, students use concrete materials to develop and understand the process for adding and subtracting up to 100. Students also develop mental strategies for finding 10 more or 10 less than a number up to 100. Subtraction with two 2-digit numbers is limited to subtracting multiples of 10.

Students begin to develop understanding and skill with adding beyond the basic facts through the use of concrete representations. Students progress to making generalizations and developing their own strategies for adding one-and two-digit numbers. Include problems that provide a context for addition as often as possible. Equations should be written both horizontally and vertically. Encourage students to make estimates before adding to determine if their answers are reasonable.

It is not expected that students master the standard algorithm for addition at this time.

Instructional Resources

Math Expressions: Unit 3 (Sections: 3.1 – 3.12); Unit 4 (Sections 4.1 – 4.18)

Manipulatives: Student Math White Boards, Objects for counting, such as beans, linking cubes, two-color counters, Hundreds Chart, ten frames, Dot cards, Open number line, Part-Part-Whole chart, Dice (1-6, 1-10), Number line to 20, Open number line, Linking cubes for place value, Place Value Chart to tens, and Greater than, Less than = cards

Achieve The Core Fluency Resource

Digital: Think Central – Soar to Success for Below Level and Mega Math for On Level

Differentiated Instructional Activities: Pages: 191, 197, 205, 211, 217,225, 231, 239, 247, 253, 259, 265, 279, 285, 291, 299, 307, 315, 321, 327, 333, 341, 345, 351, 357, 365, 371, 377, 383 and 389.

Assessment Resources

Unit 3: Quick Quiz 1, 2 and 3

Unit 3: Assessment Form A and Form B

Unit 4: Quick Quiz 1, 2, 3, and

Unit 4 Assessment Form A and Form B

Formative: "Check for Understanding embedded in each lesson.

Addressing Student Misconceptions and Common Errors

1.OA.1

The vocabulary of comparison situations can cause confusion for students. While the words more than implies addition and fewer than implies subtraction, in comparison situations, that is not always the case. Look at this example:

Patty has 16 tickets for the raffle. She has 8 fewer than Marcus. How many tickets does Marcus have?

Although the problem includes the word fewer, a student would actually add 16 + 8 to find the solution. Modeling with concrete objects to use the information by showing Patty's tickets and 8 more will help students realize that this is actually an addition problem.

Addressing Student Misconceptions and Common Errors Cont.

1.OA.3

Although subtraction is not commutative, it is important not to contribute to a potential student misconception by saying that you cannot take a larger number from a smaller number. It is appropriate to say that $8 - 5 \neq 5 - 8$.

It is possible to take a larger number from a smaller number. The result will be a negative number. Integers are not introduced until middle school.

1.OA.5

Watch for students who may double count a number when adding or subtracting. This may occur with physical objects, pictures or using a hundreds chart. For example, if a student is adding 6 + 4, she may begin with the 6 (6, 7, 8, 9) with a result of 9 rather than counting on to the 6 (7, 8, 9, 10). The same may happen in subtraction. If a student is counting to subtract 8 – 5, he may count the 8 as part of the count (8, 7, 6, 5, 4) with a result of 4 rather than subtracting from the 8 (7, 6, 5, 4, 3) to get the accurate amount. Not only should this be pointed out to students, but it is essential also to provide more explicit experiences with concrete materials in which students are adding on the given addend or subtracting from the total.

1.OA.6

Continue to watch for students who are double counting a number when adding or subtracting.

1.OA.7

Some students may develop the misconception that the equal sign indicates the answer comes next to calls for the action of doing the mathematical operation. When students use calculators, pressing the equal key results in the answer, which can also cause this misconception. Students should have experiences early on that reinforce that the equal sign indicates both sides of the equation represent the amount. Using a balance scale or picture of a balance scale with the equal sign on the center helps students to understand that the equal sign on the enter helps students understand that the equal sign means both sides are balanced. As teachers model writing equations or give students examples to solve, it is important to repeat that the equal sign means “the same as.” It is appropriate in early experiences using the equal sign to have students read it as “is the same as.” For example, students would read 10 – 7 = 3 as “10 minus 7 is the same as 3.”

Addressing Student Misconceptions and Common Errors Cont.

1.OA.8

Although students may be able to model problem situations with materials and pictures, the transition to writing equations using symbols may be more difficult for them, particularly when their reasoning requires finding a missing addend. Asking students to explain their reasoning as they solve the problem with materials will help them to connect what they have done with the materials to the symbolic equation. Be sure that students have multiple experiences solving equations in which the unknown is in different positions.

3 + 8 = __ 3 + ___ = 11 ___ + 3 = 11 11 – 3 = ___ 11 - __ = 8 __ - 3 = 8

1.NBT.1

It is not expected that students develop an understanding of place value with this standard. However, watch for students who reverse digits in writing the numeral or do not demonstrate an understanding that 21 does not have the same value as 12. When reversals occur, have students model each number, using straws or linking cubes to reinforce the place value of digits and to help differentiate between the numbers.

1.NBT.2

Continue to watch for students who reverse digits. These students need more opportunities to decompose numbers into groups of ten and ones using concrete materials and then to put the items in the correct places on a place value chart. They describe the number in terms of tens and ones and then write the numeral below the concrete representation.

Observe students counting tens and ones separately. For example, students who count 10, 20, 1,2,3, rather than 10, 20, 21, 22,23, need more practice with counting.

Some students may have difficulty differentiating number words that sound alike, for example, fifty and fifteen. These number words can be spelled out and added to a word wall showing pictures, numbers, and words.

Addressing Student Misconceptions and Common Errors Cont.

1.NBT.3
Students who recognize two-digit numbers but do not understand that the position of the digit determines its value need additional work with concrete representations. Give each student a number and ask them to represent that number on their place value chart. They work with a partner to determine which number is greater. They use cards with <, >, or = and put the correct sign between their charts. Only when students show understanding with materials and pictorial representations should they begin to connect those representations to using numerals.

It is important for students to associate the symbols < and > with their real meaning. Rather use aids such as alligators or Pac-Man, it may help students who confuse the symbols to think that the open end of the symbol is always closest to the greater number and the closed end is always pointed to the lesser number. It is also important to give students opportunities to change the order of the numbers to see how it impacts the symbols and their meaning.
Example: 35 < 65 or 65 > 35

1.NBT.4
Students who do not know basic facts may be inaccurate computing with two-digit numbers. As those students continue to work on facts, physical models will help in adding accurately. Be sure that all students have ample experience with adding physical models on place value charts, counting on by benchmark numbers (tens and ones), using a hundreds chart, and using ten frames as appropriate. Make explicit connections among written physical models, strategies, and written formats.

Regrouping (composing tens from ones) when adding two-digit numbers is included in this standard. It is appropriate for students to use physical models for these examples and explain their reasoning, explicitly connecting physical models with symbolic notation (written equations).

Source: The Common Core Mathematics Companion: The Standards Decoded (What They Say, What They Mean, How to Teach Them)
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