Core Content

Cluster Title: Add and subtract within 20.

Standard 2: Fluently add and subtract within 20 using mental strategies. By end of grade 2, know from memory all sums of two one-digit numbers.

MASTERY Patterns of Reasoning:

Conceptual:

Students will understand how to use whole-part relationships of numbers to efficiently compose and decompose one-digit numbers.
Students will understand the relationship between addition and subtraction.
Students will understand that fluency includes accuracy, efficiency, appropriateness, and flexibility.

Procedural:

Some of the mental strategies students use may include:

- Counting on: 8 + 4 = □ (8 …9, 10,11,12)
- Counting back: 12 - 4 = □ (12…11, 10, 9, 8)
- Making tens: 5 + 7 = □ (5 = 2 + 3 so 3 + 7 = 10 therefore 10 + 2 = 12)
- Doubles: 6 + 6 = □
- Doubles plus/minus one: 6 + 7 = □ (6 + 6 + 1 or 7 + 7 – 1)
- Decomposing a number leading to a ten: 15 – 7 = □, so 15 – 5 = 10, therefore 10 – 2 = 8)
- Working knowledge of fact families/related facts: 3 + 9 = 12 so 12 - 9 = □

(See Standard 1.OA.6 for a list of mental strategies.)

Representational:

Students may use objects, pictures, words, and numbers to show and explain their thinking process at the beginning. By the time they reach fluency they should be using mental strategies and their explanations should reflect that.

Supports for Teachers

Critical Background Knowledge

Conceptual:

Students will understand that each number has a unique value.
Students will understand what it means to compose and decompose numbers.
Students will understand that whole numbers can be decomposed into parts that make them easier to work with.
Students will understand the number combinations of 10.

Procedural:

Students can recognize and form combinations of 10.
Students can add and subtract two whole numbers.
Students can add and subtract within 20.

Representational:

Students can draw pictures and use objects, a number line, and/or words to understand and solve addition and subtraction problems.
Students can communicate strategy for determining the total number of dots on a given dot card.

Academic Vocabulary and Notation

decompose, compose, number relationships, mental strategies, number combinations, doubles, doubles plus/minus one, equal part, expanded notation, facts, sum, difference, addend, subtrahend, fact family, fluency

Instructional Strategies Used	**Resources Used**
Teachers will provide opportunities for students to develop each of the mental strategies, and encourage students to share their strategies for solving problems. Teachers will also model the strategy with concrete or visual materials and allow for sufficient practice using the same materials. Remember, the goal is to move students to mental computation strategies. Some suggestions are: **<u>STEP ONE</u>** Develop the strategies using visual representations in a "Number Talk" routine (see resources on the right). • ten frames and two color counters	Tens Go Fish Game ("go fish" game, looking for combinations of ten) Turn Over Ten (concentration, looking for combinations of ten) Hong, Lily Toy. *Two of Everything*. Albert Whitman and Company, 1993. Richardson, Kathy. *Thinking with Numbers: Numbers Talks* DVD. Math Perspectives.

• dot pattern cards • rekenrek • linking cubes **STEP TWO** Apply the strategies to given combinations of numbers. Some strategies lend themselves to specific number sets. (Leading to a ten is very helpful for +8 and +9.) **STEP THREE** Move students toward using the strategy mentally by solving without the use of concrete items. (Note: Each of these steps is essential in providing vital foundational understanding. Repeated practice develops the flexibility required to achieve fluency.)	Parrish, Sherry. *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K-5*. Math Solutions, 2010. Hope, Jack A., Leutzinger, Larry, Reys, Barbara J., Reys, Robert E. *Mental Math in the Primary Grades*. Dale Seymour, 1988. http://www.k-5mathteachingresources.com/ 2nd-grade-number-activities.html http://www.mathwire.com/numbersense/bfacts.html
Assessment Tasks Used	
Skill-Based Task: Use a written number fact assessment showing students' ability to solve addition and subtraction facts of all two-digit numbers without the aid of objects or tools.	**Problem Task:** This objective specifies that the student solves addition and subtraction problems within 20 using ***mental strategies***. This assessment is done without a context to demonstrate fluency. This could be accomplished in an interview with the student or while observing partner interaction.