Whole Number Addition & Subtraction in Grade 4

How Does Fluency Build from Conceptual Understanding in Grade 4?

Students flourish in mathematics when procedural fluency builds from a foundation of conceptual understanding, reasoning, and problem solving. When students make connections between concepts and procedures, they become confident mathematicians. This enables students to know which procedure is appropriate for a given situation and helps students anticipate their answers when using a selected procedure.

In Grade 4, students are expected to fluently add and subtract within 100,000. Their conceptual understanding for this goal stems from grade 3 in which students use estimation strategies to assess reasonableness of answers, model and explain how the relationship between addition and subtraction can be applied to solve addition and subtraction problems, and use expanded form to decompose numbers and then find sums and differences. Grade 4, students extend this understanding to add and subtract multi-digit whole numbers using the standard algorithm with place value understanding. Example:

Problem:

Carolina Elementary won the community can drive competition. They collected 14,835 cans of food. If the total amount of cans collected by the community was 32,231, how many items were not collected by Carolina Elementary?

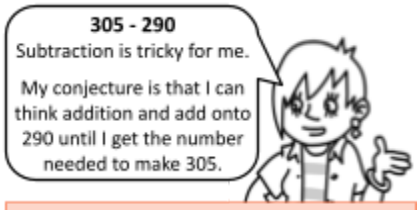
I need to find the difference between Carolina Elementary's amount of cans and the Community's amount of cans.

$$\begin{array}{r} 32,231 \\ -\ 14,835 \\ \hline 17,396 \end{array}$$

Standard Algorithm for Subtraction

What Role Does Problem Solving Play?

Problem solving is an opportunity for students to select, use, and adapt computation strategies. It promotes reasoning, sense making, formulating conjectures, and seeing connections. As students solve problems, they need time to discuss their ideas with classmates and the teacher in order to know why a specific computation is needed to solve a problem.



Conjecture: an opinion about what you believe is true based on some information

When students are given problems and allowed to select procedures meaningful to them, they naturally build upon their current understanding to construct their own strategies. Students adapt these strategies as they work together and share ideas.

As students engage in problem solving, it is important to use accurate terminology. Words, phrases, and procedures that expire (won't work in all situations) should be avoided. Examples:

- **Replace the words *borrow* and *carry* with *regroup*.** Borrow and carry do not accurately describe the mathematics used when adding or subtracting and are misleading (borrow suggests we'll return it later). Regroup is more precise as it describes the place value concepts used.
- **Replace the phrase *show your steps* with *explain your thinking*.** Explaining thinking encourages use of multiple strategies for problem solving, whereas showing steps implies there is one specific procedure that must be followed.
- **Replace focus on *keywords* with a focus on *meaning*.** Isolating keywords can be misleading, especially when solving multi-step problems. Instead, focus on meaning and context of situations, which will open the door to multiple strategies.

What is Procedural Fluency?

Procedural fluency is being able to apply procedures efficiently, flexibly, and accurately.

- **Efficient:** Select a strategy within a reasonable amount of time.
- **Flexible:** Know multiple strategies; apply or adapt strategies when needed.
- **Accurate:** Solve Correctly.

Procedural fluency is broader than basic fact fluency, which only involves single-digit numbers.

What are the Actions of a Fluent Fourth Grader?

Component	Action
Efficient	Select an appropriate strategy. Easily use the strategy. Add and subtract within 100,000 in a reasonable amount of time. Add and subtract multiples of ten from memory through reasoning or recall.
Flexible	Use strategies to add and subtract within 100,000 including • Count on from one number or add up in chunks. • Count back. • Decompose numbers (e.g., decompose a number leading to a ten). • Use friendly numbers (e.g., make a ten, doubles and near doubles, compensation, adjust one number before subtracting). • Use the relationship between addition and subtraction. • Keep a constant difference. • Use the standard algorithm. Adapt a strategy to fit the numbers or situation. Trade out strategies if the first one isn't helpful or becomes cumbersome.
Accurate	Complete steps accurately. Get the correct answer.

Grade 4 Resources to Build Conceptual Understanding and Develop Fluency

- Destination NC (lesson), *Tools4NCTeachers*
- Math Flips (activity), *Berkeley Everett*
- Chimney Rock, p. 23 (game), *NCDPI*
- Valuable Digits, pp. 24-25 (game), *NCDPI*
- Win Win Math Games (game), *Marilyn Burns*
- To Regroup or Not to Regroup (task), *Illustrative Mathematics*
- Sum to 10,000 (task), *Open Middle*

Link to Developing Proficiency with Whole Number Addition & Subtraction