SCAFFOLDING TASK: Multi-digit Addition Strategies

Approximately 3 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.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.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers without regrouping. Students should also have experience solving various story problems with the use of manipulatives. Students can use place value blocks, number charts, create drawings of place value blocks, or number lines to support their work.

Some students may draw a picture, solve the problem with manipulatives, or use benchmark numbers. All of these strategies demonstrate a solid foundation of number sense. If you notice students using the traditional algorithm for regrouping, it is imperative that you ask them to explain their reasoning for using this method. The idea that numbers can be "carried" is not a natural progression when numbers are combined. Algorithms are a short cut method that makes recording numbers more convenient and efficient. Students need to explore many different strategies for combining numbers before they can understand the idea of an amount being "carried" from one place value position to another. Moving to the standard algorithm too early

will often prevent students from continuing to make sense of the numbers that work within a given situation.

ESSENTIAL QUESTIONS

- How can we solve addition problems with and without regrouping?
- Can we change the order of numbers when we add (or subtract)? Why or why not?
- How can we solve problems mentally?
- How can strategies help us when adding and subtracting with regrouping?

MATERIALS

- Various manipulatives (counters, base-ten blocks, unifix cubes)
- Chart paper for class recording sheets

GROUPING

Large group, Partners, Individual, Small group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Introduce task with this story problem:

Mrs. Brown and Mrs. White are going to join their classes together for a popsicle party. Mrs. Brown has 18 students in her class and Mrs. White has 19 students in her class. They plan on getting one popsicle for each student in their classes. How many popsicles do Mrs. Brown and Mrs. White need to buy?

Have several students retell the story problem to you and discuss what is happening in the problem to ensure their understanding.

Part II
Split students into pairs and give each student a half sheet of chart paper to use in solving the problem. Also, have various manipulatives available for students to use as they work to solve the problem. Walk around and observe students as they are problem solving. Ask questions such as:

- What are you trying to find out?
- How many students are in Mrs. Brown's class?
- How many students are in Mrs. White's class?
- Can you explain the strategies you are you using to solve this problem?
- Are there other ways you could solve the problem?
- Is there a way you can check your answer?

As you are walking around, find students who are using a variety of strategies.

Part III
Let several students share their different strategies and answers to the problems. Allow the students to call on their peers to ask questions or make comments about their strategy and the answer that was found. After students have shared various strategies, spend some additional time discussing the different strategies students have used. Some students may have broken the numbers into smaller pieces to simplify the addition problem.

- For example, in 18 + 19 you can begin by pulling out the tens and add 10 +10 = 20. You then have 8 + 9. You can then break up the 9 into 7 and 2. Next, add 8 + 2 to get 10. You will then have 7 more to add. 10 +10 +10 +7 = 37.
- Other students may have used benchmark numbers to help add. For example 18 + 19 could have been solved by keeping the 18 and taking 2 from 19. You can have 20 and 17. You can then add 20 + 17 to get 37.
- Another Strategy may be to add 1 to 19 to make a group of 20 then add 17 to 20 by grouping 10 more, equally 30 then add 7.
- Creating groups of 10 with the numbers to 20 is another strategy. Adding 1 to 19 and 2 to 18 to make them both 20. Then adding 20 and 20 to get 40 then taking off the 3 (from the 1 and 2) to get 37.

This may sound convoluted to adults, but students who have strong number sense will tend to think in this way. When we teach **just** the algorithm we discourage the students from using a more natural strategy. When they are allowed to develop strategies that make sense to them then they are developing better number sense of addition… and subtraction! Create a list with students of the various strategies they can use when solving addition problems. Some students may have also mentioned the traditional algorithm for addition with regrouping. As long as they can explain **what** they are doing and **why** it works then it is okay to include this as a strategy. It is more beneficial to encourage students to utilize the various other strategies at this time; then move towards the algorithm when they can demonstrate true number sense.

Comments
If no student describes using the number line or number chart as a strategy, then this is a good time to bring up this tool for combining amounts. Students should be able to use the number line or number chart as a tool for adding numbers. For example, students could find 18 on the number line or number chart and count on 19 or vice versa. Use of models in this way elicits a natural discussion about the commutative property of addition.

Part IV
Give students this problem:
Max had an ant collection with 38 ants. His friend Lily had an ant collection with 24 ants. If they combine their ants, how many ants did the two friends have?

Allow students to attempt to solve this problem on their own. As students work, walk around asking questions about the students' strategy use. Look to see if students are using the strategies mentioned above.

After students have completed solving the problem, allow students to take turns sharing their strategy with people at their table or other small groups of students. The task should be closed with the teacher selecting students to highlight various strategies used in the classroom and again referring to the number line or number chart if it is not one of the strategies presented by students.

FORMATIVE ASSESSMENT QUESTIONS

- Describe how did you solved the problem.
- Do you think you could solve the problem another way?
- How is your strategy for solving the problem the same as your neighbor's? How is it different?
- How do you think we should record our work so that someone else could understand what we did?

DIFFERENTIATION

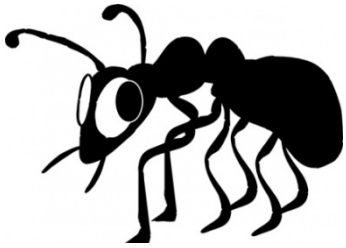
Extension

- Give students this problem to supplement problem 1: If popsicles come in boxes of 10, how many boxes do Mrs. Parkerson and Mrs. Young need to get for their classes of 24 students? If each student gets one popsicle, how many popsicles will be left over?
- Give students this problem to supplement problem 2: If Max and Lily join their ants together in Lily's ant farm, and the ant farm can hold up to 100 ants, will there be enough room for both Max and Lily's ants? How do you know? How many more ants could Max and Lily place into the ant farm before it reaches its maximum capacity?
- Write a problem involving either the ants or the popsicles, and ask a partner to solve it. What strategy was used?

Intervention

- Some students may need to work on the second problem with partner groups. They may not be ready to utilize the addition strategies independently in this lesson. They may also need to use manipulatives to physically act out the problem.
- Some students may not be able to communicate their strategy in written form. Those students could be pulled and solve the second problem individually in an interview type setting, so they could explain their process as they go.

Name: _____ Date: _____



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