Scaffolding: Lots of Dots

Approximately 2-3 Days Adapted from NCTM Navigating Through Algebra K-2

STANDARDS FOR MATHEMATICAL CONTENT

MCC.1.OA.3. Apply properties of operations as strategies to add and subtract. Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2+ 10 = 12. (Associative property of addition.)

MCC.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.

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

MCC.1.OA.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as 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).

STANDARDS FOR MATHEMATICAL 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.

BACKGROUND KNOWLEDGE

First graders might have informally encountered negative numbers in their lives, so they think they can take away more than the number of items in a given set, resulting in a negative number below zero. Provide many problems situations where students take away all objects from a set, e.g. 19 - 19 = 0 and focus on the meaning of 0 objects and 0 as a number. Ask students to discuss whether they can take away more objects than what they have. (N.C. Dept. of Public Instruction)

ESSENTIAL QUESTIONS

- How can we show that addition and subtraction are related?
- How can we use different combinations of numbers and operations to represent the same quantity?
- How can decomposing a number help you?

MATERIALS

- Lots of Dots blackline master
- Copy one set of 6 ladybugs for each student
- Student math journals
- How Many Counters Game
- Small Counters

GROUPING

whole/partner/small group task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Students will explore finding sums, forming equations, expressions, and the Commutative Property.

Place the ladybugs (cut apart) in an envelope. Have the students count the number of dots on the ladybugs. Ask, "How many ways can you put the ladybugs together to make three, four, or five?" Discuss the different ways that the lady bugs can be put together and record the student's responses on chart paper, as they record classmate responses in their personal math journals. Be sure to point out the variety of ways the students are coming up with. They may discover that one and two are the same as two and one. Encourage the discussion and allow students to create their own rule.

Continue by having them find as many number combinations for 6, 7, and 8 as they can. They will write expressions to match their number combinations. A possible solution might be: *7 is 3+4, 2+5, 1+2+4, 0+3+4, 0+2+5*. End by having students write in their journal about the number 9.

Part II
Begin to pose situations where dots are missing. For example, "All together the ladybugs have 4 spots. If one has 3 dots, how many does the other ladybug(s) have?" Record the equation 3+□= 4. Provide students with additional "missing dots" questions and have them record and solve the equations in their math journals.

Part III
Students combine envelopes of ladybugs to represent larger quantities. They will continue to write equations with and without missing dots. They will also have opportunities to put together more than two addends.

Part IV
Students should play the game, *How Many Counters?* This partner game was created to increase proficiency with number combinations. Students will need blank ten-frames, counters and a number cube. One player secretly arranges some counters on a ten-frame. The other player asks questions that can be answered "yes" or "no", trying to gain enough clues to work out the arrangement of counters. For example: Is the top row full? Are there 8 counters? Is there an empty box in the bottom row? As players become more skilled, the number of questions can be counted. The player asking fewer questions wins.

FORMATIVE ASSESSMENT QUESTIONS

- Is there another way that you could make the number?
- How did you determine the missing addend?
- Are you sure that you have found them all? Why do you think so? How do you know?
- Did you identify any patterns or rules? Explain!

DIFFERENTIATION

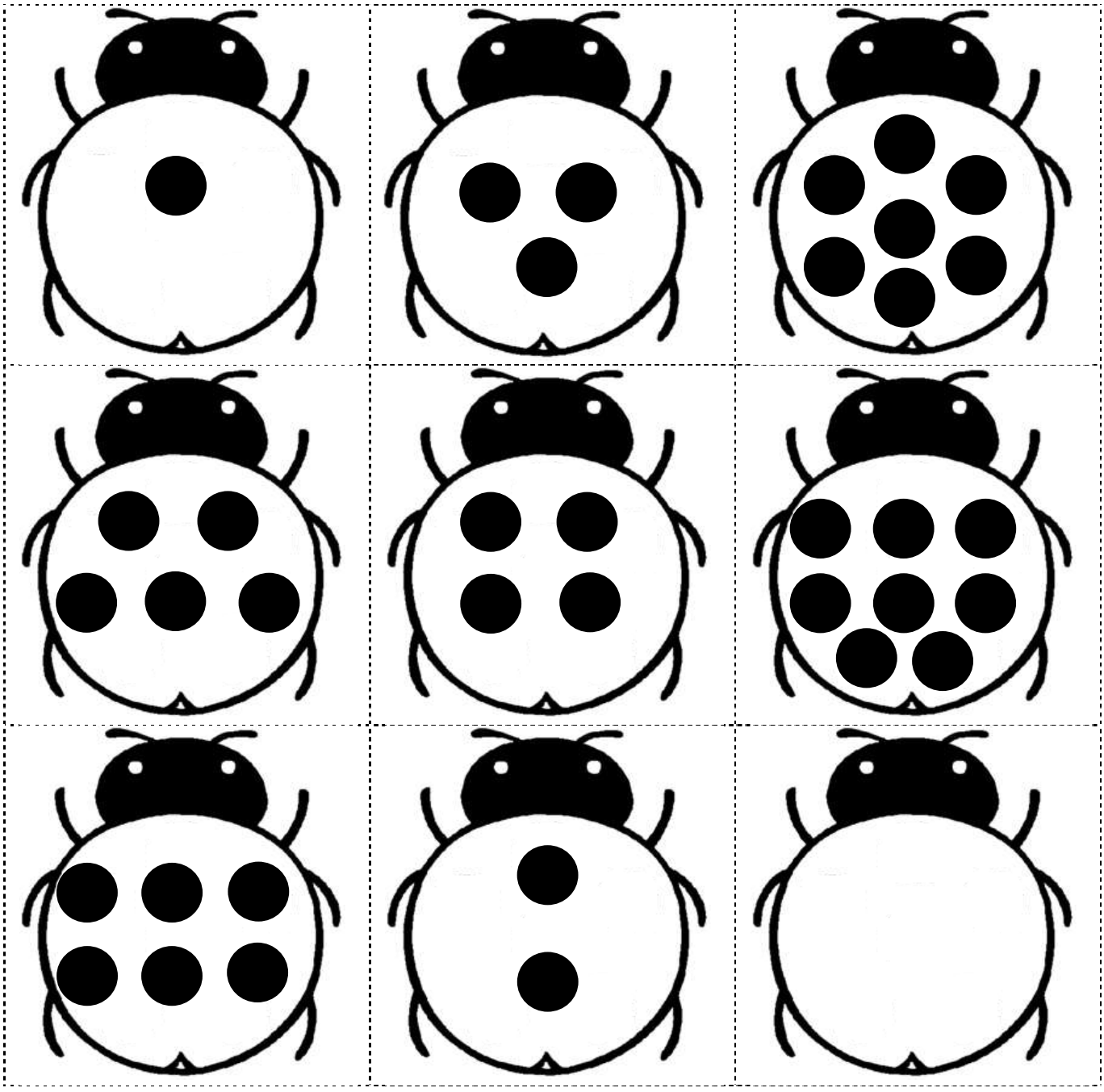
Extension

- Provide students with problems involving two expressions where one has a missing addend. For example: There were two windows with two ladybugs on each window. Both sets of ladybugs have the same number of spots. If one window has ladybugs with three spots and four spots, and the other window has one ladybug with 2 spots, how many spots does the other lady bug have? Write an equation to solve this problem.

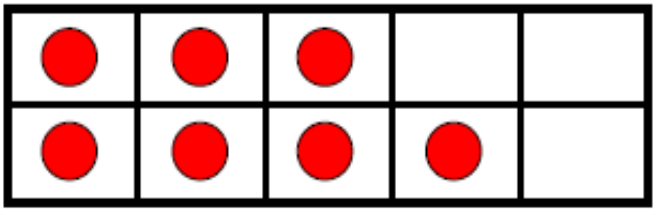
Intervention

- Complete this task in a smaller setting**.** Students may work in pairs and the sum may not be greater than five. Gradually increase the sum until the concept is grasped.

Lots of Dots



How Many Counters?



Materials: Blank ten-frames, one or more per player
Counters
A number cube

Players: Two

Rules: One player secretly arranges some counters on a ten-frame. The other player asks questions that can be answered yes or no, trying to gain enough clues to work out the arrangement of counters. For example: Is the top row full? Are there 8 counters? Is there an empty box in the bottom row?

Variation: As players become more skilled, the number of questions can be counted. The player asking fewer questions wins.

How Many Counters?