3.OA Markers in Boxes

Alignments to Content Standards: 3.OA.A.2

Task

- Presley has 18 markers. Her teacher gives her three boxes and asks her to put an equal number of markers in each box.
- Anthony has 18 markers. His teacher wants him to put 3 markers in each box until he is markers.

a. Before you figure out what the students should do, answer these questions:

What is happening in these two situations? How are they similar? How are they different

b. Figure out how many markers Presley should put in each box. Show your work. Then fig out how many boxes Anthony should fill with markers. Show your work.

IM Commentary

The purpose of this task is for students to compare two problems that draw on the same context but represent the two different interpretations of division, namely, the "How many groups?" interpretation and the "How many in each group?" interpretation. Before solving the students should analyze and understand the problem structures. Students may work i pairs, discussing and recording their ideas. After students have analyzed the problem struc they can work individually to solve the problems, showing their solution strategies. The att PDF shows a classroom vignette that indicates how a teacher might wish to lead a classroo discussion for the first part of this task. As students work, the teacher should be monitorin

students' progress, looking for students who solved the problem in different ways who will share out. While there are many possibilities for the share out, one goal would be the idea partitioning, or dealing out, one by one to a given number of groups. Another goal would b creating groups one at a time. Why were different actions used to solve the problems? Wo each strategy work for the other problem? Why or why not?

The Standards for Mathematical Practice focus on the nature of the learning experiences b attending to the thinking processes and habits of mind that students need to develop in or to attain a deep and flexible understanding of mathematics. Certain tasks lend themselves the demonstration of specific practices by students. The practices that are observable duri exploration of a task depend on how instruction unfolds in the classroom. While it is possil that tasks may be connected to several practices, only one practice connection will be disc in depth. Possible secondary practice connections may be discussed but not in the same d of detail.

This particular task helps illustrate Mathematical Practice Standard 1, Make sense of probl and persevere in solving them. Problem solving is based upon students engaging in a task which a solution pathway is not known in advance. As third graders approach these two problems, they will analyze the problems to make sense of what each is asking, working to understand the structures and the two interpretations of division. Through this analysis students will understand that the numbers and answers are the same, however, the actior strategies students use for solving the two problems are quite different. A common misconception is that division can always be thought of as repeated subtraction. This work "How many groups?" problem, but not for a "How many in each group?" problem, and only whole numbers. Students need experience with both kinds of division problems to addres misconception; this will support students later when they divide fractions. As an extension students can design story problems to match both the "How many groups?" and "How ma each group?" problem types.

Solutions

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Solution: Some similarities and differences for part (a)

Some things the students might say about comparing the two problems:

- Both problems are about students putting 18 markers in boxes.
- Both problems have a 3.
- But the 3's are different in each problem. In the first problem there are 3 boxes and Pre

going to put an equal number of markers in each box. In the second problem, Anthony put markers in each box.

- In the first problem we are trying to figure out how many are in each group, and in the second we are trying to figure out how many groups there are. So the first is a "How many each group?" division problem and the second is a "How many groups?" division problem.

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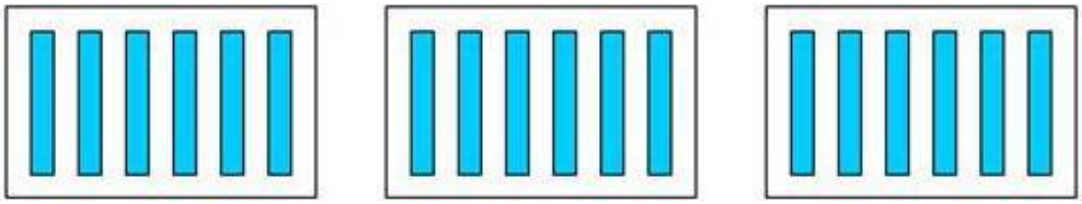
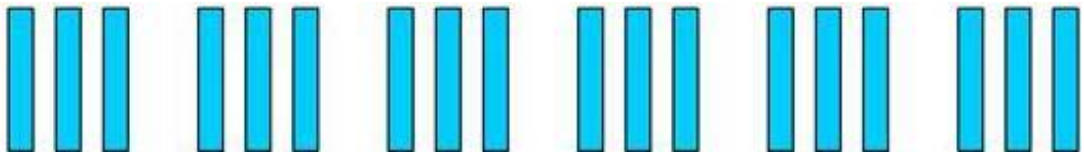
Solution: Level 1 solution to part (b): Direct Modeling

To solve Problem 1, students may draw three boxes and distribute the markers, one at a ti from left to right until all markers have been distributed, similar to dealing out cards. Then student might count the markers in each group to reach the answer of 6. There are 6 mark each box.



A direct modeling solution to Problem 2 would look quite different. Students may count ou cubes. Next they may set out three cubes in a group and build additional groupings of 3 ur 18 cubes have been used.



Notice the differences in solution strategies, problem 1 requires more of a dealing or partitioning into groups that are already determined, while problem 2 requires forming the groups. Students must have experiences with both types of problems.

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Solution: Level 2 solution to part (b): Counting on

Students may use a trial and error method of counting, such as those listed below, to solve problem 1.

- 3 markers in each...3, 6, 9. There will be more than 3 markers in each box.

- 5 markers in each box...5, 10, 15. 15 is getting closer...it's only 3 away from 18, so I think markers are in each box.
- 6, 12, 18 ... There are 6 markers in each box

Counting strategies for problem 2 may appear more strategic as the "group of 3" may elicit students to count 3, 6, 9, 12, 15, 18. Then the student will track the number of 3's counted (marking with fingers, a visual or physical representation.

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Solution: Level 3 solution to part (b): Convert to an Easier Equivalent Problem

Students may solve problems 1 and 2 using what they know about the relationship of multiplication and division. For example,

- Using Inverse Operation

$18 \div 3 = n$. I know multiplication is the inverse of division and I know

$3 \times 6 = 18$, so $n = 6$

- Students may also use their understanding of multiplication facts and the properties of operations.

$$3 \times 5 = 15$$
$$3 \times 1 = 3$$
$$15 + 3 = 18$$

So $3 \times 6 = 18$ and there are 6 markers in each box.

- Another strategy students may use to solve problem 2 is repeated subtraction. This stra is likely to be used to solve this problem because the problem calls for the markers being i groups of 3.

$$18 - 3 = 15$$

$$15 - 3 = 12$$

$$12 - 3 = 9$$

$$9 - 3 = 6$$

$$6 - 3 = 3$$

$$3 - 3 = 0$$

Because we subtracted three 6 times, there are 6 boxes.

This is only a sampling of strategies students may use to solve the problem. For additional reading: Progressions for the Common Core Standards in Math K, Counting and Cardinality Operations and Algebraic Thinking
http://commoncoretools.files.wordpress.com/2011/05/ccss_progression_cc_oa_k5_2011_0