Representing Multiplication

Student Probe
Mrs. Wall had 7 boxes of crayons. Each box had 14 crayons. How many crayons did Mrs. Wall have in all? Show all the ways you can solve this problem.

If a student cannot solve the problem, or only has 1 correct strategy, he should do this lesson.

Lesson Description
This lesson was designed to help students understand different ways to represent multiplication situations. In this lesson the teacher will work through the problem in the Student Probe modeling different strategies.

Rationale
One of the main difficulties in working with multiplication situations is understanding groups of items as single entities with a certain number of objects in each group. It is very important that students have multiple experiences making and counting groups in contextual situations. If a child is introduced to memorizing facts and step-by-step procedures, he will not gain a deep understanding of the meaning of operations. By having many opportunities to solve contextual problems in many different ways, connections will be made which leads to a deeper understanding of mathematics.

Preparation
Make an array that has 7 rows and 14 columns. Make a number line like the one shown below.

At a Glance
What: Representation of multiplication in multiple ways
Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.
Mathematical Practices:
Make sense of problems and persevere in solving them.
Model with mathematics.
Look for and make use of structure.
Look for and express regularity in repeated reasoning.
Who: Students who only have one strategy to solve problems involving multiplication
Grade Level: 3
Prerequisite Vocabulary: equal, array
Prerequisite Skills: using a number line, addition
Delivery Format: small group, individual
Lesson Length: 30 minutes
Materials, Resources, Technology: None
Student Worksheets: None
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<thead>
<tr>
<th>The teacher says or does...</th>
<th>Expect students to say or do...</th>
<th>If students do not, then the teacher says or does...</th>
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<td><strong>1. Equal Groups</strong>&lt;br&gt;Draw 7 boxes and ask students what each box represents in the problem.</td>
<td>Each box represents a box of crayons.</td>
<td>Reread the problem and count the boxes.</td>
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<td><strong>2. Next, put the number 14 in each box and ask students what the number 14 in each box represents in the problem.</strong></td>
<td>The 14 tells how many crayons are in each box.</td>
<td>Reread the problem and point out where it says 14 crayons in each box.</td>
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<td><strong>3. Ask students how they could figure out how many crayons there are in all using addition and write a number sentence that matches the strategy.</strong></td>
<td>Add 14 together 7 times. &lt;br&gt;14 + 14 + 14 + 14 + 14 + 14 + 14 = 98</td>
<td>Let the students use manipulatives to show the 7 boxes of 14 crayons. &lt;br&gt;Model the number sentence for the students.</td>
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<td><strong>4. Ask students to write a multiplication sentence to represent the same problem. Have students explain what each number in the number sentence represents.</strong></td>
<td>7 x 14 = 98</td>
<td>Model the number sentence for the students. Say “7 groups of 14 crayons is the same as 98”.</td>
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<td><strong>5. Array</strong>&lt;br&gt;Show students the 7 x 14 array. Ask them to give the dimensions of the array.</td>
<td>7 x 14</td>
<td>Reread the problem and have the students count the rows and columns.</td>
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<td><strong>6. Ask students what the 7 and 14 represent in the problem.</strong></td>
<td>The 7 shows how many boxes of crayons there are and the 14 shows how many crayons are in each box.</td>
<td>Reread the problem and point out that there were 7 boxes of crayons with 14 crayons in each box.</td>
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<td><strong>7. Ask students to write a number sentence that shows how many crayons there are in all the boxes together.</strong></td>
<td>7 x 14 = 98</td>
<td>Model writing the number sentence. Say “7 groups of 14 crayons is the same as 98”.</td>
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<td>8. Ask students to write a number sentence to show how the addition sentence from Step 3 relates to the multiplication sentence in Step 7.</td>
<td>$14 + 14 + 14 + 14 + 14 + 14 + 14 = 7 \times 14$.</td>
<td>Count the groups of 14 to get 7 groups. Say “1 group of 14, 2 groups of 14, 3 groups of 14,”, etc., as you count each 14. This is the same as 7 groups of 14.</td>
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<td>9. Number Line</td>
<td>Show students the number line that you prepared. Ask students how the 7 boxes of crayons are represented on the number line.</td>
<td>There are 7 jumps of 14.</td>
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<td>10. Ask student what the 14s across the top of the number line represent.</td>
<td>The number of crayons in each box.</td>
<td>Reread the problem and point out that each box of crayons has 14 crayons.</td>
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<td>11. Ask students to explain how to use the number line to find the total number of crayons.</td>
<td>After doing 7 jumps of 14 each, you land on 98. 98 tells the total number of crayons.</td>
<td>Model making 7 jumps of 14 and landing on 98.</td>
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<td>12. Do additional problems as needed. Each time, (1) ask students to show as many ways as possible to solve the problem, (2) ask students to write a number sentence that matches their strategy, and (3) ask students to relate any drawings and/or numbers they have written back to the original problem.</td>
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Teacher Notes:
These are some sample problems to use for additional practice.
1. Christian has $10. Ben has 3 times as much money as Christian. How much money does Ben have?
2. Emma made 9 necklaces. Each necklace had 8 beads. How many beads did Emma use?
3. Alysa rode her bike 6 miles a day for 11 days. How many miles did she ride in all?

Variations
Use smaller or larger numbers as needed.

Formative Assessment
Mrs. Wilson bought 4 cartons of eggs. Each carton had 12 eggs. How many eggs did Mrs. Wilson buy in all?

References