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Lesson in Action

Modeling: Learn Multiplication

AT A GLANCE

Launch

- Explain the goal of the lesson.
- Introduce the problem that students will work with during the lesson.
- Give students a few minutes to consider the problem and then introduce a model of the situation.
- Discuss the model with the class.
- Continue the discussion, connecting the model to abstract mathematical concepts.

Learning Task

- Have students to work on the learning task.
- Circulate around the room, pausing to listen to the discussion of each pair.
- Guide students toward appropriate manipulatives.
- As students move on to another problem, observe the models they choose.
- Check in with the students who did not understand the model at the beginning of the lesson.

Closure

- Bring the class together and ask pairs to share their strategies.
- Lead discussion of students' strategies.
- Give each student an exit ticket (assessment).

Context

Ms. Howard's Grade 4 class has reviewed multiplication facts up to 10 x 10 and products of one digit with multiples of 10 up to 90 (e.g., 3 x 40, where one digit, 40, is a multiple of 10). Ms. Howard will use this lesson to begin teaching students the distributive property of multiplication over addition, using various supports to model the situation.

Common Core State Standards

- CCSS.Math.4.NBT.5 (http://www.corestandards.org/Math/Content/4/NBT/B/5) Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- CCSS.Math.M4 (http://www.corestandards.org/Math/Practice/MP4) Model with mathematics.

Lesson Objective

Students will use a model to represent multiplication of a one-digit and two-digit number, which will lay the groundwork for the multiplication algorithm.

Technology

- Interactive whiteboard to communicate visually with the class and interact with numbers
- Rectangle Multiplication virtual manipulative (http://enlvm.usu.edu/ma/nav/activity.jsp?sid=nlvm&cid=2_1&lid=192) as an alternative to base-ten blocks or other models

Assessment

- Solicit explanations about the model to verify understanding of the representation
- Observe students' discussions and strategies

Ms. Howard's Class in Action

Launch

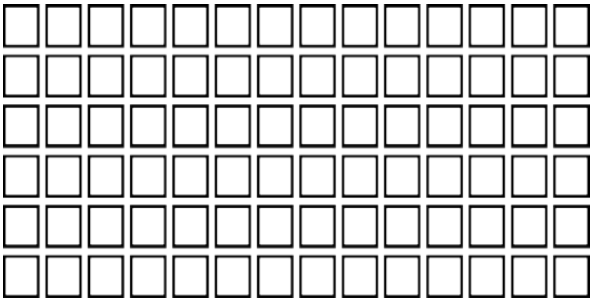
Ms. Howard introduces the lesson goal. "Today you will learn how to do two things. The first is to find products of a one-digit number and a two-digit number. The second is for you to be able to explain how you found the product."

Pausing for a moment, she asks, "Are there any questions about the goal?"

When no students raise their hands, she puts a problem on the whiteboard:

> *There are six grades in our building. Principal Jones wants to get 14 computers for each grade. How many computers is that?*

She gives students a few minutes to think about the problem. She then puts a rectangular array of squares (6 rows of 14 squares) on the whiteboard.



"This is a model for the problem," she explains. "Each square represents one computer. There are six grades, so I have made six rows of computers."

To be sure her students understand the model, she asks, "How many computers should there be in each row? Write the number on your individual tablets and hold them up."

Some students have written 6 instead of 14. Ms. Howard asks Manuel why he had written 14. Manuel says, "Each grade has 14 computers. Since each row is a grade, each row should have 14 computers."

"If you agree with Manuel, raise your hand," Ms. Howard tells the class. Everyone raises their hands, including the students who wrote six. She makes a mental note to check in with those students later to be sure they can set up their models correctly.

"The computers are arranged in a rectangle," she points out, "Six grades by 14 computers for each class. What operation does this make you think of, Annie?"

Annie thinks for a minute, "Addition?"

"That's true," Ms. Howard nods, "you could add 14 for each row. Is there another operation that we have used instead of adding the same number over and over?" Annie answers, "Multiplication! We've done that before."

"Right," Ms. Howard says, "and how does the rectangle represent multiplication?"

Annie responds, "You can think of each row as a group of 14 computers, so there are six equal-sized groups of 14—there are 6 times 14 computers."

Ms. Howard tells the class, “You could add the number of computers in each row.” She writes 14 + 14 + 14 + 14 + 14 + 14 on the interactive whiteboard. “But just like we use multiplication as a quicker way to find something like 6 times 8, we want a quicker way to find 6 times 14.”

Learning Task

Ms. Howard gives each student a handout of the array. “Work with a partner to find a strategy that uses multiplication to find the total number of computers. You can use a pencil and paper, base-ten blocks, or any of the virtual manipulatives to develop your strategy.”

As students work, Ms. Howard circulates around the room. She listens to each pair’s discussion, reminding students to use multiplication in their strategies.

Annie and Michele are struggling to build a model with the base-ten blocks. Ms. Howard says to them, “I know you can multiply by five, so suppose there were only five computers for each grade. How much of your array shows five computers for each grade?” When Annie and Michele point out five columns for the six rows, Ms. Howard asks them how many computers are in that part of the array. She then asks, “Now, how many more are needed? Think about that and I’ll come back.”

Steve and Alisha are also struggling with the task. They both tend to get distracted when using manipulatives. Ms. Howard sends them to the computer to use the Rectangle Multiplication virtual manipulative. She tells them they can ignore the equations for now.

Bob decides that he and Jamie should get some manipulatives, too. Without calling attention to Jamie’s fine motor issues, Ms. Howard suggests that they might enjoy using the virtual manipulative instead.

As pairs finish up, Ms. Howard directs them to the second problem on the handout. Some pull out base-ten blocks to build arrays; others draw on paper rather than create a physical array. She interrupts a few pairs that include students who answered “six” at the beginning of the lesson. She asks those students to explain the model they are using for the problem, prompting them to tell her what each square represents and to explain how they decided how many rows and columns should be in the array.

Closure

As the last group is about to move on to the second problem, Ms. Howard brings the class back together and asks students to share their strategies. She puts the problem and the array back up on the whiteboard.

“Everyone decided to split the array into two pieces,” she says, “and everyone did it differently. For example, Taunita and Manuel made a section of 10 computers and one of 4.” She writes 6 * (10 + 4) at the bottom of the board. Pointing to the board she asks, “What multiplication fact does six rows of 10 computers represent?” She has Taunita come to the board and write 6 * 10, and then repeat the process with the 6 by 4 section of the array and put + between the 6 * 10 and the 6 * 4.

“So 6 times 14 is the same as 6 times 10,” Ms. Howard says, as she writes 60 on the board, “and then another 6 times 4.” She writes + 24 on the board. “So the total number of computers is 84.”

She points at the 6 * (10 + 4) and the 6 * 10 + 6 * 4 and asks, “Do you remember the name of the property used here?” Corey says, “The distributive property!” With some prompting, he connects the array to the distributive property.

Ms. Howard gives each student an exit ticket, which asks students to multiply 7 * 13 and explain their solutions.

Reflection

As Ms. Howard later reviews the exit tickets, she writes, “Although not all the students split 13 into 10 + 3, everyone completed the problem correctly. Only a few referred to the distributive property in their explanations, and most drew an array. This is good for now. They should continue to keep the array in mind—it will help as we develop the multiplication algorithm to do two-digit by two-digit multiplication. I will keep an eye on Annie and Michele, since they had more difficulty than most. The virtual manipulative helped Alisha connect the array to the distributive property on her exit ticket, but I couldn’t tell from Steve’s response if he really understood the process. The additional equation information in the virtual manipulative may have been distracting. I may need to pair him with someone who stays on task tomorrow and have them use the physical model.