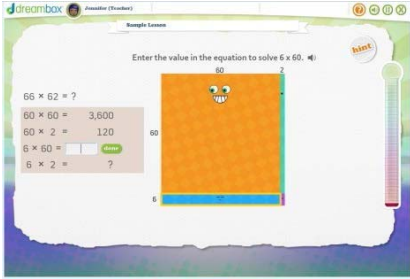# Multiplication: Open Arrays

The interactive white board tool for this lesson can be found on our website under Resources and Teacher Tools. (www.dreambox.com/teachertools)

In this DreamBox lesson ensures students connect partial products to a concrete area   context on the open array. Students learn to efficiently choose and solve partial   products that enable better mental multiplication with multi-digit numbers. These   lessons teach students to use multiples of 10 and the distributive property as   powerful strategies for multiplying and efficient mental computation.

Sample Lesson

Objective: Students compose arrays and use partial products with the distributive property to solve multi-digit multiplication problems and compute the area of a rectangle and learn the distributive property.

Background: The open array model and the DreamBox lesson progression are designed so students learn the distributive property. Specifically, students learn to create smaller arrays using multiples of ten to compose the larger array. Prior to this lesson, students should know multiplication relationships and   facts and have used basic arrays to solve problems and explain multiplication strategies.

Instruction:
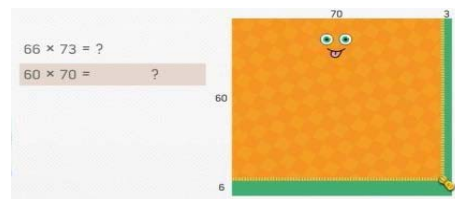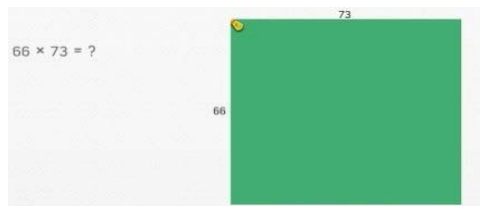
1. The teacher begins by listing the math string below one at a time. She asks students to find the sum in their head (mental math). She calls on individual students to discuss their strategies before the subsequent problem is presented.

   6 x 10

   60 x 10

   12 x 2

   12 x 20

   120 x 20

Adapted from: Fosnot & Uittenbogaard. Minilessons for Early Multiplication and Division (Portsmouth, NH: Heinemann), 54-58.

2. The teacher then draws a rectangle on the board and labels it as shown below.

23

9 x 23   9

The teacher explains, "We can represent multiplication problems using arrays; however, with large arrays, we can divide (decompose) the rectangle into smaller arrays using landmark numbers to find the answer. Draw this rectangle on the paper at your seat and divide it. Share your drawing with a partner and discuss how you divided your rectangle."

After partners share their responses, ask a student to come up to the board and demonstrate how he divided the rectangle and explain his reasoning.

Possible answers:

a. "I would decompose the 23 into 20 and 3 because I know the multiplication fact of 9 x 2 and can find 9 x 20 like we did in the number string above."
b. "23 because I don't know my multiplication tables to 23. I would choose 20 because I can multiply 2 x 9."
c. "I would choose 23 and break it into 2 tens and a 3. I can multiply 9 x 10 easily."

10   10   3

9   9 x 10   9 x 10   9 x 3
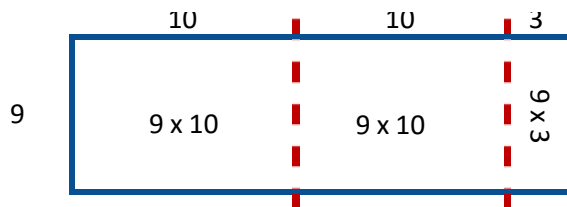
3. The teacher summarizes, "We can add the products of the smaller arrays together to get the answer to the larger array. The "helper" equations enable us to find the final product of the more difficult equation." $9 \times 23 = (9 \times 10) + (9 \times 10) + (9 \times 3) = 90 + 90 + 27 = 207$

4. Bring up the DreamBox interactive white board lesson.

5. The teacher explains, "We can use the same strategy to solve two-digit by two-digit multiplication problems as well." Ask a student to come to the white board and pull the zipper from the corner of the rectangle. Ask students to describe what is happening as the student pulls the zipper.

Adapted from: Fosnot & Uittenbogaard. Minilessons for Early Multiplication and Division (Portsmouth, NH: Heinemann), 54-58.

6. Ask the student to sit down and request another volunteer to create the first array. After the student has 'unzipped' the first array, ask him why he chose to create that array. Ask the student to click done and return to his seat.

7. The first helper equation appears, ask for another volunteer to solve and type the product of that equation and click done. If the answer is correct, ask the student to explain how he solved that problem in his head and then return to their seat. If incorrect, guide the student to the correct response using questioning.

8. Ask for another volunteer to create the next array and repeat steps 6 and 7 until the large rectangle is covered and all helper equations have been solved.

9. Ask the class to think about what we should do next and how do we should use the helper equations to find the larger product and then discuss their strategy with a partner. After students have discussed their strategies, ask for a volunteer to explain their strategy and come up to the board to type the final product.

10. Repeat the strategy discussion with the new problem and repeat steps 6-9.

Adapted from: Fosnot & Uittenbogaard. Minilessons for Early Multiplication and Division (Portsmouth, NH: Heinemann), 54-58.