

## Minilesson: A Multiplication String (10–15 minutes)

This mental-math minilesson builds on students' previous experiences with the distributive property. The string uses related problems designed to encourage students to think about what they know and to use partial products for solving more difficult multiplication problems. Do one problem at a time, giving enough think time before you start discussion. Record student strategies to the side of the string with open arrays, but have graph paper available so you can draw the arrays on it if necessary. Keeping the previous problems, answers, and representations in the string visible to students will help them think about how the problems are related. Invite students to discuss the relationships among the problems.

### String of related problems:

$$10 \times 5$$

$$4 \times 5$$

$$14 \times 5$$

$$14 \times 10$$

$$14 \times 9$$

$$14 \times 19$$

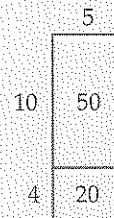
$$12 \times 19$$

☀ Work on a string of problems designed to encourage students to use partial products to solve more difficult problems.

☀ Use the open array to record students' strategies.

## Behind the Numbers

The numbers in the string were chosen to continue to develop the idea that several small arrays can be used to build larger arrays. The focus is now on double-digit multiplication; the array is used both to model student strategies and to help students think about distributivity. Expect students to quickly find the products of the first two problems in the string. Because these two solutions are relatively easy to find, don't spend a lot of time discussing them, but draw the arrays to represent students' solutions. The third problem gives you a chance to add the two arrays together if students offer that strategy.



The next three problems are related in a similar fashion. The fourth problem in the string ( $14 \times 10$ ) doubles the product of the previous problem (because the factor of 5 becomes 10). Once again the distributive property underlies the partial products:  $(14 \times 5) + (14 \times 5) = 14 \times 10$ . Now another  $14 \times 5$  can be attached to the right of the earlier drawn  $14 \times 5$  array, forming a  $14 \times 10$ . The last problem in the string requires students to make their own helper problems.

## Developing the Context

A new investigation is introduced with an intriguing twist to the Muffles story. In this investigation, students think about how to label wrapped boxes without actually seeing the blueprints that give the boxes' dimensions. The only tools they use are the arrays in Appendix I. With these open arrays as tools, students find ways to label box outlines. To solve the problem presented

☀ Explain to students that they will now investigate how to label wrapped boxes without being given the dimensions of the boxes.