AREA MODEL MATCH-UP

GRADES 4, 5

COMMON CORE STANDARDS

4.NBT.A.2
4.NBT.B.5
4.NBT.B.6
5.NBT.B.5

MATHEMATICAL PRACTICES

MP1
MP3
MP4
MP5
MP7

MATERIALS

- Base ten block sets (one set per student)
- Area Model Match-Up problem cards (one set per group)
- Timer (one per group)
- Area Model Match-Up recording sheet (one or more per student)
- Modeling with Base Ten Blocks chart

OVERVIEW

This activity helps students **understand two-digit multiplication using arrays and base ten blocks**. This process provides the opportunity for students to make connections between the standard algorithm and rectangular arrays. It also **expands student understanding of place value** in terms of multiplication and breaking apart more difficult problems. This activity helps students see the partial products within a problem as decomposition of the numbers within a problem.

For teachers and students who have not had experience modeling with arrays and base ten blocks, a chart showing the step-by-step procedure of how to model with base ten blocks is included.

PROCEDURE

Whole-class practice

1. Create several practice problems using multiplication of 2 two-digit numbers. Do not duplicate the problems on the Area Model Match-Up problem cards.
2. Have students practice modeling problems using base ten block sets. On the recording sheet, students write the problem, make a sketch of their model, and write the expanded or array form of the problem.

PROCEDURE

Groups of 2 – 3

1. Each student chooses a problem card from the pile but does not show the other players the problem.
2. Set a timer (longer at first, shorter for more challenge).
3. Using base ten blocks, each student builds a model of his/her problem within the allotted time. In turn, each student reveals his/her model to the group.
4. Group members examine each model and write the multiplication problem they think each model represents.
5. Group members share/compare their answers. Students defend and explain any discrepancies.

Area Model Match-Up

PROBLEM CARDS

13 x 12	12 x 21	13 x 22
11 x 21	13 x 11	11 x 12
13 x 13	21 x 13	16 x 17

Area Model Match-Up

PROBLEM CARDS

14 x 16	19 x 21	18 x 19
15 x 13	15 x 17	23 x 14
19 x 12	14 x 21	20 x 15

Area Model Match-Up

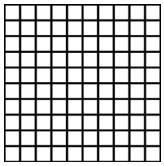
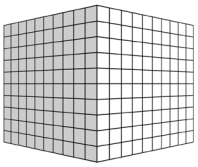
RECORDING SHEET

Name: _____ Date: _____

Problem _____ _____ Expanded form _____ _____ _____ _____ _____ Answer _____ _____	Area model sketch
Problem _____ _____ Expanded form _____ _____ _____ _____ _____ Answer _____ _____	Area model sketch
Problem _____ _____ Expanded form _____ _____ _____ _____ _____ Answer _____ _____	Area model sketch

Modeling with Base Ten Blocks

There are four kinds of base ten blocks:

The one block, which is a small cube	The ten rod, which is a long rectangular stick	The flat, which represents 100 cubes or 10 rods	The cube, which is 1000 or ten flats, or 100 rods.
			

The term "array" refers to the vertical and horizontal multiplication model used to teach basic multiplication, such as 2 sets of 3 or 3 sets of 2.

Using the example *18 x 13*:

The traditional algorithm sets up the problem as

$$\begin{array}{r} 18 \\ \times\ 13 \\ \hline \end{array}$$

Breaking down the problem:

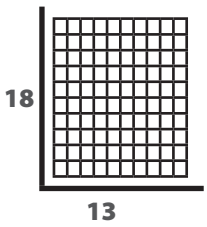
3 x 8 = 24
3 x 10 = 30
10 x 8 = 80
10 x 10 = 100

How to model this problem using base ten blocks:

1

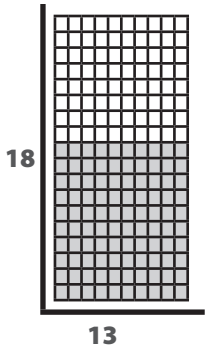
Draw a right angle base. Place the problem, broken down into place value parts, along the outside edges of the angle (*18* down one side, *13* across the other).

2



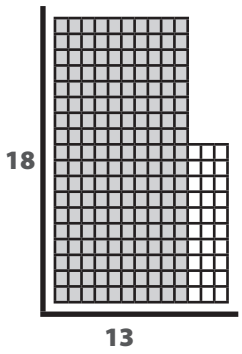
Begin at the bottom left corner and place one base ten flat in the corner to represent 10 x 10.

1



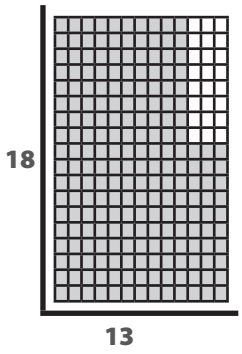
Place 8 base ten rods above the 100 block to represent *10 x 8*.

2



Place 3 base ten rods to the right of the hundreds block to represent 3 x 10.

3



Place 24 single base ten cubes in the angle created above the 30 and to the right of the 80 to represent 3 x 8. This forms a rectangular array and demonstrates the answer in place value or expanded form.

NOTE

This process works well to model multiplication problems that are two-digit by two-digit numbers.