

Exploring 2-Digit Multiplication

Grade 4

Activity #421

Relevant Chapters in the *Digi-Block Comprehensive Teacher's Guide*
Book III, 3-6: Multiplying by Two-Digit Numbers

Overview

Students use blocks to explore 2-digit multiplication. They use paper-and-pencil techniques to find the product and then pack as much as possible to check. (Note: A prerequisite for this lesson is a familiarity with the "shifting" of the digits. See lesson #415 in the Weekly Pack-it archive for background information and an introduction to multiplying by ten with the blocks.)

Objectives

Thinking Skills: Students use their knowledge of basic facts and multiplying by 10 to separate 2-digit multiplication problems into partial products.

Mastery Skills: Students learn to use blocks to model 2-digit by 2-digit problems. They pack as much as possible to show the product.

Materials

Each group of students needs:

- Digit cards
- 3 - 4 blocks-of-100 (Students can unpack to get the blocks they need for particular problems.)
- Activity Sheet #1
- Activity Sheet #2 (as needed)

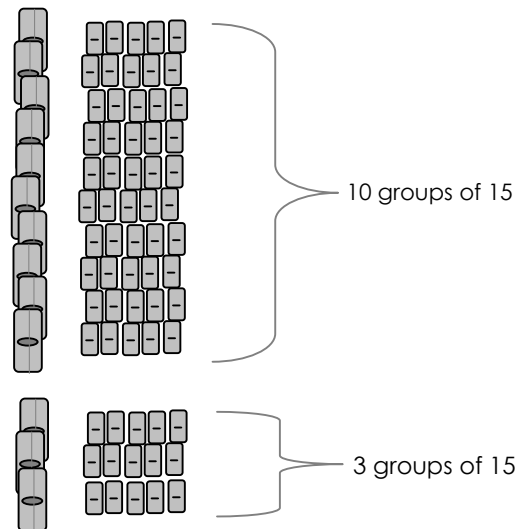
Class Introduction

(20 minutes)

Have students use blocks to make 13 groups of 15.

Elicit various strategies for finding the total number of blocks before packing as much as possible. Then discuss the following strategy for finding the product using their knowledge of multiplying by ten and their knowledge of basic facts.

Have students consider the first ten groups of 15.



- Ask, How does knowing that you have ten groups of 15 help you find the product?
- Students familiar with the "shift" of the digits when multiplying by 10 should realize that 10 groups of 15 equals 150.
- Have students pack ten groups of 15 to make 1 block-of-100 and 5 blocks-of-10.

Have students consider the rest of the blocks. Ask, How many more groups of 15 do we have?

- Students should see that they have 3 groups of 15.
- Ask, How many blocks are there in 3 groups of 15?
- Elicit ideas about how to find this product. Some students may see this as 3 groups of 10 and 15 single blocks: $30 + 15 = 45$.
- Have students pack to make 3 groups of 15 to make 4 blocks-of-10 and 5 single blocks.

Help students come to the conclusion that this strategy involves separating the problem into the sum of two products; say, 13 groups of 15 equals 3 groups of 15 plus 10 groups of 15.

- Ask students to consider how they might use paper-and-pencil to solve the problem. Write their ideas on the board. For example:

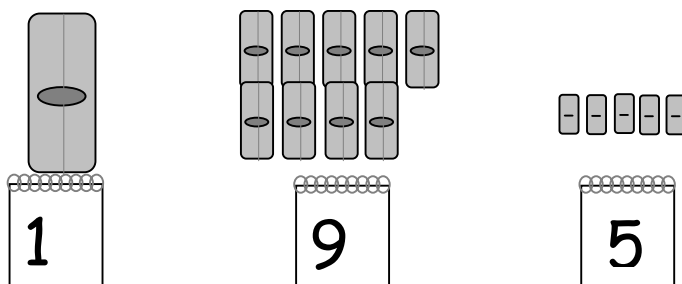
$$\begin{array}{r}
 13 \text{ groups of } 15 \dots \\
 + \quad 10 \text{ groups of } 15 \\
 \hline
 \end{array}$$

- Have students use what they know to predict the product of 13 groups of 15.

$$\begin{array}{l}
 3 \text{ groups of } 15 = 45 \\
 10 \text{ groups of } 15 = 150
 \end{array}$$

$$45 + 150 = ?$$

Have students pack as much as possible. They have 1 block-of-100, 9 blocks-of-10, and 5 single blocks: 195 blocks.



Try other problems until students are comfortable modeling 2-digit by 2-digit multiplication with blocks and finding the product. Some problems to try are:

- 11 groups of 13
- 17 groups of 12
- 12 groups of 14

Small Group Activity

(20 minutes)

Have students solve the two problems on Activity Sheet #1 by modeling the problems with blocks and using paper-and-pencil recording techniques. Help students accurately describe their strategies in words, drawings, and number sentences.

If students finish early, pass out Activity Sheet #2. Fill in the blanks with problems or have students choose appropriate problems on their own.

Closure

(15 - 20 minutes)

Choose a problem to discuss. Have two or more groups share their strategy for finding the total number of blocks. Discuss:

- How did you set up the blocks on your mat?
- Did you separate the problem into familiar parts?
- Did you use any basic facts in your solution strategy?
- Where did you think about multiplying by ten?
- How did you get the final answer?

Model how to record different strategies in more familiar ways (as an introduction to an algorithm):

13 groups of 15 is the same as...

$$\begin{array}{r} 15 \\ \times 13 \\ \hline 45 \\ 150 \end{array}$$

3 groups of 15
10 groups of 15

195 total number of blocks

Assessment

As students are working, observe and note the following:

- Do students model the problem with blocks?
- Do students know how to multiply by ten?
- Do students use their knowledge of basic facts and multiplying by 10 to separate 2-digit multiplication problems into partial products?
- Do students consider an accurate pencil-paper representation for these multiplication problems?
- Do students use a paper-and-pencil strategy to find the product before packing as much as possible?
- Do students pack as much as possible?

Extension

- Continue to encourage students to transition from a block representation of the problem to a paper-and-pencil representation. Use Activity Sheet #2 to continue modeling and recording 2-digit multiplication problems.
- Have student engage in activities that encourage prediction and estimation as they solve the problems.