The Digi Shift

Grade 4
Activity #415
Relevant Chapters in the *Digi-Block Comprehensive Teacher's Guide:*
Book III: 3-3, Combining Equal Groups of Larger Blocks, pp.80-86

Overview

Students use blocks to model multiplication by 10. They identify the shift of the digits one place to the left as a general rule for multiplying by ten.

Objectives

Thinking Skills: Students look for and identify patterns in the way the digits and the blocks shift when a number is multiplied by ten. They use this pattern to predict a product.

Mastery Skills: Students learn what it means to "shift the digits" as a visual representation for multiplying by ten.

Materials

Each group of 2-4 students needs:

- 3-4 blocks-of-100 (Students can unpack to get the blocks they need for particular problems.)
- 2 place value mats with digit cards (If enough materials aren't available, have students make paper versions for this activity.)
- Activity Sheets pp. 1-2

Class Introduction (15 minutes)

Have students sit in groups on the floor or at tables and pass out the materials. Ask students to put 14 single blocks on one place value mat. Have them pack as much as possible and set the digit cards. They should have 1 block-of-10 and 4 single blocks on their mats.

Ask students to explain the meaning of 14 X 10. One way for students to think of it is 14 groups of ten.

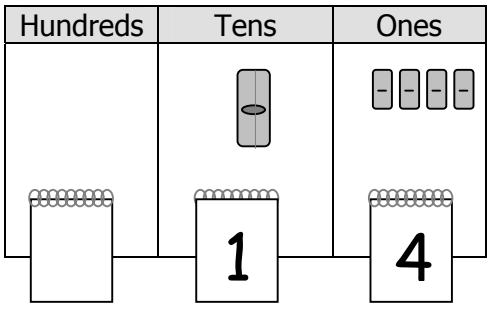
Have students use their blocks to model 14 X 10. Allow student groups to decide how they will do this step. Two ways that student groups may choose are:

- 14 groups of 10 single blocks
- 14 blocks-of-10

To show the end result, make sure that students pack as much as possible to show 1 block-of-100 and 4 blocks-of-10 on a second place value mat. Have them place the mat with 14 blocks above the mat with 140 blocks:

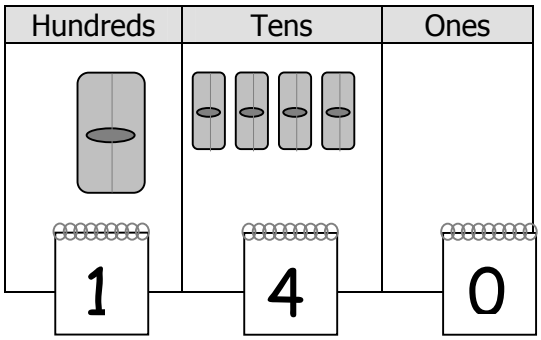
14 x 1 =

14 groups of 1



14 x 10 =

14 groups of 10



Ask students to make observations about the relationship between the two sets of numbers on the place value mats. Students may want to arrange their blocks so they can more clearly see the "shift" of the blocks one place to the left. Observations should include:

- The digits are the same (other than zero).
- The 4 blocks in the ones place "shifted" one place to the left to the tens place.
- The 1 block in the tens place "shifted" one place to the left to the hundreds place.
- Both digits shifted one place to the left.
- The 0 in the ones place for the number 140 is needed to show that there are no single blocks.
- In essence, the 4 single blocks were replaced by blocks ten times larger: 4 blocks-of-10. Similarly, the 1 block-of-10 was replaced by a block ten times larger: 1 block-of-100.

Students work in small groups to complete the activity sheet.

Small Group Activity (25 minutes)

Have students model the multiplication sentences presented on the activity sheets. For question 2-d, students are asked to predict the result of 37X10. Have students use blocks for this question only if needed.

Closure (10 minutes)

Ask students to describe their conclusions about multiplying numbers by 10.

- When a number is multiplied by ten, the blocks become ten times bigger.
- The blocks must all shift one place to the left.
- The digits must all shift one place to the left.
- A 0 is used to show that there are no single blocks in the answer.

(Teacher Note: Avoid encouraging students to think that a zero is added when they multiply by ten. This rule does not work when applied to decimal numbers. For example, 3.2 x 10 does not equal 3.20. Instead the digits shift one place to the left: 3.2 x 10 = 32.)

Assessment

As the students are working, observe the following:

- Are the students working collaboratively?
- Do students use all single blocks or are they confident using blocks-of-10 to model equal groups?
- Do the students model the multiplication sentences accurately?

- Do the students pack as much as possible and set the digit cards for each equation?
- Did students organize the blocks on their place value mats to easily the "shift" more easily?
- Are the students able to explain why it is necessary to shift the blocks and the digits one place to the left?
- Do the students see how each block becomes ten times bigger when they multiply by ten?
- Are the students able to predict the product for the multiplication sentence without the use of the blocks?
- Do students adequately explain their thinking behind their prediction?

Extension

- Have students make 10 groups of 14 and compare it to 14 groups of 10. Repeat with 10 groups of 8 and 10 groups of 23 by comparing these products with their answers on their activity sheets. Help students see and experience the commutative property of multiplication.
- Have students multiply by 100 using the same activity structure. Help them discover that when they multiply by 100, they replace each block with a block 2 sizes (100 times) larger. The digits and the blocks shift <u>two</u> places to the left.
- Have students write about what they think would happen if they multiplied by 1000, 10,000, and beyond.