# Leave A Trail

## Overview

Students develop their own recording techniques for multiplication story problems.

## Objectives

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| Thinking Skills: | Students use the Digi-Block materials to relate their understanding of multiplication to paper-and-pencil recording techniques. |
| Mastery Skills: | Students learn to record, in their own manner, how they use the blocks to solve a multiplication story problem. |

## Materials

Each pair of students needs:
- 4 blocks-of-100 (Students can unpack to get the blocks and holders they need for particular problems.)
- 1 place value mat (optional)
- Activity sheet #1
- Activity sheet #2
- 1-2 large sheets of paper (11x17 or larger)

## Class Introduction                                                    (15-20 minutes)

Pass out the blocks, Activity Sheet #1, and the place value mats. Have students sit with a partner. Ask students to consider the story problem on the activity sheet:
- Mia has 3 boxes of pencils.
- Each box holds 45 pencils.
- How many pencils does Mia have?

Ask students to model with blocks how they would represent Mia's pencil situation.
- Students experienced with the blocks will most likely show 3 groups of 45 blocks using 3 groups of (4 blocks-of-10 and 5 single blocks.)
- If students show 3 groups of 45 using only single blocks, they need more practice with the Digi-Block materials. It will take these students a much longer time to work through this problem.
- Students may or may not choose to use the place value mat. If they use the mat, they may want to visually separate each group of 45.

3 groups of 45 on the mat:                     3 groups of 45 not on the mat:
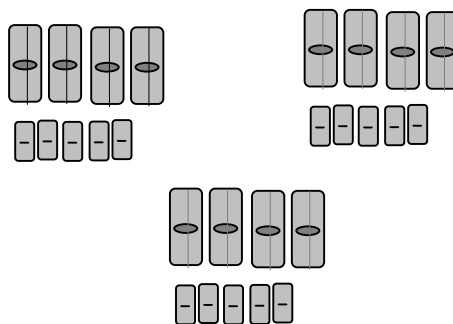
Explain to the class that they are going to show each step along the way to solving a problem. They are going to leave a trail behind them so anyone can follow what they did. Their trail is the pencil markings showing what they did with the blocks.

On the activity sheet, students need to show in numbers and/or draw the blocks to show how they first set up the problem. Walk around and help students find ways of clearly recording this step.

[Note: It is the specific intention of this lesson to give students the opportunity to develop their own recording techniques for their work. The teacher should assist students in being clear in their recordings so that others understand their work. However, it will be very important not to insist on a particular method. The closure section allows students to come together to share their techniques and to begin to pay particular attention to techniques that are efficient, clear, and easy to understand. This discussion will eventually lead students to develop and understand an efficient algorithm.]

Return to the question presented in the problem: "How many pencils does Mia have?" Discuss as a class how to find the solution.
- Students may still want to count the blocks by tens and then count on the ones (10, 20,...120, 121,...135). This is a fine method.
- However, also encourage students to pack as much as possible. This will result in 1 block-of-100, 3 blocks-of-10, and 5 single blocks:
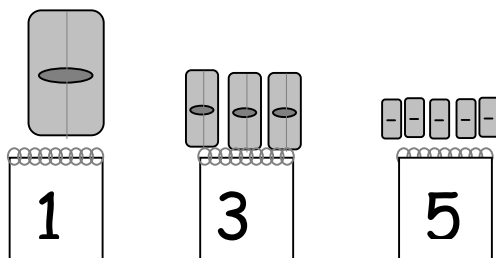


Have students show on their activity sheet how they found the solution.
- If they counted the blocks by tens and then counted on the ones, they may want to show how they counted.
- If students packed as much as possible, they need to show which blocks were packed and how they arrived at the final answer.
- Encourage all groups to be as clear as they can in their recording techniques.

## Student Activity                                                          (20 minutes)

Hand out Activity Sheet #2 and a large sheet of paper to each pair of students. Explain the activity:
- Students choose one word problem to solve with the blocks.
- As they work on the problem with the blocks, they will make a poster-size recording of each step along the way. This poster will serve as a trail of their work. Partners may want to split the work accordingly: one person handles the blocks and the other person records.
- The posters are not meant to be "works of art," but rather to be clear and easy to follow.
- At the end of class, they will get a chance to show the trail of their work to the rest of the class.

If students finish early, give them a second poster-size sheet of paper to try a second word problem. Let them know that they may or may not have time to finish a second problem.

## Closure <span style="float:right">(10 minutes)</span>

When everyone is finished with their first poster, bring the class together to share and discuss different recording methods.

Call out each problem one at a time. Have all students who chose a particular problem post their solution method at the front of the class. As a class, reflect on the posters for each problem. Discuss:
- Which trails are "easy to follow"? Why?
- Which trails seem similar? Why?
- Which trails seem quite different from the others?
- Which recording techniques do you prefer?
- Which solution methods would you like to try?

## Assessment

As students are working, observe and note the following. Do they:
- Use blocks-of-10 and single blocks to represent 2-digit numbers in the story problems?
- Make the appropriate number of equal groups for the problems?
- Show the initial problem situation in their recording?
- Solve the story problem correctly using the blocks?
- Pack as much as possible to solve the problem?
- Record their solution process with drawings, with numbers, or with a combination of drawings and numbers?
- Adequately convey their solution process in their recording?
- Identify similar recording techniques and solution methods?

## Extension

- ❑ Have students write their own story problems. Identify well-written and challenging problems to share with the class. Students can exchange problems to solve.
- ❑ Have students solve a range of word problems and record their solution methods for discussion purposes. Include some division situations. Here are two examples of problems to try:
  - Tanya earns $17 per hour. She worked for 8 hours on Friday. How much money does Tanya earn on Friday?
  - The four of us earned $36 helping our parents rake leaves. If we share the money equally, how much will each of us get?