Exploring Fraction Multiplication

Based on the discussion on pp. 323-324

Grade Level: Fifth or sixth grade.

Mathematics Goals

- To explore how fractions can be multiplied. No development of an algorithm is intended.

Thinking About the Students

Students must have a good understanding of fraction concepts, especially the meanings of the top and bottom numbers.

Materials and Preparation

- Prepare a page for each student with two story problems (see the *Task* below).

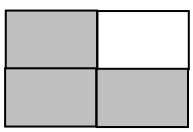
  Alternatively, put the problems on the board or overhead and have students copy them.

LESSON

BEFORE

Begin with a simpler version of the task:

- Review quickly the meaning of multiplication. Use 3 x 5 (3 sets of 5) and then one or two examples where one factor is a fraction: 3/4 x 8 and 4 x 2/3. Students should be able to do these problems mentally from the meaning of multiplication and their understanding of fractions.
- Next challenge them to solve 2/3 x 3/4. Sketch a simple picture of 3/4 as shown here:



Again, this should be relatively simple with the answer being determined by taking 2 of the 3 shaded regions.

- Finally, use the same drawing and have students solve 1/2 x 3/4. Here there are at least two possible methods: Take half of each shaded region to form 3/8 or one whole region (1/4) and half of the third region (1/8). The answer in either case is 3/8.

The Task

Students are to solve each of the following two problems:

There were 3¾ gallons of lemonade in the cooler for the class picnic. During the picnic, the students drank ⅔ of this lemonade. How many gallons did they drink?

Carlos and his father were sharing a large pizza. Carlos' father ate ⅓ of the pizza and Carlos ate ¾ of the rest. How much of the whole pizza did Carlos eat?

Establish expectations:

For each problem, students should use words, pictures, and numbers to not only get an answer but also to show how they got the answer. They should be ready to explain why they think their answer is correct.

If you wish, have students work in pairs. Each student is responsible for explaining what he or she has written.

DURING

- The only assistance you will likely give is to those students who do not seem to know how to get started. Suggest that they draw a picture of 3¾ (for the lemonade problem). It need not look like containers. A rectangle model will work well. Then ask them to

explain to you what the problem is asking. That should be enough to get students working.

- Watch to see what different kinds of drawings and explanations students are using. Do not correct or help students who get an incorrect answer. Rather, consider calling on these students during the discussion.

AFTER

- Discuss one problem at a time. Ask for answers first and record these on the board with no evaluation. The discussion will be more interesting if there are different answers.
- Since the lemonade problem is easier than the pizza problem, it is a good place to begin with students who may not have solutions to the pizza problem.
- Be certain not to make evaluative comments about student solutions. Even if there is a correct solution given, see if other students have solved the problem in a different manner. Also check to see whether students not sharing have any questions and that they understand what their classmates have said.

ASSESSMENT NOTES

- The most serious problem would be students who are not able to translate whole-number meaning of multiplication to these fractional situations. These students need to review the meaning of multiplication.
- Another area of real concern would be students whose solutions do not indicate an understanding of fractions, especially the meanings of numerator and denominator.

- If there are students who are using a standard algorithm for these problems, it is essential that they be able to draw pictures and use words that demonstrate that they understand why the algorithm makes sense.