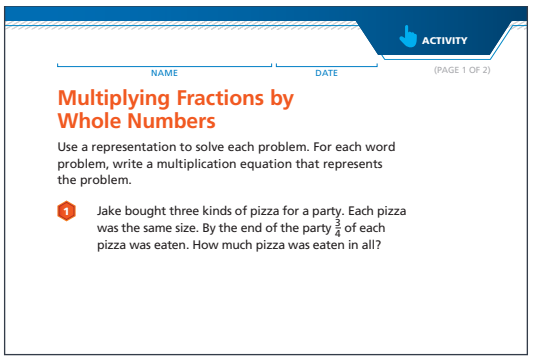
Strategies for Multiplying a Fraction by a Whole Number

At the beginning of Session 4.2, students are discussing their solutions to Problem 1 on *Student Activity Book* page 411.

STUDENT ACTIVITY BOOK, P. 411



ACTIVITY

NAME DATE (PAGE 1 OF 2)

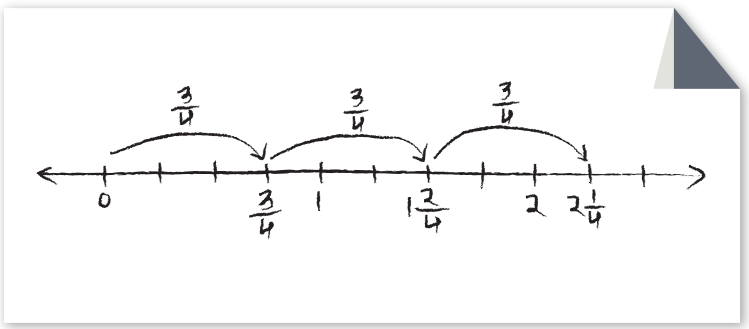
Multiplying Fractions by Whole Numbers

Use a representation to solve each problem. For each word problem, write a multiplication equation that represents the problem.

1. Jake bought three kinds of pizza for a party. Each pizza was the same size. By the end of the party $\frac{3}{4}$ of each pizza was eaten. How much pizza was eaten in all?

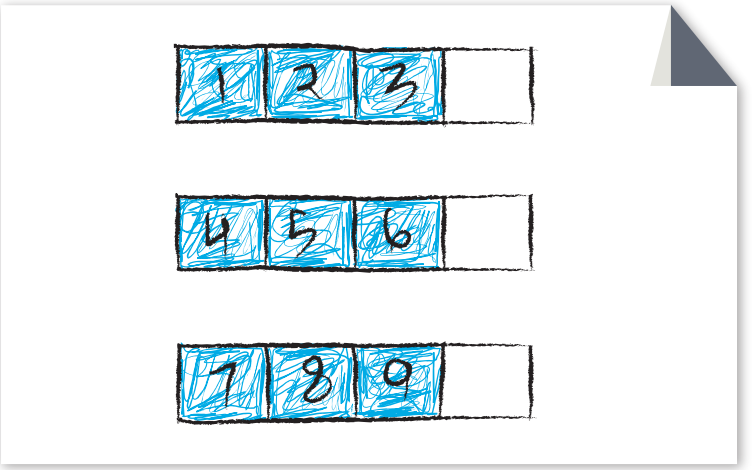
Teacher: Yesterday you solved this problem. I have asked a few students to share their solutions. Terrell, how did you solve this problem?

Terrell: Well, there were 3 pizzas and $\frac{3}{4}$ of each pizza was eaten. So that's $\frac{3}{4} + \frac{3}{4} + \frac{3}{4}$. I used a number line. I put $\frac{3}{4}$ on the number line. First I added $\frac{3}{4}$. $\frac{1}{4}$ more is 1 and then another $\frac{2}{4}$ is $1\frac{2}{4}$. Then I added another $\frac{3}{4}$. $\frac{2}{4}$ more is 2 and then $\frac{1}{4}$ more is $2\frac{1}{4}$. They ate $2\frac{1}{4}$.



Teacher: Did anyone draw the pizzas to help them solve the problem?

Luke: I did and I colored in $\frac{3}{4}$ on each and then I counted. 1, 2, 3, 4, 5, 6, 7, 8, 9 because $3 \times 3 = 9$. But they are actually fourths, so it's $\frac{9}{4}$.



Marisol: I cut all the pizzas into fourths because they ate $\frac{3}{4}$ of each pizza, and so they ate $2\frac{1}{4}$.

Teacher: I am missing some part of how you got to $2\frac{1}{4}$.

Marisol: Instead of keeping each piece in its own pizza, I moved them over. The part colored in blue is the $\frac{3}{4}$ from the first pizza. This yellow here is the $\frac{3}{4}$ from the second pizza and this red here belongs to the third pizza. And you can see that I colored in $2\frac{1}{4}$ pizzas.

Teacher: So we've seen some different solutions. What equation can I use to represent this problem?

Terrell: $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} = 2\frac{1}{4}$

Teacher: What do the $\frac{3}{4}$s represent in the problem? What does the $2\frac{1}{4}$ represent?

Terrell: Each of the $\frac{3}{4}$ represents $\frac{3}{4}$ of one of the 3 pizzas. $2\frac{1}{4}$ is how much pizza they ate altogether.

Teacher: Is there a multiplication equation that we could use?

Yuki: If they ate 3 whole pizzas, the equation would be $3 \times 1 = 3$. But they ate three $\frac{3}{4}$ pizzas, so I think it is $3 \times \frac{3}{4} = 2\frac{1}{4}$. That makes sense with Terrell's equation because $\frac{3}{4} + \frac{3}{4} + \frac{3}{4}$ is the same thing as three $\frac{3}{4}$s.

Teacher: Let's look at Terrell's and Marisol's representations. Where do you see the 3? Where do you see the $\frac{3}{4}$? Where do you see the multiplication?

Yuki: The 3 in Terrell's is the three $\frac{3}{4}$s. And the $\frac{3}{4}$s are obvious. The three in Marisol's are the 3 pizzas, I guess. Or maybe the 3 different colors. And the $\frac{3}{4}$ is each $\frac{3}{4}$ colored in.

Enrique: I was thinking about multiplication and thinking about the number of groups and the number in each group. If they ate 3 whole pizzas, the 3 is the number of groups and the 1 is the number in each group. With $3 \times \frac{3}{4}$ the number of groups would be 3, which is the 3 pizzas, but the number in each group is $\frac{3}{4}$. I'm not sure that makes sense.

Teacher: What if you thought of it as the size of the group rather than the number in each? Does that make more sense to you? Would that work for both problems?

Enrique: Hmm. I guess so. 1 is the size of the group in the first problem and $\frac{3}{4}$ of a pizza is the size of the group in the second problem.

Amelia: Yeah. It's 3 groups of $\frac{3}{4}$s!

Luke: The equation could also be $3 \times \frac{3}{4} = \frac{9}{4}$, like I figured out in my solution.

Teacher: Does everyone agree? Could the equation be $3 \times \frac{3}{4} = 2\frac{1}{4}$ or $3 \times \frac{3}{4} = \frac{9}{4}$?

Jill: $\frac{9}{4}$ is the same thing as $2\frac{1}{4}$. $\frac{4}{4}$ is 1. $\frac{8}{4}$ is 2 and $\frac{9}{4}$ is 1 more fourth, so that is $2\frac{1}{4}$. It's the same answer.

After students share different ways to solve the problem, the teacher asks the students to connect their solutions and their representations to multiplication equations. This is very similar to work the teacher has done in Unit 3 with multiplication with whole numbers. By connecting the word problem, the representation, and the equation, the teacher is helping students expand their understanding of multiplication to now include fractions.