GRADE

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STRAND

NUMBER
GEOMETRY
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Assessing Understanding of Fractions

I developed this lesson to assess students' understanding of fractions and learn about their ability to apply fractions in different problem-solving situations. I taught the lesson to fourth and fifth graders in West Babylon, New York, and to fifth graders in Mill Valley, California.

When teaching fractions, I find it's important to assess regularly what students understand. I gather information about what students are learning in three ways: from leading class discussions about students' reasoning, from observing and listening to students talk with one another as they work on problems, and from examining the written work that students produce. These types of assessments aren't perceived by students as "testing" situations. Rather, they're similar to other lessons in which students grapple with problems, share their solutions, and reflect on their thinking.

A Class Discussion

To initiate a class discussion about fractions, I wrote three statements on the board:

1. When pitching, Joe struck out 7 of 18 batters.
2. Sally blocked 5 field goals out of 9 attempts.

3. Dick did not collect at 14 of the 35 homes where he delivers papers.

I read the first statement aloud and asked the students whether Joe had struck out exactly half, about half, less than half, or more than half of the batters. Below the statements, I wrote:

Exactly half
About half
Less than (<) half
More than (>) half

I invited all of the students who were interested to express their ideas. Most thought that "less than half" made sense.

Philip said, "It's less than half because 7 and 7 is 14, and that's less than 18."

Sophia said, "I think the same, but I used multiplication and did 7 times 2. That's 14, and it's smaller than 18."

Mira said, "Nine is half of 18, and 7 isn't enough."

Emmy thought that "about half" was a better estimate. She was the only student who thought this. "It's pretty close," she said," because it's just 2 off from being exactly half."

Nick thought that "less than half" made better sense. "I did it with subtraction," he explained. "I did 7 take away 18, and that's 11 and that's more." I didn't correct Nick's explanation of the subtraction.

Several other students also expressed ideas that were similar to those already offered, so I moved on to the next statement: *Sally blocked 5 field goals out of 9 attempts.*

"It's more than half," Angelica said, "because it would have to be 10 to be exactly half."

"I think it's just about half," Josh said, "because 5 is about half of 9."

Chris was thinking about the situation numerically. He said, "You can't take half of 9 because it's an odd number.

"Yes, you can," Raquel responded. "You can take half of any number. The answer is just in the middle."

"What is half of 9?" I asked.

"It's 4½," Eli said. "I agree with Raquel that you can always take half."

"But you can't count half of 9 goals," Daniel argued. "That doesn't make any sense."

"Well, you *should* be able to take half of anything," Raquel said.

I offered my perspective. "Can you divide 9 apples in half?" I asked. Most of the students nodded.

"Half of 9 apples is 4½ apples," Ali said.

"What about 9 balloons?" I asked. The students laughed.

"You'd wreck a balloon," Eli said.

"It would be stupid," Sarah added.

"There are things we can divide in half and other things that we can't," I said. "When we study fractions, some things that make sense with numbers don't always make sense when you think about them in a real-life situation. It's important that we pay attention to how we use fractions as we learn about them."

Raquel's next comment shifted the direction of the discussion. "I have something to say about the first sentence, about Joe the pitcher," she said. "I think it's closer to ⅓ than ½."

"Why do you think that?" I asked.

Raquel explained, "Because you can divide 18 into thirds—6 plus 6 plus 6. And 7 is just one away from 18. But it's 2 away from 9, which is half. So it's closer to ⅓ than ½."

"Maybe I need to add another choice to the list," I said. I wrote *About one-third* on the board.

I then went on to the third statement: *Dick did not collect at 14 of the 35 homes where he delivers papers.* It seemed clear to most of the students that "less than half" was the best descriptor for that statement. The students' explanations were similar to the ones they had given for the other two statements.

Raquel surprised me with her observation. "I think that 14 is ⅖ of 35," she said. "Look, two 7s make 14, and three 7s make 21, and 14 plus 21 is 35, so 14 is ⅖."

I thought for a moment to understand Raquel's reasoning. None of the other students, however, seemed interested.

"I agree, Raquel," I said, to acknowledge her contribution, but I didn't pursue it further.

I have discussions such as this one frequently. I learn what some of the students are thinking,