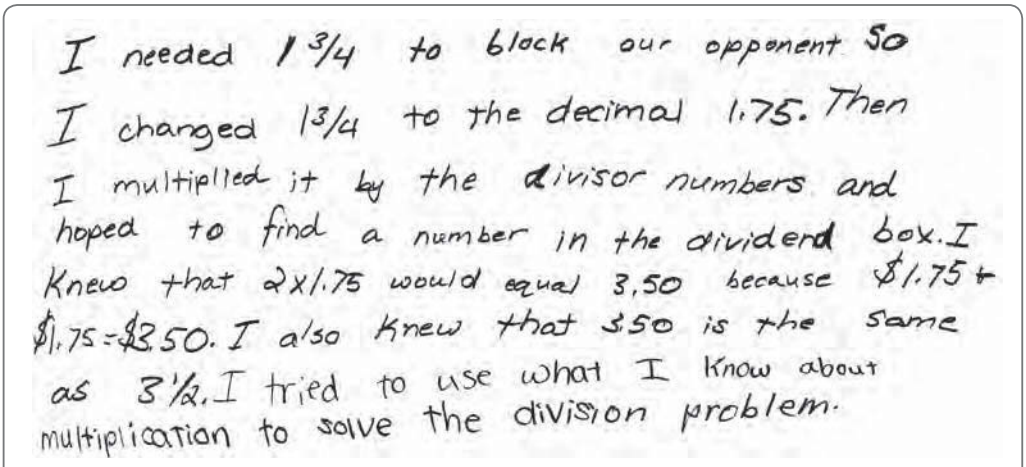
I needed 1 3/4 to block our opponent So I changed 1 3/4 to the decimal 1.75. Then I multiplied it by the divisor numbers and hoped to find a number in the dividend box. I Knew that 2x1.75 would equal 3.50 because $1.75 + $1.75 = $3.50. I also Knew that 3.50 is the same as 3 1/2. I tried to use what I Know about multiplication to solve the division problem.

Figure 3.3 Student response to the first exit card

Extension

Have students create, exchange, and play their own versions of the game. They choose five numbers for each set, compute the related twenty-five possible quotients, replace any combinations that don't provide unique quotients, and then randomly write the quotients on the game board.

Game adapted from *Estimation Bingo* in *Zeroing in on Number and Operations: Key Ideas and Common Misconceptions, Grades 5–6*, by Anne Collins and Linda Dacey. (Portland, ME: Stenhouse, 2010).

Why This Game or Puzzle?

It takes time for students to understand operations with positive and negative integers. In particular, students may struggle with interpreting the minus sign and develop the habit of using language such as "negative negative five," rather than the more useful "the opposite of negative five" (Bofferding 2010). Frequent opportunities to discuss expressions involving integers can support students' development of more productive terminology.

In this game, playing cards represent negative (red) and positive (black) target numbers. Teams must then find three numbers on the game board to use in an expression with a value equal to the target

number. Additional points are scored if the numbers chosen are adjacent on the board, which encourages students to consider a variety of options. As they do so, they are finding the values of numerous expressions and talking to their teammates about how to read and interpret the expressions they create.

Math Focus

- Computing with positive and negative integers

Materials Needed

- 1 *Three-For* Game Board per team (page A-13)
- 1 standard deck of playing cards with face cards and jokers removed; aces = 1
- 1 *Three-For* Recording Sheet per team (page A-14)
- Optional: 1 *Three-For* Directions per team (page A-15)

***Three-For* Game Board**

-1	7	22	-4	5	-25
1	-18	9	20	18	6
10	-19	-7	8	-12	-16
-14	25	11	-15	2	-8
-10	14	-9	19	-16	3
-21	0	-11	6	-3	-20

Directions

Goal: Create sets of three cards each that equate to a target number.

- Give each team a copy of the game board.
- One team draws a card from the deck and places it for all to see. If the card is red, it is a negative integer; if the card is black, it is a positive integer.
- Teams are to find three numbers on the board that can be used in an equation (all four operations are allowed) to equal the target number.
- When they find the three numbers, they call "Three-For" and the other team must stop looking for a solution. They should record their equation on the recording sheet.
- The equation is checked by the opposing team. If it is correct, the team that found the three numbers gets 1 point and crosses the three numbers off the board. Additional scoring will occur if the team finds three numbers in which two are adjacent, allowing two points to be scored, and three points if all three are adjacent.
- If the equation is incorrect, both teams return to finding a solution.
- Play continues until there are no more numbers to choose from or there are no more possible "*Three-Fors*" when a target number is displayed.

How It Looks in the Classroom

As students enter their seventh-grade classroom, each is handed a number card. The teacher brings the class together briefly to discuss the warm-up for today's lesson by stating, "I have provided each of you with a card. If you have a red card, the number is negative. If you have a black card, the number is positive. I will put a target number on the board. You must try to find students in the room who have cards that you can group together to create expressions with a value equal to the target number. You will have six minutes to cooperatively find as many expressions as you can for the target number. Ready, set, go!"

As the teacher circulates, she enjoys listening to how her students discuss not only the rules for integer operations, but why the rules work. She hears Melissa tell another classmate, "Remember we learned that $3 \times -4 = -12$ because that means three groups of negative four." Kai wants to check his thinking about $4 - (-5)$, so the teacher tells him to get a number line template from their classroom materials. Shortly thereafter she hears him say, "If I were subtracting a positive number I would move five left, so I move five right instead."

When the six minutes are up, the teacher asks the students to share some of their expressions for the target number -12. One group shares their expression $3 \times 4 \times (-1)$, but Aidan is concerned, thinking that the answer is 12. When asked why, he shares, "Well, I thought that you would multiply both the three and the four by negative one, and that would make positive twelve." The teacher is pleased that this misconception has been stated and a conversation ensues about the order in which numbers are multiplied and how these parentheses do not necessitate the need to use the distributive property.

After several other examples, the teacher believes that the students are ready to play *Three-For* at their tables. She explains how the game is played and relates the work involved in the warm-up problem to the game. Students are eager to see what target number they will start with as they begin round 1.

Tips from the Classroom

- When field-testing this game, we noticed that opposing teams were often eager to check the work since, if it were incorrect, there would be more time to try to find a solution. Some students suggested that, if they found an error in an opponent's computation, they would receive the point instead, or the opponent would have to lose a point.
- Some students who were still working on understanding computation with integers wanted to use a manipulative, such as colored chips or a number line, to help them determine accurate answers. We encourage the use of these models while students are playing the game, to support conceptual understanding.

What to Look For

- What strategies do you hear discussed that you want students to share in a whole-group summary discussion following the game?
- Do some students need to use a manipulative or a number line for a longer period of time than others when playing the game?
- How well do students persist in their thinking regarding choices for the target number? Are some students ending their turn too quickly, needing some encouragement to continue looking?

Variations

- Change the numbers on the game board to greater numbers, such as those from 30 to 100, including both positive and negative integers.
- Vary the amount of numbers they may use and create a different scoring system, such as one in which students count the numbers they chose to identify a score for that round.
- Other rules might include requiring students to use at least one positive and two negative numbers, or vice-versa, in their choices.

Exit Card Choices

- You are playing *Three-For* and the target number is -9. You think you'd like to use the 3, but need two other numbers. Name four possibilities of number combinations you could use to make -9.
- There are only three numbers left on the board: -4, 5, and 8. What target number would you like to get in order to win a point? If possible, try to find at least one positive and one negative target number that would work.

The student response shown in Figure 3.4 for the second exit card depicts the student's interest in finding more than one positive and negative target number that works.

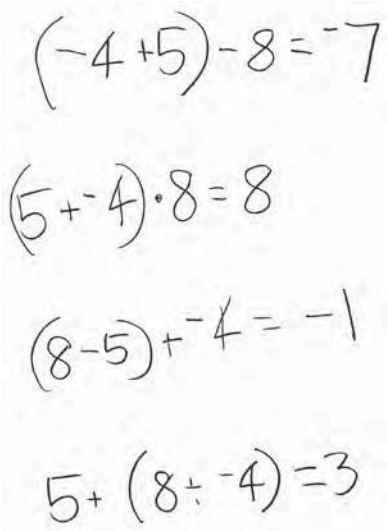

Figure 3.4 Student response to the second exit card

Extension

Change the game to a puzzle, with each number on the game board used exactly once. The solvers use the playing cards to identify twelve target numbers and then try to create an expression, using three numbers on the game board, for each target number.

Three-For Game Board

-1	7	22	-4	5	-25
1	-18	9	20	18	6
10	-19	-7	8	-12	-16
-14	25	11	-15	2	-8
-10	14	-9	19	-16	3
-21	0	-11	6	-3	-20

Three-For Recording Sheet

Students on Team A _____

Students on Team B _____

Target Number	Num-bers Used	Equation	Team A Points	Team B Points
			Total Points	**Total Points**

Three-For Directions

Directions

Goal: Create sets of three cards each that equate to a target number.

- Give each team a copy of the game board.
- One team draws a card from the deck and places it for all to see. If the card is red, it is a negative integer; if the card is black, it is a positive integer.
- Teams are to find three numbers on the board that can be used in an equation (all four operations are allowed) to equal the target number.
- When they find the three numbers, they call "Three-For" and the other team must stop looking for a solution. They should record their equation on the recording sheet.
- The equation is checked by the opposing team. If it is correct, the team that found the three numbers gets 1 point and crosses the three numbers off the board. Additional scoring will occur if the team finds three numbers in which two are adjacent, allowing two points to be scored, and three points if all three are adjacent.
- If the equation is incorrect, both teams return to finding a solution.
- Play continues until there are no more numbers to choose from or there are no more possible "*Three-Fors*" when a target number is displayed.