The Integer Dice

A Lesson with Sixth, Seventh, and Eighth Graders

by Cheryl Rectanus

featured in *Math Solutions Online Newsletter,* Spring 2007, Issue 25

This activity is excerpted from Cheryl Rectanus's new book, So You Have to Teach Math? Sound Advice for Grades 6–8 Teachers *(Math Solutions Publications, 2006). The focus of the book isn't primarily on classroom lessons but on responses from an experienced teacher to questions raised by middle school math teachers. (See a sample in this issue's Ask Math Solutions section.) However, Cheryl includes classroom activities when they offer useful clarification. In this example, Cheryl offers a probability activity,* The Integer Dice, *in response to the following question:* I think it's important for students to describe, justify, generalize, and verify their mathematical thinking. But does this mean that students always need to write long explanations with complete sentences?

No. Explain to students that it's important that they include details and explain their thinking as thoroughly as they can. But they don't need to write a novel! Including words, numbers, and diagrams, charts, and symbols are all useful ways of representing thinking.

My colleague, Nicole, was teaching a probability unit to her students. One of the problems in the unit was *The Integer Dice:*

> *Travis and Nathan were trying to be clever and invent a new dice game to fool a friend. They made two dice with the following six numbers on each: –3, –2, –1, 0, 1, 2. Before they could invent a game that ensured that they would win, they did some problem solving to determine the probabilities with the dice. If you roll the two dice 100 times, what sum will occur most often? Explain your thinking and your answer completely.*

Students worked together to determine the answer and shared their findings during a class discussion. Students were asked to explain their reasoning and answers in writing. Ted used a combination of charts, lists, and words to clearly explain and verify his thinking. (See Figure 1.) Sharquela took the assignment a step further and described a game using the dice in which one player would have better odds of winning. (See Figure 2.) Their writing reflects their approaches to solving the problem. An assignment that just asked for the answer would not have accessed these students' rich thinking.

The Integer Dice

Travis and Nathan were trying to be clever and invent a new dice game to fool a friend. They made two dice with the following six numbers on it: –3, –2, –1, 0, 1, 2. Before they could invent a game that ensured that they would win, they did some problem solving to determine the probabilities with the dice. If you roll the two dice 100 times, what sum will occur most often?

Explain your thinking and your answer completely.

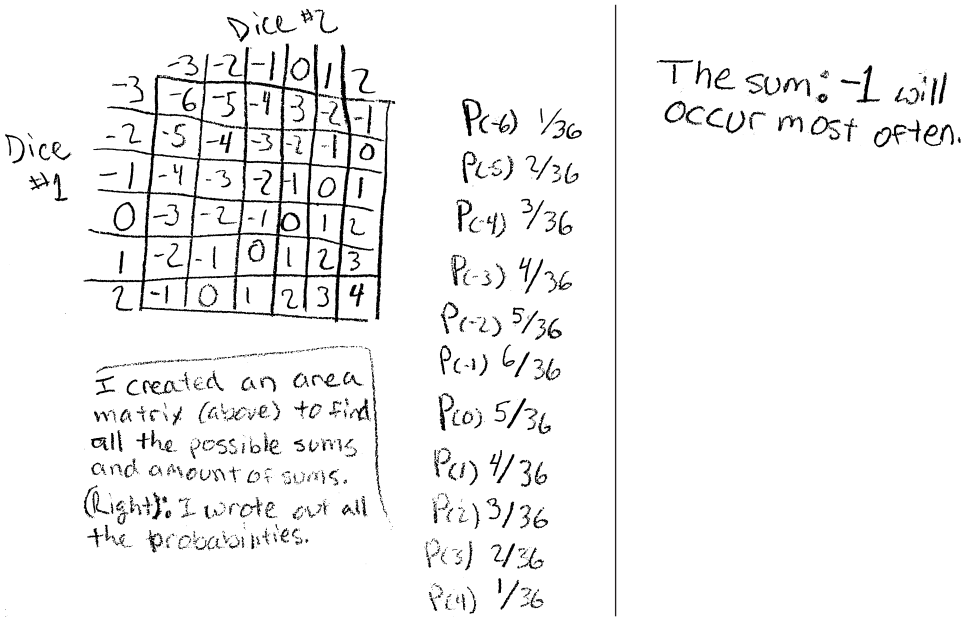


Figure 1. Ted's solution incorporated writing.

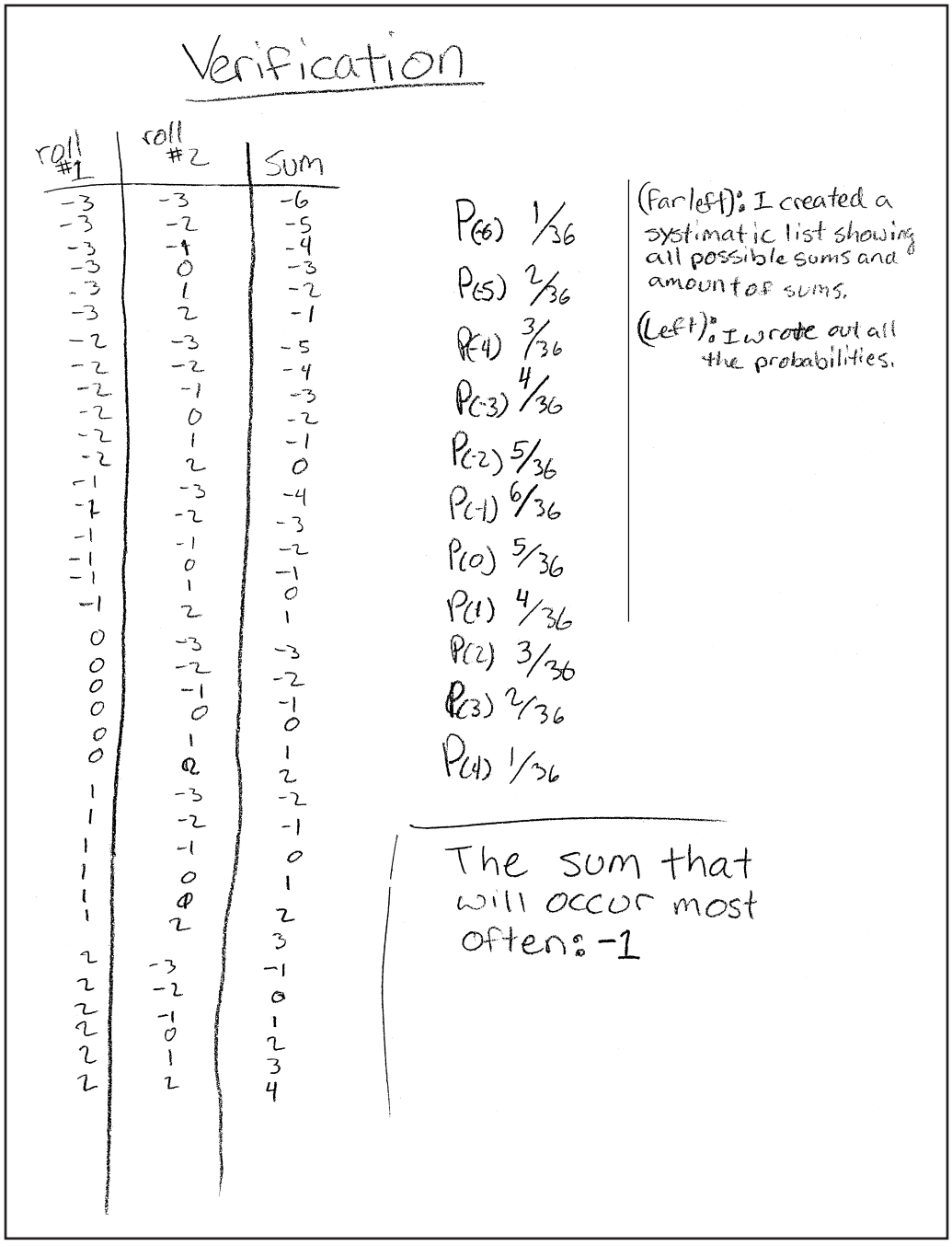
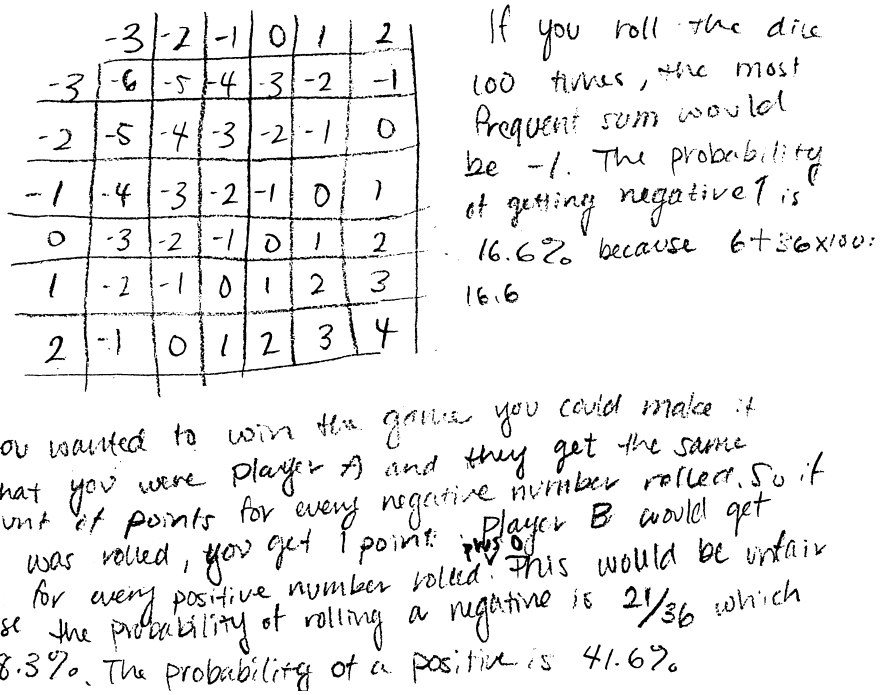


Figure 1. *(continued)*

The Integer Dice

Travis and Nathan were trying to be clever and invent a new dice game to fool a friend. They made two dice with the following six numbers on it: –3, –2, –1, 0, 1, 2. Before they could invent a game that ensured that they would win, they did some problem solving to determine the probabilities with the dice. If you roll the two dice 100 times, what sum will occur most often?

Explain your thinking and your answer completely.



	-3	-2	-1	0	1	2
-3	-6	-5	-4	-3	-2	-1
-2	-5	-4	-3	-2	-1	0
-1	-4	-3	-2	-1	0	1
0	-3	-2	-1	0	1	2
1	-2	-1	0	1	2	3
2	-1	0	1	2	3	4

If you roll the dice 100 times, the most frequent sum would be -1. The probability of getting negative 1 is 16.6% because 6÷36x100: 16.6

If you wanted to win the game you could make it so that you were player A and they get the same amount of points for every negative number rolled. So if a -6 was rolled, you get 1 point. Player B would get 1 point for every positive number rolled. This would be unfair because the probability of rolling a negative is 21/36 which is 58.3%. The probability of a positive is 41.6%.

Figure 2. Sharquela's solution incorporated writing.

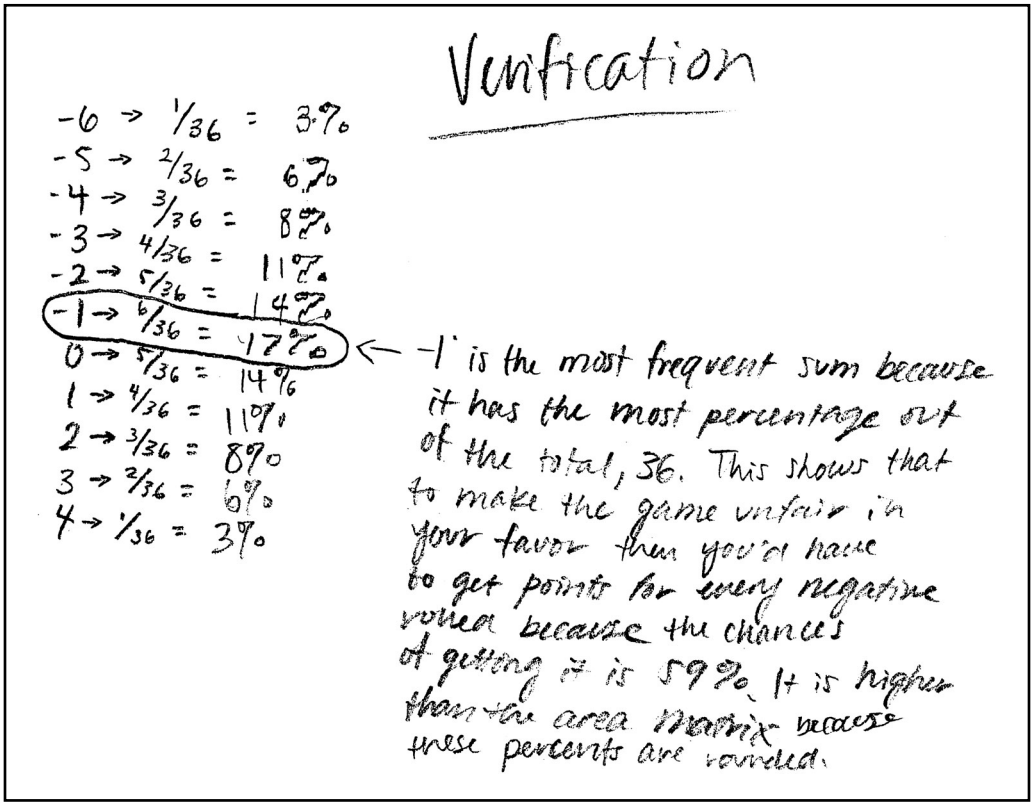


Figure 2. *(continued)*