



## Basic Facts A Lesson with Sixth, Seventh, and Eighth Graders

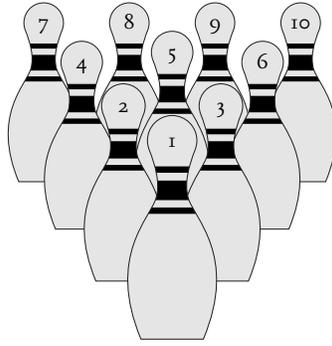
by Cheryl Rectanus

*This lesson 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 rather on responses from a master 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 the activity Math Bowling in her response to this question: How can I help my students become more proficient with their basic facts so that they don't always grab a calculator to compute problems they should be able to figure mentally?*

It's important that students are aware of the use and purpose of calculators, and it's also important that calculators are not a substitute for students learning to think about and calculate effectively and efficiently on their own. Adolescents need to continue to develop their number sense and computational fluency, especially with rational numbers. As adults, most of us use calculators when we want to save time and a calculation is more complex than we want to do mentally or with paper and pencil. We also use calculators when accuracy is important—for figuring taxes, balancing our checkbook, and so on. Similarly, students should learn when to use calculators and when other methods of calculating, such as paper and pencil, estimation, and figuring mentally, are more appropriate. Also, when students do use a calculator, they should be able to draw on their skills of rounding numbers and calculating mentally to get a sense of the approximate size of the answer. Furthermore, they need to have strategies to check and repeat the calculation if they are not sure whether it is right.

If you're assessing your students' ability to calculate or you want them to have practice with computation, then it's fine to restrict their access to calculators. Just be sure to explain why you are restricting access. The key is to think about when you want students to use calculators and when you don't.

One way to provide computation practice is to teach students how to play the *Math Bowling* game. Edward first explained to his class how conventional bowling is played and scored. Then he described how to play the *Math Bowling* game. "You take a die and roll it three times," he told his class. "The three numbers rolled make one ball. You have five minutes to write as many different equations as you can using the three numbers. You can use the three numbers in any order and include any operation and any symbols. You can also use the numbers more than once. You'll have to decide what tool is most useful for any given calculation—a calculator, mental math, or paper and pencil." He put a transparency of a set of bowling pins on the overhead.



“In bowling,” he continued, “you’re trying to knock down all of the pins with one ball. In our *Math Bowling* game, the object of the game is to cross out or ‘knock down’ all the pins with one ball, which is three rolls of the die. Each time you write an equation that yields one of the numbers on a pin, you get to cross off or ‘knock down’ that pin. So you want to create equations that give as many different answers from one to ten as possible. Let’s try playing *Math Bowling* and see what happens.”

Edward had a student roll a die three times. The numbers 2, 3, and 1 were rolled. “One equation I can write is twenty-one divided by three equals seven,” Edward told the class. “So I’ll be able to cross off the seven shortly since I’ve ‘knocked it down.’ I could also write one times three squared equals nine and then cross off the nine when it’s time.”

“Oh, I get it,” several students exclaimed and excitedly began writing.

“You can add three plus two plus one and get six. Cross it off!” shouted one student.

“Not so fast,” replied Edward with a laugh, pleased by his students’ enthusiasm. “Everyone has five minutes to record calculations, and then we’ll see how we did as a class. Ready? Go.” He set his timer and students quickly got to work. Some used mental math to generate equations, some scrawled equations on a sheet of paper, and many used a calculator. After five minutes were up, Edward called time. “Let’s see how we did.” He reached into a can containing Popsicle sticks marked with individual students’ names, his method of ensuring that students were called on equitably. The student whose name was drawn offered the equation  $12 - 3 = 9$ . Edward had the student record the equation on the board and cross out the 9 pin on the overhead transparency.

Then he drew another name. That student said, “Three times (two minus one) equals three.” She recorded the number sentence on the board and crossed off the 3.

“Can I use the example we did earlier? Twenty-one divided by three equals seven?” queried another student.

“Sure,” Edward replied and had the student cross off the 7 pin on the overhead and write the equation on the board. The next student offered  $3^2 - 2^2 + 1 - 1 = 5$  and crossed off the 5 pin.

“How about two times (three plus one) equals eight?” asked another student. Play continued until all the pins were crossed off.

“That’s called a strike,” Edward explained. “If we hadn’t knocked down all the pins, we would have rolled a second ‘ball,’ called a ‘spare,’ and tried again.” He went on to explain how bowling is scored and how they would keep track of their progress as a class. He then led the class in a discussion of how the game helped them with their computational skills including practicing their basic facts. He had them identify all the concepts they used in their equations, including exponents, integers, the distributive property, order of operations, brackets and parentheses, and more. Finally they discussed when paper and pencil, mental math, or a calculator was most appropriate. “That was way more fun than just doing worksheets!” exclaimed one student on her way out of class that day.