Arrays, Composite Numbers, Square Numbers, and Primes

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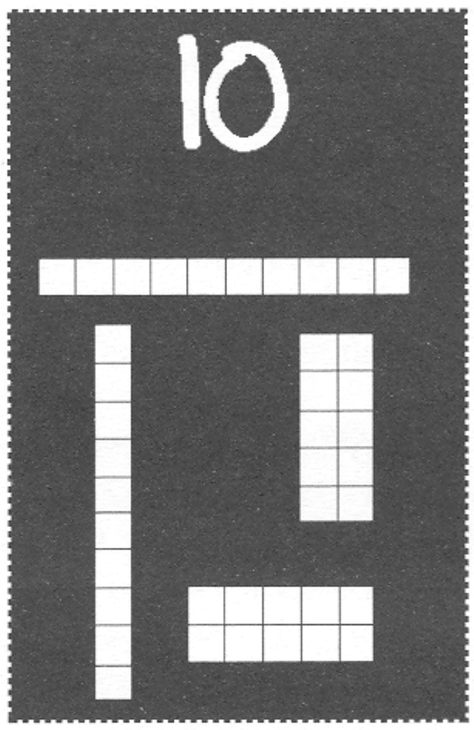
I teach at Red Creek Central School District, a rural district located at the northeastern end of Wayne County, one of the poorest counties in the state of New York.The district has about 1300 students. This unit was presented to a heterogeneous 5th-grade inclusion class of 24 students, seated in cooperative groups of four.

On the first day of this unit each student received one or two 12×18 pieces of black construction paper and centimeter graph paper. Each piece of black paper had one numeral (ranging from 1 to 30) written on the top with chalk. The construction paper was handed out randomly, but if a student received a low number, then I would try to give him/her another number so everyone would finish about the same time.



The task was to outline rectangular arrays on the centimeter paper which contained the number of squares shown on their black paper. They were to make as many as they could, then cut out the rectangles, glue them on the black paper, and label the dimensions of the rectangles. The papers were then hung around the room in numerical order, and the students discussed in their groups what they noticed about the numbers.

We regrouped and discussed their observations as a class. Students noticed that: some numbers (2, 3, 5, 7, 11, 13, 17, 19, 23, and 29) had two rectangles, but all the others had more. 24 had a lot of rectangles; some numbers (1, 4, 9, 16, and 25) had an odd number of rectangles, and they were the same numbers that had squares under them!

On the second day of this unit each student received 25 color tiles. They repeated the previous day's activity, using blocks instead of centimeter paper, but this time instead of finding all rectangles for a single number, they were to find all rectangles for each of the numbers from 1 to 25, recording their findings on a chart.

The third day was for discussion of the previous two days' work. This discussion got very lively; in fact, it already became lively by the time we got to the number 1. They could accept that 1 was a square number, since it fell on the diagonal on the multiplication table with the other square numbers. No problem. The problem arose when we discussed whether 1 was *prime* or not. This took two class meetings to discuss! The verdict was that 1 is square, but not prime. (In fact, this is how mathematicians classify the number 1.)

I found that this unit helped students understand that square numbers are special composite numbers, that prime numbers form exactly two rectangles, and that 1 is a square number, but not prime. Putting the black construction papers with the rectangles on them around the room is, visually, a very powerful activity. Numbers and their rectangles jump right out at the students.

Discussion is the most important part of this unit. Students need to have the opportunity for math talk with each other, as well as with the teacher. They need to make their own conjectures and listen to others' conjectures, then modify or continue with their conjecture. This unit gave them the opportunity to do all of that.

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For information, call Bonnie Katz, 732-445-4065, email her at bonnie@dimacs.rutgers.edu, download the materials from http://dimacs.rutgers.edu/lp/crash-course/, or write to: Leadership Program, P.O. Box 10867, New Brunswick, NJ 08906.