Figuring Areas

A Lesson for Fifth Graders

by Marilyn Burns

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While browsing through About Teaching Mathematics *recently, I came upon an activity, Area and Perimeter, that had once been one of my favorites but that I hadn't taught in quite some time. I decided to use it with fifth graders in a different way than suggested in the book and have described below what I did. The students had already completed three other activities from* About Teaching Mathematics — Foot Area and Perimeter, Squaring Up*, and* The Perimeter Stays the Same.

I chose the activity because I felt that the students needed more experience with finding the areas of shapes. To prepare for the lesson, I duplicated for each pair of students the shapes for the activity and a sheet of inch-squared paper. I used yellow paper for the shapes so that there would be contrast when they pasted them on white paper. Also, I made an overhead transparency of each of the sheets I distributed.

To begin, I projected an overhead transparency of the inch-squared paper, which was a 9-by-7 grid. We first talked about the area of the grid. From their study of multiplication, the students knew to multiply 7 by 9 to get the area of 63 square inches. I showed them three options for recording this area: 63 sq in, 63 sq", and 63 in^2. (When the students later worked on finding the areas of shapes, I nagged them regularly to identify the units and record them in one of these ways.)

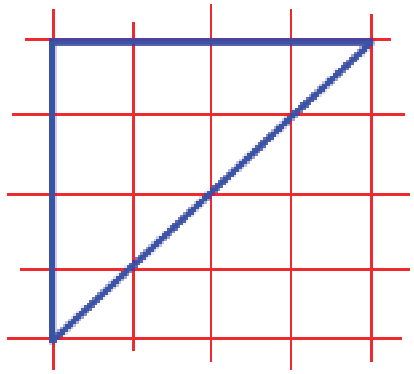
I next placed a 5-by-8-inch index card on the grid, positioning it carefully so its sides were on lines and it covered 40 of the squares completely. I asked, "What is the area of the index card?" Some students multiplied 5 by 8 to get the area of 40 sq in. Others counted to find that 23 squares on the grid weren't covered and then subtracted 23 from 63.

I removed the 5-by-8-inch index card, folded it in half the short way, and cut on the fold. I placed one half on the overhead grid. All of the students knew its area was 20 square units, some figuring that 20 was half of 40 and others multiplying 4 by 5.

I then trimmed the 4-by-5-inch card so it was a 4-by-4-inch square. It was easy for the students to figure out that its area was 16 square inches. Next I cut the square in half on the diagonal, making two triangles. I placed one of them on the grid. Some students knew immediately that its area had to be 8 square inches. "It's half of sixteen, so it has to be eight," Michael said.

Others weren't sure. "Some of the squares are only halves," Alicia said.

Tracing the triangle on the squared paper and then removing it helped the students see that it was, indeed, 8 square inches.



Janie explained, "There are six whole squares. Then two halves make a whole and two more halves make a whole. So it's eight squares altogether."

I then projected a transparency of the shapes the students were going to explore. I explained what they were to do, also writing the directions on the board:

1. Figure out the area of all the shapes and label them.

2. Cut out the shapes, order them from least area to greatest area, and glue them onto the 12-by-18-inch white paper.

3. Write about what you notice, what you learned, any questions you have, and any confusion you encountered.

Students worked in pairs and I circulated, giving help as needed. I suggested to some students that they place a shape on the inch-squared paper and count the squares it covered. (I assured Sam that this wasn't "cheating.") I talked with some about how the triangles were half of rectangles and pointed out that it was easier to figure the area of rectangles. I suggested to others who were having difficulty to orient shapes on the grid in different ways to make the problem easier. The parallelograms were the most difficult for the students, and I gave suggestions about drawing a diagonal to divide them into two triangles. We had a double period for math (an hour and a half), so there was time for all of the students to finish, although some didn't get a chance to write as much as others. If the class had been a regular-length period, I would have collected their work and returned it to them to complete the next day.

About twenty minutes before the end of class, I gave a five-minute warning. Then I called the students together to discuss what they had learned. Kiko reported that she and Carlos used the small pieces to figure out the areas of the larger ones. "We especially used the one-inch square and the triangle that was one-half of a square inch," she explained.

Nicholas explained what he learned. "I didn't know that you could cut a parallelogram in half and get two triangles the same size. That was cool."

Tamika explained the difficulty that she and Jason had encountered. She said, "First we thought that the big triangle was nine square inches, but then we turned it a different way on the squared paper and realized that it was eight inches." Rotating the triangle made it possible for them to figure out how many squares it covered.

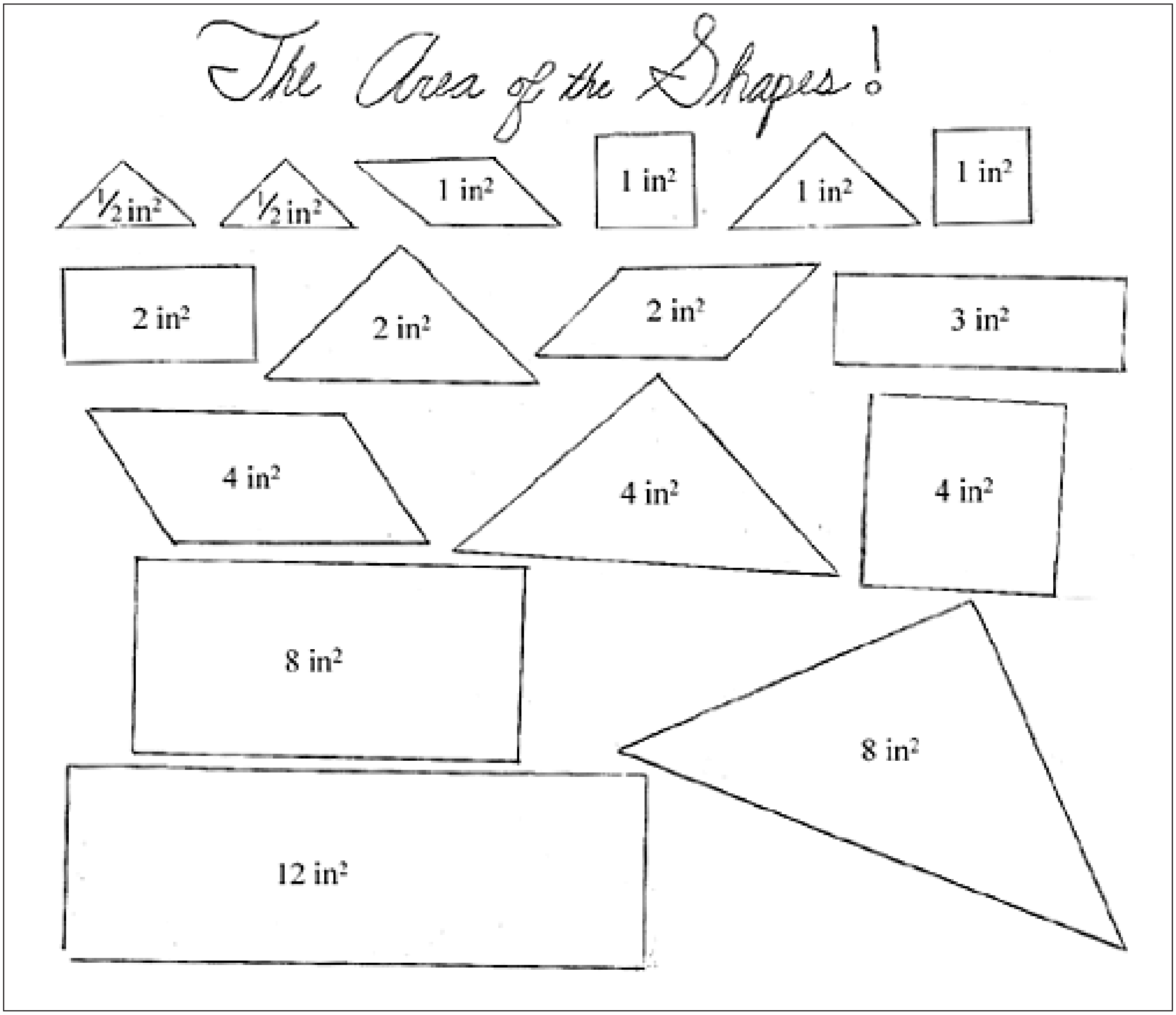
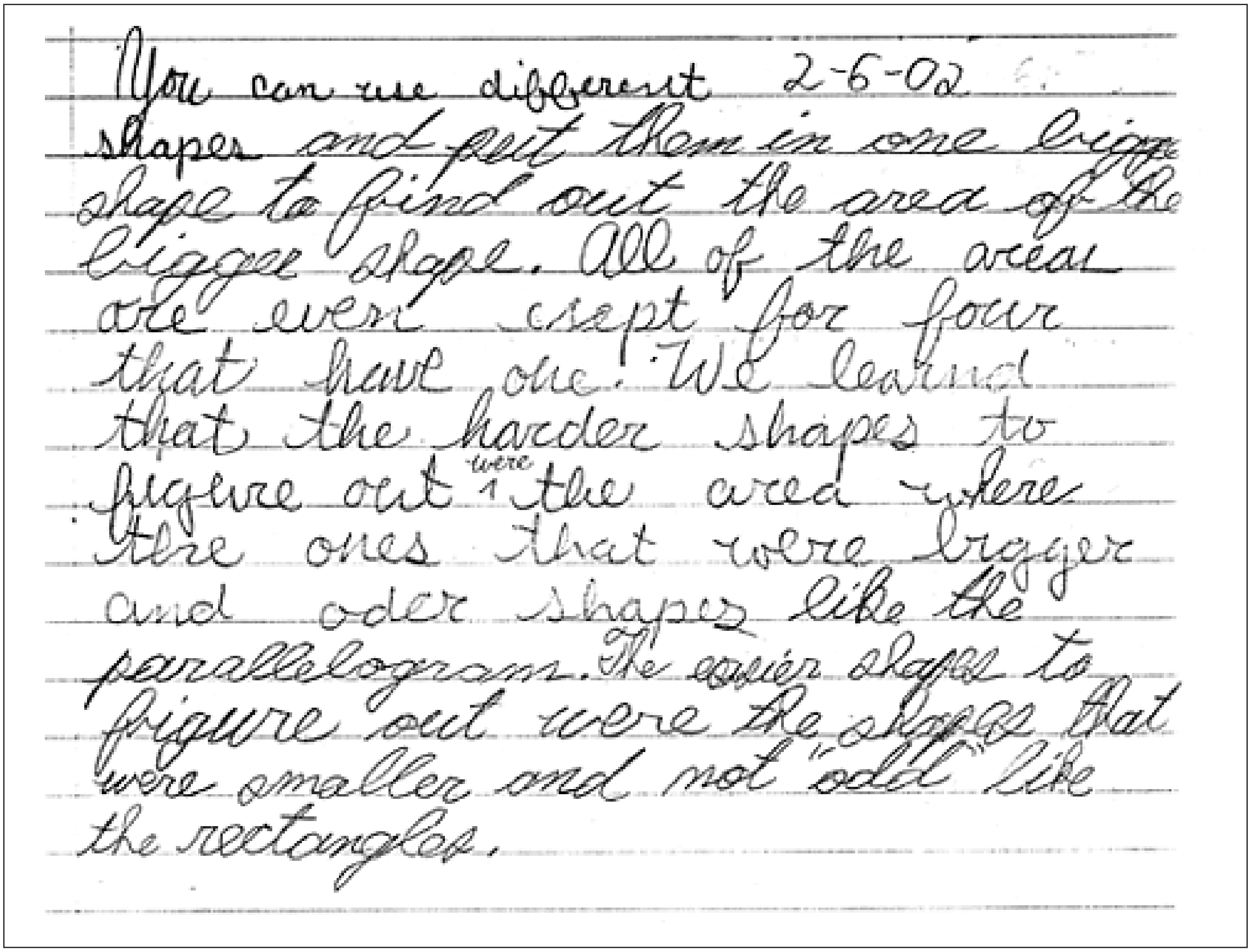


Figure 1. Andrew and Hiroshi arranged their shapes from least area to greatest, as instructed.



You can use different 2-6-02
shapes and put them in one bigge
shape to find out the area of the
bigger shape. All of the areas
are even exept for four
that have one! We learnd
that the harder shapes to
figure out were the area where
the ones that were bigger
and oder shapes like the
parallelogram. The easier shapes to
figure out were the shapes that
were smaller and not "odd" like
the rectangles.

Figure 2. Roberto and Laura shared the writing of their discoveries.

- Half of a parrallagram is always a triangle – two triangles are in a parrallagram.
- Once you find out the square inches of shapes, you can use them to help you find the area of other Shapes
- Squares are easyer to figure out than triangles
- The most comen shapes that help you to figer out other shapes area's are: the 4sq.in. square and the 1sq in square.
- The hardest one was the 1sq in. Pollygon.
- The easyest one was the one square inch
- We never new you didn't have to put a period after sq and in

Figure 3. In their fifth statement, Maria and Lizzie were referring to the small parallelogram, not a polygon, as they noted.