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Everybody Wins!

A Lesson for Third Graders

by Maryann Wickett and Marilyn Burns

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This excerpt is from the introductory lesson in Maryann Wickett, Susan Ohanian, and Marilyn Burns's book, Teaching Arithmetic: Lessons for Introducing Division, Grades 3–4 *(Math Solutions Publications, 2002). This book is a revision of the popular* Math By All Means unit Division, Grades 3–4, *and this lesson is one of the new additions. The context for the lesson is Sheila Bruce's book* Everybody Wins! *(Kane Press, 2001), in which Oscar, Emmy, Hugo, and Tony figure how to share pizzas, baseball tickets, bubble gum, and more. The lesson gives students experience with the sharing, or partitioning, model of division.*

I showed the class the book *Everybody Wins!* "It's a story that includes some division problems," I said.

I began to read the story, stopping near the top of page 7. "The prize is one hundred pizzas. If Emmy and Oscar divide them, how many will each get?" I asked. Hands flew into the air. "Tell me in a whisper voice," I said.

"Fifty!" the class said.

"Who would like to explain why the answer is fifty?" I asked.

Kylie said, "I know that fifty plus fifty is one hundred. And adding two fifties is like multiplying fifty by two."

I wrote on the board:

$50 + 50 = 100$

$50 \times 2 = 100$

Mark said, "I thought of money. One hundred pennies equals one dollar. If you divide one dollar in half, it's fifty cents."

I recorded Mark's idea on the board:

100 pennies = $1.00

$1.00 ÷ in half = $.50

$\$1.00 \div 2 = \$.50$

I explained, "Mark said to divide the dollar in half. Dividing in half is like dividing by two. That's why I wrote the last line of Mark's thinking with 'divided by two.'" Then I showed the

class three ways to record a division problem like this. I wrote on the board, using the context of the lesson to introduce new notation:

$\$100 \div 2 = 50$

$\frac{100}{2} = 50$

$2\overline{)100}\ 50$

"All three are ways to show how to record dividing one hundred pizzas between two people," I explained. Third graders typically first learn the first representation, but I think it's useful for them to begin to see the three representations as interchangeable. The next problem from the book for students to solve involves twenty-four bags of marshmallows. Oscar and Emmy decide to share the twenty-four bags between themselves, then change their minds and decide to share them with their classmates. There are twenty-four students, including Oscar and Emmy. Four students don't show up, which means they have to share twenty-four bags among twenty people, resulting in four bags left over, or a remainder of four.

Maya raised her hand. She said, "I get why twenty-four people would get one bag of marshmallows if there were twenty-four bags, but I don't get the leftovers."

I counted out twenty-four cubes and said, "Suppose each cube is a bag of marshmallows." I spread the cubes along the chalkboard tray, putting them into twenty piles of one. I said, "There are twenty bags of marshmallows, one for each of twenty people. I still have four bags left. Do I have enough bags to give every person another bag?" The students shook their heads. I continued, "That means there is one bag per person with four left over, or remainder four."

"But you could open them and split up the marshmallows inside," Tony insisted.

"That's possible," I said, "but the story leads us to believe that the bags weren't opened."

"So the R my sister uses means 'remainder'?" Becky asked. I nodded.

I recorded on the board:

$24 \div 20 = 1\ R4$

I nodded and continued solving the other problems in the book with the class.

Introducing an Activity

I then asked, "What are some things you'd like to win twelve of that you could share with others?"

After hearing several suggestions, I chose ice cream cones to use as an example to show the students how to do the assignment. I wrote on the board:

12 Ice Cream Cones.

"If I won twelve ice cream cones, among how many people could I share them equally so there wouldn't be any leftovers?" I asked.

Kylie explained, "You could keep them all to yourself!"

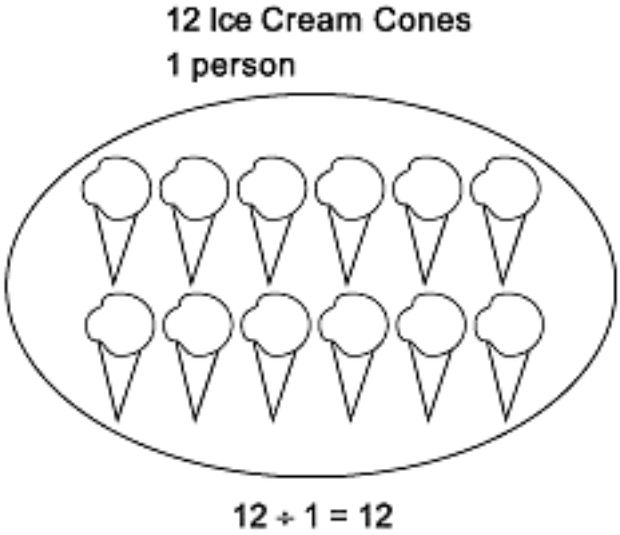
"How would I write a division sentence to show your idea?" I asked.

Kylie came up and wrote on the board:

$1\overline{)12}$

The students nodded.

"If I kept them all to myself, how many would I get?" I asked.



"Twelve," the students chorused.

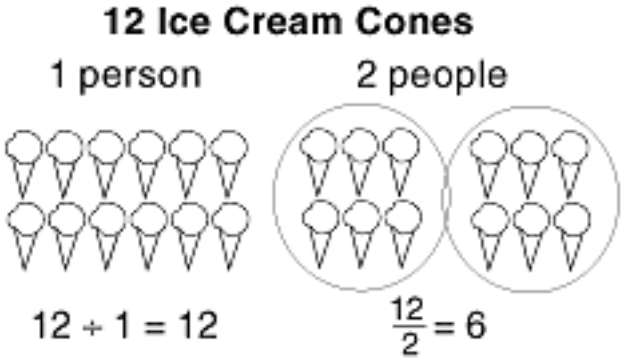
I said as I drew on the board, "Here's how I can record on my paper."

"What if I wanted to divide my twelve ice cream cones between two people?" I asked. "Show me with your fingers how many ice cream cones two people will get if I share twelve cones between them," I said. Most students put up six fingers.

"How could I show this on the board?" I asked.

Corinne explained, "Draw twelve ice cream cones and then circle one group of six and then circle the other six." I did as Corinne suggested.

"What division sentence could I write?" I asked.



Mark volunteered, "Write it like a fraction. Put the twelve on top and the two on the bottom and then make an equals sign and write six." I followed Mark's directions.

I continued, "What are some other ways I can divide twelve ice cream cones into equal groups with no remainders?"

As the students listed the numbers, I recorded them on the board:

Ways to Divide 12

$12 \div 1 = 12$

$12 \div 2 = 6$

$12 \div 3 = 4$

$12 \div 4 = 3$

$12 \div 6 = 2$

$12 \div 12 = 1$

I said, "I notice five isn't on the list. How come?"

Jamison explained, "You could divide by five, but you'd have leftovers and you said to use numbers that won't make leftovers."

"Are there other numbers that would result in leftovers, like five?" I asked.

"You can't use seven," Hannah said. "It would be one ice cream cone for seven people with five left."

I returned to explaining the activity. "You need to choose a prize — something you won twelve of. Then show all the ways you can share your twelve prizes equally with no leftovers. Show your work and record the division for each."

I wrote on the board:

1. Decide on a prize. Remember there will be twelve of them to share.

2. Show all the ways to share your twelve prizes equally with no leftovers.

3. On your paper, show how you divided and record the division for each way.

The students worked quietly. Maya chose twelve pens as her prize; Becky chose lunch boxes; Tony chose eggs.

When the students were finished, they shared their work.

Clare had drawn twelve tickets on her paper and pointed out each of the ways she had divided the twelve tickets. She explained, "I didn't draw on my paper to show all the groups because I thought it would be too messy and confusing. So I just explained how I did it" (see Figure 1).

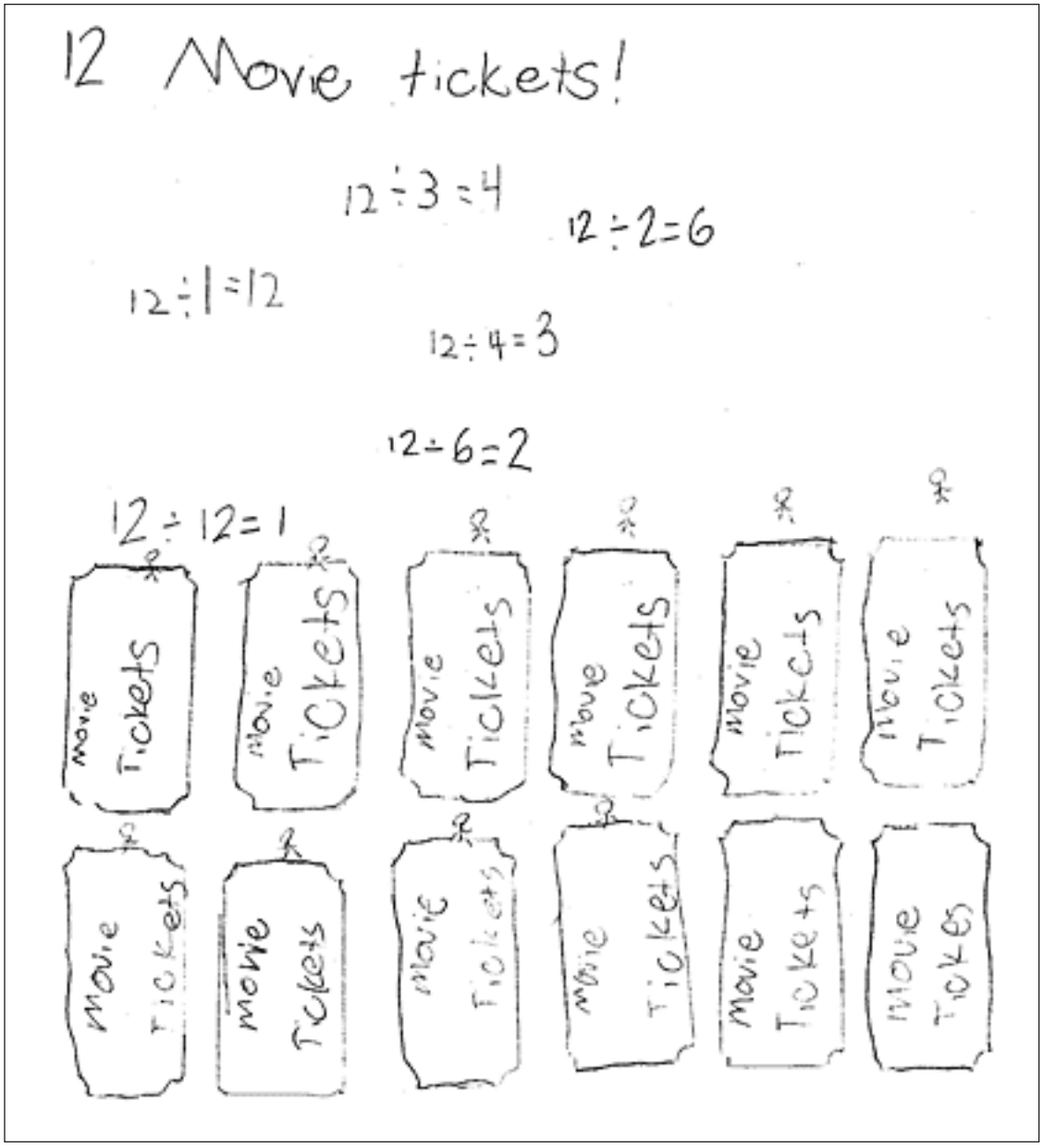


Figure 1. Clare used her picture and a verbal explanation to show her understanding.

Maya explained next, "I started with pens as my prize. I did twelve pens divided by twelve people is one pen each. Then I did twelve pens divided by two people and got six pens each. I checked it with multiplication by doing six times two is twelve. Then I did repeated addition. Six plus six is twelve. And then I wrote a division sentence. It was 'Twelve divided by two is six.' I got bored with pens, so I switched to marshmallows and cookies" (see Figure 2).

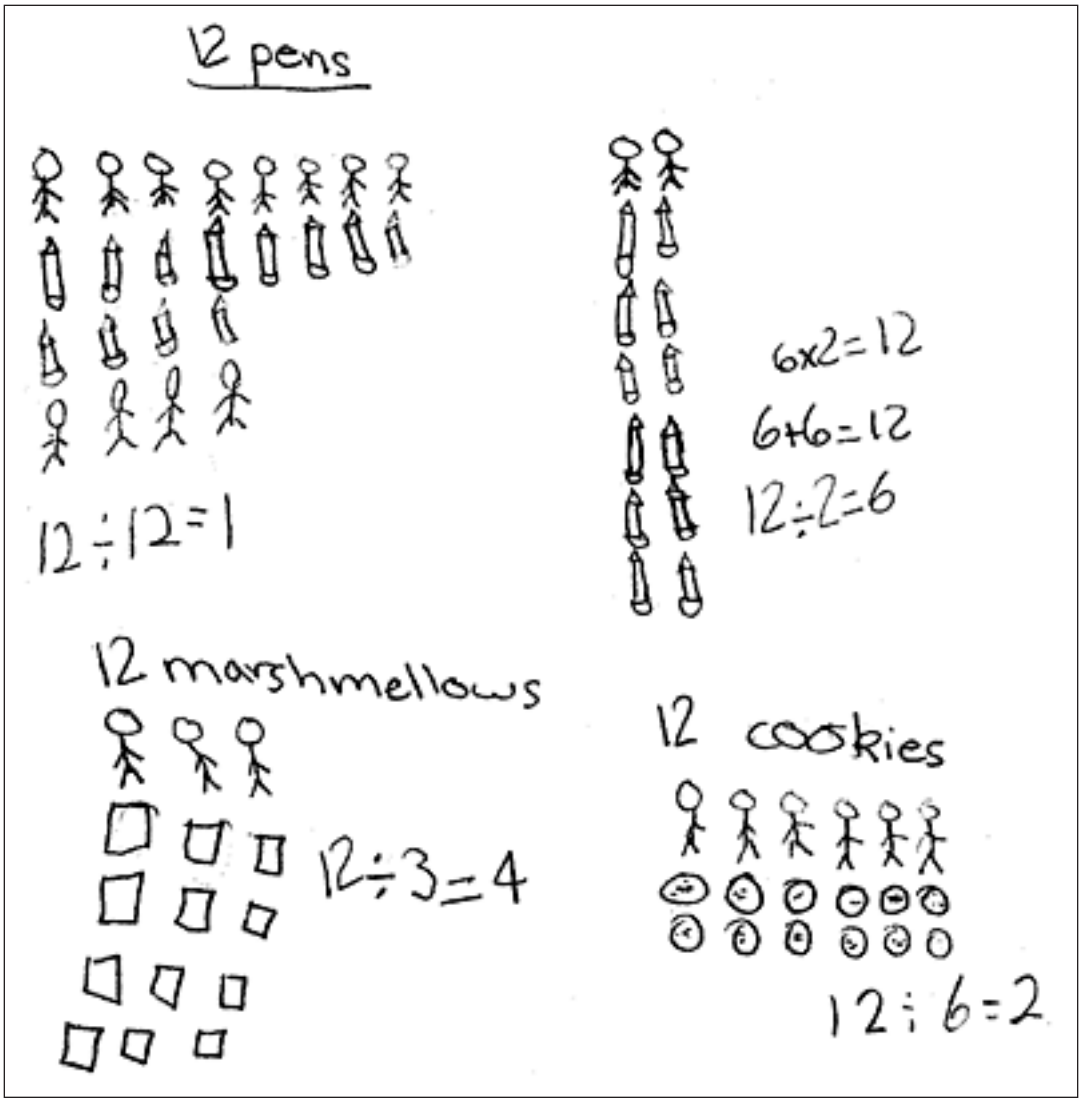


Figure 2. Maya switched from pens to marshmallows and cookies to show her understanding.

All who wanted to do so shared their work. Then I collected their papers and posted them on the wall for everyone to admire. I repeated the activity again throughout the year so students could investigate ways to divide other numbers without having remainders.