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Exploring Ones, Tens, and Hundreds with Base Ten Blocks

A Lesson for Third Graders

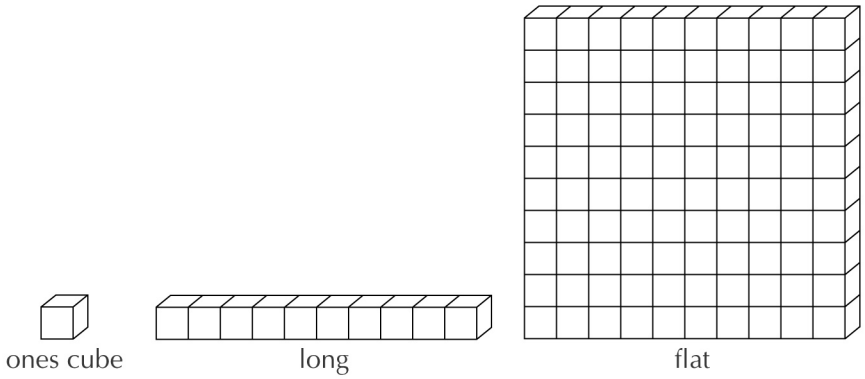
by Maryann Wickett and Marilyn Burns

From Online Newsletter Issue Number 19, Fall 2005

In this lesson, excerpted from Maryann Wickett and Marilyn Burns's new book, Teaching Arithmetic: Lessons for Extending Place Value, Grade 3 *(Math Solutions Publications, 2005), children use base ten blocks to cement their understanding of how ones, tens, and hundreds relate to our number system.*

Before class, I gathered the base ten blocks and enough baskets so there was one basket for each group of four children. In each basket I placed about one hundred ones cubes, about forty-five longs, and five or six flats. I then arranged the baskets on the students' tables.

To begin the lesson, I held up a basket of base ten blocks and said, "Raise a hand if you've used blocks like these before." Half of the students raised their hands. I then held up each type of block and named it for the students, using names that related to the shapes—ones cube, *long,* and *flat.* On the board, I drew a sketch of each and wrote the name underneath.



I asked the students to explore the blocks and figure out the relationships among them. After five minutes, I asked for their attention.

I asked, "What did you notice about the relationships among the blocks?"

"I noticed that it takes ten little cubes to make a long one," Jared said.

I responded, "Raise a hand if you also discovered what Jared shared." Everyone raised a hand.

Olina added, "It takes ten longs to make the flat block." Again I asked who else had discovered Olina's idea, and again everyone raised a hand.

Kassidee said, "You could also make the flat with one hundred little cubes." Most students raised their hands to show that they agreed.

Isaac then said, "The little cubes are like ones and the longs are like tens!"

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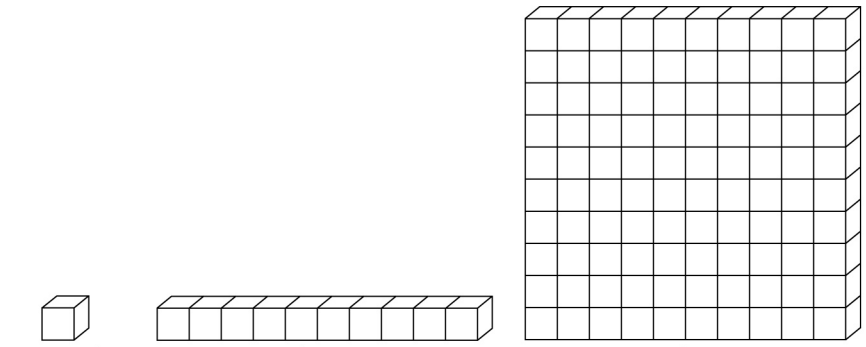
I said, "Yes, we can also call the ones cube a one, the long a ten, and the flat a hundred." I added these labels to what I had already written on the board and used them interchangeably with the others for the rest of the lesson.



I then placed one flat on the overhead projector and asked, "How much is this worth?"

"One hundred," the children chorused.

"What about this?" I asked. I removed the flat and replaced it with ten longs.

"One hundred," the children chorused.

"Let's count them by tens to be sure," I said. Together we counted as I pointed to each, "Ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred." Then I arranged the longs so that they looked like a flat to reinforce visually the equivalence of ten tens and one hundred.

Next I counted out nine longs and then ten ones cubes. I asked, "How much are these worth altogether?"

"One hundred," the students responded.

"Who would like to explain?" I asked.

Adama said, "I counted the longs and I got to ninety. Then I counted on the ones—ninety-one, ninety-two, like that—and I got to one hundred."

Jessie added, "The longs are ninety altogether, and the little cubes are ten, so ninety plus ten more is one hundred exactly."

Tina said, "You can push them together and then you can see that it's one hundred." I did this, arranging the nine longs and ten ones cubes into the shape of a flat.

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I cleared the projector, put up one long, and asked, "How many little cubes would I need to add to show one hundred?" The students were clear that I would need ninety ones cubes.

I then put eleven longs and two ones cubes on the projector and asked, "How much is this worth altogether?"

Adama said, "You have eleven longs, so that's one hundred ten, and two ones cubes, so that's one hundred twelve altogether." I wrote on the board:

11 tens and 2 ones is 112.

I asked, "Did anyone have another way of figuring out that these blocks together are worth one hundred twelve?"

Tina explained, "Ten longs can make a flat, so you can push them together to make a flat, or you can take them away and put a flat instead. That's one hundred. Then the one long that's left makes one hundred ten. Then add on the two ones, and that's one hundred twelve." I did as Tina instructed, carefully counting and pushing together ten of the longs on the projector. I laid a flat on top of them to show that they were equivalent amounts and then removed the ten longs, leaving the flat in their place. There were a few looks of surprise along with a few comments, such as "There can either be eleven tens or one hundred and one ten!" I wasn't surprised by these comments. Many students leave second grade able to identify the ones, tens, and hundreds places but not understanding the meaning of the digits in those places. I wrote on the board, adding this idea to what I had already recorded:

11 tens and 2 ones is 112.

1 hundred and 1 ten and 2 ones is 112.

Tanya said, "You could make one hundred twelve with one hundred and twelve ones cubes!"

I added to what I had recorded on the board, this time shifting to using an equals sign instead of the word *is.*

11 tens and 2 ones is 112.

1 hundred and 1 ten and 2 ones is 112.

112 ones = 112

I wrote 72 on the overhead and said, "You and a partner will be exploring different ways to show seventy-two using the tens and ones blocks. But first I'll show you how to record your ideas on paper." I placed seven longs and two ones cubes on the overhead projector. I pointed to the blocks and asked, "How much are these blocks worth?"

"Seventy-two," they chorused.

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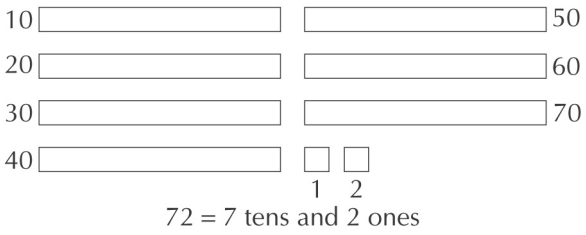
On the board, I modeled for the children how to record this way of representing seventy-two.



72 = 7 tens and 2 ones

"You and your partner are to build seventy-two with other combinations of the tens and ones blocks, the way we built one hundred in different ways. Record each way you find as I did for the example I showed."

I continued, "You'll work with your partner, but each of you will record on your own piece of paper. You'll have to share blocks with the other people at your table because there may not be enough for everyone to have his or her own. Write *Seventy-Two* as the title, and copy onto your paper the way we made seventy-two together. Record your ideas using a picture and with numbers."

The exploration was accessible to all of the students but was more difficult for Karena. I gave her individual help while the others worked. I started by giving Karena smaller numbers to think about. We explored different ways to make twenty, then twenty-three, and finally thirty-four. By the time we finished working on thirty-four, she wanted to work on seventy-two without my help.

Arin, another student who often had difficulty, was thrilled with her work. She found three ways to make seventy-two using the base ten blocks. (See Figure 1.)

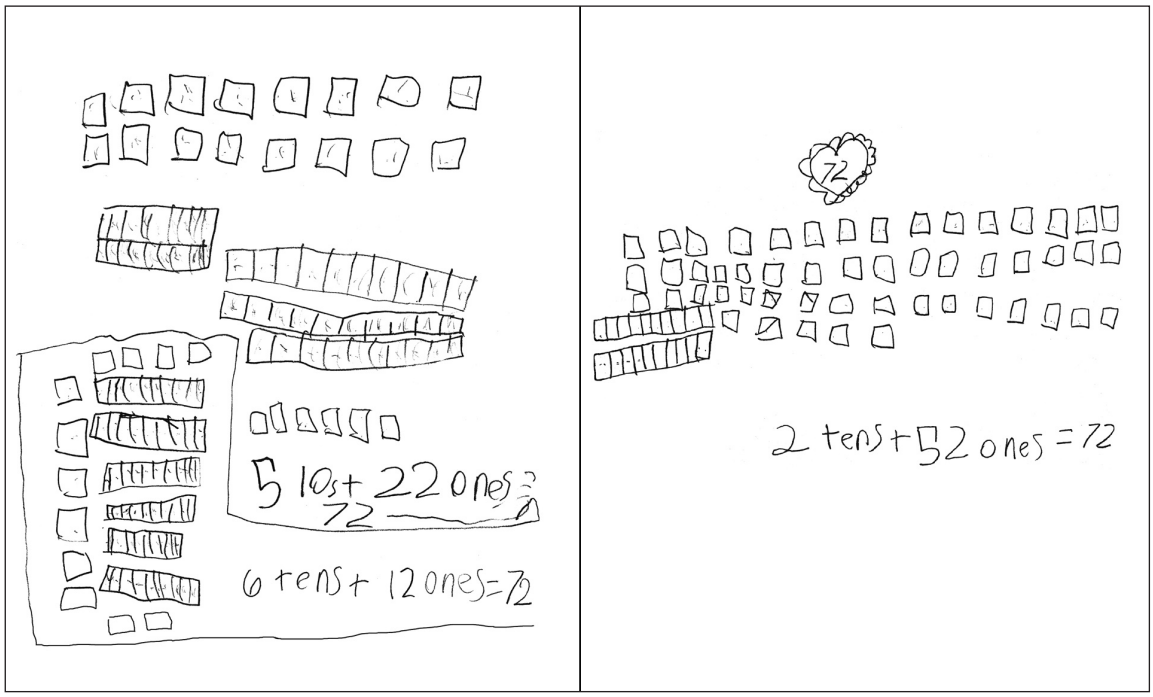


Figure 1. Arin showed her growing understanding by making seventy-two in three ways.

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As the students finished, I looked over their papers, asked for further clarification when needed, and then gave them the challenge of finding as many ways as possible to make 124 using base ten blocks.

Vinay's work reflected how he systematically explored the possibilities by reducing the number of tens by one and increasing the number of ones by ten. He recognized that when he got to thirty-four ones and nine tens, he could no longer use a hundreds flat. (See Figure 2.)

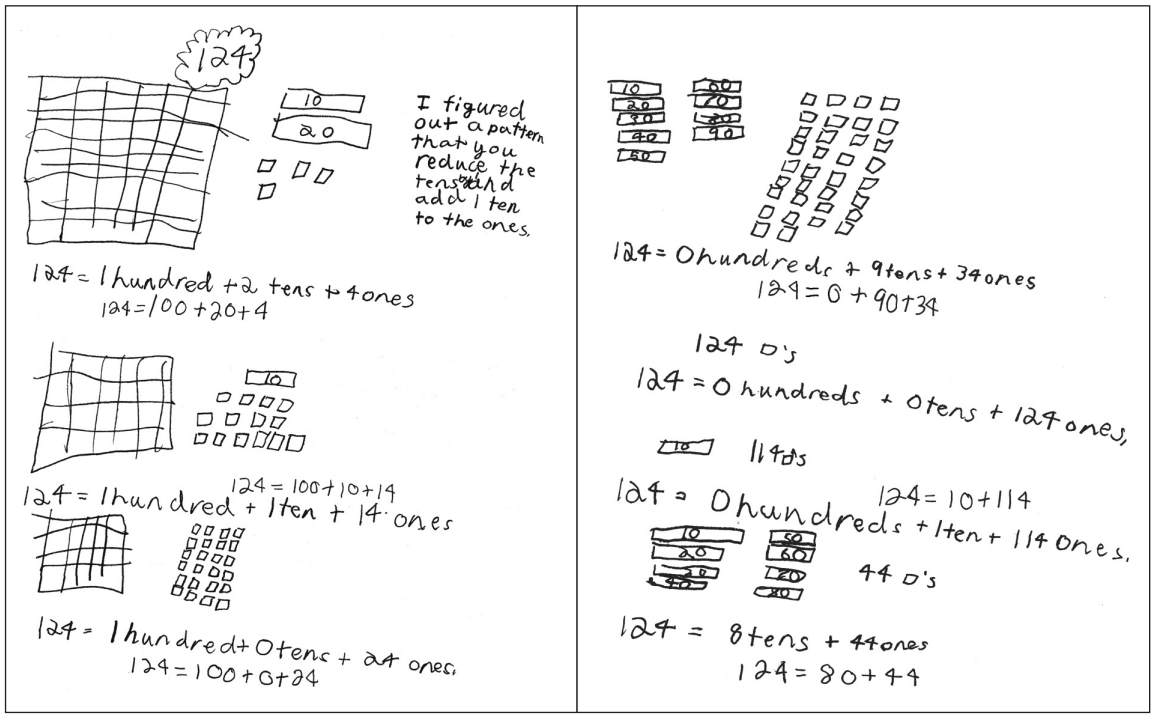

Figure 2. Vinay applied the pattern he noticed earlier to the more challenging problem of making 124. He also used expanded notation to represent his words and pictures.

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