

Celebrating 100 with Number Sense

Joe woke me up. “Mom,” he said, “it’s today!” “Today, what?” I managed to mumble. “The hundredth day of school, Mom; it is so special. I want to dress up to go to school and be real nice for our party,” he added. And so he did.

Joe’s kindergarten teacher invited me to conduct a mathematics lesson on the 100th day of school. (Joe is my son; the names of all other children in this article are pseudonyms.) As an elementary mathematics educator, I immediately asked myself what I would like kindergartners to know about the number 100. “I will be glad to come and help children explore the number 100,” I replied. I then proposed, “How about working with different combinations that make 100?” This concept became our plan. In this article, I describe two activities I used to help these kindergartners cele-

brate the 100th day of school: the 100-straw necklace and the 100 puzzle.

Getting Ready

When planning for this lesson, my goal was to give children opportunities to develop number sense. Howden (1989) defines number sense as “a good intuition about numbers and their relationships” (p. 11). As *Principles and Standards for School Mathematics* (NCTM 2000) explains, number sense is “the ability to decompose numbers naturally, use particular numbers like 100 or $\frac{1}{2}$ as referents, use the relationships among arithmetic operations to solve problems, understand the base-ten number system, estimate, make sense of numbers, and recognize the relative and absolute magnitude of numbers” (p. 32). Number sense develops gradually as children explore numbers and relate them in different ways. It requires flexibility in using and thinking about numbers; therefore, “during the early years teachers must help

Paola Sztajn



Paola Sztajn, psztajn@coe.uga.edu, is a mathematics educator at the University of Georgia in Athens. She works with in-service and preservice elementary school teachers.

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students strengthen their sense of number, moving from the initial development of basic counting techniques to more sophisticated understandings of the size of numbers, number relationships, patterns, operations, and place value” (p. 79).

I knew that children in this class could count by ones to 100 because I heard Joe counting this way many times. They also could count by tens to 100, and a few students had started to practice counting by fives to 100. The activities I prepared for the lesson on the 100th day of school were directed toward grouping numbers to make 100 and discussing these groups. Children should explore the idea that when we count by tens to 100, we are putting groups of ten together to make 100. We also can group other numbers to make 100. Thus, my overall objective was to help children see that in addition to putting together 100 ones, we could find other ways to make 100.

Because kindergarten children count at different levels, I had varying objectives for different learners. I expected some children in the classroom to understand the idea of grouping and counting groups because they had started to count by tens and could extend the idea of counting by making groups of ten and counting these groups. These children were beginning to use groups and singles to count, and I wanted them to explore various groups that make 100.

I also expected that some children in this kindergarten class could count only by ones. My goal was to prompt these children to think about the possibility of grouping numbers to get to 100 and to develop the understanding that when we count by tens to 100, we are not only counting by rote but also using groups of ten to make 100. Children who could count only by ones would benefit from this lesson in a number of ways, including practicing counting, experiencing 100 in different ways, beginning to group numbers, and discussing with their peers which numbers can be grouped to make 100.

Although the expectation that all children would end the class counting groups or understanding that we can make 100 with different groups would be unreasonable, I believed that they could all increase their awareness of the magnitude of 100 and begin to ponder what goes into the “making” of 100. My job during this special day was to figure out how each child currently thought about 100 and help her or him move toward the next level of understanding.

The Whole-Class Opening

Reading the book *I Can Count to 100 . . . Can You?* (Howard 1979) at the beginning of the lesson was my way of finding out about children’s counting

skills and whether they could count properly—an activity I found necessary because I was not the children’s regular teacher. I had the twenty-four students sit on the floor near me, and in about five minutes, I heard them count without difficulty from 1 to 10 and from 10 to 20. Children pointed to the drawings in the book as they counted, indicating their proficiency in counting. I also heard many count by tens to 100, which made me confident that the activities I had prepared were appropriate for most children in this classroom.

We began exploring the number 100 by making necklaces with 100 “beads” (Thomas 2000). For our necklaces, however, we used pieces of straws. To save time and keep costs low, Joe’s teacher had suggested that I cut straws of five different colors, blue, green, pink, purple, and white, into 0.5-centimeter lengths in preparation for the activity. I gave each child a plastic bag with twenty straw pieces from each color, a piece of yarn, and a paper plate. The yarn had been prepared with a knot on one end that was big enough to hold the straws and dried glue on the other end to help the children string the pieces. “The plates,” I told the children, “are your working spaces. Make sure you keep your straws on your plate and do not lose any piece as you make your 100-straw necklace.”

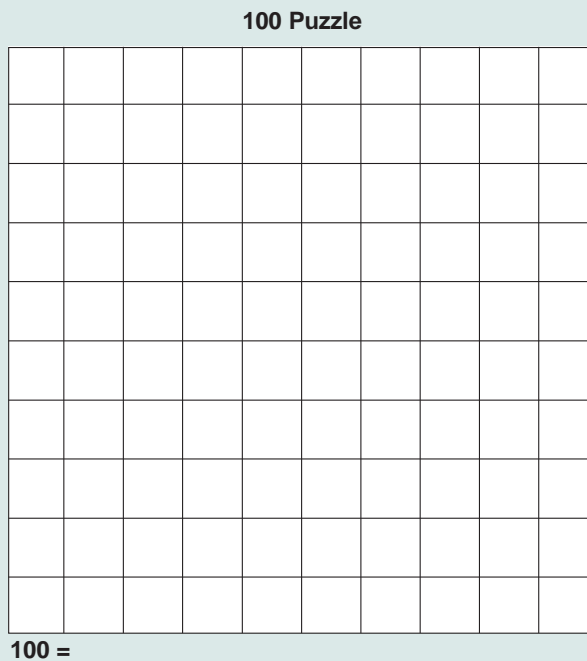
With this activity, I wanted children to experience the amount 100 by touching and counting all the straw pieces. I told the kindergartners that I tried to put 100 straw pieces in each bag; however, I could have made a mistake, and their job was to make sure that their necklaces had 100 straws. Before the children started working, we spent time talking about the straws. We noticed their sizes, shapes, and colors. We talked about 100 being “a lot” and about finding a “good, organized” way to count the straws and make the necklaces.

As children spread over the floor to work, I noticed the different approaches they used. Some were so excited about making the necklace that they did not bother counting the straws but immediately began putting the pieces through the yarn. When I asked one of these children how she was going to make sure that she had 100 pieces on her necklace, she said, “I will count the pieces after the necklace is ready. It will be easier.”

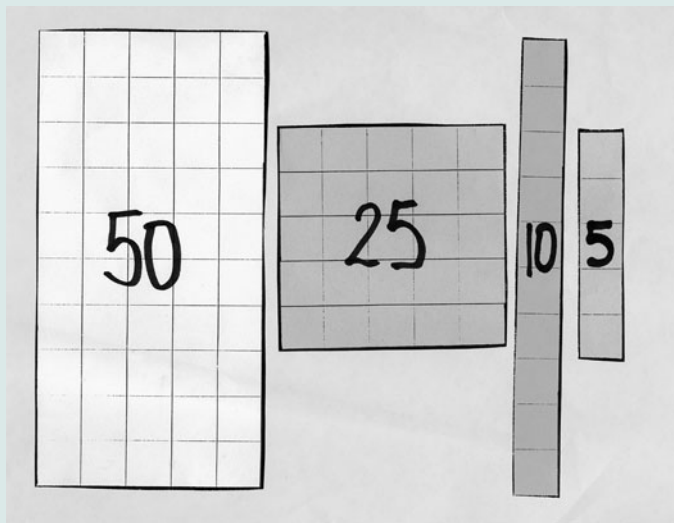
Other kindergartners were intrigued by the question of whether their bags really held 100 straws. These children poured their straws onto their plates and started to count the pieces. “One hundred is really a lot,” one girl claimed as she stared at her plate. A couple of children who were trying to count their straws by ones nodded in agreement—they had already restarted counting a few times because they got lost. A few kindergartners sorted their straws by color. After these

FIGURE 1

The children used a 10 by 10 square-inch grid (shown reduced) for the 100 puzzle.

**FIGURE 2**

Children had to use the cut-out pieces to completely cover the mat.



children had five groups, they went on to count each group by ones. Some counted each group from 1 to 20; others preferred to count the whole set from 1 to 100, using the colors to help them keep track of the groups they had already counted. Some children, prompted by their teacher, divided their groups of twenty into smaller groups of ten to count by tens to 100.

This initial activity gave me many opportunities to talk to children individually about how they organized their 100-straw necklaces. The informal

setting allowed children to follow their own approaches to the task. If children had grouped their beads in some way, I stopped to discuss their groups and how the grouping would help them count to 100. My goal of having children “experience” 100, as well as find their own organization for the activity, did not require much guidance from me.

Not all children finished their necklaces in the twenty minutes we spent on this part of our mathematics lesson. As we moved to the next activity, many children asked if they could finish their necklaces during recess; they wanted to display their work by wearing the necklaces on that special day. The 100-piece straw necklace could have been a whole lesson, allowing more time for discussion and for children to share their different approaches to counting to 100. We also could have explored the patterns children made when putting their necklaces together and addressed other kindergarten objectives that were present in the activity.

Making the straw necklace was not an easy task for kindergartners; the activity challenged different children on different levels. For some children, counting the beads was challenging. For others, putting the straws through the yarn to make a necklace was difficult. I had not anticipated that making a necklace with 100 pieces would tax the motor skills of many children to such a great extent.

Reflecting on the lesson, I think that in repeating this activity, I would have a few bags with straw pieces taped together in groups of five or ten to help those children who were having a hard time making the necklaces. With these prepared packages, children could complete their necklaces and still discuss the possibility of using groups to make 100, which was my mathematical goal for the activity.

The 100 Puzzle

Because kindergartners are just beginning to develop number concepts and to expand their counting sequence, they must explore new numerical connections through concrete and visual experiences. With this fact in mind, I created the 100 puzzle. This activity was designed to help children explore the number 100 by thinking about it in terms of other benchmark numbers, such as 5, 10, 25, and 50. My goal was to allow kindergartners to use these “important” numbers to begin developing part-whole relationships for 100.

For the puzzle mat, I used a grid of 10 by 10 square inches (see **fig. 1**). I gave each child a puzzle mat and said, “We are going to work on a puzzle, and this grid is your puzzle mat. Our goal is to cover all the squares from this grid.” We looked at the mat and discussed the reason that the activity was called a 100 puzzle. “Because it has 100 little

squares,” children were quick to notice. I showed the children one puzzle piece of each size without the size written on it. We discussed what number each piece represented and counted the squares in each piece. On the 5-piece, we wrote a 5. We did the same for the 10-, 25-, and 50-pieces. Together, we observed that the number written on each piece told us the number of squares in the piece.

Children worked in groups of eight for this activity. At the center of the table, I put a basket full of 50-, 25-, 10-, and 5-pieces with the numbers already written on them for children to use. The cutout pieces were different colors for different sizes; that is, all 50s had the same shape (5 by 10) and were white, the 25s were 5 by 5 and green, 10s were 10 by 1 and yellow, and 5s were 5 by 1 and purple (see **fig. 2**). Each piece was numbered, indicating how many squares it covered. Children had to use the cutout pieces to completely cover the mat without overlapping, missing any square, or going beyond the border. I had put enough pieces in the basket so that all children could decide to complete their puzzles using only 25s or only 10s, for example. Once children had covered their puzzle mats, they could write down the numbers they had combined to make 100.

I explained to the children that before gluing the pieces on their mats, they should make sure that the pieces they chose would all fit and would properly cover the 100 squares. I showed children how two 50-pieces covered the mat without overlapping, without missing squares, and without going over the border. I also told them that 50 and 50 made 100. “However,” I said, “I don’t want you to use two 50s to make 100. That is too easy! You need to find other combinations.”

The children worked individually on their puzzles, although they constantly shared what they were doing. One boy, Keith, immediately got one 50 and two 25s from the basket and covered his 100 square. I then asked him to “write” that he used 50 and 25 and 25 to make 100 (see **fig. 3**). When he realized that he had finished before all his friends—because his solution was “so easy,” as he explained—Keith asked whether he could do another puzzle. Children were excited to know that they could get more than one mat and find different solutions to their puzzles. For his second puzzle, Keith decided to do a “harder” one, using more pieces, so that he could work on it longer (see **fig. 4**).

Working together at a table allowed children to share results and compare puzzles as they addressed the challenge of “making 100.” These informal conversations involved a good deal of mathematics as children chose pieces of the appropriate sizes to use. Looking at Keith’s first mat, for example, the children saw that the two 25-pieces

FIGURE 3

Keith’s first puzzle

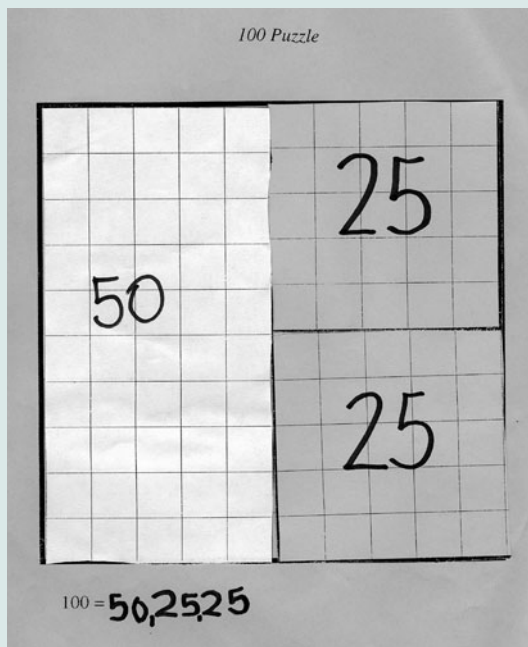
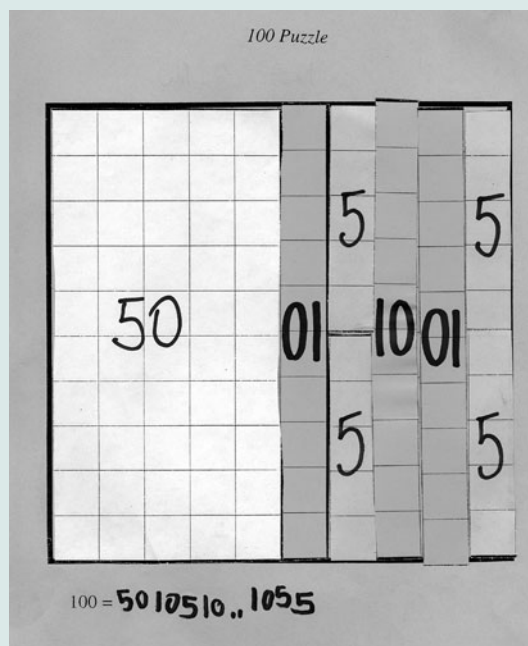


FIGURE 4

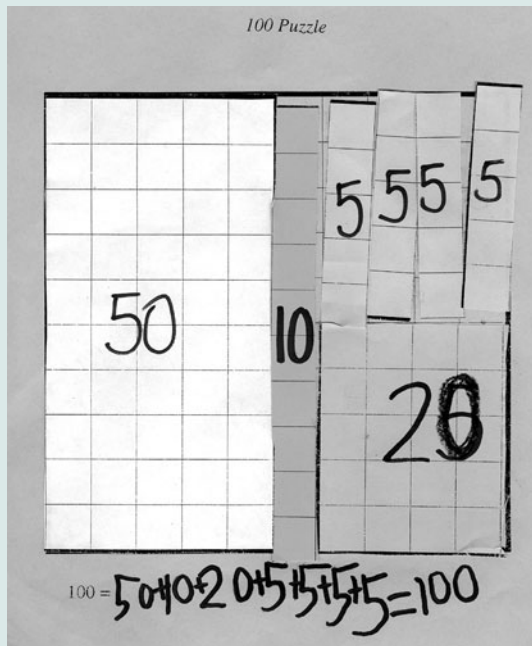
Keith used more pieces for his second puzzle.



could “cover” the 50-piece. Children observed that some of them were using “many” 5s and needed a lot of pieces to make 100. They also noticed that when they used a 50-piece, they did not have much space for other pieces. One girl, April, chose to use all equal pieces to make 100. She commented that her puzzle was “all one color” and that she needed four 25-pieces to make 100. Later, her friend Rachel used all 10-pieces to make 100, saying, “I

FIGURE 5

Jerome cut and relabeled a piece to make it fit.



kind of knew [this arrangement] before doing.”

Some children were very careful in constructing their puzzles and took all the time to make one puzzle. Picking different pieces, making sure they fit, then gluing them on the mat were challenging for the students. These actions required fine motor

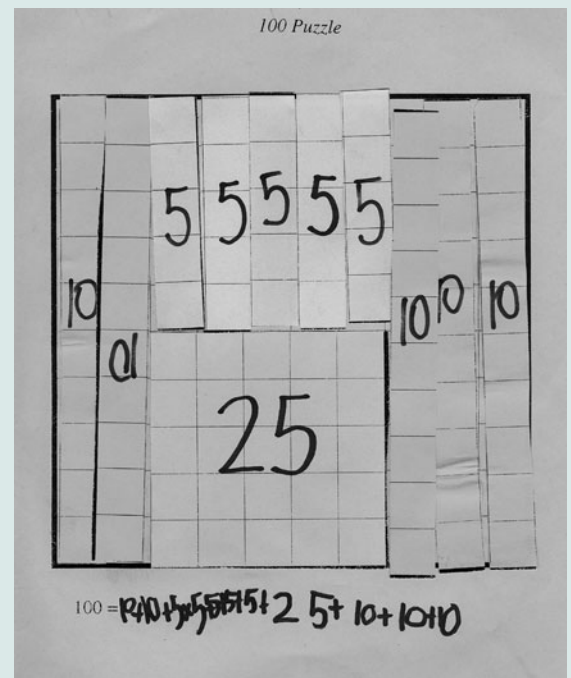
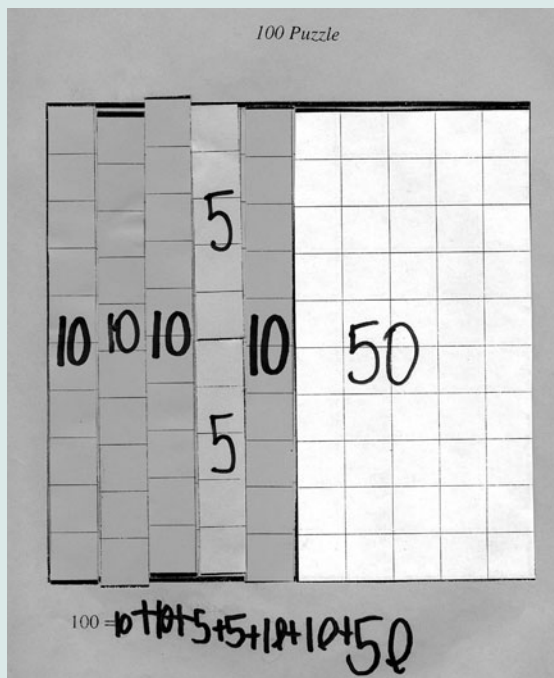
skills, which are not always developed in kindergartners. Some children also were particular in covering their 100 squares. They wanted to use specific pieces and, at times, had to reorganize their mats for the new pieces to fit. Melissa, for example, wanted to use a 10-piece in a 5-by-1 area. She had to change the other pieces around and take away a 5-piece to make a space of the appropriate size and shape to fit her 10-piece.

Jerome glued the pieces onto his mat without making sure that all the pieces would fit. After he was about halfway through, he realized that he could not use the 25-square piece he wanted to use because he had a 5-by-4 space left. Instead of looking for other ways to complete his puzzle with more than one piece, Jerome insisted that he wanted to use the 25-piece. “Can we just cut it to make it fit?” he asked. “If we do that,” I argued, “it will no longer be a 25-piece because it will not have 25 little squares.” Jerome did not move on but kept looking at his mat and the 25-square. I waited to see what he would do. He finally proposed that we cut off one row of 5 and label the new piece “20.” Despite my intent to work with 5, 10, 25, and 50 as benchmarks in making 100, Jerome’s suggestion was astute and showed his understanding of the activity. After we cut off the squares, he finished his puzzle.

When asked to record the numbers he used, Jerome wrote the number sentence $100 = 50 + 10 + 20 + 5 + 5 + 5 + 5$ (see **fig. 5**) and went on to start

FIGURE 6

Other 100 puzzles completed by students



a new puzzle. He knew how to properly write a number sentence using the equals and plus signs. Most children wrote their “sentences” using numbers separated by commas or by just listing the numbers. Joe, for example, wrote his sentence as “100 = + 10, 10, 25, 5, 50.” He explained that the plus sign was there to show that he had to put all those numbers together to get 100. For a kindergarten, this representation was an appropriate way of expressing his understanding that he had used these numbers to make 100.

During our work on the 100 puzzle, children discussed many ways to make 100 with 50s, 25s, 10s, and 5s, some using only equal pieces and some using different pieces. The children also talked about how smaller numbers “fit” into bigger ones and how we could combine smaller pieces to make some of the larger ones. In particular, children discussed and compared different ways to make 100, achieving the goal of the activity.

Celebrating 100

Time went by quickly as children worked on the activities. The classroom was full of life, and we heard the pleasant noise of children discussing numbers, the main topic of their conversation. The shapes and colors served as aids for children as they

tried to put numbers together. Some children probably used these attributes for constructing 100 on their mats, combining numbers in a nominal way rather than a cardinal way. Children who did not think about the pieces in this way still got a chance to develop familiarity with 100, count the squares in each piece, and explore numbers. With these children, further work would be necessary to explore the idea of counting groups instead of ones.

We had to wrap up the activity when parents arrived for the celebration to continue. This day was full of special activities, and parents were invited to come and join the children for a music show and a 100 cake. We displayed the 100 puzzles on the wall (see **fig. 6**) to show what we had done earlier. With their straw necklaces on and a better understanding of the number 100, children continued to celebrate their 100th day of school.

References

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