Lesson 9

Missing Number Puzzles

Overview

In this lesson, students work with puzzles that are pieces of a hundreds chart. The focus, which is on just a portion of the chart, helps students concentrate on where a particular number is in relation to the numbers around it. Students think about how the numbers on the chart are related, both by tens in columns and by ones in rows.

Related Lessons

You might teach the following lessons first:

- L-1 Building the Hundreds Chart (Version 1)
- L-2 Building the Hundreds Chart (Version 2)
- L-4 Building a Wacky Hundreds Chart

Consider this game as a follow-up:

- G-5 Don't Get Lost

Key Questions

- Where do you start on a new puzzle? Is there one square on each puzzle that makes a better starting place than the others?
- Are any of the puzzles harder than others? Which ones? Why?
- What shapes are the easiest puzzles?

Time

30 to 40 minutes

Materials

Missing Number Puzzles (Reproducible 12, Sets 1–4) copied on cardstock or other stiff paper, laminated, and cut out

dry-erase markers, one for each pair of students (for puzzle option)

Missing Number Puzzles (Reproducible 12, 1 of Sets 1–4), 1 copy per student (for worksheet option)

Missing Number Puzzles Assessment (Reproducible 13), 1 per student

Common Core State Standards

For connections to the Common Core State Standards, see pages xxi through xxxix.

Teaching Directions

Introduce

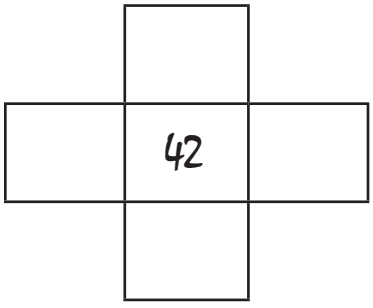
1. Gather students together to introduce the lesson. Begin with the puzzle in the shape of a plus sign (see Reproducible 12, Set 3). Project or place the enlarged version of this puzzle where all students can see it.
2. Explain to students, "This is a puzzle piece for a game you're going to play today called *Missing Number Puzzles.* Can you tell what this piece is a part of ? Does it remind you of anything?"

   Examples of Student Thinking

   "It looks like a plus with forty-two in the middle."

   "I think it looks like a T, but there's a number in the middle."

   If students do not connect it with a hundreds chart, explain, "This is a small part of a hundreds chart. It looks like I just copied this one tiny piece, but I erased all the numbers around the forty-two."
3. Tell students that their job is to decide which numbers are missing from each piece of the chart and fill them in.
4. Ask for a student volunteer to fill in one of the empty boxes on the puzzle and to explain how she knows which number goes there.



Example of Student Thinking

"I know that forty-one comes before forty-two, so it goes in the box before forty-two."

5. Continue eliciting numbers for the puzzle until it is complete. Each time a student fills in a number, ask her to explain her thinking.

   Examples of Student Thinking

   "I think forty-three goes after the forty-two, because that's what you say when you count: forty-one, forty-two, forty-three."

   "I know that thirty-two goes on top of forty-two because it's like when we played the *Wacky Hundreds Chart* game (L-4). When the number is ten less it goes on top of the other number."

Explore

6. Now it's the students' turn to work in pairs and complete the puzzles. Hand out two laminated puzzles for every pair of students, along with a dry-erase marker (or hand out copies of one of the entire sets in Reproducible 12).

7. Explain that students will work together to fill in the missing numbers. Next, they will use a hundreds chart to check their puzzle to be sure they have filled in the correct numbers. Last, students will erase their puzzles before returning them to a central location and choosing two more puzzles on which to work.

8. Display Directions for Missing Number Puzzles for everyone to see.

   Directions for Missing Number Puzzles

   1. Fill in the numbers on your puzzles.
   2. Check your puzzle by looking at a complete hundreds chart.
   3. Erase the numbers on your puzzles.
   4. Return your puzzles and choose two more.

9. Circulate in the classroom as students are working on their puzzles. Ask the key questions listed at the beginning of this lesson.

Teaching Tip

Options for Practice

There are two options for students' independent practice with Missing Number Puzzles. One option is simply to photocopy the sets in Reproducible 12 and have students work alone or with a partner to fill in the missing numbers on their "worksheets." A second option is to reproduce the same sets on heavy paper, laminate them, and cut out the individual puzzles. Then have students record on the puzzles using a dry-erase marker. In this way, students concentrate on one puzzle at a time and, because the puzzles are nonconsumable, you can put them in a center to be solved again later.

Summarize

10. After students have had the chance to complete at least three puzzles, call them back together. Use the key questions to lead a short discussion about how the puzzles relate to previous lesson experiences (L-1 *Building the Hundreds Chart* (*Version 1*), L-2 *Building the Hundreds Chart* (*Version 2*), and L-4 *Building a Wacky Hundreds Chart*).

11. Explain to the class that the puzzles will be put in a center (math station) for future exploration. Although students may have solved several of the puzzles, they benefit from repeating mathematical experiences several times, and often deepen their understanding the second or third time they work on a puzzle.

Teaching Tip

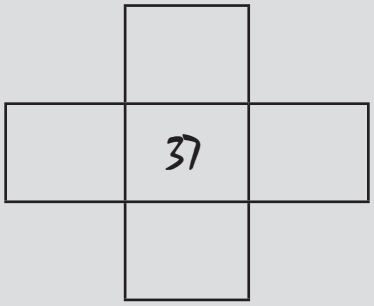
Assessment

After the Missing Number Puzzles have been in your math stations for two weeks or so, you may want to use Missing Number Puzzles Assessment (Reproducible 13) as an assessment to determine how well your students are able to use what they know about the hundreds chart to fill in the missing numbers.

Teacher Reflection

My Experiences with *Missing Number Puzzles*

I introduced Missing Number Puzzles with the puzzle that looks like a plus sign. I drew it on the easel, large enough for the class to see, with boxes big enough to write inside. This puzzle is simple in that it involves moving straight up and down one column and across one row, in the same way most of the previous lessons and games do. I asked students, "Can you tell where it looks like this puzzle came from? Does it remind you of anything?"



Tia responded, "It looks like a piece of the hundreds chart cut out!"

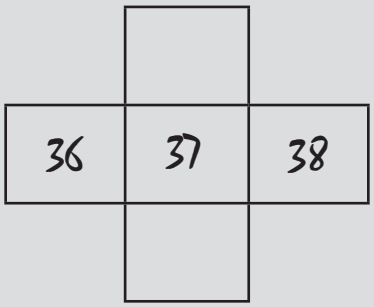
I then asked, "What numbers do you think should go in the squares?" I gave the class a few minutes to think about their answers, and then I called on Ben.

"I think next to the thirty-seven should be thirty-eight; on the right side, because thirty-eight comes after thirty-seven," Ben declared.

Several students nodded to indicate their agreement, so I had Ben come up and write *38* on the puzzle.

Shazia spoke next. "So on the other side it should be thirty-six, so it goes thirty-six, thirty-seven, thirty-eight across."

Shazia came up and wrote *36* in the box next to the thirty-seven.



I asked the class if they agreed with Shazia's thinking.

Diamond said, "I agree with Shazia and Ben. Now it looks like part of the hundreds chart with the corners missing."

"What do you think should go in this box and why do you think that?" I asked, pointing to the box above thirty-seven.

Demetrius raised his hand. "I think it's twenty-seven because it's just like the *Arrow Arithmetic* game. When you go up in a column it's ten. I counted thirty-seven, thirty-six, thirty-five, thirty-four, thirty-three," Demetrius explained as he kept track with his fingers, "thirty-two, thirty-one, thirty, twenty-nine, twenty-eight, twenty-seven." He pointed triumphantly at the box and wrote *27* above the thirty-seven. (**Note:** The game to which Demetrius is referring is Lesson L-3, *Arrow Arithmetic.*)

"So that means forty-seven goes under thirty-seven because it's ten more," Kiara said. "That finishes the puzzle!"

"What could we use to check ourselves to be sure we've filled in the puzzle correctly?" I inquired further.

"We could just look at a real hundreds chart," Nia suggested. Because I have a basket with laminated hundreds charts always available to students at the front of the room, we quickly passed out the charts and agreed that the puzzle was filled in correctly.

I then directed students to turn their hundreds charts face down on the floor before starting the next puzzle. I showed students the following:

"Here's another puzzle with just one number in it. It's a piece of the hundreds chart, just like the last puzzle. You have to figure out what numbers go in the other spaces. Who wants to tell us a number that fits into this puzzle?" I asked. I gave everyone a few quiet moments to think, then called on Grace.

"I think sixty-three goes next to sixty-four, because it's one less than sixty-four," Grace mused.

Nia nodded and added, "And fifty-three goes on top of sixty-three. It's ten less than sixty-three."

Trevon finished the puzzle by writing *52* in the last empty square.

I assigned each student a partner with whom to work and passed out two laminated puzzles and one dry-erase marker to each pair. I explained that partners needed to discuss how to fill in the puzzle before using the dry-erase marker. I reminded them to check their work by looking at a hundreds chart when they were finished, then they needed to clean off the laminated puzzles and come get two more from the basket filled with extra puzzles. The students eagerly got to work while I circulated around the room, observing and asking key questions.