

## What Comes After 109?

As they work on counting strips in Session 2.3, students are discussing how they read and write numbers and how they use patterns in the sequence of numbers to think about what comes next.

Amaya has successfully written the numbers up to 59. After a long pause she says, “OK, this time it’s a 6.” She writes 60, and continues.

Leigh is writing numbers down her counting strip: 1, 2, 3, . . . 18. After writing 19 she writes a one, takes time to think, and then erases the one and writes 20. She continues writing: 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 40. At this point she pauses, and goes back to recheck her work. On her own, she notices the mistakes and squeezes in 28 and 38.

Holly wonders aloud, “Does it matter which way you make a 10?” Her partner, Nadia, responds, “Yes, it doesn’t matter how you make a 0 or 1, but a 10 backward is really one.”

The teacher noticed few errors below 100. Most students who made errors, such as Leigh, found and corrected them on their own or in response to a question from her. The most common issues, she noted, were the transitions between decades and students who reversed numbers, writing 05 for 50. Although a few students struggled with certain aspects of writing the number below 100, most could accurately write the numbers up to 100. Then interesting mistakes began to crop up. Two students stumbled after writing 100.

One wrote 100, 110, 120, 130, and so on. The other wrote 100, 1001, 1002, 1003. Five students struggled with what to write after 109. Two followed 109 with 200; two wrote “109, 1010,” and one wrote “109, 1000.” Yama is one of the students struggling with how to write 110.

**Yama:** How do you write 110?

The teacher, having seen many students struggling with the same issue, decides to bring up the issue with the class.

**Teacher:** Yama just asked me a question that I’d like to put to the group, because I’ve seen other people who are unsure about how to write the number that comes after 109, too. What number comes after 109? [Students call out 110.] Everyone seems pretty sure of the name of the number. The question is, how do you write 110?

The teacher gathers students’ ideas, including 101, 110, 200, 1010, 10010, and 1000.

**Teacher:** Are there any that you think could *not* be the way to write 110? Can you explain why it couldn’t be the way to write 110?

**Leo:** Well I know that the last number is one thousand. It’s just a number I know.

Other students agree, acknowledging 1000 as a number they are familiar with.

**Jacy:** I don’t think it can be 200 because at first I thought it should be 200. Because, before when it was a nine, the number changed, and it’s 109. But when I said the numbers out loud, it didn’t sound right. You don’t say 109, 200. You say 109, 110.

**Teacher:** Can you say more about what you mean about the numbers changing after a nine?

**Jacy:** Well, like it goes 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. And all of those numbers would have the same number in the front. Like here [he shows his counting strip, pointing out the numbers from 20–29; the teacher records these numbers on the board] it’s a 2.

**Teacher:** Jacy is saying that the numbers in the ones place [pointing] go from 0 through 9, and the number in the tens place [pointing] is the same for all those numbers. Does everybody see that? What Jacy is saying is that after the number with a nine in the ones place, the number in the tens place changes. What number comes after 29? [30] Can someone find another example of a place on their counting strip where the numbers change after a 9?

Several examples are shared, then she asks students to consider the remaining potential answers: 101, 110, 1010, and 10010.

**Teacher:** What about the possibilities we have left—they all have ones and zeros. . . . Are there any we can eliminate?

**Malcolm:** This one [points to 10010] looks funny to me, but we're trying to write one hundred and ten. If you say 100 and 10, you have to write 100 and the 10.

**Melissa:** No, you don't need to write all 100. One hundred and one is [writes 101], not [writes 1001] and one hundred and two is [writes 102], not [writes 1002]. So one hundred and ten should be [writes 110], not [writes 10010].

**Teacher:** Melissa used a great strategy. She went back and looked at the numbers that she already wrote before 110 to see whether they could help her. [The teacher writes the numbers from 99 to 109 in a column on the board.] Malcolm, what do you think of Melissa's idea? Did your numbers from 101 to 109 look like Melissa's?

**Malcolm:** Yeah, they do. They all have three numbers in them. I guess that's why 10010 looked funny.

**Teacher:** How many digits are in all your numbers in the hundreds so far?

**Malcolm:** Three. [Others agree.]

**Melissa:** So if 101 and 102 have three numbers, then 110 has to have three numbers.

**Juan:** Yes, we don't need to write the entire 100. The one tells you that it is 100 and then you write the 10.

Students at this age are learning the oral counting sequence, the written counting sequence, and how these written and spoken symbols represent quantities. The process is a complex one, particularly once the boundary of 100 is crossed. This teacher knows from past experience that learning to correctly write the numbers in sequence takes time and plans to provide further opportunities for students to bump up against the challenge of how to write larger numbers.