Dialogue Box

Is It 2 or 20?

Throughout this unit, students will be solving addition and subtraction problems involving 2-digit numbers. As students work with those operations, as well as with ideas involving the place value of numbers, they often encounter some predictable confusions.

In this first example, the teacher has noticed that some students are losing track of the value of the quantities in the problems; for example, thinking of two strips of ten as 2 rather than 20. She notices that Henry has just begun to work on the following problem: 1 strip of 10 and 5 singles + 2 strips of 10 and 1 single. On his paper Henry has written 10, 5, 2, 1. She asks him to describe what he has done so far.

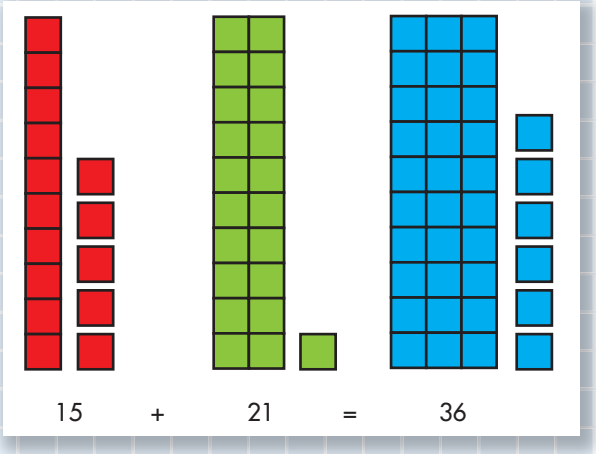
Henry: First I put all of the numbers in the problem on the paper.

Teacher: Tell why you wrote those numbers.

Henry: Ten because that's one strip and a strip of stickers is ten. Then five, two, and one.

Teacher: So ten is one strip, five is five singles, two is two singles and one is one single?

Henry: No, two should be 20 because it's two strips. [He changes 2 to 20.] Then 20 and ten more is 30, and five more is 35, and one more is 36.



When brought back to the context, Henry is able to see and correct his own mistake. This kind of error sometimes arises when students are trying to apply the U.S. standard algorithm. Consider Paige, who is trying to use the traditional algorithm to add 53 + 17.

Paige: I did the stacking way. I put 53 and then the plus sign and then the 17 beneath it and then the line. Then I would put the zero under the seven and the ten above the 50. And then I'd do 1 + 1 equals 2.

$$\begin{array}{r} {\scriptstyle 1} \\ 53 \\ +\ 17 \\ \hline 0 \end{array}$$

Teacher: Where do you see 1 + 1?

Paige: I mean, it's ten and ten and five is 25. [The teacher writes 25 in the space below the column of numbers she has just added.]

$$\begin{array}{r} {\scriptstyle 1} \\ 53 \\ +\ 17 \\ \hline 250 \end{array}$$

Teacher: So it would be 250?

Paige: No, I meant 50 and 20 is 70. But 700 . . . Is this when I only write the 7?

Paige knows that 700 does not "sound right" as the answer to 53 + 17. It is easy for her to lose track of what she knows about addition and the quantities in this problem. She is working so hard to remember a particular step that she may not yet understand. Moreover, the standard notation for the traditional U.S. algorithm does not make the mathematics of the strategy more transparent. In fact, it often seems to encourage students to think of the quantities as ones ("7 + 3 is 10, put down the zero, carry the one. 5 + 1 is 6 plus 1 more is 7.") The teacher senses that Paige is on the cusp of understanding some of the ideas behind the algorithm. The teacher works through the problem with

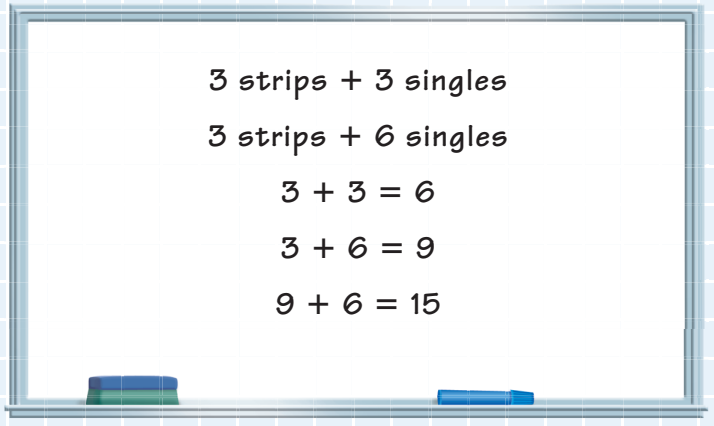
Paige again, providing an alternative way to record the same strategy. This helps her keep the values in the original problem.

$$\begin{array}{r} 53 \\ +\ 17 \\ \hline 10 \\ +\ 60 \\ \hline 70 \end{array}$$

Because she has seen these kinds of mistakes, she poses a similar question to the whole class.

Teacher: I'm going to show you something. It's an easy mistake to make when you work on these problems. Imagine that the problem is three strips and three singles plus three strips and six singles. And here is something I have seen.

On the board she writes the following:



Teacher: What went wrong here?

Darren: They forgot the strips.

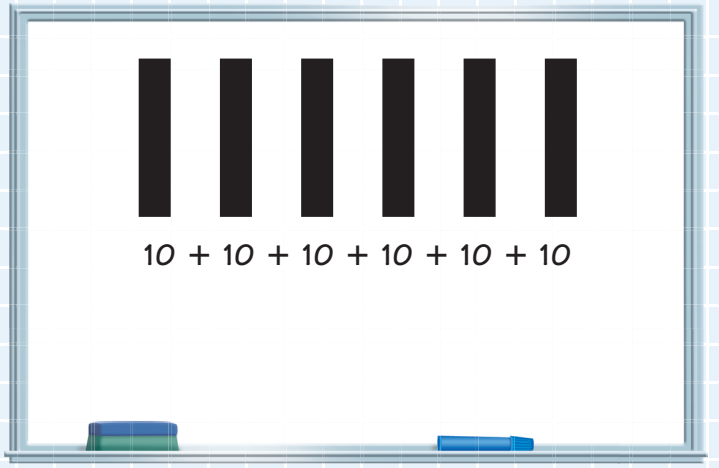
Teacher: When would this be correct?

Darren: If they were all singles.

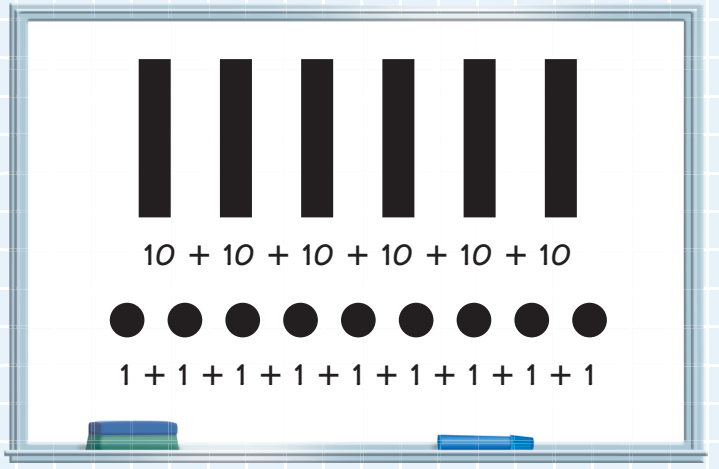
Teacher: If the original problem was three strips and three singles plus three strips and six singles, does an answer of 15 make sense? Why not?

Nadia: Because if there are three strips and three singles, that's already 33 and you didn't even add the other stickers yet.

Teacher: We need to think of these strips as groups of? (*ten*) How many strips of ten do we have? (10 + 10 + 10 + 10 + 10 + 10)



Teacher: And how many singles?



Teacher: How could we count this, or add these up?

Nadia: 10, 20, 30, 40, 50, 60. Plus 9 is 69.

Teacher: Notice the difference. The way I've seen some students doing this got an answer of 15. When we thought about the strips as strips of 10 we got 69.

As you work with students throughout this unit, look for opportunities to discuss confusion or even potential confusion around the place value of the numbers students are working with.