Near-Doubles

In Session 2.2, the teacher gathers the class for a discussion focused on using what you know to solve a problem, a useful strategy in the game *Close to 20*. She introduces the idea of near-doubles (or, doubles plus or minus 1), which she has already seen and heard some students using.

Teacher: We've been talking about how using something you know can help you solve a problem more quickly. I've seen many students using combinations that make ten or doubles that they know as their first step when they work on number strings. Think for a minute about these two problems.

$$6 + 6 = \_\_\_$$
$$6 + 7 = \_\_\_$$

We all know that 6 + 6 = 12. How could that help you solve 6 + 7?

Juan: I looked at the calendar and saw 6 and looked under it. And that was 13.

The teacher probes Juan's thinking and then models what he did on the class calendar.

Teacher: So you knew that one week from the sixth was 7 days, and that when you go down one row on our calendar that's one week. So one week—or 7 days—from the sixth got you to the thirteenth. Good thinking. Did anyone use 6 + 6 to help with 6 + 7?

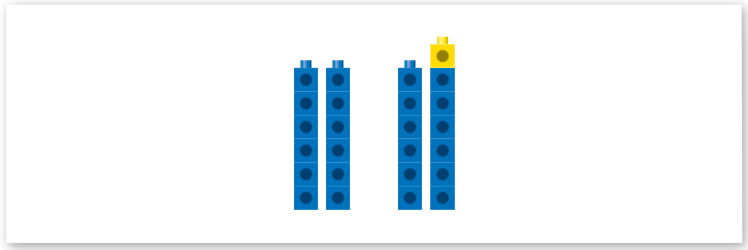
Amaya: It's 13.

Teacher: How do you know?

Amaya: Because 6 + 6 = 12 and take one of the 6s, make it 7 . . .

Amaya knows that 6 + 6 = 12, but seems unsure about how to use that information to solve 6 + 7. The teacher builds two towers of six blue connecting cubes.

Teacher: Here's 6 + 6. Then, you said one of the 6s turns into a seven (The teacher adds one yellow cube to one tower.) So 7 is 1 . . .



Amaya: More than 6.

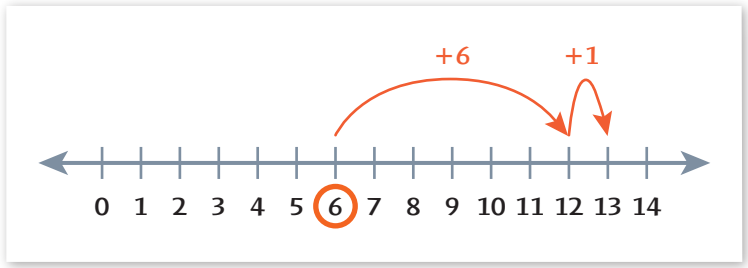
Teacher: What other number is 1 more?

Amaya: 12 and 13.

Teacher: Yes, 13 is one more than 12. Why is the answer 1 more than 12?

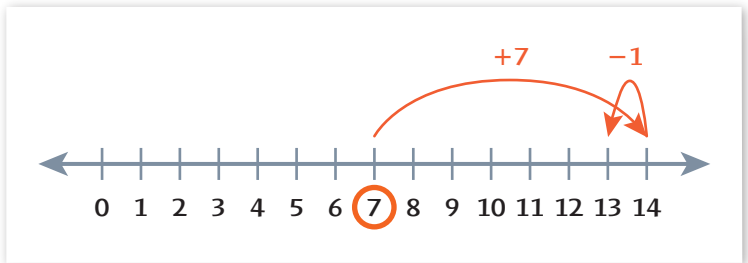
Melissa: You're adding 1 more to 6 so you add 1 more to 12 to get 13.

The teacher demonstrates on the number line.



Chen: It's like Amaya's. I know that 7 + 7 = 14. I took 1 off of 14 because 6 is 1 less.

The teacher builds two towers of seven blue connecting cubes and asks another student to show Chen's idea. She also sketches and talks through this method on the number line.

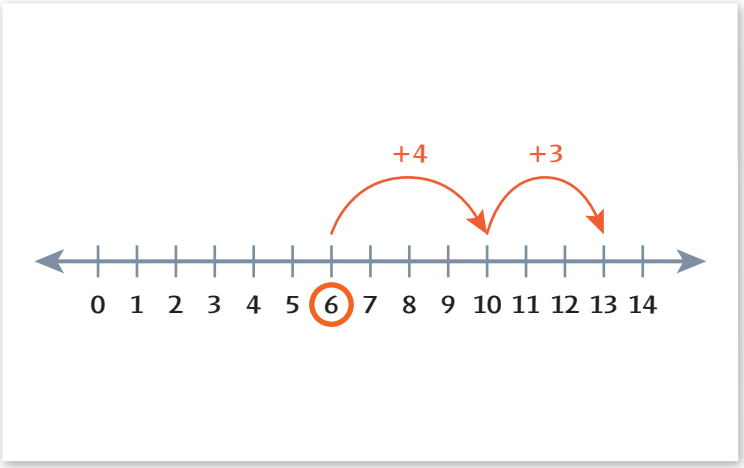


Teacher: Chen used the higher double and took one away, and Amaya used the lower double and added one to get 13.

Roshaun: And another way is 6 + 4 = 10, plus 3 is 13.

Teacher: Roshaun thought of the 7 as 4 + 3, and then added the 4 to the 6 and then added the 3.

The teacher writes 6 + 4 = 10 and then 10 + 3 = 13 and shows it on the number line.



Teacher: What about 5 + 6? Could you use 6 + 6 = 12 to help with 5 + 6?

The teacher adds 5 + 6 to the list.

$$5 + 6 = \_\_\_$$
$$6 + 6 = \_\_\_$$
$$6 + 7 = \_\_\_$$

Paige: I know that 5 + 6 = 11 because if you put 6 right here (she points to the 5), it would be 12, but 5 is 1 less than 6, so 5 + 6 = 11.

The teacher again brings out two towers of six blue connecting cubes.

Teacher: That's my double, 6 + 6, and many of us know that equals 12. So I'm going to change 6 and 6 (removes one cube from one of the towers of six). It's not 6 and 6 anymore; what did I change it to?

Tia: 5 and 6.

Teacher: What about the answer? Does that change? (It's 11!) Why did my answer go from 12 to 11? (She records the answer, 11, in the first equation.)

Luis: Because 11 is one away from 12.

Tia: Because you know before it was 6, you took 1 away from 6 and 1 away from 12 is 11.

Melissa: They're all just one number away.

Teacher: I think Melissa is noticing that these three equations are related. Does anyone see how?

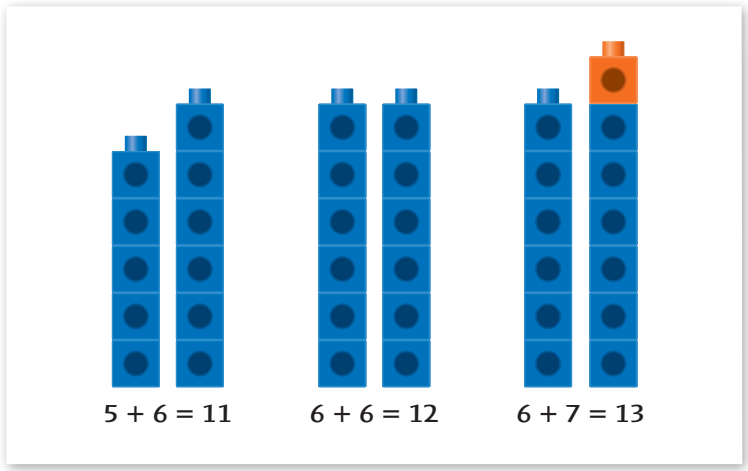
Holly: First take 1 away from 6, then plain old 6, then on the last one, you add 1 to 6.

Melissa: They're one away from each other. They're both related to the one in the middle.

Teacher: Can you say more about how they are related? Holly said that the first addend in each problem increases by one: five plus six, six plus six, and seven plus six.

Melissa: They're all adding six. So the one more Holly's talking about makes the answers one more too. 11, 12, 13.

The teacher rephrases what Holly and Melissa are saying as she builds towers that represent each problem.



In this discussion, the teacher uses connecting cubes to model the relationship between doubles and near-doubles. She focuses students' attention on what happens to the sum when you increase (or decrease) one of the addends by 1.