Describing, Comparing, and Classifying Subtraction Strategies

In Investigation 2, students describe and classify their subtraction strategies. They classified both addition and subtraction strategies in Grade 4 and multiplication strategies this year in Unit 1, *Number Puzzles and Multiple Towers.*

Subtraction strategies are classified by the way students start to solve a problem—their first step. The first step generally indicates how they are thinking about the problem.

892 − 567 =
892 − 500 = 392
392 − 60 = 332
332 − 7 = 325

Shandra's Work

892 − 570 =
892 − 500 = 392
392 − 70 = 322
322 + 3 = 325

Joshua's Work

To solve 892 − 567, Shandra starts by subtracting 500 from 892 whereas Joshua starts by adding 3 to 567. Shandra is breaking up 567 by place and subtracting each part, and Joshua is adding up from 567 to 892.

Strategies are made public so that all students can benefit from seeing the different subtraction methods. Students are encouraged to expand their repertoire of strategies so that they continue to become more flexible and fluent in their computation. Comparing different solutions in the same category also offers the opportunity to discuss how to become more efficient in solving problems by adding or subtracting larger "chunks" of the numbers.

Identifying strategies helps students understand the mathematics of their work. As you listen to students explain their strategies, model language they can use to describe their methods by reflecting back to them what they are doing. For example, you might say, "I see that you are breaking up 567 by place," or "Are you adding up from 567?"

Your language can also help students notice similarities between variations of a method: "Renaldo is also adding up from 567, but he decided to add on 300 first." Ask students to compare their methods to those that have been shared, "Who else broke up 567 into parts, then subtracted each part from 892? . . . Yumiko broke up 567 differently from the way Shandra did; she broke it into 2 + 60 + 500 + 5 because she noticed that she could subtract 2 from 892 as her first step to get to 890, which was an easy number to work with."

Let students decide as a class which methods should be grouped together on one chart and which are different. This work is about helping students make sense of a variety of solutions; it is not about matching their work to predetermined categories. However, you may have to guide the discussion to keep the number of categories reasonable and useful. Variations of similar methods by different students—such as Shandra's and Yumiko's—can go on the same chart.

Some students combine methods. For example, students might start by changing one of the numbers in the problem, then solve the problem by using another method, and then adjust for the change. For example, Hana solved 892 − 567 this way:

$892 - 567 =$

$567 + 3 = 570$

$570 + 30 = 600$

$600 + 200 = 800$

$800 + 92 = 892$

$3 + 30 + 200 + 92 = 325$

Hana's Work

Hana started by adding 3 to 567 to make it 570, subtracted 570 in two parts, and then adjusted for her initial change by adding 3.

As you discuss strategies, you may want to ask students who are not combining methods to share their methods first so that some clear categories can be established. Then students can decide how to classify a method like Hana's. They might classify it according to its first step as "changing one number to make it easier and then adjusting at the end;" they might make a new chart of "mixed methods;" or they might want to label the variations on the "changing one number" chart with the ways that each is continued. Students and adults who are fluent with computation often use a mixture of methods in the way that Hana does.