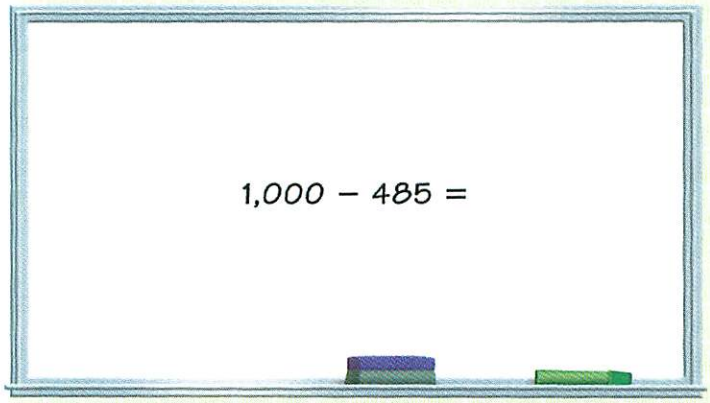
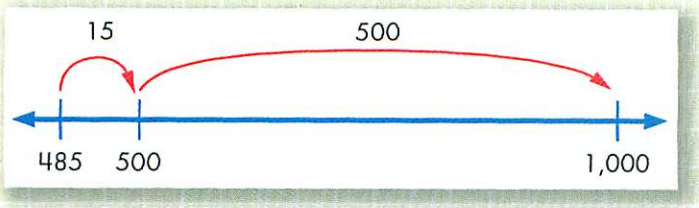
Representing Subtraction on the Number Line

When students use a number line to represent the action in a subtraction situation, they may think about it in two different ways. Let us contrast these two ways by considering the following problem:

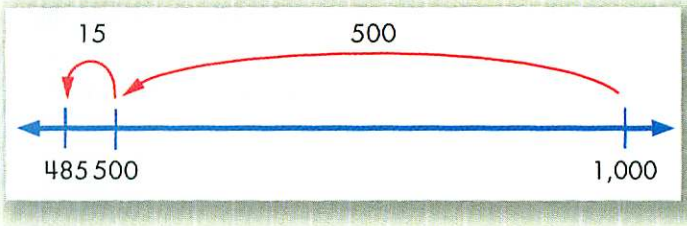


Some students look at this problem and think about the question "How far is it from 485 to 1,000?" They may do this if the context of the problem suggests visualizing the problem in this way, or this may simply be their preferred way of thinking about subtraction, regardless of the context. When these students use a number line to represent subtraction problems, they show either adding up in jumps from the smaller number to the larger number or subtracting back in jumps from the larger number to the smaller number.

Finding the Difference by Adding Up



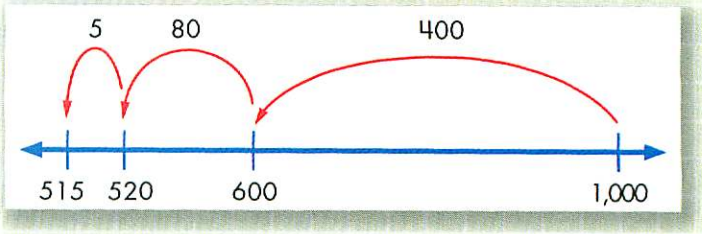
Finding the Difference by Subtracting Back



In both of these representations, the jumps represent the distance between the two numbers on the number line: How much more is 1,000 than 485? How much less is 485 than 1,000? Students may notate this conception of the problem as 485 + ____ = 1,000 or 1,000 − ____ = 485.

Finding the Difference by Taking Away

Other students think of the problem in quite a different way, and their number line representation is quite different. In this case, students think about the question "If I take away 485 from 1,000, how much is left?" Again, this way of thinking about the problem may be suggested by a particular context, or some students may always solve subtraction problems by thinking about removing one quantity from the other, regardless of context. Their representations on the number line start at the number from which they are going to remove some amount and then show how they "take away" that quantity in parts.



Students may notate this conception of the problem as 1,000 − 485 = ____.

The number line representations of both distance and taking away are useful in visualizing subtraction. However, keep in mind that a student thinking about the distance between the two numbers on the number line may not at first understand the representation of the same problem as taking away a quantity, and vice versa.

Make sure that students notice where the solution to the problem is found on each representation. In the first two figures, in which a student is adding up from the smaller number or subtracting back from the greater number, the difference is seen in the distance (the jumps) between the two numbers on the number line. In the third figure, in which a student is subtracting the smaller number in parts, the difference is the number on which the student finally lands on the number line after making all the jumps. Help students see how each number line representation works and how it connects to a particular way of thinking about subtraction.