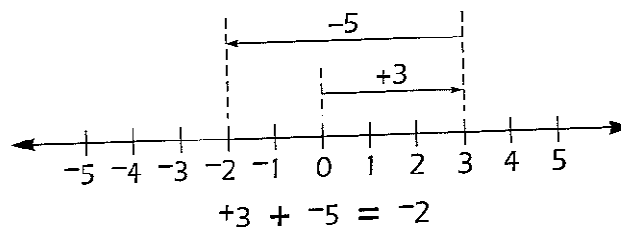


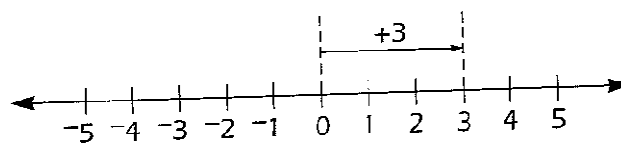
The Number Line Approach to Integers

Read the following section from *Math Matters* by S. H. Chapin and A. Johnson:

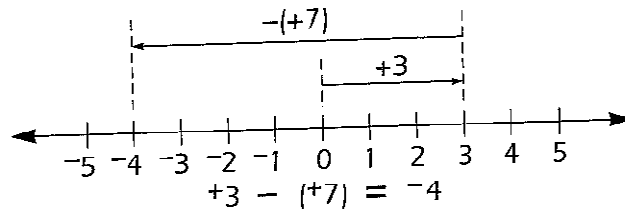
The operations of addition and subtraction can also be modeled as movements on the number line. Adding signed numbers is like moving forward and backward on a football field. If a team gains 3 yards on one play and then loses 5 yards on the next play, the net result is a 2-yard loss, $3 + (-5) = -2$. On the number line, start at 0 and move in the direction of the positive numbers, 3 units. Next, to show that you are adding what amounts to a loss of 5 yards -5 , move in the direction of the negative numbers, 5 spaces to the left. You end up at -2 , so $3 + -5 = -2$. Notice that we use the concept of magnitude to determine how many units to move and the concept of direction to help us decide in which direction to move



When using the number line to model subtraction of signed numbers, it helps to first recognize that the minus sign ($-$) can be interpreted in three ways: (1) as an operation sign for subtraction; (2) as a sign to indicate a negative number; and (3) as an operation sign meaning "the opposite of." Thus, -4 can be interpreted as "subtract positive 4 from some number," "the negative number located four units to the left of 0," and "the opposite of positive 4." The idea of using the minus sign to indicate movement in the "opposite" direction is especially useful when modeling subtraction of negative numbers on a number line. For example, consider $3 - 7$. Start at 0 and move to the right 3 units since 3 is a positive number

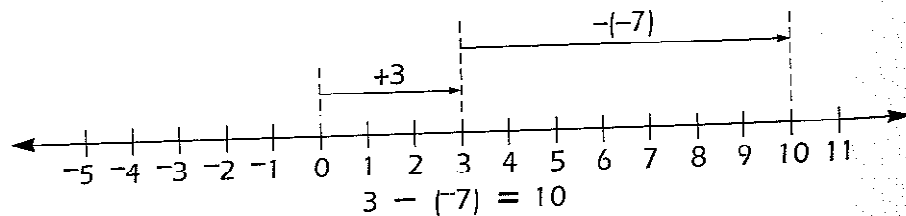


If we were adding positive 7, we would move 7 additional spaces to the right toward the positives. But since we are subtracting, use the idea of "opposites" and move in the opposite direction from positive 3 toward the negative numbers



We end at -4 , so $3 - 7 = -4$.

Here is another example: $3 - -7$. Again start at 0 and move to the right 3 units. If you were adding -7 we would go 7 spaces to the left toward the negative numbers, but because we are subtracting -7 , we move in the opposite direction, or right toward the positive numbers



This time we end at 10, so $3 - -7 = 10$

Instead of using rules to compute with signed numbers, try to reason out the answer using the concept of movement and direction. When adding positive numbers we move to the right, and when adding negative numbers we move to the left. When subtracting, we move in the opposite direction from that indicated by the number: subtracting a positive number means we move to the left toward the negatives, and subtracting a negative number means we move to the right toward the positive numbers!

Now, work on Activity 5:

Activity



Using a Number Line to Add and Subtract Integers

Objective: become familiar with how to model addition and subtraction of signed numbers on a number line

Draw a number line to illustrate the following addition and subtraction problems.

1. $-4 + 3$
2. $-5 + -3$
3. $-1 - -4$
4. $-1 - 4$

How did you interpret the minus sign? Did this interpretation help you in using the number line to model these operations?