



## Arithmetic Calculations with Signed Numbers

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Signed numbers are often referred to as integers. Integers include both positive and negative numbers. In this lesson, you will learn how to add, subtract, multiply, and divide integers.

### Signed Numbers

**Signed numbers** are also referred to as **integers**. Integers are the set of whole numbers and their opposites. The set of integers would include values ...-3, -2, -1, 0, 1, 2, 3... etc.

Sam's friends decided to surprise him with a scavenger hunt for his birthday. His friends started the scavenger hunt from the big oak tree at the park.

Sam knows that his journey will begin at the oak tree. So the oak tree will represent zero on a number line.

### Adding Integers

Adding integers is the process for adding both positive and negative numbers. When adding integers, if the signs of the values are the same, you will add the two values. If the signs are different, subtract the two values. You will always keep the sign of the largest value.

Back at the oak tree, Sam finds a note that tells him to take 15 steps forward and 26 steps backwards. Sam has decided to just add these two values. 15 steps forward would be positive 15 and 26 steps backwards would be -26. So Sam decides to add  $15 + -26$ .

Looking at these two values, Sam sees that they have different signs. This means that he will subtract the two values. 26 minus 15 would equal 11. Since 26 is the largest value and it's negative, the 11 would also be negative. So Sam knows that the answer to this problem is negative 11. This means that he will need to take 11 steps backward from the tree.

### Subtracting Integers

Subtracting integers is actually the process of adding the opposite of the stated value. To work a subtracting integer problem, you must first change the problem by changing the operation to addition and the sign of the last number to its opposite.

Let's check back with Sam as he continues his scavenger hunt. Sam is now 11 paces back from the tree where he started. This number would be represented by the integer -11. On the ground, Sam finds a fortune cookie. Inside the fortune cookie, the directions tell Sam to subtract 8 paces from his current location. Sam knows that he needs to subtract -11 minus 8.

Sam knows that in order to start the subtraction problem that he must change the problem to adding its opposite. To do so, Sam will change the subtraction sign to addition and the positive 8 to a negative 8.

Now Sam has an adding integer problem. Since the signs are the same, he will add the two values. 11 plus 8 equals 19. The sign of the 19 would be negative since the larger value, 11, was also negative. Sam knows that his next clue will be 19 paces backwards from the tree.

## Multiplying and Dividing Integers

When multiplying and dividing integers, you will need to multiply and divide as normal. The sign of your answer is determined by the sign of the values that were multiplied and divided. If the signs of the two values were the same, your answer will be positive. If the signs of the two values are different, your answer will be negative.

Sam feels that the end of the scavenger hunt is getting near. As he looks up, he sees a balloon floating above him. Sam takes the balloon and pops it. Inside he finds his final clue. The clue states that he needs to take his current location and multiply by negative 3.

Sam now knows that he needs to multiply negative 19 times negative 3.

19 times 3 equals 57. Because the signs of the 19 and 3 are the same, negative, the answer to this problem will be positive. Sam knows that the prize for the scavenger hunt can be found 57 paces forward from the tree.

To reach the destination of positive 57, Sam must return to the oak tree, which represented zero. Sam now needs to go 57 paces past the oak tree in order to reach the clue. Sam sprints past the oak tree 57 paces to a set of bushes. Behind the bushes, Sam finds all of his friends hiding and waiting to wish him happy birthday.

## Lesson Summary

Let's recap these four operations that we can perform with signed numbers.

Adding integers is the process for adding both positive and negative numbers. When adding integers, if the signs of the values are the same, you will add the two values. If the signs of the values are different, subtract the two values. You will always keep the sign of the largest value.

Subtracting integers is actually the process of adding the opposite of the stated value. To work a subtracting integer problem, you must first change the problem by changing the operation to addition and the sign of the last number to its opposite.

When multiplying and dividing integers, you will need to multiply and divide as normal. The sign of your answer will be determined by the sign of the values that were being multiplied and divided. If the signs of the two values were the same, your answer will be positive. If the signs of the two values are different, your answer will be negative.

## Learning Outcomes

Once you have finished this lesson, you should be able to:

- Recognize signed numbers (integers)
- Add and subtract using integers on a number line
- Understand that the sign of your answer is determined by the sign of the values when you're multiplying and dividing positive and negative numbers