Lesson 3: Negative Numbers

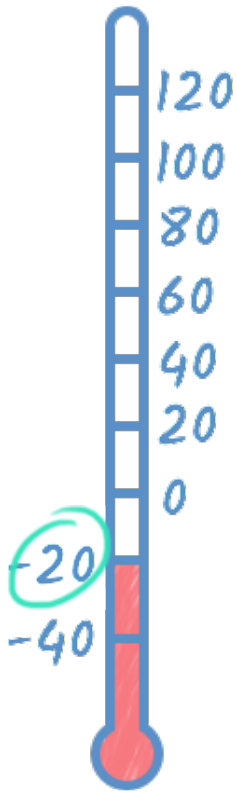
What are negative numbers?

A **negative number** is any number that is less than zero. For instance, **-7** is a number that is **seven less** than 0.

-7

It might seem a little odd to say that a number is **less than** 0. After all, we often think of zero as meaning **nothing**. For instance, if you have 0 pieces of chocolate left in your candy bowl, you have **no** candy. There's **nothing** left. It's difficult to imagine having less than nothing in this case.

However, there are instances in real life where you use numbers that are less than zero. For example, have you ever been outside on a really cold winter day when the temperature was below zero? Any temperature below zero is a negative number. For instance, the temperature on this thermometer is **-20**, or twenty degrees **below** zero.



You can also use negative numbers for more abstract ideas. For instance, in finances negative numbers can be used to show **debt**. If I overdraw my account (take out more money than I actually have), my new bank balance will be a **negative number**. Not only will I have no money in the bank—I'll actually have **less** than none because I owe the bank money**.**

Watch the video below to learn more about negative numbers.

Any number without a minus sign in front of it is considered to be a **positive** number, meaning a number that's **greater than** zero. So while -7 is **negative seven**, 7 is **positive seven**, or simply **seven**.

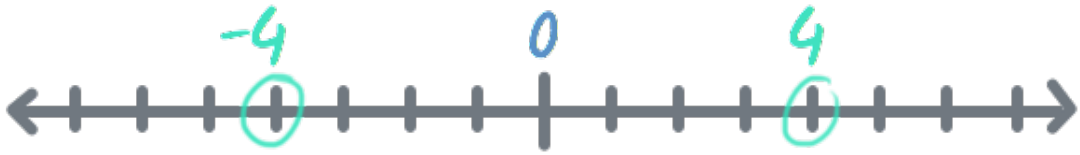
Understanding negative numbers

As you might have noticed, you write negative numbers with the same symbol you use in subtraction: the minus sign (**-**). The minus sign doesn't mean you should think of a number like -4 as **subtract four**. After all, how would you subtract this?

-4

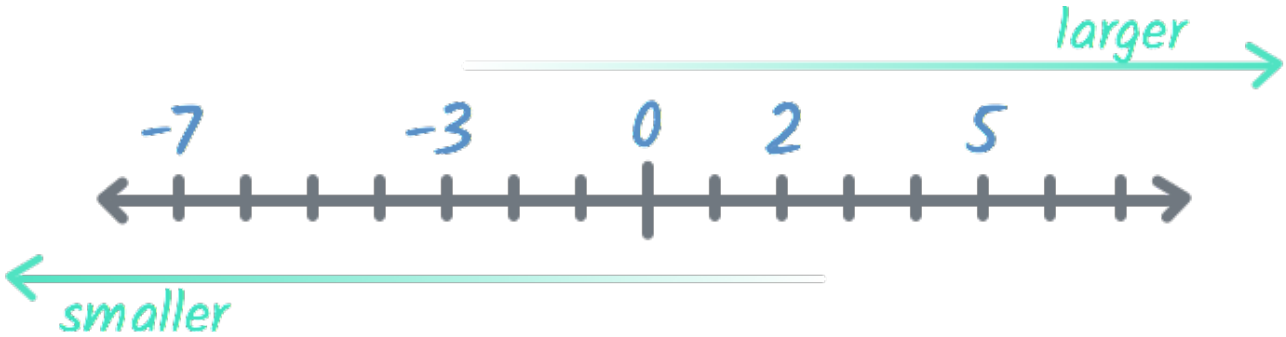
You couldn't—because there's nothing to subtract it from. We can write -4 on its own precisely because it **doesn't** mean **subtract 4**. It means the **opposite** of four.

Take a look at **4** and **-4** on the number line:



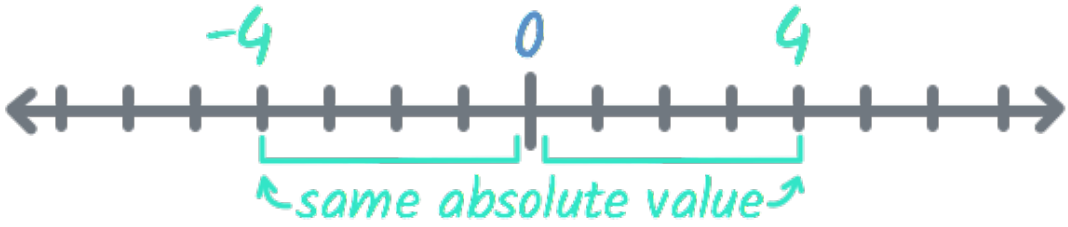
You can think of a number line as having three parts: a **positive** direction, a **negative** direction, and **zero**. Everything to the right of zero is **positive** and everything to the left of zero is **negative**. We think of positive and negative numbers as being **opposites** because they are on **opposite** sides of the number line.

Another important thing to know about negative numbers is that they get **smaller** the farther they get from 0. On this number line, the farther **left** a number is, the smaller it is. So **1** is smaller than **3**. **-2** is smaller than **1**, and **-7** is smaller than **-2**.



Understanding absolute value

When we talk about the **absolute value** of a number, we are talking about that number's distance from 0 on the number line. Remember how we said 4 and -4 were the same distance from 0? That means 4 and -4 have the same absolute value. We represent taking the absolute value of a number with two straight vertical lines **| |**. For example, **|-3| = 3**. This is read "the absolute value of negative three is three."



Something important to remember: even though negative numbers get **smaller** as they get further from 0, their absolute value gets **bigger**. For example, -10 is smaller than -6. However, |-10| is bigger than |-6| because -10 has a greater distance from 0 than -6.

Calculating with negative numbers

Using negative numbers in arithmetic is fairly simple. There are just a few special rules to keep in mind.

Adding and subtracting negative numbers

When you're adding and subtracting negative numbers, it helps to think about a number line, at least at first. Let's take a look at this problem: **6 - 7**. Even though 7 is larger than 6, you can subtract it in the exact same way as any other number, as long as you understand there are numbers **smaller** than 0.

$$6 - 7 = -1$$

While the number line makes it easy to picture this problem, there's also a trick you could have used to solve it.

First, ignore the negative signs for a moment. Just find the **difference** between the two numbers. In this case, it means solving for **7 - 6**, which is **1**. Next, look at your original problem. Which number has the **highest absolute value**? In this case, it's **-7**. Because -7 is a negative number, our answer will be one too: **-1**. Because the absolute value of **-7** is greater than the distance between **6** and **0**, our answer ends up being **less than 0**.

Adding negative numbers

How would you solve this problem?

$$6 + -7$$

Believe it or not, this is the exact same problem we just solved!

This is because the plus sign simply lets you know you're combining two numbers. When you combine a negative number with a positive one, the sum will be **less** than the original number—so you might as well be **subtracting**. So **6 + -7** is the same thing as **6 - 7**, and they both equal **-1**.

$$6 + -7 = -1$$

Whenever you see a positive and negative sign next to each other, you should read it as a **negative**. Just like 6 + -7 is the same as 6 - 7:

10 + -11 is equal to **10 - 11**.

3 + -2 is equal to **3 - 2**.

50 + -100 is equal to **50 -100**.

This is true whenever you're adding a negative number. Adding a negative number is always the same as subtracting that number's absolute value.

Subtracting negative numbers

If adding a negative number is actually equal to subtracting, how do you **subtract** a negative number? For example, how do you solve this problem?

$$6 - - 3$$

If you guessed that you **add** them, you're right. Here's why: Remember how we said a negative number was the opposite of a positive one? We compared them to you and your mirror image. Your mirror image is your opposite, which means your mirror image's opposite is **you**. In other words, the opposite of your opposite is **you**.

In the same way, you can simplify these two minus signs by reading them as two negatives. The first minus sign **negates**—or makes negative—the second. Because the negative—or opposite—of a negative is a positive, you can replace both minus signs with a plus sign. This means you'd solve for this:

$$6 + 3$$

This is a lot easier, to solve, right? If it seems confusing, you can just remember this simple trick: **When you see two minus signs back to back, replace them with a plus sign**.

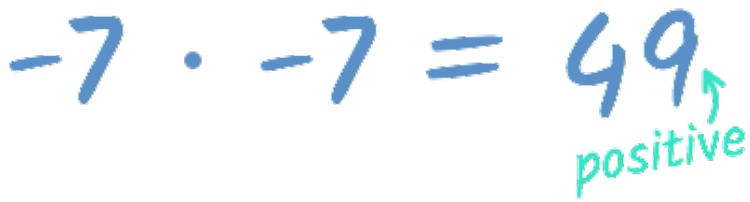
So **6** minus **negative 3** is equal to **6 plus 3**. That's equal to **9**. In other words, **6 - -3** is **9**.

Remembering all of the rules for adding and subtracting numbers can be overwhelming. Watch the video below for a trick to help you.

Multiplying and dividing negative numbers

There are two rules for multiplying and dividing numbers:

If you're multiplying or dividing two numbers that are either both positive or both negative, your result will be **positive**.



If you're multiplying or dividing a positive number and a negative number, your result will be **negative**.

That's it! You multiply or divide as normal, then use these rules to determine whether the answer is positive or negative. For instance, take this problem, **-3 · -4**. **3 · 4** is **12**. Because both numbers we multiplied were negative, the answer is **positive**: **12**.

$$-3 \cdot -4 = 12$$

On the other hand, if we were to multiply **3 · -4**, we'd get a different answer:

$$3 \cdot -4 = -12$$

Again, **3 · 4** is **12**. But because one of our multiples is **negative** and the other is **positive**, our answer must also be **negative**: **-12**.

It works the same way for division. **-40 / -10** is **4** because -**40** and **-10** are both **negatives**. However, **-40 / 10** is **-4** because one number is **negative** and the other is **positive**.

Assessment

Want even more practice? Try out a short assessment to test your skills by clicking the link below: