# Adding and subtracting signed numbers

Think about signed numbers just as positive and negative numbers. Positive numbers have positive signs (even though we often write positive numbers without actually putting a positive sign in front of them), whereas negative numbers have negative signs. So $3$, $7$, and $11$ are all positive numbers, and $-2$, $-6$, and $-9$ are all negative numbers.

When it comes to adding and subtracting signed numbers, let's break down the three possible combinations we could face when we have two signed numbers:

1. Two positive numbers
2. Two negative numbers
3. One positive number and one negative number

Let's tackle **adding** numbers for these three combinations.

**Positive** + **Positive** = **Positive.** The trick is: add the numbers, keeping the sign positive.

$$3 + 4 = 7$$

$$10 + 1 = 11$$

**Negative** + **Negative** = **Negative.** The trick is: add the numbers as if they were both positive, but make the sign negative.

$$-3 + (-4) = -7$$

$$-10 + (-1) = -11$$

**Positive + Negative, Negative + Positive.** When we add one positive number and one negative number, we want to start by treating both numbers as positives. For instance, if we're trying to add $-7$ and $4$, we want to instead first consider $7$ and $4$. Once we've imagined that both numbers are positive, we can say that the result will be **positive if the positive number is larger, but negative if the negative number is larger.** So $7$ is larger than $4$, but $7$ was originally our negative numbers, so the negative number is larger, in this case. The trick is: think of the numbers as if they were both positive, and subtract the smaller number from the larger number; the sign of the answer will be the original sign of the larger number.

$$3 + (-4) = -1$$

Here, the negative number is $-4$ and the positive number is $3$. $4$ is larger than $3$, so the negative number is larger, which means the answer will be negative. So we subtract $3$ from $4$ and get $1$. The sign needs to be negative, so we get $-1$.

$$10 + (-1) = 9$$

Here, the negative number is $-1$, and the positive number is $10$. $10$ is larger than $1$, so the positive number is larger, which means the answer will be positive. So we subtract $1$ from $10$ and get $9$. The sign needs to be positive, so we get $9$.

If the positive number and the negative number are opposites, the answer is $0$.

$$3 + (-3) = 0$$

$$-10 + 10 = 0$$

Let's tackle **subtracting** numbers for the same combinations we considered for addition.

**Positive – Positive.** When we subtract one positive number from another, the result will be **positive if the first number is larger, but negative if the second number is larger.**

$$3 - 4 = 3 + (-4) = -1$$

Here, the first number is $3$ and the second number is $4$. Since $4 > 3$, the second number is larger so the result is negative.

$$10 - 1 = 10 + (-1) = 9$$

Here, the first number is $10$ and the second number is $1$. Since $10 > 1$, the first number is larger so the sign of the result is positive.

If the two positive numbers are equal, the result is $0$.

$$3 - 3 = 3 + (-3) = 0$$

**Negative – Negative.** When we subtract one negative number from another, the result will be **positive if the first number is larger, but**



**negative if the second number is larger.** In this context, the "larger" number refers to the number further right on a number line. For instance, the number $-2$ is to the right of $-6$ on the number line, so $-2$ is the larger number.

$$-3-(-4)=-3+4=1$$

Here, the first number is $-3$ and the second number is $-4$. Since $-3>-4$, the first number is larger so the result is positive.

$$-10-(-1)=-10+1=-9$$

Here, the first number is $-10$ and the second number is $-1$. Since $-1>-10$, the second number is larger so the sign of the result is negative.

If the two negative numbers are equal, the result is $0$.

$$-3-(-3)=-3+3=0$$

Notice that the effect of subtracting a negative number is that the two negative signs cancel.

**Positive** $-$ **Negative** $=$ **Positive.** When we subtract a negative number from a positive number, the result will always be positive, because of the fact that the negative signs will cancel, leaving just the addition of two positive numbers.

$$3-(-4)=3+4=7$$

$$10-(-1)=10+1=11$$

**Negative − Positive = Negative.** When we subtract a positive number from a negative number, the result will always be negative.

$$-3-4=-3+(-4)=-7$$

$$-10-1=-10+(-1)=-11$$

Here's a summary of our findings:

| | |
|---|---|
| Positive + Positive | Positive |
| Negative + Negative | Negative |
| Positive + Negative | Positive if the positive number is larger than the opposite of the negative number<br>Negative if the opposite of the negative number is larger than the positive number<br>$0$ if the numbers are equal |
| Negative + Positive | Positive if the positive number is larger than the opposite of the negative number<br>Negative if the opposite of the negative number is larger than the positive number<br>$0$ if the numbers are equal |

| | |
|---|---|
| Positive – Positive | Positive if the first number is larger |
| | Negative if the second number is larger |
| | $0$ if the numbers are equal |
| Negative – Negative | Positive if the first number is larger |
| | Negative if the second number is larger |
| | $0$ if the numbers are equal |
| Positive – Negative | Positive |
| Negative – Positive | Negative |

Keep in mind that when we add signed numbers, the order of the numbers doesn't make a difference.

$$3+4=7=4+3$$

$$-10+(-1)=-11=-1+(-10)$$

$$-3+(-4)=-7=-4+(-3)$$

$$10+(-1)=9=-1+10$$

$$3+(-3)=0=-3+3$$

But if we subtract signed numbers, the order of the numbers always matters.

$3-4=3+(-4)=-1$ but $4-3=4+(-3)=1$

$-10-(-1)=-10+1=-9$ **but** $-1-(-10)=-1+10=9$

$-3-(-4)=-3+4=1$ **but** $-4-(-3)=-4+3=-1$

$10-(-1)=10+1=11$ **but** $-1-10=-1+(-10)=-11$