Multiplying signed numbers

As a reminder, signed numbers are positive and negative numbers. When we multiply signed numbers, therefore, there are three possible combinations. We could be multiplying

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

For each of these combinations, let's talk about what happens when we multiply.

When we multiply two positive numbers, the result will always be positive.

$$3 \times 4 = 12$$

$$10 \times 1 = 10$$

When we multiply two negative numbers, the result will always be positive.

$$(-3) \times (-4) = 12$$

$$(-10) \times (-1) = 10$$

When we multiply a positive number by a negative number, the result will always be negative.

$$3 \times (-4) = -12$$

$$(-10) \times 1 = -10$$

Here's a summary of our findings:

Positive × Positive	Positive
Negative × Negative	Positive
Positive × Negative	Negative
Negative × Positive	Negative

In other words, if the signs are the same, the product will be positive. But if the signs are different, the product will be negative.

Even though 0 isn't a signed number, it's important to know that the result of multiplying any number by 0 is 0.

$$5 \times 0 = 0$$

$$0 \times -3 = 0$$

The result of a multiplication doesn't depend on the order of the numbers.

$$4 \times 5 = 20 = 5 \times 4$$

$$3 \times -2 = -6 = -2 \times 3$$

$$-5 \times 6 = -30 = 6 \times -5$$

$$-3 \times -7 = 21 = -7 \times -3$$

Up to now, we've usually used the times symbol $\times$ to indicate multiplication. But as we go forward in math, we'll start to use the dot symbol $\cdot$ more and more for multiplication. So 6×2 and $6 \cdot 2$ mean the same thing.

The dot is a little bit raised, so we won't confuse it with a decimal point. The reason we use this dot symbol is because it's easy to confuse $\times$ with the variable x.

When we're multiplying negative numbers, it's good to get into the habit of enclosing negative numbers in parentheses, especially when the negative number is the second number, but all of these are acceptable:

$$6 \times -2 = -12$$

$$(-5) \cdot 3 = -15$$

$$(-7) \cdot (-4) = 28$$

$$(-8) \times (6) = -48$$

It's also acceptable to indicate multiplication using only parentheses, instead of the $\times$ or $\cdot$ symbols. We can put just one number in parentheses or both numbers in parentheses. All of these express multiplication:

$$3(4) = 12$$

$$-2(5) = -10$$

$$(-7)(3) = -21$$

$$(-6)(-7) = 42$$