Variables

Algebra is when we first start to heavily use **variables**, which are symbols for numbers we don't know yet. We usually use a letter like x or y to indicate a variable.

Before Algebra, we focus almost exclusively on **constants**, which are numbers on their own. For example, take the simple statement,

$$3 + 2 = 5$$

In this equation, 3, 2, and 5 are all regular numbers on their own, so we would call them "constants."

But if we replace the 3 in the equation with x, we could write the equation as

$$x + 2 = 5$$

In this equation, x is a variable, while 2 and 5 are still constants. We call x a "variable" because it represents a number we don't know. However, just by looking at the equation $x + 2 = 5$, and also given that we know we started with $3 + 2 = 5$, we realize that we can solve for the value of the variable. Since this equation statement is so simple, we can see right away that the only value of the variable that makes the equation true is $x = 3$.

Later in this Algebra course, we'll spend a lot of time talking about how to solve equations like these for the values of the variables they contain.

A little more vocabulary

Let's look at another equation, like

$$3x - 10 = 8$$

We know already that x is a variable and that 10 and 8 are constants. When we have a number attached to and in front of a variable, like the 3 in this equation, we call it a **coefficient**. When we have a coefficient in front of a variable, it means that we're supposed to multiply the coefficient by the variable. So $3x$ means "three multiplied by x," or "three times x."

We can also have coefficients that aren't numbers, but are actually letters instead. If we typically use letters like x and y to represent variables, we typically use letters like a and b to represent constant coefficients. So in an expression like,

$$ax^2 + bx + c$$

we can say that x is the variable, a and b are both constant coefficients, and c is a constant.

We called $ax^2 + bx + c$ an expression, and we did that to distinguish this from an equation. **Equations** include an equals sign, and tell us that whatever we have on the left side of the equals sign is equivalent/equal to/has the same value as whatever we have on the right side of the equals sign.

On the other hand, **expressions** don't include an equals sign, but instead are just groups of terms, where a **term** is a single number or a variable, or numbers and variables multiplied together. So $ax^2 + bx + c$ is an expression

because it doesn't include an equals sign, and instead a collection of three terms, ax^2, bx, and c.

Let's look at an example so that we can get a little practice identifying these things.

Example

Use the vocabulary we've learned to describe as many parts of the statement as possible.

$$3x - 10 = 8$$

Let's start by talking about equations and expressions. We can say that $3x - 10 = 8$ is an equation, because it includes an equals sign that tells us that the left and right sides must have the same value. We could also say that $3x - 10$ is an expression and 8 is an expression, and therefore that the equation sets those two expressions equal to one another.

The terms in the equation are $3x$, 10, and 8, where x is a variable, and 10 and 8 are constants. The x variable has a constant coefficient of 3.