Today we're going to talk about literal equations. So we'll start by talking about what a literal equation is, and then we'll do some examples.

So let's start by reviewing the idea of an equation. An equation is just a statement that says that two quantities are equal. So for example, the equation 12y minus 8 equals 40 says that the expression on the left, 12y minus 8, has the same value as the expression on the right side of the equals, 40.

We have another example of an equation 9a squared minus b squared equals 15. And this type of equation is called a literal equation because it has more than one variable. However, even in a literal equation, the expression on the left side of the equals has to equal, or has the same value, as the expression on the right side of the equal sign.

And we use literal equations all the time in math. For example, the equation y is equal to mx plus b is another example of a literal equation.

A common type of literal equation is a formula. So for example we have the formula for the area of a rectangle. A is equal to l times w, where A is the area of the rectangle, l is the length of the rectangle, and w is the width.

And depending on what information you're given, you might want to rewrite a formula in a different way. So for example, if I wanted to use the formula to solve for the width, I want an equation that starts with w equals, or has w isolated on one side of the equation.

So I could rewrite this by dividing both sides by l, which would give me that w is equal to the area divided by the length of the rectangle. We could do the same thing to find in the equation for the length of the rectangle. We would do that by dividing both sides by w to isolate the l variable. So we see that the length of a rectangle is equal to the area over the width.

Let's look at another example of a formula, a literal equation. I have the formula for the area of a circle, a is equal to pi r squared. So I can rearrange this formula to have an equation that has r isolated by itself. So we're solving in terms of r.

So with my equation, to isolate the r variable, I'm going to start by dividing both sides by pi. So then I have A over pi is equal to r squared. And then to cancel out the 2 exponent, I'll take the square root of both sides. And I found that my radius is equal to the square root of the area of the circle divided by pi.

Let's look at the literal equation, the formula, relating the variables distance, rate, and time. So we can say that distance is equal to the rate times the time, but we can also rewrite this equation in terms of the rate and the time.

So to find an equation in terms of the rate, I'm going to isolate the r variable by dividing by t on both sides. So I found that the rate is equal to the distance traveled over the time.

I can do the same thing to solve for the time variable, t. So to do that I'll divide both sides by r, and I found that time is equal to the distance traveled divided by the rate, or the speed that you're traveling.

So finally let's look at the Pythagorean theorem, which says that a squared plus b squared equals c squared, where a and b are the legs of a right triangle, and c is the hypotenuse of a right triangle. So we can write this formula, or this equation, in terms of each side length, a, b, and c.

So first, if I want to write this in terms of a, I'm going to start by subtracting b squared from both sides. So this will give me a squared is equal to c squared minus b squared.

And then to cancel out the two exponents, I'll take the square root of both sides. So I'm left with a is equal to the square root of c squared minus b squared. Let's do the same thing and solve for-- write an equation in terms of the side lengths of b.

So to isolate the b variable, I'm going to subtract a squared from both sides. This will give me b squared is equal to c squared minus a squared. And then I'll take the square root again to cancel out the 2 exponents. So I find that b is equal to c squared minus a squared.

So we can guess that c then will be equal to something with a squared and b squared. But it's going to look a little bit different than these equations because we already have c squared isolated by itself. So then to just get c by itself, we only need to take the square root. So we found that c is equal to a squared plus b squared.

So let's go over our key points from today. Literal equations are equations that have more than one variable. Formulas are literal equations and are used often in mathematics. Depending on what kind of information you are given, you may wish to express literal equations or formulas in different ways.

So I hope that these key points and examples helps you understand a little bit more about literal equations. Keep using your notes and keep on practicing, and soon you'll be a pro. Thanks for watching.