Hi, this is Anthony Varela. And today, we're going to be solving single-step equations. So what we're going to do is talk about rules in equations. Then we're going to look at inverse operations and how that can help us solve equations, and then we're going to practice solving equations in a single step.

So let's talk about equations. Well, here is an equation x plus 13 equals 20. And what an equation is is it's a mathematical statement that expressions or quantities have the same value. So this is saying that the quantity x plus 13 has the same value as 20.

So we have this variable x in here. And a variable is a value that can change. But when it's in an equation, there is then a certain value that makes the statement true. Then x could have several values that make it true. But it's not always the case that x can be whatever it wants to be. It has to fit this equation.

And another thing about equations is that I can write this in the other direction. I could say 20 equals x plus 13. And this is what we call the rule of symmetry, that you can write the equation in the other direction. So with equations, we have quantities that have the same value. And we can read this forwards or backwards.

So now, let's talk about isolating the variable, which is the same thing as solving for your variables in your equation. So basically, what you want to do is you want to rewrite this equation so that it looks something like this. We have our variable x on one side of the equation, and then everything else is going to be on the other side that we can evaluate. So what we're asking ourselves is what's happening to x, our variable that we'd like to solve for. And we see that we're adding 13.

So how can we undo this addition of 13? Well, we can subtract 13. And this is using inverse operations. So what we're going to do is subtract 13 from this left side of the equation that's going to cancel out or undo 13 being added to x.

But what we have to do on the other side of the equation is subtract 13 as well. And this is called the rule of equality. And you've probably heard your math teacher say this many, many, many times. What you do to one side, you must do to the other. They're referring to the rule of equality.

So we have x plus 13. Then we take away 13. So we have just x on one side of our equation. And on the other side of the equation, we have 20 minus 13, which is 7. So now, you've solved this equation. We can plug 7 in for x and say, OK, 7 plus 13 equals 20. I've solved my equation.

So let's talk about inverse operations because we're going to be using these to solve our equations. We've already talked about addition and subtraction being inverse operations. So here's an example that we just walked through where if we add 13, we could subtract 13. Now, subtraction is the inverse operation of addition. So if we have x minus 13, we can add 13 to undo that.

Multiplication and division are inverse operations. So here's an example where we have 2 being multiplied by x. So we divide by 2 to undo that. And division is the inverse operation of multiplication. So if we have x divided by 2, we can multiply by 2 to get back to x.

Now, squaring and taking the square root are inverse operations. So if we have a positive number x squared, we can take the square root of that to get back to x. And similarly, if we have a positive number x that we have the square root of that, we can square that and get back to x.

And we can generalize squaring and taking the square root to talking about the n-th power and the n-th root as being inverse operations. So here are our inverse operations-- addition and subtraction, multiplication and division, and then we have powers and roots.

So now, let's go through a whole bunch of examples where we're using these different inverse operations to solve equations in a single step. So here, we have 7/3 equals x minus 2/3. So looking at the operation that I see next to that variable x, I see subtracting 2/3.

So we need to add 2/3 applying the inverse operation. And what we do to one side, we have to do to the other. So now, our equation is 7/3 plus 2/3, which is 9/3 equals x and 9/3 equals 3. So that's how we can solve that equation.

Our next equation is 5 equals 2x. And what operation do I see here? Well, I see multiplication. 2x is 2 times x. So I need to apply the inverse operation, which is division. So I need to divide by 2 on both sides of my equation. So x equals 5/2.

And in the next example, we have x over 3 equals 8. Now, what operation do I see here? I see x being divided by 3. So I need to apply the inverse operation of division, which is multiplication. So I need to multiply by 3 on the left side and multiply it by 3 on the right side. So now, I have x equals 8 times 3 or 24.

In this example, we have 8 equals x squared. And then what operation do I see here? I see x being squared. So I need to take the square root, applying the inverse operation. And then I need to do this on the other side of the equation as well.

So now, what do I get then? Well, the square root of x squared equals x. And then we have the square root of 8. And now, it's important when you're taking square roots that you're going to include the plus or minus when we're talking about equations because negative root 8 times negative root 8 will also give us 8.

And our last example here, we have 7.8 equals the square root of x. So how we're going to solve this equation-- well, I see that we're taking the square root of x. So we're going to square that side of the equation. Now, since we squared the right side of the equation, we have to square the other side. So x equals 7.8 squared, which is 60.84.

So let's review solving a single-step equation. Well, we talked about equations being quantities that have the same value, that statement that quantities had the same value. We could read equations both forwards and backwards. The rule of inequality says any operation performed on one side of the equation must be performed on the other side in order to keep the quantities equal in value. That's important.

And to solve our equations, we applied inverse operations. Addition and subtraction are inverse operations. Multiplication and division are inverse operations. And powers and roots are inverse operations. Well, thanks for watching this video on solving single-step equations. Hope to see you next time.