Hi, I'm Anthony Varela. And today, I'm going to talk about isolating variables in order to solve equations. So we'll talk about what it means to isolate variables. We'll look at how to use inverse operations to isolate variables. And then we'll talk about the order in which we perform our operations when we want to isolate a variable.

So first, let's review solving an equation. So I'm going to use a very basic example here. We have x minus 2 equals 5. And "isolating the variable" means we want something that looks like this. We want our variable alone on one side of the equation. It's isolated.

And on the other side of the equation, we have everything else, some expression that we can evaluate to solve our equation. So isolating the variable, we want are variable on one side, all by itself. And then everything else is on the other side.

So how do we do that? We see x minus 2. And we want just x. So since we have x minus 2, we have to add 2 to undo that. And because we added 2 to one side of the equation, we have to add 2 to the other side of the equation. This is following our rule of equality, that anything you do to one side of the equation, you have to do to the other side of the equation in order to keep things equal.

So now we've isolated our variable. We have x minus 2 plus 2. So the minus 2 and the plus 2 cancel out. And we just have x. So what's the other side of our equation? Well, that would be 5 plus 2, which is 7. And now we've solved for x in this equation.

So notice we used an inverse operation. We saw subtraction and we applied addition. So let's talk more about inverse operations. We're going to talk about addition and subtraction, multiplication and division, and powers and roots.

So taking a look at addition and subtraction as inverse operations, I could say if I have 7 minus 2 and I add 2, I get back 7 because the addition undid the subtraction. Similarly, if I have 7 plus 2, I could subtract 2 and get back to 7 because that subtraction undid the addition.

With the multiplication and division, let's say I have 2 multiplied by 3. And I wanted to get back to 3, I would divide by 2, because that division undoes the multiplication. And we can go the other direction too. We have 3 being divided by 2, so we can multiply it by 2 to get back 3 because that multiplication will undo the division.

With powers and roots, let's say we have 8 squared and we'd like to get back to our base 8. So we'd

take the square root of that and showing that the square root undoes that number being squared.

And, in the other direction, let's say we have a cubed root of 8. And we'd like to get just back that 8. So I'd have to cube that entire expression. So cubing a cubed root will bring me back what's underneath that radical, showing that cuing is an inverse operation of the cubed root. So powers and roots are inverse operations.

All right. Well, let's practice then isolating the variable in order to solve some equations. So here I have 7 equals 2x minus 3. So what operations do I see? Well, I see multiplication here, with the 2x. And then I see subtraction, with the minus 3.

So I have two operations. Which one am I going to undo first? Should I divide, undo the multiplication? Or should I add, to undo the subtraction? And what we want to do is we want to isolate everything else that's attached to the x term, or whatever variable you're trying to solve for, and then worry about any coefficients or anything else closely involved with the variable.

So I want to undo the minus 3 first. So let's add 3 to this side of the equation. That means we have to add 3 to the other side. So what do we get so far? Well, we get 10 equals 2x. We've undone the subtraction. Now it's time to undo the multiplication. So we'll divide both sides by 2. So now we have 5 equals x.

So notice, I did the addition first. And then I did the division. So what we're doing is we're following the reverse order of operations. So when you learned order of operations to evaluate the expressions, you learned PEMDAS. Well, if you're isolating the variable, you're working backwards. You're using the inverse operations to undo. So you're going to follow the reverse order of operations.

Well, let's take a look at this equation here. And we're really going to talk about things that you can do to your equation before you even begin isolating. And so with this equation, one thing you could do is you could distribute 3 into 2x and 4. So this is simplifying this equation, 6x plus 12 equals 24.

Now another thing that you could do is you could straight away just divide everything by 3. That will take care of the 3 outside of 2x plus 4. But remember, then you'd have to divide 24 by 3, as well. So all of these are equivalent equations. So let's go ahead and solve then these equations. We'll isolate x.

So looking over on this side, I have multiplication and addition. And remember, I'm going to use the reverse order of operations, which means first I subtract 12 from both sides. This will give me 6x

equals 12. Then I could divide both sides by 6. And this will give me x equals 2. And if you're curious how this works on our 2x plus 4, we would take care of that addition first, and then divide by 2. We get the same solution.

Now sometimes, simplifying might mean combining some like-terms. So in this example, we have 5x plus 3 plus 2x equals 24. And my like-terms here are 5x and 2x. They're both x-terms. And we can combine these.

So we add them together. 5x plus 2x is 7x. So we have 7x plus 3 equals 24. So we're simplifying before we even begin to isolate x. So it just makes everything easier.

So to isolate x, what we're going to do now is take care of our plus 3 first. So we're going to subtract 3 from both sides. This will give us 7x equals 21. And then we divide both sides of our equation by 7. So x equals 3.

So what did we talk about with isolating variables? When we're isolating the variable, that means our variable's on one side. Everything else is on the other side. And we use inverse operations to isolate variables.

So our inverse operations are addition and subtraction, multiplication and division, and then powers and roots. And, remember, you're going to use the reverse order of operations when you're isolating.

So thanks for watching this video on isolating variables. Hope to see you next time.