Today we're going to talk about solving a multi-step equation. A multi-step equation is just one that you have to do multiple steps in order to isolate your variable. So we'll start by reviewing the general process for solving an equation. And then we'll do some examples.

So let's go over our general process for solving an equation. So we are going to use inverse operations to undo any operations so that we can isolate the variable we're trying to solve for. And our inverse operations are multiplication and division, addition and subtraction, and powers and roots. So in general, when you are applying your inverse operations, you do it in the reverse order of operations to isolate your variable. And then by the rule of equality, whatever operation is done on one side of the equation needs to be done on the other side of the equation.

So let's see how we can use this process to solve some multi-step equations. So here's my first example. I've got 28 is equal to negative 4, times 2x plus 5 in parentheses. So when I solve this equation, I always want to remember that I'm going to start by simplifying if necessary. And then I'm going to do my inverse operations in the opposite order of order of operations, so starting at the bottom and working our way up.

So in this example, I can simplify. I can start by distributing my negative 4 to both things in the parentheses. So negative 4 times 2x is going to give me negative 8x. And negative 4 times a positive 5 is going to give me negative 20. Then I can bring down my other side of the equation.

So now that I'm simplified, I'm going to start by using my inverse operations by doing any adding or subtracting. So I'm going to undo the subtracting 20 by adding 20. And I know that I need to do it on both sides. So this is going to give me 48 is equal to negative 8x, because these two things canceled out.

Now I can undo my negative 8 that's being multiplied by the x by dividing by negative 8 on both sides. So now these two negative 8s will cancel out. And I've isolated my x variable. And then I just simplify. 48 divided by negative 8 will give me a negative 6 for my final answer.

So here's my second example. I've got negative 11 is equal to 132 divided by x. So for this example, I need to start by moving my x variable from the denominator of the fraction, because you can't isolate a variable if it's in the denominator of a fraction.

So to do that, to bring the x from the denominator, I'm going to do the inverse operation. So since this is dividing by x, I'm going to multiply by x on both sides. And I'm going to multiply by x on the other. So now these two cancel each other out. And I'm left with negative 11 times x is equal to 132.

So now that I no longer have my x variable in the denominator of a fraction, I can go ahead and apply my order of operations backwards. I don't have any adding or subtracting to undo, so I'm just going to cancel out the negative 11 that's multiplying by the x. So I'm going to divide both sides by negative 11. These two will cancel each other.

And I've isolated my variable. So now I just need to simplify. 132 divided by negative 11 gives me negative 12 for my final answer.

So for my third example, I've got 7 is equal to the square root of 5x minus 16. So I can see that I don't have anything to simplify. And so normally I would start by doing my order of operations backwards.

However, when you're solving an equation with a radical in it, you need to start by undoing the radical operation first. So this is an exception. We're not going to follow order of operations backwards. We're going to start by undoing our radical operation first.

So because this is a square root, I'm going to undo it by squaring both sides. So here, these will cancel. And I'll be left with 5x minus 16. And on the other side, 7 squared is 49.

Now I'm going to start by canceling out my subtracting operation. So I'm going to add 16 to both sides. This is going to give me 65 is equal to 5x.

Then I just need to cancel out my multiplying operation by dividing by 5 on both sides. This will give me x. And on the other side 65 divided by 5 is 13. So I've found that x is equal to 13.

So let's go over our key points from today. As usual, make sure you get them in your notes if you don't have them already so you can refer to them later. The process for solving an equation involves using inverse operations in the reverse order of operations or PEMDAS backwards. And you need to simplify the equation if possible before using those inverse operations.

If a variable is in the denominator of a fraction, you need to multiply both sides of the equation by that variable to solve the equation. And finally, if solving an equation with a radical, you need to isolate the radical and use a power to cancel it out before doing anything underneath the radical.

So I hope that these key points and examples helped you understand a little bit more about solving multi-step equations. Keep using your notes. And keep on practicing. And soon you'll be a pro. Thanks for watching.