>> Balance the following equations. What we have here are acid-based equations. They're neutralizations. Whenever an acid and a base comes together, they neutralize each other. And acid is very corrosive, base is very caustic, but when you put them together, they form water and salt, two things that won't hurt our pipes. They're very safe. And so this – anyway, this is called a neutralization. Your products for neutralization of the acid and base are always a salt and water. Now we want to balance these equations. We have been balancing these equations already, but when you do balance acids with bases, there's an easier way of doing it, and so that's what I'd like to show you right now. When you're – what we're looking at are simply the hydroxide, which is the part of the base, and the hydrogen, which is a part of the acid. When we have one hydroxide and one hydrogen, they come together to form one molecule of water. And what we want to do in order to neutralize is to make sure we have the same number of hydroxides and the same number of hydrogens. And you can see here with sodium hydroxide, there's just the one hydroxide. With hydrochloric acid there's just one hydrogen. So these already balance, and they form one water. So if I were balancing this equation, I wouldn't want to leave it like this because my instructor would probably be saying, well, they never did the work. You want to go ahead and put in ones to show that you did the work. So to balance, we have one here, one here, one here. Now the last thing we have to do now is look at our salt and make sure that that balances also. One sodium over here, one sodium here. One chloride, one chloride. It balances, so we can go ahead and put a coefficient of one there also. So this is already a balanced equation. Now let's take a look at our second one. Again, we have sodium hydroxide, but this time we're working with sulfuric acid. Sodium hydroxide has the one hydroxide, but sulfuric acid has two hydrogens, so now you see there's one hydroxide and two hydrogens. They don't balance each other out. We want them to balance out, and so we have to increase this number to meet this number, to become this number. One times two will give us two hydroxides. This times two means we're going to go ahead and put the coefficient two in front of the sodium hydroxide. We don't have to change this one because this balances already. Now two hydroxides and two hydrogens will form two waters. And so here's our two waters. We only have one up here, so to get from here to here, we're multiplying again here by two. One times two will give us two. So this times two tells us that our coefficient here is going to be a two. We said we're not changing this, so we can just go ahead and put the one there. Now all we have to do is look at our salt and make sure this balances. Here we have two sodiums. Here we have two sodiums. We have one sulfate and we just have the one sulfate polyatomic ion. So this is balanced as it is. We'll go ahead and put that one there. And now we've finished balancing the second one. Notice we didn't have to take inventory. It worked out very nicely. Okay, let's look at this third one now. And now we have calcium hydroxide neutralizing phosphoric acid. Again, we have our water and our salt. Hydroxides, look at the coefficient – or the subscript outside of the parentheses. There's two of them, so we have two hydroxides. Here we have the subscript three with the hydrogen. We have three hydrogens, two of one, three of another. They're not matching again.

We have to balance them. There's no whole number we can multiply two by to equal three. And so what we want to do is we want to look for our least common multiple of two and three. Least common multiple for two and three is six. So two times three will give us six hydroxides. There's our three here. We're going to use that as our coefficient. Here we want to make this six also. Three times two is six. Here's our two. That's going to be this coefficient. So now we have six hydroxides, six hydrogens, they're going to form six waters. So we're taking our one water that we originally had, multiplying it by six to give us six waters. So this six now is the coefficient for water. Now let's check our salt. We've got calcium, three calciums here, three calciums there. Two phosphates, two phosphates. And so everything is balancing out. This is a nice balanced equation.