Hi, my name is Anthony Varela. And today, we're going to multiply radical expressions. So we're going to talk about distribution. Then we're also going to talk about a process called foiling. And we'll look at both distribution and FOIL with radical expressions.

So let's review the distribution property. And this lets us multiply an outside factor by a sum by distributing that outside factor. So we distribute a into both b and c. So here's a numerical example of distribution.

Now I'm just going to write off over to the side that I already know this equals 21 because 5 minus 2 equals 3. And then 7 times 3 equals 21. But let's show that this is true by distribution.

So I need to distribute or multiply 7 by both 5 and my negative 2 because I have subtraction here. So 7 times 5 is 35. And 7 times negative 2 is negative 14. And then 35 minus 14 is 21. And I knew that I was going to get 21 because I showed that over here.

So distribution, multiplying an outside factor by a sum. We distribute that outside factor. Well, distribution works with all real numbers. And this then includes radicals. So let's go ahead and work through distribution with some radicals.

So here we have the square root of 5 multiplied by the quantity 3 plus the square root of 5. So here, we're going to distribute the square root of 5 into everything we see inside the parentheses. So first, multiplying then the square root of 5 by 3, we get 3 times the square root of 5. Then we have the square root of 5 times the square root of 5.

Now the cool thing here is that with square roots, if we have two identical square roots, and we multiply them together, that just equals what's ever underneath the radical. As in this case, it's the integer 5. So this then simplifies to 3 times the square root of 5 plus 5.

Now let's talk about FOIL. And this can be considered a more complicated distributive rule. There's just another element to it. And basically, what we do with FOIL is first we distribute a into c and d. Then we distribute b into c and d.

So we have a couple of different products that we would add together more than in just distribution. So that is what we call the FOIL method. And why do we call that the FOIL method? Well, FOIL is an acronym to remember steps for distributing factors in binomial multiplication. And we multiply the first terms together, then the outside terms, then the inside terms, and then the last term.

So let's take a look at an example of foiling with integers. So here we have 8 minus 3. And we're going to multiply that by the quantity negative 4 plus 3.

So I need to multiply my first two terms together. That would be the 8 and the negative 4. That equals negative 32. Then I'm going to multiply the outside terms together. So that'd be 8 and 3. That gives me positive 24.

Then I multiply the inside terms together. That would be negative 3 and negative 4. So that gives me a positive 12. And then I multiply the last two terms together, negative 3 and positive 3. That will give me negative 9.

Well, then I just add and subtract all of these up. And this gives me a final value then of negative 5. That's when I evaluate this binomial multiplication here.

So now let's use FOIL with radical expression. So here I have 4 plus the square root of 6. I'm going to multiply that by the quantity 3 minus the square root of 6. So let's go ahead and use our FOIL process, multiplying the first two terms, 4 and 3. That gives me 12.

Multiplying the outside terms, 4 times negative square root of 6. So I'm going to subtract 4 times the square root of 6. Then I'm going to multiply my inside terms, positive square root of 6 times 3. So I'm going to add 3 times the square root of 6.

And now I have my last two terms, positive square root of 6 times negative square root of 6. This equals negative 6 because remember I have these identical square roots. So it evaluates to the integer 6. Positive times a negative is negative, so I have minus 6.

Well, now let's take a look if I can combine any of these terms here. Well, I have a negative 4 root 6 and a positive 3 root 6. So I can combine them. And that will give me a negative 1 root 6.

Notice that I don't have to write the 1. And then I can combine those integer terms as well, 12 minus 6. So fully simplified, this is 6 minus the square root of 6.

Let's go through another example of using FOIL with radical expressions. So here, I have 2 times the square root of 5 minus 3. And I'm multiplying that by the quantity 7 minus the square root of 5. So using FOIL, I'm going to multiply my first two terms together, 2 times the square root of 5 and 7.

So this gives me 14 times the square root of 5. Now I'm going to multiply my outside terms. So I would

have 2 times the square root of 5 times negative square root of 5.

Notice, once again, we have these two identical square roots. So when you multiply them together, they equal the integer 5. Then I have this scalar value 2. And it is a negative square root of 5 over here. So that's why I'm going to subtract 2 times the integer 5.

Next step in FOIL is to multiply the two inside terms, which is negative 3 and 7. So I'm going to subtract a 21. And finally, multiplying the last two terms. Negative 3 and negative square root of 5 gives me a positive 3 times the square root of 5.

Taking a look here at this negative 2 times 5, that equals 10. So I'm just going to write that in here. And now we'll see if we can combine anything.

Well, we have 14 times the square root of 5 plus 3 times the square of 5. So that'd be 17 times the square root of 5. And then I have my negative 10 and negative 21. So that would be minus 31 to finish that one.

So let's review multiplying radical expressions. We talked about distribution. This is taking an outside factor and multiplying it into everything inside the parentheses. Then we talked about FOIL, which is like distributing twice. And FOIL is an acronym to remember the steps for distributing these factors in binomial multiplication. You multiply the first two terms, then the outside terms, the inside terms, and finally, the last two terms.

So thanks for watching this tutorial on multiplying radical expressions. Hope to catch you next time.