Exponents and Polynomials II

SUMMARY KEYWORDS
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You're going to get a lot of questions about exponents. And the best way for me to help you answer these questions and understand different exponent rules, is just that to walk you actually through the rules themselves. So let's take a look at the first problem in your slides. Now, I'm just going to break this down and just let's look at four. Oh, let's look at four to the power of three. What is that saying? Well, it's saying four should be multiplied by itself three times. So that's four, times four, times four, and four to the power of two, is four should be multiplied by itself twice. So we have four times four. Now, the very long winded answer to this question right here, is going to be well, for the power of two times four, the power three is four times four, times four, times four. And you can see that that's four to the power of five. Now, why is that important? Because there's an easier way than writing out and this long form the way I have to get the answer. And that's shorthand if the bases are the same. In this case, they are they're both equal to four, then we can add the exponents, four to the power of two, plus three, while that's gives us four to the power of five. So we didn't have to go through that intermediate step, we can just use the shorthand rule to get the right answer. Now, I mentioned to you that four is the base, so four is the base to the exponent. One thing to keep in mind, this is when we're multiplying one base times another, if I wrote four to the power of two plus four to the power of three, that is not going to be equal to four to the power of five. Now, if you're sitting there, and you're going, Yeah, of course, it's not that would be stupid. This is a common common mistakes students make many, many times very, very often students make this mistake. Don't be one of them. Practice, practice. So these rules become second nature. And you'll never you'll never make a mistake like that. But if you don't practice, do you think you won't make that mistake, but when you're sitting in an exam, you can't get the answer, and you start to stress out and you start to panic. Those are the kinds of mistakes students make. I see it all the time. Now let's look at the next question. The question at the bottom of your slides, we've got a fraction. Well, if we've got a fraction raised to a power, it's still the same methodology, we've got three divided by five, multiplied by itself three times. So I could write that out as three over five, times three over five, times three over five. Notice that I could also write it as three to the power of three over five to the power of three. What I want to say here is that the rules apply, even if the base is a fraction. So don't be confused at the basis of fraction. Also, keep in mind that the factor or excuse me, the exponent is coming into the fraction. Now what are we doing see four raised to the power of negative one? Well, that's actually another way of writing one over four. So another thing, when I'm used to thinking of is this is the inverse of four, it's the inverse of four. Now what if we have two factors that are multiplied by each other with negative negative exponents? Well, there's a few things few different ways I could rewrite this one I could do is point out to you that we've got four raised to the power of negative two, well, that's like being raised to the power of two times negative one. And we've got four to the power of three times negative one. And so that's going to be like one over four to the power of two, times one over four, the power of three because I can bring that negative and switch the numerator and the denominator accordingly. And so another way I could write this, I've got one over four Multiply by itself How many times? Well, two plus three, or one over four to the power of five. That's what it looks like. more simply, I could say, well, I've got for the negative two, minus three, which gives me four to the negative five. All these different ways of writing are equivalent, I can add the exponents, even if they're negative, I can add the exponents, even if they're negative. What's four to the power of zero? You might be tempted to think that it's equal to zero. But it's actually equal to one. Why is it equal to one? Well, we know that for say, to the power of two minus two, well, that should be equal to four times four times one over four, times one over four, and that's going to be equal to one. So four raised to the power of zero is equal to one, it's not equal to zero, it's actually it's actually equal to one. Now what about exponents raised to another exponents, so we've got four squared raised to the power of three. Well, I can write that out, like four squared, times four squared, times four squared. And that's equal to four. You guessed it four, times four, times four, times four. And this is equal to four to the power of six. So if I have four squared raised to the power of three, that's like having four raise to the power of two times three, like so. And I end up with four to the power of six. So I don't have to do it this long way and write it all out, I can just jump to these rules. And I know that if I have an exponent raised to another exponent, they're gonna multiply each other. Okay, so those are some of those are the power rules that I wanted to emphasize to you. Now let's look at an example. Question from ALEKS. So we've got this messy bunch of exponents. We've got two unknown variables, an X and a Y, and a bunch of exponents floating around. And it says Write your answer without using negative exponents. So we have to transform every negative exponent into a positive exponent. How are we going to do that? Well, I'll start off by dealing with this negative three exponent. And so what's that going to look like? Well, every factor in the bracket is going to be raised to the power of negative three, so I've got four to the power of negative three, I've got x to the power of negative two, multiplied by negative three, right, we're gonna multiply the exponents. And I've got y to the power of three, multiplied by negative three. So I'm just going to leave four to the power of negative three as it is for now. Then I'm going to multiply out these exponents. So we've got x to the power of six, and we've got y to the power of negative nine. Now we need to get rid of the negative exponents. So any factor that have has a negative and an exponent is going to move to the denominator. So we're gonna have six to the power, or excuse me, x to the power of six, over four cubed times wide and the nine. Now ALEKS would like us to multiply out that four cubed. So we're going to have x to the power of six. Four times four is 1616 times four is 64. Y nine and so there's our answer. Now we can take a look at ALEKS. Now I've been recording this video and I already put the answer in ALEKS. I actually forgot to hit the record button so the answer is already in there. But you can see that we have the correct answer. The correct answer, just like we did on the slides is x to the power of six divided by 64 times y to the power of nine. Sometimes we need to factor by grouping. This is a more challenging way of factoring. But I just want to try and help you help you with it. It's not very difficult, as long as you recognize what the question wants you to do. So we can't This is not a quadratic. And since it's not a quadratic factoring, it is not going to be straightforward. But I want one thing I can do I notice here is, if I, I'm going to sort of why we call by grouping is I'm going to have two groups, we'll call this a, and we'll call this B. And so I'm going to focus my attention on a and I'm going to try and make a look like be good to try and make a look like B How am I going to do that? Well, if I just look at a in isolation, I can see that I could factor out a two and a V squared. Two is can't be divided into 10 or eight and get a whole number. If I do that, I'm left with five v plus four. And then over here, we have minus V minus four. Now notice that I've made Group A look more like Group B. Now, they might look the same, but they're not exactly the same yet. And one thing I can do to make them more similar is I could factor out a negative these negative sign so I could rewrite this whole thing as to v squared, five v plus four plus negative one, times five v plus four. Now, they're the same. So I can have to the square Oh, be careful. minus one, five V, plus four. So I've essentially factored out five v plus four in that bad whole bracket, this whole bracket, right here. And when I do that, I'm left with two v squared minus one. And that whole thing is going to be multiplied by five v plus four. So here we are on ALEKS. And I'm going to put in the answer, but two v squared. And then make hit the right arrow minus one Oh, and I forgot my brackets. So I'm going to go back and put brackets around that factor. And then another bracket, and I've got five B plus four. And it looks looks a little funny. But I've got the right answer. The brackets are different sizes for some reason, but I guess that's just the way I typed it in. And we we did it we factored by groups. And so I divided the question into a group A and Group B. And then I made Group A look as much like Group B as possible. So we're told to combine like terms and simplify this expression before us. So I'm going to start off by multiplying the factor into the bracket and, or what I like to call opening up the brackets, I'm going to open up the brackets, so I've got negative four times negative five u, so that's going to be plus 20 u plus four y plus 15 y minus nine you so a negative times a positive is a negative right. We saw that in a previous question. And so I've got those groups. I've got the U groups. And I've got the Y groups. So I've got two types of terms. And when I add them together, I'm going to have 11 u 20 minus nine plus 19 y. And typically, the term should appear in alphabetical order. So we've got the you have the Y here. Now let's put it into ALEKS and see if we've got the right answer. So here we are in ALEKS, we had 11 u plus 19 y. And let's see what happens when we hit the check. We had the right answer, we collected the terms successfully.