

M3_P12

📅 Thu, 11/25 3:22PM ⌚ 8:56

SUMMARY KEYWORDS

square root, equal, exponent, negative, fraction, expression, power, remember, write, suppose, fractional exponent, rewrite, undefined, change, positive integer, raised, wished, multiplied, rates, social sciences

SPEAKERS

Robert McKeown

Hello, Robert J McKeown here. Welcome to our video on fractional exponents. A fractional exponent is one where we have a base, which is a real number, and it has an exponent, that is a fraction. And though that fraction is important in the social sciences, because it can tell us something about how expression or a function, which we'll talk about in the next series of videos, is evolving, or changing over time, which brings us into calculus, where we're going to spend quite a bit of time looking at rates of change. Let's start off with something that you can either already know, or something that you can easily convince yourself is true. So if I write the square root of four, that's equivalent to writing four to the power of one half. And you can use your calculator to show that that's indeed true. Now, why is it true? Well, if I write the square root of four times the square root of four, that's just equal to four. Right? You know, you, you could write it out, you could solve for the square roots, if you wished. But that's just going to be equal to four.

So this part was pretty easy to show, what about four to the power of one half? Well, if I wrote four to the one half, times four to the one half, that would be equivalent to writing four to the one half raised to the power of two. And we know from our exponent rules we looked at before, that this is going to give us two times one half in the exponent, which is going to be four to the two over two, which is just equal to four. Consequently, it should be the case that these two are equal to each other. Because if we multiply each of them by their self, they're going to give us the same answer. And this is true whether we use four or a different number. And so we can write more generally, that the square root of a , a is a positive integer, the square root of a is going to be equal to a to the one half. Now let's combine some of the exponent rules with fractions. So if we wrote something like say we had the square root of A times B , that's just equal to the square root of A multiplied by the square root of b . Similarly, if we had a to the one half, b to the one half, and here b is also a positive integer. This is going to be equal to a b to the one half. We've seen that before, these same rules are applying when the exponent is a fraction. I could also use division. So suppose we have the square root of a divided by the square root of b . That would be like a over b all in the square root. And that would be equivalent to a over b raised to the one half. Now what about negative exponents? Suppose I write a over b to the power of negative one half? Well, I could rewrite this as a over b to the power of negative one to the exponent of one half. And remember that

remember that previously, we saw we had a number like a to the negative one, that was equal to one over A . And if we have here we have a over b to the negative one, that's going to be equal to b over a , we're going to flip the numerator and denominator and so I can rewrite this expression over here, I can rewrite this as B over A to the power of one half. And if I wished, and if you wish, we could write it as the square root of b over a .

Now what about a negative base? There's nothing to stop us from writing negative two to the power of three, that's fine. That's okay. We could write a negative one half to the power of three, that's fine. But what if I write, say, negative four? The square root of negative four or negative four to the power of one half? Hmm, well, there's a problem here. Remember, the square root is saying, this is essentially saying what? number multiplied by itself equals negative four

and the answer is undefined. It's undefined. No real number satisfies say x is equal to the square root of negative four, we can't find an x that is going to satisfy this expression. So remember, you can't take the square root of a negative

all just saying negative value. So you should remember that, don't forget that. Keep that in mind. Now, what if we have something like x squared is equal to 16. And suppose we want to solve for x . So one way to solve for x would be to take the square root or raise both sides of this expression to the power of one half. And that's going to give us x , that's going to just give us x on the left hand side, and it's going to give us four on the right hand side. But remember, x could actually take on two values here, x could be equal to four or x could be equal to negative four. So we could say that x is equal to plus or minus four. So if you're taking the square root of a positive number, you can do that. But remember that there are often two solutions. If I have a setup or you have a setup like this, remember that there could be two solutions to that expression.