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SUMMARY KEYWORDS

equal, equation, square root, multiplied, solve, meals, expression, subtract, sides, denominator, elimination method, problem, divide, 3d, drink, values, sentence, substitution method, price, scratch

SPEAKERS

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Here we have another challenging system of equations problem. I encourage you to try it yourself, press pause on your video, give it a try. And then when you're ready, continue the video. And we'll solve for X and Y together. Now looking at this problem, you see the trick being while we've got fractions, but we also have the variables we want to solve in these square roots. One thing you could do is you could say, well, let W equal the square root of X. And we could say, let V equal the square root of Y, we could do that. I'm going to solve this without doing that first. And we might find that it's not necessary. But you could go ahead and do that if you want to make it easier to look at. So I'm not going to use that I'll leave it up there, we'll just scratch it off.

Now looking at this, anything with a square root X is a like term. So I can actually add three, multiplied by the square root of X plus two multiplied by the square root of X, that's going to give me five square root of X. So I can just sort of pretend the square roots are not there for now. And if I do that, I want to, well, I'm going to use the elimination method here, then I don't have to try and, you know, isolate the actual X values. So that said, I'm going to multiply the top expression by let's say two and the bottom one by three. I'll do it that way. So now we're going to have six square root of X plus four, square root of Y, and two times two, that's for this equation down here, the bottom equation, I'm going to want to multiply that by three, so that I can have six multiplied by the square root of X in both equations. And so we have six times the square root of X minus nine, square root of Y is equal to three over four, three quarters. Now I can subtract the bottom equation from the top equation. And if I do that, I've got zero plus 13, square root of Y is equal to well 16 over four, 13 over four. So we've got 13 over four here. Normally, 13 is not a great number to work with, but we got a 13 here and a 13 there. So if we divide 13, or divide both sides of the equation by 13, we're going to end up with the square root of Y is equal to one over four.

How do we deal with this? Well, we can square both sides of the expression. So we're going to have Y is equal to one over four square, one over four times one over four, that's equal to one over 16. So we've got Y is equal to one over 16. I just moved that work that we did a little bit out of the way, so that we can exploit this expression we have down here, Y is equal to one over 16 to go ahead and solve for X. Now I'll use the top equation, we can use either we've got three times the square root of X plus two, multiplied by the square root of one over 16 is equal to two. Now, what is two multiplied by

the square root of one over 16? Well, the square root of one over 16 is saying what two numbers multiplied by itself is equal to one over 16. And the answer to that is one over four. One over four times one over four, gave us one over 16. We actually did that over here. And this is equal to two. Now we can go ahead and solve. We've got three square root of X plus one half equals two, three square root of X is equal to two minus one half square root of X is equal to, well, you could say this is three over two, divided by three. And the square root of X is therefore going to be equal to one half, or three over six, which simplified becomes one half. If we square both sides of this expression, we're going to find that X is equal to one over four.

Give this word problem a try, see if you can write it as a system, or as specifically a linear system of equations, and then solve the system. So see if you can find the price of the meals and the price of the drinks. Pause your video when you're ready, resume play, and we'll solve it together. We can break this into parts. So we've got two sentences, and we want to find two equations. The first sentence is going to be one equation, and it says five meals. So let's let M equal the price of a meal, and D will be equal to the price of a drink. So we've got five M, five meals, plus, or five meals multiplied by the price of those meals M plus 20. Drinks multiplied by the price of a drink is going to have a total cost or total value of \$900. The second sentence, two meals, three drinks cost \$210, so that 2M, two meals plus 3D is equal to \$210. There's our system of equations. Now we want to go ahead and solve for M and solve for D.

I'm going to use the substitution method. And that's going to mean that I've got 2M is equal to \$210 minus 3D. And if I divide both sides of the equation by two, I end up with M is equal to 210 minus 3D over two, like so. Now I want to use this M that I got from the bottom equation, I want to sub that into the top equation. So we have, I'll just rewrite it, we've got 5M plus 20D is equal to 900. Now we've got five times 210 minus 3D over two plus oops 20D is equal to 900. I've got that two in the denominator down here. So I could multiply this entire expression by two and that would eliminate all values in the denominator. The denominator is equal to one for everything. So let's do that. That'll give us five times 210 minus 3D plus 40D is equal to \$1,800. Almost forgot a bracket there.

Let's work through the bracket. So now we've got five times 210. That's going to be 1050 minus 15D plus 40D is equal to 1800. Next, let's subtract 1050 from both sides and collect like terms, we're going to end up with 25D is equal to 750. 750 divided by 25, that's going to give us. Now we've got D equals 30. We can use one of the two equations up here to solve for the cost of meals, and let's use the bottom one, 2M plus three, 3D, is equal to 210. Replace D with 30. And subtract 90 on both sides of the expression and we end up with meal costing \$60 for we found a drink cost \$30, and there we have it