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SUMMARY KEYWORDS

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SPEAKERS

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Welcome. In this lecture, I'm going to go through a linear word problem example. I've already wrote the problem on the board. You can also, if it's a little difficult to read on here, you can read it in the notes there. But I kind of wanted to do this one by hand, because I want to be able to draw the picture, I like to draw pictures. Okay, so we're in a situation where we have, so we have these three cities, we have Appleville, Orangeville, Bananaville, they lay on the same road. Okay, and it's one mile from Appleville to Orangeville and two miles from Orangeville to Bananaville. Okay. And then the story goes, that most mornings, you're going to walk the two miles from Orangeville to Bananaville. Okay, so maybe I live in Orangeville, I walk two miles from Orangeville to Bananavillage normally, but instead, maybe last night, I was visiting a friend in Appleville, and I need to get to Bananaville. Okay. And I'm going to walk at a rate of three miles per hour. And the question is, how long will it take me to reach Bananaville? Okay. And part of why I gave this particular problem is because intuitive, you know how long it takes, if I'm walking, what's one plus two. So if I'm walking three miles, and I'm walking at a rate of, and let's kind of add my rate into here, so I'm walking at a rate of three miles per hour, so miles per hour. Right? Then it's going to take me one hour. Okay, so let's actually write that down. And the reason why this is nice is often, and you can even do this for yourself, if a, if a problem is too confusing, find an analogous simple problem, where you know the answer intuitively and check your reasoning and see if you get the same output answer. I even do this, sometimes. I'm not sure how to tackle something, so I look at a very, like special, you know, circumstance that's much simpler. And I kind of, where I immediately kind of my intuition knows what to do, and then I see if I can kind of use that same technique. Okay, so here's the intuitive answer. Right, which was, as I said, we're going three miles at three miles per hour. So that should take me one, one hour, right? So, right, three, so traveling, traveling three miles at three miles per hour, takes one hour.

Okay, now, um, let's kind of do something that's kind of more generalizable or flexible. I'll kind of start this over here. Okay, so that's kind of the intuitive way to do it, but let's do like the generalizable or flexible approach. The generalizable or flexible approach Okay, so the situation can be represented by an equation, okay. So the situation, situation can be represented, so it can be represented by this particular equation. And the equation is going to be Y equals $3X$. So, let's let's do and this is going to be for your future, going to make that red. Just like I actually have it red up here. Okay, so $3X$. Oh, this isn't the same one is that one, $3X$ minus 1. Actually, because that's confusing. If it's red, because

you're gonna think that it's, it's, it's red because of that. Um, no, this is actually red for that one. Okay, there we go. Sorry. Um, where I'm gonna have, so where we have, so our X. Oh, I wanted my X to be orange though, that I did want to be true.

The one tricky thing about this problem was because I wanted it to be intuitive, the three shows up in two different places. So that was why I, for a moment, wasn't sure that I wanted that like that. Okay, so where we have, so we have that X equals the time output, or the time passed. And then we have that Y is going to be the distance past Orangeville. Y equals distance past Orangeville, right, which in our circumstance, we're going to want to be two miles, we want to go two miles past. Okay? So with let's graph this equation, so I have my Y axis, or sorry my X axis is my horizontal axis, my Y axis is going to be here. And then I guess I'm out of colors, but I'm going to just do this whole thing in red. So I've got Y equals $3X$ minus 1. Y equals $3X$ minus 1. Okay. So this is this picture. So with that equation. So if we want to be, so if want to be what do we want? We want to be two miles past, right? So this is the distance past Orangeville. So we want, right looking up from here, I walk the two miles from Orangeville to work, okay. So if I want to be two miles past, so if I want to be two miles past Orangeville, right, then we substitute, right, my Y tells me my distance past Orangeville, so we need to substitute Y equals two into my equation. So we want to substitute Y equals two into this equation.

And let's kind of do this, we can just kind of do this here. So I have Y equals and then I, I have three, we'll go back to doing this blue, because I want to use red for the entire thing there. So you have $3X$ minus 1, right? So we want to put in this Y equals two into there. So I have this Y equals two. I want that to go into here. Okay. So that just gives me that two is going to equal three and I know I'm solving for this X, right? Because X is going to give me my time output. So X minus 1, okay, and now we need to solve for the time output X, right? So and I want to solve for the time output X. So solve for time, output X. Right, because that's what I'm asking for, is when it says, how long will it take me to reach Bananaville, okay. So I want to know how long it takes. So that's going to be my X. Okay, so then I've got now I can just solve here, so I have, move, you know, I'm going to add one to both sides, I'm going to get two plus one equals $3X$.

Right, here, I just, I added one to both sides. That was all I did. So I added one to both sides. Okay, and now I just need to isolate X, so I need to divide both sides by three. So I'm going to get, right, this here is three. Right, this is three, sorry, three equals $3X$. And now I'm going to get that X equals one by dividing both sides by three. Okay, so in the next step, I'm going to divide both sides by three.

Okay, so I'm going to get that. So I have three equals $3X$. I divide both sides by three, and I'm going to get one equals X or in other words so i.e. I'm going to have that X equals one hour. And that's my final answer. Okay, um, and I want to say that this is kind of not a coincidence that there's this point on here. So, I do actually have a point on this graph, which is one, two.

Okay. So looking at what I have over there, right, the fact that I could have two is as a Y value, and one is an X value at the same time does correspond to the fact that this is the graph of this equation. Okay? So not a coincidence, this point is on here. So not a coincidence this point is on the graph. Okay, and we're gonna kind of focus in on that kind of thing in the following lectures. So but it's good

to have this example in the back of your mind, where you even kind of had intuition for what was going on. We knew we needed to go the two miles past Bananaville. Okay. And the equation that's gonna tell us if my input is the time it takes, and my Y is the distance past. Oh, is the time did I write output, there I meant to write the time input. This is an input. That would make more sense, right? So the time that it takes to go, and then Y is the distance past Orangeville? Right, then it's like, I've got to have this rate three times the time, right, because that's how you kind of get the distance gone, I have to have a minus one here, because I'm actually starting in Appleville, okay, which is one mile before Orangeville. Okay, um, and then I'm going to get that, right, so this is going to be the equation that's going to represent that. Three is coming from this rate that I'm going, I'm walking at a rate of three miles per hour. And then so this is kind of like the, the distance that I've gone, but the first mile doesn't matter, because that got me from Appleville to Orangeville. I want to go past Orangeville to Bananaville. Okay. And so I just kind of I wanted to solve for, so I can put the two miles into here, and then I wanted to solve for my X. So I went ahead and did that and found it was indeed one hour. So I put the two in for Y and then I'm solving for X, right, added one to both sides, divide both sides by three. And then we kind of noted that this point where I have X equals one, and Y equals two, does actually happen on the graph of this function, because this or have this equation because this equation is actually the one that describes the circumstance. Okay, so I hope that made some sense, and I'll see you in the next lecture.