Hi, and welcome. My name is Anthony Varela, and this tutorial is about distance, rate, and time. So we're going to start by talking about the relationship between distance, rate, and time. And that's going to help us develop formulas for distance, rate, and time. And then, we'll be able to use these formulas to solve certain problems, if we're looking for distance, or if we want to solve for a rate, or calculate a time.

So first, let's look at the speed limit. We've all seen a speed limit sign on the road before. And really, what this means is that you're not allowed to go over 45 miles per hour. And this 45 miles per hour actually has the relationship between distance, rate, and time already in it. We just need to draw that relationship out.

So thinking about 45 miles per hour being 45 miles per 1 hour. And we can see that 45 miles per hour is a rate. 45 miles is a distance. And 1 hour is a time. So here is our relationship between distance, rate, and time. We can say that rate equals distance over time.

So that's going to be a key formula that we're going to use in this tutorial, that rate equals distance over time. Well, now, let's manipulate this equation or this formula to express this relationship in terms of distance and then in terms of time. So if we were to multiply both sides of this equation by time, we would end up with an equivalent equation, that distance equals rate times time. So we're going to write that down too, that distance equals rate times time.

So let's take that newly developed formula, d equals r times t, and let's see. We already have a formula that expresses rate in terms of distance and time. We have an equation that expresses distance in terms of rate and time. Let's develop a formula that expresses time. So what we could do to this equation here is divide both sides by rate. And then, we get a final equation that says that time equals distance over rate.

So here, we have three equations, or three formulas, that we're going to use in a couple of scenarios, where we will want to solve for either a rate, a distance, or a time.

So my brother and sister are really big into biking. They love taking biking trips across the country. And they're currently planning a trip from Minneapolis, that's where we live, to St. Louis, Missouri. And so as they're planning, they're thinking, OK, well, we usually travel about 12 miles per hour on our bike. They're giving themselves 10 days to get to St. Louis. And they plan on being on their bikes for 5 hours each day.

So that got me thinking then, well, what's the distance between Minneapolis and St. Louis? So we're going to use one of our equations, then, to solve for this distance. Well, we want to know what the distance is. So we're going to use this equation, where distance is on one side of that equation.

So we need to then pull out a rate and a time. And then, we'll multiply those together to get our distance. Well, we're going to use the rate 12 miles per hour and I've written it as a fraction, so that we can multiply this. And what's the total time? Well, they're going to be on their bikes for 5 hours a day for a total of 10 days. So they'll spend 50 hours on their bikes. So now, we can multiply, then, 12 miles per hour by 50 hours.

And so when we multiply 12 by 50, we get 600. And then, notice our units of hours have canceled. So this confirms, then, that 600 is a unit of distance or miles here. So there are 600 miles between Minneapolis and St. Louis. So now, I want to join them in St. Louis. I don't like biking 600 miles. I'd rather fly there.

So I am interested in purchasing a ticket to St. Louis. So that's 600 miles away. And I looked up how long flights are. And the average flight seems to be about an hour and a half. So if my distance is 600 miles and it's going to take me an hour and a half to get there, that got me thinking, how fast is the plane traveling? So we want to find out then a speed or a rate.

So we're going to use this equation, r equals d over t, so we can plug in distance and time and then solve for r, the rate. So my distance is 600 miles. And my time is 1.5 hours. So I can simply divide 600 by 1.5. So that's 400. And then, what's my unit here? Well, it's miles per hour, which we write as MPH. So the plane is traveling, then, about 400 miles per hour to get from Minneapolis to St. Louis in an hour and a half.

Let's go through one more situation here. And here, we're going to solve for a time. So maybe the plane tickets are too expensive and I'm going to drive from Minneapolis to St. Louis. So I know that it's 600 miles. And thinking about a car on the highway, I'll probably average 65 miles per hour. That will be my rate. So how much time should I give myself to make the drive from Minneapolis to St. Louis?

So I want to solve for a time. So I'm going to use the equation t equals d over r. t is time. d is distance. And r is rate. So this is how I'm going to set up my equation. The time is going to be 600 miles over 65 miles per hour. Now, thinking about miles per hour, well, that's a fraction in itself. So I'm going to write this as 600 miles over 65 miles over 1 hour.

Well, now, we have a fraction in the denominator of this larger fraction. I don't like that. So I'm going to rewrite this as multiplying by the reciprocal. So I'm going to write this as 600 miles and putting that over 1. And I'm going to multiply it by the reciprocal of 65 miles per hour. That would be 1 hour per 65 miles.

So now, when I multiply across my numerator and a multiply across my denominator, I get 600 over 65. When I round, that's 9.23. And you can see that my units of miles have canceled. So I'm left with just hours. So it will take me a little bit over nine hours to travel from Minneapolis to St. Louis by car.

So let's review our notes on distance, rate, and time. And we developed three formulas to explain this relationship. We have rate equals distance over time. And if we multiplied time by both sides of that equation, we would get that distance equals rate times time. And if we divided both sides of this equation by rate, we would get time equals distance divided by rate. So thanks for watching this tutorial on distance, rates, and time. Hope to see you next time.