Hi. Welcome to economics. This is Kate. This tutorial is on own-price elasticity. As always, my examples will be in green and my key terms will be in red.

This tutorial is all about calculating elasticity when the price of a good itself changes. We will be using what we call the midpoint formula, and I'll take you through that. You'll understand what the elasticity coefficient tells us, whether it makes demand elastic, unit elastic, inelastic, and so on.

Just a little bit about elasticity itself. You already know the common sense law of demand, that as things get more expensive, we buy less, and as things go on sale or prices fall, we buy more. Elasticity is all about how much more or less. Just how responsive are we as consumers to price changes? So with own-price elasticity, it's the elasticity of demand when the price of a good itself is changing, keeping everything else separate or the same.

Let's run through an example. I was at the zoo the other day, so I was thinking about bottled water at the zoo. Do we think it has elastic or inelastic demand, meaning do people respond very much and buy different amounts when the price changes, or inelastic would mean that people don't really respond very much and they buy the same amount as price changes? Well, let's take a look at my example.

I suggested that the zoo was selling bottled water for $2, and when they looked at their numbers, they were selling 500 bottles of water daily. They decided, you know what? We can raise price on that. People are thirsty. So they raised price to $4. They doubled price, in fact, and now they're selling 400 bottles of water a day. So we would expect that as price went up, they are selling less, but just how responsive is that?

What we're going to look at on a graph is arc price elasticity, which is dividing the percent change in quantity by the percent change in price to analyze the relationship between these two variables. Let's look at the graph first. The arc price elasticity, like I was saying, looks at two points along the demand curve, and those two points were in my example. So at $4, they were selling 400. Before they changed, price was $2 and they had been selling 500. That shows the two points.

But now we have to get into the equation. Just how do we calculate this? We take the percentage change in quantity, how much we as consumers respond, and we look at it as a proportion to how much the price has changed. There it is just written in simple form, percentage change in quantity divided by percentage change in price.

I want you to keep in mind that for the purposes of own-price elasticity, that this is always going to be negative and we're really just going to be concerned with absolute value. It will always be negative, if you think about it, because

there's a negative relationship between quantity and price. One of them will be negative. If price is going up, quantity will be negative because people buy less. If price is going down, that's the negative one, but quantity is going up because people buy more as prices fall. So really, if we're looking at elasticity of demand for own-price elasticity, it will always be a negative number, so we can kind of forget that and just look at absolute value. I'll come back to that in a little bit.

Now, here's where we need to talk about why we use something called the midpoint formula. Here's my price and my quantity in both situations, and what we need to do is find the percentage change in quantity and the percentage change in price. Well, I don't know about you, but when I was in school, I learned that to calculate a percentage change, you take the difference between the two numbers and you divide by the original number. So here, if we did the change divided by 500, that would give us a 20% change.

But what if price went down instead of up? So for the quantity, we would be dividing by the original would have been 400 instead of 500, and that would yield a 25% change. It really shouldn't make it difference, should it, whether price is going up or down? Why is the percentage yielding a different answer? So which is it? Do we use 400 or do we use 500 as what we're dividing by?

Well, the midpoint formula just simply says, let's take the midpoint between the two numbers. So what we would do is percentage change in quantity and percentage change in price is do the change in the two numbers, but divide by the average of those two numbers, or the midpoint. So instead of dividing by 500 or 400, we divide by 450, and we would get 22.2% as the percentage change in quantity. If we were taking percentage change in price, again, we would do the difference between the two numbers and divide by the average, or the midpoint between them, and we would get 66.7%.

For own-price elasticity, it's really nice because we don't actually have to worry about the order here. Because again, it's always going to be negative so you don't have to worry about, should I do 400 minus 500 or 500 minus 400? The order in this situation doesn't really matter much. So the midpoint formula is defined as what I was just talking about, the middle point that represents the average of price and quantity when determining price elasticity. If we have two quantities, we would do quantity A plus quantity B divided by 2, just taking the average, or the midpoint, of them.

Back to our calculation, if we plugged in the numbers that we found on that previous slide, we would get 0.33 as our elasticity coefficient. Now, don't convert this to a percentage. It's not a percentage. It's a coefficient. Before I come back and tell you what in the world this number means, let's actually look at the formula in an easier way to remember it.

If we have percentage change in quantity, that is the change in quantity divided by the midpoint of the two

quantities, or the change in quantity divided by, like I said, you add them up and divide by 2, the average. That would be all over. You've got to do the same thing now for price, the change in price divided by the midpoint, or average, of the two prices, and that is what this down here is showing us.

Notice that there was a divided by 2, or a 1/2, in both the numerator and the denominator. So to simplify it, they cancel each other out. That's going to leave us with this. So elasticity, if you're a person who just likes to plug the numbers right in, here it is. Elasticity will be the difference, the change in quantity, divided by the quantities added together, the change in price divided by the prices added together. Remember, we canceled out those divided by 2's.

So if we're going to go back, let's see if we get the same thing plugging in the numbers to this equation now that we've simplified it. We would do quantity A minus quantity B divided by the two added, and do the same thing for price. If you get out your calculator and check my math, you would, in fact, get a negative 0.33. But remember I said we don't have to worry about the negative because it will always be negative. In this case, our denominator is what is negative.

What does that number mean, though? It's not a percentage, so what does this coefficient actually tell us? Well, it tells us-- this is just a reminder that we're just using absolute value for now. So what it tells us is that if our coefficient is greater than 1, that means we have elastic demand.

Think about it. If it's greater than 1, that means that the numerator is bigger than the denominator. People change their mind. A rubber band is elastic. It changes in response to us stretching it, so that should make sense.

If our coefficient is less than 1, if it's a decimal point, then that means that actually the price changed by a greater amount than did the numerator, or the quantity. If the percentage change is the same, if they're in proportion to one another, price went up by a certain percentage and people cut back in buying by that same percentage, then we have what's called unit elastic demand. So our elasticity of 0.33, where does that put our bottled water? You got it. It's inelastic because it's less than 1.

So let's look back at the graph and see if that's consistent with what we had, and it is. As the price of water doubled, in proportion to that doubling of price, consumers really did not change their purchasing habits very much. This is why at stadiums, they can charge $10 for a beer because people still buy it. The curve's relatively steep. That's consistent with our elastic coefficient we got.

So what did you learn in this tutorial? We talked about how elasticity measures how responsive we are to price changes. We calculated elasticity by comparing the percentage change in quantity with the percentage change in price. Remember we used that midpoint formula to get the percentage changes. And then finally, we looked at

what that coefficient actually tells us. Is it elastic, is it inelastic, or does it have unit elastic demand? Thank you so much for listening. Have a great day.