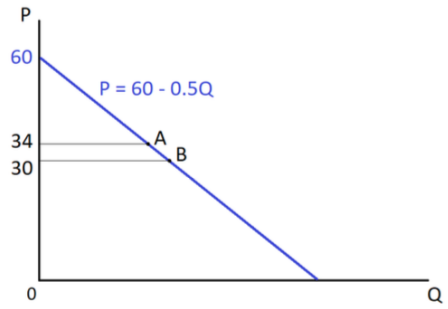
**Section Exercise 6 Solutions**

1) Take a look at the demand curve pictured. The inverse demand curve equation here is

$$P_D = 60 - 0.5Q_D$$

Two points are marked: at point A price is 34 and at point B price is 30.




a) What is the price elasticity of demand (using the midpoint method) between points A and B? Please type out the calculation you performed as well as your answer, and explain in plain English what the calculation is measuring.

**First, what are the two points? We can use the demand curve relationship to find that at A, $P = 34$ and $Q = 52$ and at B, $P = 30$ and $Q = 60$. Price elasticity of demand is the percentage change in quantity demanded divided by percentage change in price. By the midpoint method, that here is**

$$\frac{\frac{8}{56}}{\frac{4}{32}} = \frac{8}{7} \approx 1.14 \qquad (1)$$

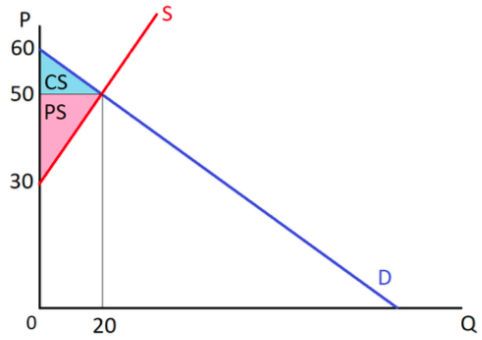
**This is telling us the sensitivity of demand to a change in price.**

b) Taking the same demand curve from question 1, say that we had a supply curve in this market given by $Q_S = P_S - 30$. Find the equilibrium price and quantity traded, and calculate consumer and producer surplus. Please type out your calculations as well as your answers. What exactly is being measured by consumer surplus?

**curve is (by flipping around the stated inverse demand curve)** $Q_D = 120 - 2P_D$. **So to get the equilibrium price and quantity:**

$$120 - 2P = P - 30 \quad (2)$$
$$P^* = 50 \quad (3)$$
$$Q^* = 20 \quad (4)$$

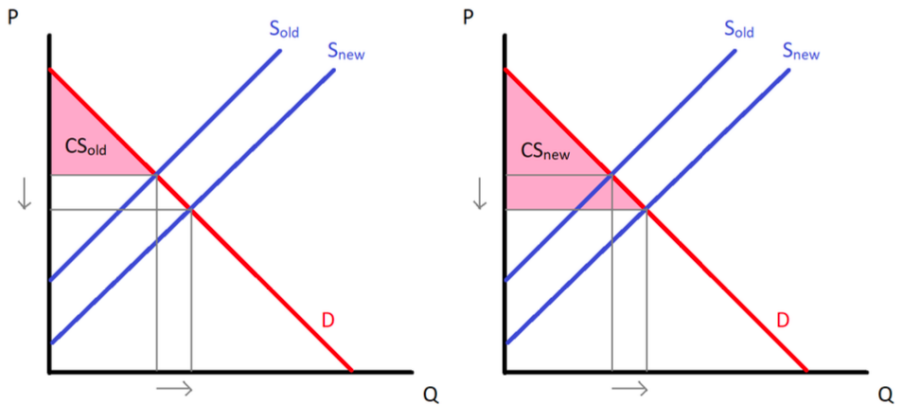
**Using a sketch, we can see that** $CS = \frac{1}{2}20 * 10 = 100$ **and** $PS = \frac{1}{2}20 * 20 = 200$. **Consumer surplus is difference between the consumers' willingness and**




**ability to pay for something and the price they actually paid, added up over all units traded: it's the surplus value they get from something over and above the price.**

2) Mayor Jim, sushi enjoyer, is concerned about high sushi prices in Berkeley and promises to do something about it. He implements pro-sushi policies: he creates a program of grants and tax breaks to make it cheaper and easier to open sushi restaurants.

a) Using a supply and demand model (assuming for simplicity that the market for sushi is perfectly competitive) and aided by a diagram, explain the rationale behind Jim's policy. Do you think Jim's policy will be good or bad for consumers of sushi? Why and in what sense?

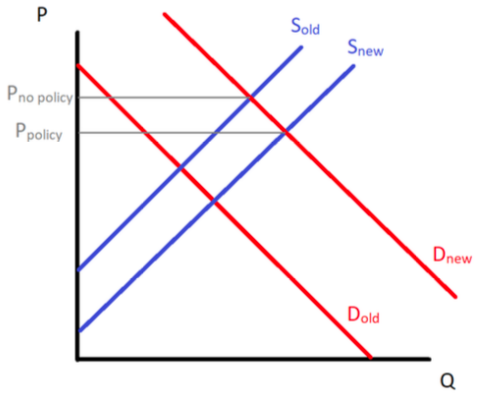



**According to the supply and demand model, Mayor Jim's policies are a positive supply shock in this market: by reducing the cost of supplying sushi, they shift the supply curve to the right as producers are willing and able to supply more sushi at every price. From the diagram, we see that (all else equal) this would result in a lower equilibrium price for sushi and a higher quantity of sushi traded.**

**Consumers are better off in the sense that they get more consumer surplus in the new situation. We can see this in the diagrams above: consumers pay less for more stuff in the new situation, which is good for them. Consumer surplus measures the sum across all the sushi sold of consumers' willingness and ability to pay over and above the actual price of sushi. That's higher than before.**

b) A couple of years after Jim's policies are implemented, sushi prices in Berkeley are higher than before the policies were implemented. Did Jim's policies fail? Explain with a diagram and an explanation that considers an appropriate counterfactual analysis.

**Jim's policies did not necessarily fail. The proper counterfactual is: what would have happened if Jim's policy hadn't been implemented? If it's the case that sushi prices would have risen *more* without Jim's policy, then his policy succeeded in making sushi prices lower than they would have been.**




**In the diagram, we can see one reason why this might have been the case: if demand had shifted right during the same period (maybe sushi gets way more popular, or people are eating out more because incomes have gone up, etc) then price would have increased anyway; Jim's policy may have partially offset the rise that would otherwise have happened. The new price would have been higher without the policy than with it. (Another possibility not pictured? Maybe the supply curve would have shifted way left without Jim's policy if e.g. fish got super expensive, and so Jim's policy make it shift left less, preventing a bigger price increase.)**

3) A market has demand given by $Q_D = 80-2P_D$ and supply given by $Q_S = P_S-10$. There is a per-unit tax on the good of 15 dollars per unit.

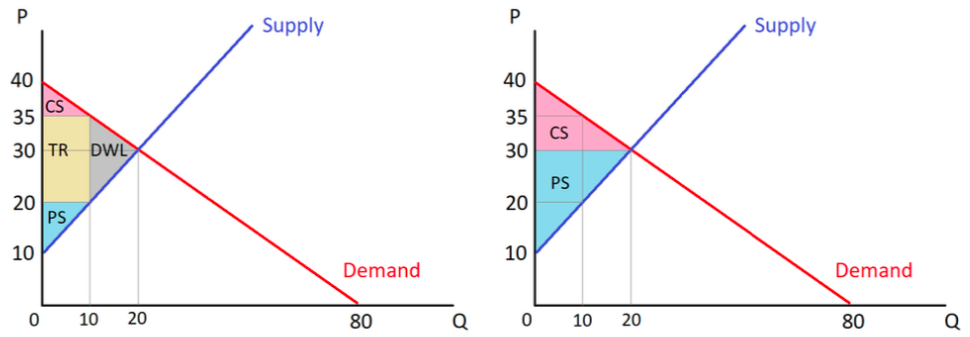
a) Find the equilibrium price and quantity, if there was no tax.

**Without the tax,** $P_D = P_S$. $Q_D = Q_S$ **occurs when** $80 - 2P = P - 10 \Rightarrow P^* = 30$, **and so** $Q^* = 20$.

b) Find the prices and quantity traded in the situation with the tax.

**With the tax,** $(P_D - 15) = P_S$. $Q_D = Q_S$ **therefore occurs when** $80 - 2P_D = (P_D - 15) - 10 \Rightarrow P_D^* = 35, P_S^* = 20, Q^* = 10$.

c) With the aid of a diagram, calculate the division of surpluses (consumer surplus, producer surplus, and, if applicable, tax revenue and deadweight loss) with and without the tax.



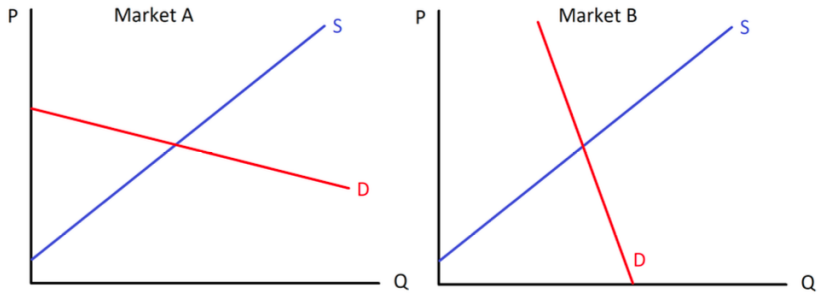

**I've shown in the diagram the situation with the tax on the left and without the tax on the right. (Either or some combination of these is OK for your diagram is fine, as long as it's accurate and lets you calculate the required surpluses!) Without the tax we can calculate (using the area of a triangle formula) that** $CS = 0.5(20 * 10) = \$100$ **and** $PS = 0.5(20 * 20) = \$200$. **With the tax, again calculating areas, we get** $CS = 0.5(10 * 5) = \$25$, $PS = 0.5(10 * 10) = \$50$, $TR = 10 * 15 = \$150$, **and** $DWL = 0.5(10 * 15) = \$75$.

d) Thinking about an application of the model of taxation in supply and demand: on slides 45-49 of the Topic 5 notes we looked at some research on the effect of soda taxes. Based on the analysis of the Philadelphia soda tax (and assuming for simplicity that this the market is perfectly competitive), which seems less price elastic in that market, the demand for soda or the supply? Why?

**Based on the evidence that "97% of the tax was passed on to consumers", it seems that demand was much less price elastic than supply. The simple perfectly competitive model captures a tax as putting a wedge between the price paid by buyers and the price received by sellers. The extent to which price rises for buyers versus falls for sellers depends on relative elasticities. From the graphical analysis on slides 42 and 43 we see that (loosely speaking, because elasticity isn't just the slope of the lines!) when demand is more inelastic than supply, the model predicts that more of the tax will be passed on to higher prices for buyers, and when demand is more elastic than supply, the model predicts that more of the tax will be passed on to lower prices for sellers.**

4) Consider two perfectly competitive markets. The supply curve looks identical in each one, and the equilibrium price is currently the same in each one. However, in one of the markets demand is more price elastic at the equilibrium price than it is in the other.

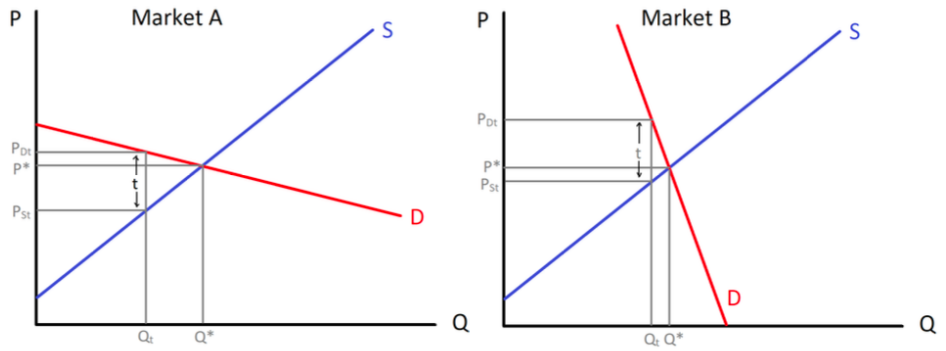
a) Explain in simple terms what 'demand is more price elastic' means. Then take a look at the following two diagrams. In which market is demand more price elastic, and how can you tell?



**'Demand is more price elastic' means that the amount that people are willing and able to buy of this product is more sensitive to price. That is: if, for example, the price was to fall in both markets, in the more price elastic case there would be a bigger increase in the amount that people are willing and able to buy than there would be in the less price elastic case.**

**Market A has more price elastic demand in this case. The demand curve is less steep around the equilibrium price. The demand curve is what shows the relationship between price and how much people are willing and able to buy. For a given price change, we see a bigger difference in quantity on the demand curve on the left hand diagram than on the right.**

b) Say that an identical per-unit tax is imposed in both markets. Illustrate this on your diagrams, including what happens to prices and quantity traded in each market. In which market would we expect to see a bigger change in quantity traded, and in which would we expect to see a bigger price increase for buyers?




**On each diagram I've down the original equilibrium price and quantity ($P^*$ and $Q^*$) and the price for buyers ($Q_{Dt}$), price for sellers ($Q_{St}$), and quantity traded ($Q_t$) with the per-unit tax $t$ added. We'd expect to see a bigger change in quantity traded in the market with more price elastic demand, market A, and a bigger price increase for buyers in the market with less price elastic demand, market B.**