Name:

Quiz # 1 October 9, 2024

PAI 897 Professor David Popp

You have the entire class period (80 minutes) in which to take the quiz. The questions are worth a total of 100 points. The number of points for each question should serve as a guide to the amount of time to spend on each question. Each question is designed to be answered in the space provided. *A short, direct answer is preferable to a long-winded explanation that includes unnecessary information.* Also, please keep in mind that partial credit is available for each question. It is in your best interest to attempt each problem on the quiz. If you do not have time to finish the math, at least include an illustration to show that you know how to proceed.

This is a closed book quiz. No notes, texts, or other reference materials may be used. The use of calculators is permitted.

Be sure to show all your work for each question. Providing a correct answer without showing how you got it will not get you full credit. You may use the back of the page for scratch work. I will not look on the back for answers or work unless you specifically tell me to do so. *Thus, if there is anything on the back of the page that you want graded, be sure to note this on the front of the page.*

Helpful formulas:		
$elasticity = \frac{\% change Q}{\% change P} =$	$=\frac{\frac{\Delta Q}{Q_0}}{\frac{\Delta P}{P_0}}=\frac{\Delta Q}{\Delta P}\frac{P_0}{Q_0}$	

area of a triangle = 1/2 (base) x (height)

area of a rectangle = $(length) \times (width)$

NOTE: PLEASE READ THE FOLLOWING AND SIGN BELOW TO ACKNOWLEDGE READING THE HONOR CODE BEFORE BEGINNING. ALSO NOTE THAT BY HANDING IN THE QUIZ, YOU IMPLICITLY AGREE TO THE FOLLOWING, WHETHER OR NOT A SIGNATURE FOLLOWS:

Providing or receiving help on this quiz is a violation of both class rules and Syracuse University's policy and academic honesty. I will not (or have not) discuss the contents of the quiz with other students until all classes have had an opportunity to complete the quiz.

Signed by:

Good luck!

- 1. (21 points) Use supply and demand diagrams to illustrate each of the following scenarios. Explain briefly. *Be sure to show how both the equilibrium price and quantity change in each case.*
 - a) A new study shows that caffeine increases student performance on quizzes. How does this affect the market for <u>caffeinated beverages such as coffee</u>?



Students will want more caffeinated beverages. Demand shifts up and to the right. The equilibrium price and quantity both rise.

A typical mistake here is shifting the wrong curve. While it is true that more caffeinated beverages are available in the new equilibrium, that is not because supply shifts out. Because preferences are changing, it is demand that shifts out. The demand shift leads to a movement along the supply curve. For supply to shift, there must be something that affects the availability of the good *at any price*. Here, it is because prices increase that more beverages are available. If price hadn't increased, more beverages would not have been available.

b) One barrier to getting consumers to buy electric vehicles is that batteries take a long time to charge. Suppose that Tesla develops a new battery that can be fully recharged in the same time it takes to fill the gas tank on a gasolinepowered vehicle. How would this technological advance affect the market for gasoline-powered vehicles?



Electric vehicles and gasoline powered vehicles are substitutes. Better batteries will increase demand for electric vehicles. That will *decrease* demand for gasoline powered vehicles. The demand curve shifts down and to the left. The equilibrium quantity and price both fall.

There were two common mistakes on this question. (1) Some students shifted demand up and to the right. That would be correct for electric vehicles, but this question is about gasoline-powered vehicles, which are a substitute for electric vehicles. (2) Some students shifted supply, saying that improved technologies cause supply to shift out. That is true when a new technology lowers production costs. But that is not the case here. Rather, we are looking at a technological improvement in a competing product

c) Most of the oranges used to produce orange juice are grown in Florida. In recent years, both severe storms and insects have destroyed several orange groves in Florida. How will this affect the market for <u>orange juice</u>?



Oranges are the key ingredient for orange juice. Crop damage will make oranges more expensive, which raises the cost of producing orange juice. Producers will need to be compensated for these higher costs. As a result, the supply curve shifts up and to the left. Equilibrium price rises, but equilibrium quantity falls. **2.** (27 points) Carina is a small country whose primary industry is agriculture. Their primary crop is corn. Because the local price of corn is higher than the price of corn on global markets, imports of corn into the country are prohibited to protect local farmers.

Unfortunately, a recent drought has destroyed one-third of the corn crop in Carina this year. Concerned over the impact of rising corn prices that followed, two legislators have proposed emergency legislation to help consumers. They suggest two competing policies:

- Policy A: Provide a subsidy to consumers for each bushel of corn purchased to help alleviate the effect of higher prices.
- Policy B: Remove the ban on corn imports, allowing consumer to purchase cheaper corn from foreign farmers.

You are asked to analyze each policy option below. Your analysis should focus on how each policy will address the current crisis that has occurred because of the drought – that is, what will the short run effect of each policy be? In doing so, *pay particular consideration to what the supply of corn is likely to look like in the short run*.

a) Begin by using a supply and demand diagram to show how a subsidy for corn, paid to consumers, will affect the local corn market. Be sure to show the price for both consumers and producers. Who will be the biggest beneficiary of such a policy – consumers or producers? Why?



In the short run, the supply of corn will be inelastic. The amount of corn available depends on how much corn farmers planted at the beginning of the season. There is little they can do now to change the amount of corn available. Recognizing this is important for this question. While many students said the subsidy helps the consumers afford more corn, buying more corn isn't possible if corn isn't available to buy.

The subsidy shifts the demand curve to the right. We use the original supply and demand curves to find prices. In this case, consumers will pay the same price they were paying before, as the quantity of food they are purchasing doesn't change. Nearly all the benefit of the subsidy goes to farmers, who not receive a higher price (P_s). The consumer price (P_c) changes very little (and, in fact, wouldn't change at all if supply is perfectly inelastic in the short run).

The key here is that, because there is no way for farmers to make more corn available this year, the subsidy doesn't help increase the amount of corn on the market, and as a result it does not address higher prices. b) On a separate supply and demand diagram, show how allowing imports of corn will affect the local corn market.



Allowing imports introduces the world supply of corn. Consumers can buy as much corn as they wish at the prevailing world price, P_W . Since supply is inelastic, farmers are forced to take less money for the corn that they have already planted. Thus, the amount supplied domestically falls just a bit (from Q_0 to Q_D). The remaining corn is imported – inputs equal $Q_T - Q_D$.

Some students simply shifted supply to the right to reflect increased supply with imports. I gave partial credit for this answer, as it appropriately reflects the additional supply, but does not make clear that the new price will be the lower world price of corn.

c) Based on your analysis, which policy does a better job addressing the current crisis resulting from the drought? Which policy would you recommend? Please explain your answer.

Because of the inelastic supply, the subsidy does not result in lower prices for consumers – nearly all of the benefit of the subsidy goes to consumers.

To help reduce prices, more corn needs to be available. Thus, a policy that increases supply is needed. Since local supply cannot be increased in the short run, this can be accomplished by allowing imports – thus expanding supply to include the full global supply of corn.

Also note that the policy goal of both legislators is to help consumers in response to the drought. Given this, your recommendation must take into account how consumers will be affected. 3. (15 points) Bloom County Park is considering raising its admissions fee by 25 percent. The park last raised their fee five years ago. Their manager, Opus, has asked you to evaluate data from the previous fee increase to determine whether the new admission fee increase will lead to an increase or decrease in revenues. For the analysis, you have been given data pertaining to the previous fee increase:

	before increase	after increase
visitors per day:	3,000	2,500
price per visit:	\$6.00	\$8.00

a) Based on the figures provided, calculate the price elasticity of demand for visits to Bloom County Park.

The formula for elasticity is:

$$\varepsilon = \frac{\% \Delta Q}{\% \Delta P} = \frac{\Delta Q}{\Delta P} \frac{P_0}{Q_0}$$

Using the first formula, recall that $\&\Delta Q = \Delta Q/Q_0$ and $\&\Delta P = \Delta P/P_0$. Thus, the percentage change in quantity = -500/3,000 = -0.1667, and the percentage change in price is 2/6 = 0.33333. From this, we calculate the elasticity to be -1.25:

$$-0.5 = \frac{-0.1667}{0.3333}$$

Alternatively, using the second formula:

$$\varepsilon = \frac{-500}{2} \frac{6}{3000} = \frac{-3000}{6000} = -0.5$$

A common error here was being inconsistent: e.g. using the new price to calculate the change in price, but the original quantity to calculate the change in quantity. A few of you used the average of the old and new quantities and prices to calculate the percentage changes. That is a legitimate method, and I gave full credit for that.

Another common error was forgetting the negative sign. Signs matter, as they tell us whether quantity demanded goes up or down. I gave half-credit for giving an elasticity of 0.5.

b) Based on your calculation above, would you expect revenues to increase or decrease if the admission fee increased by 25 percent? Why?

Revenue will increase. Demand is inelastic. Thus, the revenue lost from the reduction in quantity will be offset by the revenues gained from those who still come to the park. 4. (32 points) The following demand and supply curve describe the market for soda:

Demand: $P_C = 11 - 0.75Q$ Supply: $P_S = 1 + 0.5Q$

where *P* represents the price of soda and *Q* represents cases of soda, in thousands (e.g., Q = 1 means 1,000 cases have been sold).

a) Find the equilibrium price and quantity of soda. Illustrate on a graph.

$$11 - 0.75Q = 1 + 0.5Q$$

 $10 = 1.25Q$
 $Q = 10/1.25$
 $Q = 8$, or 8,000 cases of soda

Substitute this into either supply or demand to get:

$$P_{\rm C} = 11 - 0.75(8) =$$
\$5
or
 $P_{\rm S} = 1 + 0.5(8) =$ **\$5**

The graph for this market appears below:



b) Concerned about children consuming too much sugar, the government levies a \$1.25 tax on consumers of soda. How will this tax affect your illustration in part (a)? Which curve(s) will shift as a result? Redraw your illustration from part (a) and show the new equilibrium. (You do not need to calculate numbers yet. That will come in part c).

The result of the tax is to shift either the supply curve or demand curve in. Since the legal incidence of the tax is on consumers, we shift the demand curve.

The demand curve shifts in by the amount of the tax. The new demand curve represents the demand curve faced by suppliers. To graph it, reduce the y-intercept of the demand equation by the amount of the tax: \$1.



Algebraically, recall that $P_c - tax = P_s$. Subtracting the tax represents the downward shift of the demand curve. We thus have:

$$P_c = 11 - 0.75Q - 1.25 = 1 + 0.5Q = P_s$$
, or
 $9.75 - 0.75Q = 1 + 0.5Q$

c) Compute the quantity of soda sold after the tax. What price will consumers pay for soda? What price will producers receive for each case of soda sold?

As before, algebraically, recall that $P_C - tax = P_S$. Subtracting the tax represents the downward shift of the demand curve. We thus have:

$$P_c = 11 - 0.75Q - 1.25 = 1 + 0.5Q = P_s$$
, or
 $9.75 - 0.75Q = 1 + 0.5Q$

We begin by finding the new equilibrium. Equate the new demand curve with the old supply curve.

9.75 - 0.75Q = 1 + 0.5Q 1.25Q = 8.75 Q = 8.75/1.25 **Q = 7, or 7,000 cases of soda**

We plug this quantity into the *original* supply curve to get the price suppliers keep:

$$P_{\rm S} = 1 + (0.5)(7) =$$
\$4.5

Similarly, we plug the new quantity into the *original* demand curve to get the price consumers must pay:

$$P_C = 11 - 0.75(7) =$$
\$5.75

To check our work, note that the difference between these two prices is \$5.75, which is the amount of the tax.

d) Suppose the legal burden of the tax is placed on producers instead of consumers. How would your answers to part (c) change?

There would be no change. The legal incidence of the tax does not affect the equilibrium.

The above explanation is all that was needed on this question. It was not necessary to recalculate the equilibrium.

e) Use a supply and demand diagram to illustrate the equilibrium both before and after the tax. Labelling all relevant areas, show how the consumer surplus and producer surplus change between parts (a) and (b). What accounts for the changes that you observe (e.g. where does the surplus go)? Note that you do not need to calculate the changes in welfare – simply show the relevant areas on your graph.

Begin by labeling the areas:



We use the original supply and demand to find the surpluses. Before the tax, consumer surplus is areas ABCDE. While you were not asked to calculate the values, for those that are curious, this is a triangle with a base of 8 and a height of 6 (=11-5). Its area = 0.5(8)(6) =**\$24 (or \$24,000)**.

The producer surplus is the triangle FGHI. This is a triangle with a base of 8 and a height of 4. Its area = 0.5(8)(4) =**\$16 (or \$16,000)**.

We use the original supply and demand, at the new prices and quantities, to find consumer and producer surplus after the tax. Areas A and B in the above graph represents consumer surplus. This is a triangle with a height of 5.25 (= 11-5.75) and a base of 7. Its area = 0.5(7)(5.25) = **\$18.375** (or \$18,375).

Area I in the above graph represents producer surplus. This is a triangle with a height of 3.5 and a base of 7. Its area = 0.5(7)(3.5) =**\$12.25 (or 12,250)**.

Revenue is simply the tax times the quantity sold.

\$1.25 x 7 = **\$8.75 (or \$8,750)**.

On the above graph, revenue is the rectangle represented by areas CDFG.

The sum of consumer surplus and producer surplus before the tax is \$40. After the tax, the sum of consumer surplus, producer surplus, and revenue is \$39.375. The difference of \$0.625 (or \$625) is the deadweight loss. Graphically, this is the triangle EH.

The deadweight loss represents the value of lost opportunities, because some potentially beneficial transactions do not occur after the tax. For the quantities between 7 and 8, demand is above supply. This tells us that consumers are willing to pay more than the marginal cost of producing a sailboat. However, because of the tax, these units are not sold. The potential producer or consumer lost because of this is the deadweight loss.