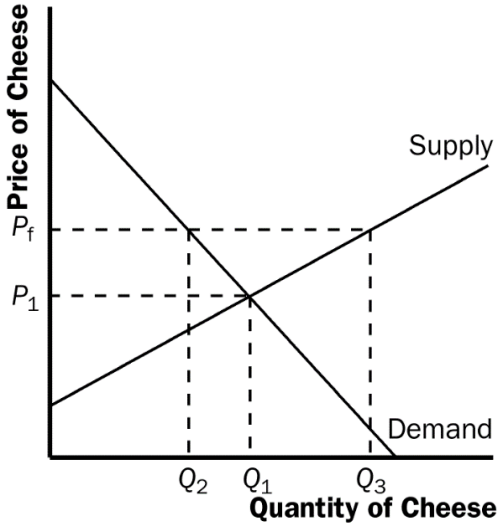
EE211 Section 1 Homework 2 Answers part 1

Mankiw, N.G., (2023) **Principles of Microeconomics**, 10th ed., Cengage, (ISBN-13: 978-981-5119-30-5)

Chapter 6 Problems and Applications # 2, 3 and 10

2. The government has decided that the free-market price of cheese is too low.



a) Suppose the government imposes a binding price floor in the cheese market. Draw a supply-and-demand diagram to show the effect of this policy on the price and quantity of cheese sold. Is there a shortage or surplus of cheese?

The imposition of a binding price floor in the cheese market is shown in Figure A. In the absence of the price floor, the price would be P_1 and the quantity would be Q_1. With the floor set at P_f, which is greater than P_1, the quantity demanded is Q_2, while quantity supplied is Q_3, so there is a surplus of cheese in the amount $Q_3 - Q_2$.

Figure A.

b) Producers of cheese complain that the price floor has reduced their total revenue. Is this possible? Explain.

The producers' complaint that their total revenue has declined is correct if demand is elastic. With elastic demand, the percentage decline in quantity would exceed the percentage rise in price, so total revenue would decline.

c) In response to cheese producers' complaints, the government agrees to purchase all the surplus cheese at the price floor. Compared to the basic price floor, who benefits from this new policy? Who loses?

If the government purchases all the surplus cheese at the price floor, producers benefit and taxpayers lose. Producers would produce quantity Q3 of cheese, and their total revenue would increase substantially. However, consumers would buy only quantity Q2 of cheese, so they are in the same position as before. Taxpayers lose because they would be financing the purchase of the surplus cheese through higher taxes.

3. A recent study found that the demand-and-supply schedules for Frisbees are as follows:

Price per Frisbee	Quantity Demanded	Quantity Supplied
$11	1 million Frisbees	15 million Frisbees
10	2	12
9	4	9
8	6	6
7	8	3
6	10	1

a) What are the equilibrium price and quantity of Frisbees?

The equilibrium price of Frisbees is $8 and the equilibrium quantity is six million Frisbees.

b) Frisbee manufacturers persuade the government that Frisbee production improves scientists' understanding of aerodynamics and is thus important for national security. A concerned Congress votes to impose a price floor $2 above the equilibrium price. What is the new market price? How many Frisbees are sold?

With a price floor of $10, the new market price is $10 because the price floor is binding. At that price, only two million Frisbees are sold, because that is the quantity demanded.

c) Irate college students march on Washington and demand a reduction in the price of Frisbees. An even more concerned Congress votes to repeal the price floor and impose a price ceiling $1 below the former price floor. What is the new market price? How many Frisbees are sold?

If there's a price ceiling of $9, it has no effect, because the market equilibrium price is $8, which is below the ceiling. So the market price is $8 and the quantity sold is six million Frisbees.

10. A market is described by the following supply and demand curves:

$$Q^S = 2P$$

$$Q^D = 300 - P$$

a) Solve for the equilibrium price and quantity.

Solve for the equilibrium price and quantity by setting the quantity supplied equal to the quantity demanded: 2P = 300 – P; 3P = 300; P = $100.

When the equilibrium price is $100, the equilibrium quantity is 2(100) = 200.

b) If the government imposes a price ceiling of $90, does a shortage or surplus (or neither) develop? What are the price, quantity supplied, quantity demanded, and size of the shortage or surplus?

If the government imposes a price ceiling of $90, a shortage develops. The ceiling is below the equilibrium price so it is a binding price ceiling. At the ceiling price of $90, the quantity supplied is 2(90) = 180 units and the quantity demanded is 300 – 90 = 210 units. Consumers want to buy 30 more units than producers want to sell at the price ceiling.

c) If the government imposes a price floor of $90, does a shortage or surplus (or neither) develop? What are the price, quantity supplied, quantity demanded, and size of the shortage or surplus?

If the government imposes a price floor of $90, neither a shortage nor a surplus develops. The floor is lower than the equilibrium price so it is not a binding price floor. With a price floor of $90, the equilibrium price of $100 will prevail. The quantity supplied and demanded will be the equilibrium quantity of 200 units.

Chapter 7

Problems and Applications # 4, 5 and 6

4) It is a hot day, and Bert is thirsty. Here is the value he places on each bottle of water:

Value of first bottle	$7
Value of second bottle	$5
Value of third bottle	$3
Value of fourth bottle	$1

a. From this information, derive Bert's demand schedule. Graph his demand curve for bottled water.

Bert's demand schedule is:

Price	Quantity Demanded
More than $7	0
$5 to $7	1
$3 to $5	2
$1 to $3	3
$1 or less	4

Bert's demand curve is shown in Figure B.

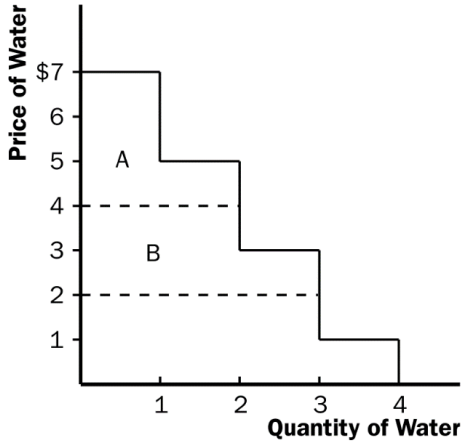


Figure B

b. If the price of a bottle of water is $4, how many bottles does Bert buy? How much consumer surplus does Bert get from his purchases? Show Bert's consumer surplus in your graph.

When the price of each bottle of water is $4, Bert buys two bottles of water. His consumer surplus is shown as area A in the figure. He values his first bottle of water at $7, but pays only $4 for it, so has consumer surplus of $3. He values his second bottle of water at $5, but pays only $4 for it, so has consumer surplus of $1. Thus Bert's total consumer surplus is $3 + $1 = $4, which is the area of A in the figure.

c. If the price falls to $2, how does the quantity demanded change? How does Bert's consumer surplus change? Show these changes in your graph.

When the price of each bottle of water falls from $4 to $2, Bert buys three bottles of water, an increase of one. His consumer surplus consists of both areas A and B in the figure, an increase in the amount of area B. He gets consumer surplus of $5 from the first bottle ($7 value minus $2 price), $3 from the second bottle ($5 value minus $2 price), and $1 from the third bottle ($3 value minus $2 price), for a total consumer surplus of $9. Thus consumer surplus rises by $5 (which is the size of area B) when the price of each bottle of water falls from $4 to $2.

5) Ernie owns a water pump. Because pumping large amounts of water is harder than pumping small amounts, the cost of producing a bottle of water rises as he pumps more. Here is the cost he incurs to produce each bottle of water:

Cost of first bottle	$1
Cost of second bottle	$3
Cost of third bottle	$5
Cost of fourth bottle	$7

a. From this information, derive Ernie's supply schedule. Graph his supply curve for bottled water.

Ernie's supply schedule for water is:

Price	Quantity Supplied
More than $7	4
$5 to $7	3
$3 to $5	2
$1 to $3	1
Less than $1	0

Ernie's supply curve is shown in Figure C.

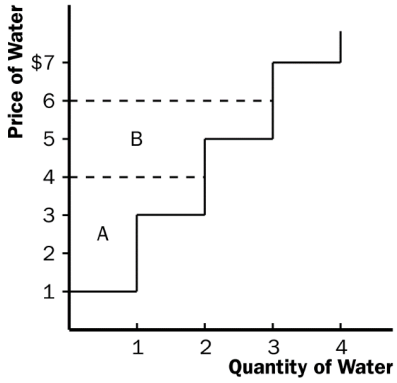


Figure C

b. If the price of a bottle of water is $4, how many bottles does Ernie produce and sell? How much producer surplus does Ernie get from these sales? Show Ernie's producer surplus in your graph.

When the price of each bottle of water is $4, Ernie sells two bottles of water. His producer surplus is shown as area A in the figure. He receives $4 for his first bottle of water, but it costs only $1 to produce, so Ernie has producer surplus of $3. He also receives $4 for his second bottle of water, which costs $3 to produce, so he has producer surplus of $1. Thus Ernie's total producer surplus is $3 + $1 = $4, which is the area of A in the figure.

c. If the price rises to $6, how does the quantity supplied change? How does Ernie's producer surplus change? Show these changes in your graph.

When the price of each bottle of water rises from $4 to $6, Ernie sells three bottles of water, an increase of one. His producer surplus consists of both areas A and B in the figure, an increase by the amount of area B. He gets producer surplus of $5 from the first bottle ($6 price minus $1 cost), $3 from the second bottle ($6 price minus $3 cost), and $1 from the third bottle ($6 price minus $5 price), for a total producer surplus of $9. Thus producer surplus rises by $5 (which is the size of area B) when the price of each bottle of water rises from $4 to $6.

6. Consider a market in which Bert from problem 4 is the buyer and Ernie from problem 5 is the seller.

a. Use Ernie's supply schedule and Bert's demand schedule to find the quantity supplied and quantity demanded at prices of $2, $4, and $6. Which of these prices brings supply and demand into equilibrium?

From Ernie's supply schedule and Bert's demand schedule, the quantity demanded and supplied are:

Price	Quantity Supplied	Quantity Demanded
$2	1	3
$4	2	2
$6	3	1

Only a price of $4 brings supply and demand into equilibrium, with an equilibrium quantity of two.

b. What are consumer surplus, producer surplus, and total surplus in this equilibrium?

At a price of $4, consumer surplus is $4 and producer surplus is $4, as shown in Problems 3 and 4 above. Total surplus is $4 + $4 = $8.

c. If Ernie produced and Bert consumed one fewer bottle of water, what would happen to total surplus?

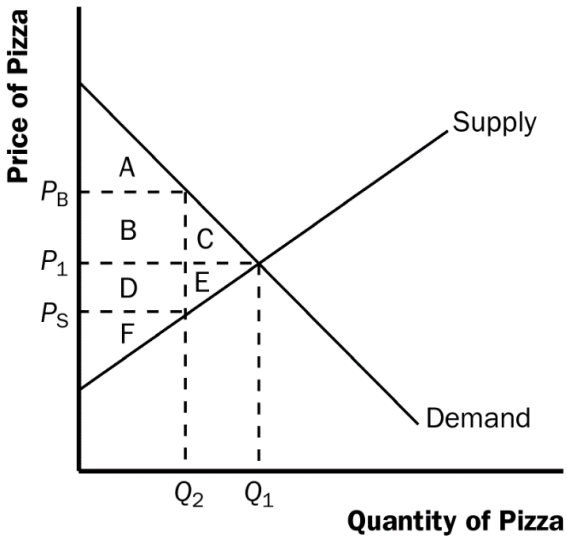
If Ernie produced one less bottle, his producer surplus would decline to $3, as shown in Problem 4 above. If Bert consumed one less bottle, his consumer surplus would decline to $3, as shown in Problem 3 above. So total surplus would decline to $3 + $3 = $6.

d. If Ernie produced and Bert consumed one additional bottle of water, what would happen to total surplus?

If Ernie produced one additional bottle of water, his cost would be $5, but the price is only $4, so his producer surplus would decline by $1. If Bert consumed one additional bottle of water, his value would be $3, but the price is $4, so his consumer surplus would decline by $1. So total surplus declines by $1 + $1 = $2.

Chapter 8 Problems and Applications # 1, 5 and 10

1. The market for pizza is characterized by a downward-sloping demand curve and an upward-sloping supply curve.



a. Draw the competitive market equilibrium. Label the price, quantity, consumer surplus, and producer surplus. Is there any deadweight loss? Explain.

The equilibrium price is P1, the equilibrium quantity is Q1, consumer surplus is area A + B + C, and producer surplus is area D + E + F. There is no deadweight loss, as all the potential gains from trade are realized; total surplus is the entire area between the demand and supply curves: A + B + C + D + E + F.

b. Suppose that the government requires each pizzeria to pay a $1 tax on each pizza sold. Illustrate the effect of this tax on the pizza market, being sure to label consumer surplus, producer surplus, government revenue, and deadweight loss. How does each area compare to the pre-tax case?

With a $1 tax on each pizza sold, the price paid by buyers, PB, is now higher than the price received by sellers, PS, where PB = PS + $1. The quantity declines to Q2, consumer surplus is area A, producer surplus is area F, government revenue is area B + D, and deadweight loss is area C + E. Consumer surplus declines by B + C, producer surplus declines by D + E, government revenue increases by B + D, and deadweight loss increases by C + E.

c. If the tax were removed, pizza eaters and sellers would be better off, but the government would lose tax revenue. Suppose that consumers and producers voluntarily transferred some of their gains to the government. Could all parties (including the government) be better off than they were with a tax? Explain using the labeled areas in your graph.

If the tax were removed and consumers and producers voluntarily transferred B + D to the government to make up for the lost tax revenue, then everyone would be better off than without the tax. The equilibrium quantity would be Q1, as in the case without the tax, and the equilibrium price would be P1. Consumer surplus would be A + C, because consumers get surplus of A + B + C, then voluntarily transfer B to the government. Producer surplus would be E + F, because producers get surplus of D + E + F, then voluntarily transfer D to the government. Both consumers and producers are better off than the case when the tax was imposed. If consumers and producers gave a little bit more than B + D to the government, then all three parties, including the government, would be better off. This illustrates the inefficiency of taxation.

5. After economics class, your friend suggests that taxing food would be a good way to raise revenue because the demand for food is quite inelastic. In what sense is taxing food a "good" way to raise revenue? In what sense is it not a "good" way to raise revenue?

Because the demand for food is inelastic, a tax on food is a good way to raise revenue because it leads to a small deadweight loss; thus taxing food is less inefficient than taxing other things. But it is not a good way to raise revenue from an equity point of view, because poorer people spend a higher proportion of their income on food. The tax would affect them more than it would affect wealthier people.

10. Suppose that a market is described by the following supply and demand equations:

$$Q^S = 2P$$

$$Q^D = 300 - P$$

a. Solve for the equilibrium price and the equilibrium quantity.

Setting quantity supplied equal to quantity demanded gives 2P = 300 – P. Adding P to both sides of the equation gives 3P = 300. Dividing both sides by 3 gives P = 100. Substituting P = 100 back into either equation for quantity demanded or supplied gives Q = 200.

b. Suppose that a tax of T is placed on buyers, so the new demand equation is:

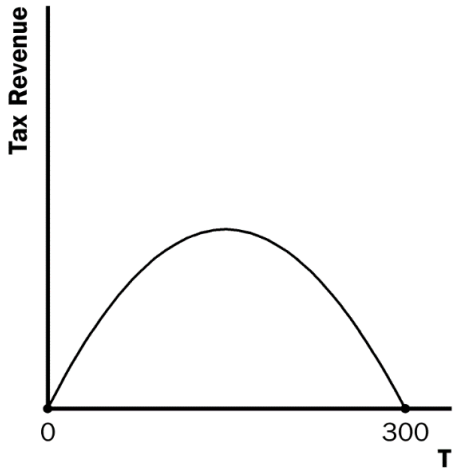
$$Q^D = 300 - (P + T)$$

Solve for the new equilibrium. What happens to the price received by sellers, the price paid by buyers, and the quantity sold?

Now P is the price received by sellers and P +T is the price paid by buyers. Equating quantity demanded to quantity supplied gives 2P = 300 − (P+T). Adding P to both sides of the equation gives 3P = 300 – T. Dividing both sides by 3 gives P = 100 –T/3. This is the price received by sellers. The buyers pay a price equal to the price received by sellers plus the tax (P +T = 100 + 2T/3). The quantity sold is now Q = 2P = 200 – 2T/3.

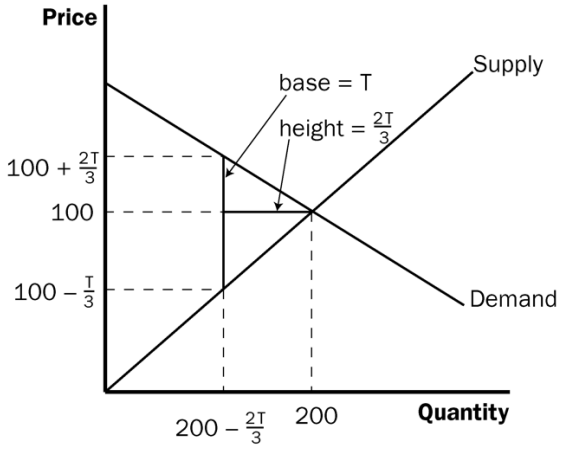
c. Tax revenue is T × Q. Use your answer from part (b) to solve for tax revenue as a function of T. Graph this relationship for T between 0 and 300.

Because tax revenue is equal to T x Q and Q = 200 – 2T/3, tax revenue equals 200T − 2T2/3. Tax revenue is zero at T = 0 and at T = 300.

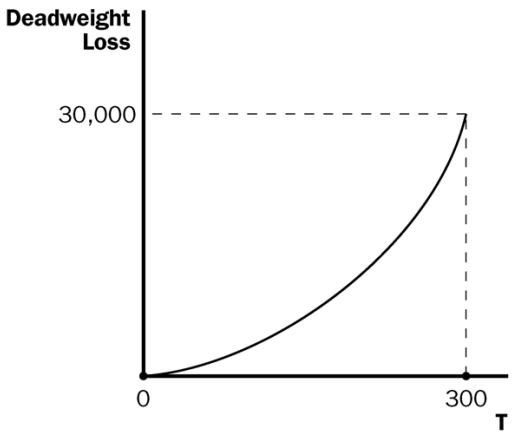


d. The deadweight loss of a tax is the area of the triangle between the supply and demand curves. Recalling that the area of a triangle is ½ × base × height, solve for deadweight loss as a function of T. Graph this relationship for T between 0 and 300. (Hint: If you look sideways, the base of the deadweight loss triangle is T, and the height is the difference between the quantity sold with the tax and the quantity sold without the tax.)

The area of the triangle (laid on its side) that represents the deadweight loss is 1/2 × base × height, where the base is the change in the price, which is the size of the tax (T) and the height is the amount of the decline in quantity (2T/3).



So the deadweight loss equals 1/2 × T × 2T/3 = T2/3. This rises exponentially from 0 (when T = 0) to 30,000 when T = 300.



e. The government now levies a tax of $200 per unit on this good. Is this a good policy? Why or why not? Can you propose a better policy?

A tax of $200 per unit is a bad policy, because tax revenue is declining at that tax level. The government could reduce the tax to $150 per unit, get more tax revenue ($15,000 when the tax is $150 versus $13,333 when the tax is $200), and reduce the deadweight loss (7,500 when the tax is $150 compared to 13,333 when the tax is $200).