Answers to the Problems – Chapter 5

1. a. The market demand schedule equals the sum of the quantity demanded by Ben, Beth, and Bo at each price. So, when the price is $3 per mile, the market quantity demanded is 85; when the price is $4 per mile, the market quantity demanded is 65; when the price is $5 per mile, the marker quantity demanded is 45; when the price is $6 per mile, the market quantity demanded is 25; when the price is $7 per mile, the market quantity demanded is 15; when the price is $8 per mile, the market quantity demanded is 5; and when the price is $9 per mile, the market quantity demanded is 0.

b. The marginal social benefit when the quantity is 50 miles is $4.75 per mile. The marginal social benefit can be determined from the demand (and marginal social benefit) curve as the maximum price that consumers will pay for the quantity. Using the demand schedule shows that the maximum price consumers will pay for 50 miles is $4.75 per mile.

c. Ben’s consumer surplus is $62.50; Beth’s consumer surplus is $40.00; and, Bo’s consumer surplus is $20.00.

When the price is $4 per mile, Ben buys 25 miles. Ben’s consumer surplus is the triangular area under his demand curve and above the price. The demand curve is linear, so Ben’s consumer surplus is \( \frac{1}{2} \times (9 - 4) \times 25 \), which equals $62.50.

When the price is $4 per mile, Beth buys 20 miles. Beth’s consumer surplus is the triangular area under her demand curve and above the price. The demand curve is linear, so Beth’s consumer surplus is \( \frac{1}{2} \times (8 - 4) \times 20 \), which equals $40.00.

When the price is $4 per mile, Bo buys 20 miles. Bo’s consumer surplus is the triangular area under his demand curve and above the price. The demand curve is linear, so Bo’s consumer surplus is \( \frac{1}{2} \times (6 - 4) \times 20 \), which equals $20.00.

d. The economy’s consumer surplus is the sum of Ben’s consumer surplus plus Beth’s consumer surplus plus Bo’s consumer surplus, or $122.50.

2. a. The minimum supply-price equals the lowest price at which a producer is willing to produce the given quantity. Ann’s minimum supply-price for 10 rides is $15.00; Arthur’s minimum supply-price is $17.50; and, Abby’s minimum supply-price is $20.00.

b. Ann has the largest producer surplus. When the price is $17.50, Ann produces the largest quantity. And, at any quantity for which Ann produces rides, her supply schedule shows that her minimum supply-price (which is equal to her marginal cost) is lower than Arthur’s and Abby’s minimum supply-price.

c. The marginal social cost of producing 45 rides a day is the minimum supply-price from the market supply schedule. From the table, the minimum supply-price is $20.00 because at this is the lowest price for which 45 rides will be supplied.

d. The market supply schedule equals the sum of the quantity supplied by Ann, Arthur, and Abby at each price. So, when the price is $10.00 per ride, the market quantity supplied is 0 rides; when the price is $12.50 per ride, the market quantity supplied is 5 rides; when the price is $15.00 per ride, the marker quantity supplied is 15 rides; when the price is $17.50 per ride, the market quantity supplied is 30 rides; and when the price is $20.00 per ride, the market quantity supplied is 45 rides.

3. a. The equilibrium price is $10.00 a CD, and the equilibrium quantity is 100 CDs a month.

b. The consumer surplus is the area of the triangle under the demand curve above the market price.

c. The producer surplus is the area of the triangle above the supply curve below the market price.
d. The total surplus is $750.
   The total surplus is the sum of consumer surplus plus producer surplus. Consumer surplus is $500. The consumer surplus is the area of the triangle under the demand curve above the market price. The market price is $10.00 a CD. The area of the triangle equals ($20 – $10)/2 multiplied by 100, which is $500. Producer surplus is $250. The producer surplus is the area of the triangle above the supply curve below the market price. The market price is $10.00 a CD. The area of the triangle equals ($10 – $5)/2 multiplied by 100, which is $250. So the total surplus is $500 + $250, which is $750.

e. The efficient quantity is 100 CDs a month.
   The efficient quantity is the quantity that makes the marginal benefit from CDs equal to the marginal cost of producing CDs. The demand curve shows the marginal benefit and the supply curve shows the marginal cost. Only if 100 CDs are produced is the quantity produced efficient.

4. a. The maximum price that consumers will pay for the 200th sandwich is $2.
   The demand schedule shows the maximum price that consumers will pay for each sandwich. The maximum price that consumers will pay for the 200th sandwich is $2.

b. The minimum price that producers will accept for the 200th sandwich is $4.
   The supply schedule shows the minimum price that producers will accept for each sandwich. The minimum price for which produces will produce the 200th sandwich is $4.

c. 200 sandwiches a day are more than the efficient quantity because the marginal social benefit (the maximum price consumers will pay) is less than the marginal social cost (the minimum price suppliers will accept).

d. Consumer surplus is $225.
   150 sandwiches is the efficient quantity. The equilibrium price is $3. The consumer surplus is the area of the triangle under the demand curve above the price. The area of the consumer surplus triangle is ($6 – $3)/2 multiplied by 150, which is $225.

e. Producer surplus is $225.
   The producer surplus is the area of the triangle above the supply curve below the price. The price is $3 and the quantity is 150. The area of the triangle is ($3 – $0)/2 multiplied by 150, which is $225.

f. The deadweight loss is $50.
   Deadweight loss is the sum of the consumer surplus and producer surplus that is lost because the quantity produced is not the efficient quantity. The deadweight loss equals the quantity (200 – 150) multiplied by ($4 – $2)/2, which is $50.

g. If the demand for sandwiches increases and the market continues to produce 200 sandwiches, the consumer surplus increases, the producer surplus increases, and the total surplus increases. The deadweight los decreases. Indeed, if the demand increases enough so that 200 sandwiches becomes the equilibrium quantity, there is no deadweight loss at all.

5. a. The maximum price that consumers will pay is $25.
   The demand schedule shows the maximum price that consumers will pay for each bottle of sunscreen. The maximum price that consumers will pay for the 300th bottle is $25.

b. The minimum price that producers will accept is $15.
   The supply schedule shows the minimum price that producers will accept for each bottle of sunscreen. The minimum price that produces will accept for the 300th bottle is $15.

c. There is less than the efficient quantity being produced. The efficient quantity is the equilibrium quantity, 400 bottles a shortage. The equilibrium price is $20. If the supply
decreases to only 300 bottles and the price remains $20, there is a shortage of 100 bottles per day.
d. The bottles can be allocated using a contest (a raffle for the bottles, perhaps), first-come, first-served (a line until all 300 bottles are distributed), personal characteristics (perhaps all fair-haired people are allocated the sun screen), or force (a fight).

Using the “fair results” criteria, none of the allocation schemes are necessarily fair because there is no guarantee that poorer people will receive the sun screen. Using the “fair rules” criteria, the force method is definitely unfair and the others are fair.

Critical Thinking

1. a. Basically, water needs to be transported from where it is available to where it is needed. This basic issue leads to two major problems: Overproduction in some areas and underproduction in other areas. Often overproduction in an area leads to later underproduction in the same area. In particular, markets in water are not competitive. In many areas, water is “free” to whomever digs a deep enough well. As a result, too many people dig wells and water is overproduced. If the overproduction is bad enough, the level of groundwater can be reduced so far that it becomes literally impossible to extract any water. Then water needs to be transported to the now arid area. In this case, often the government transports the water and sells it at a very low price or gives it away. But because the government does not sell the water at an equilibrium price (and because the government is not motivated by seeking profit) less water is transported than the efficient quantity.

b. The market for water would probably be more efficient than the current situation. Areas with a great deal of water, say Canada, could export water to areas with less water, say Mexico. If water was purchased and sold in markets, there would be greater incentive to build desalination plants where they are practical and also greater incentive to conserve water where it is in abundance.

c. A free world market in water likely would (eventually) bring an efficient use of resources as the necessary infrastructure was constructed. Of the factors that can lead to inefficiency (government price and quantity regulations, monopoly power, and so forth) the only issue that could possibly lead to inefficiency is the point that water might be a common resource. But your students’ answers probably will not recognize this point because they have yet to study deeply about common resources.

d. Your students’ answers will vary. Students who believe in the “fair results” approach to fairness might well argue that in third world countries, very poor inhabitants (for example, nomads) would not be able to afford “enough” water and so some redistribution is needed for the sake of fairness. Students who take a “fair rules” approach to fairness ought to argue that a competitive market is enough to insure fairness.

2. a. The allocation of water is almost surely inefficient. If the marginal social cost curve of distributing water is basically the same for agricultural and residential users, as is probably the case, the only way that the allocation scheme can be efficient is if the marginal social benefit curve of agricultural lies below the marginal social benefit curve of residential users. Such a situation seems unlikely because water is necessary for agricultural users to grow their crops.

b. If agricultural users pay a higher rate for water, it is likely that the allocation of resources will be more efficient. Efficiency requires that marginal social benefit equals marginal social cost. Currently it is probably the case that the marginal social benefit of the last unit
of water for agricultural users is less than the marginal social cost of producing the last unit of water.

c. If the price paid by agricultural users rises, the consumer surplus of agricultural users decreases and the producer surplus increases.

d. According to the “fair results” approach, the difference in price is fair only if agricultural users are poorer than residential users. If, however, agricultural users are wealthier than or comparable to residential users, the difference in price is not fair. The difference in price is not fair according to the “fair rules” approach.

**Web Activities**

1. a. The retail (pharmacy) prices range from $0.67 in Thailand to $2.80 in Germany.

b. The fact that prices differ across markets suggests that the market is not efficient. If the market was efficient, then the price would be the same across the different markets. If the market were efficient, then resellers would buy in nations where the price was low and sell in the nation where the price was higher, thereby equalizing the price. But in the case of AXZT, the price is heavily regulated by government price controls, which lead to inefficiency and deadweight loss.

c. The article states that “The major determining factor is the existence of alternative products on the market, i.e. competition.” So one factor that will lead to lower prices and increased quantities is either disregard the patent or wait until the patent expires. In either case, the increased competition will lead to lower prices and increased quantities. If the government does not want to disregard the patent, it could try to negotiate lower prices by perhaps negotiating purchases of larger quantities. Or the government could simply lower the allowable legal price for AZT in the nation. The drawback with this last policy is that it might lead to a decrease in the quantity of AZT available.

d. The practice of Canadian on-line pharmacies selling AZT in the United States at a price below the U.S. price increases consumer surplus in the United States. U.S. producers sell AZT to Canadian pharmacies, but at a lower price than they can sell the drug in the United States. To the extent that the Canadian sales replace sales of U.S.-sold products, producer surplus in the United States decreases. However, to the extent that the product is manufactured in the United States and to the extent that these sales are “new,” that is, would not have been made except for the lower price, the sales increase U.S. producer surplus. Producer surplus in Canada increases.

e. The market for AZT is inefficient because of government price and quantity regulations and because the patent grants a monopoly in many countries. The market for AZT can be made efficient by removing the government price and quantity regulations and letting the patent expire. Presumably breaking the patent before its scheduled expiration date (which was in 2005) would make the market for AZT (more) efficient, but would have tremendous adverse consequences for the future investment into other life-saving drugs.