Chapter 2: Answers to Questions and Problems

1.
   a. Since X is a normal good, a decrease in income will lead to a decrease in the demand for X (the demand curve for X will shift to the left).
   b. Since Y is an inferior good, an increase in income will lead to a decrease in the demand for good Y (the demand curve for Y will shift to the left).
   c. Since goods X and Y are substitutes, an increase in the price of good Y will lead to an increase in the demand for good X (the demand curve for X will shift to the right).
   d. No. The term "inferior good" does not mean "inferior quality," it simply means that income and consumption are inversely related.

2.
   a. The supply of good X will increase (shift to the right).
   b. The supply of good X will decrease. More specifically, the supply curve will shift vertically up by exactly $3 at each level of output.
   c. The supply of good X will decrease. More specifically, the supply curve will rotate counter-clockwise.
   d. The supply curve for good X will increase (shift to the right).

3.
   a. $Q_x^s = -30 + 2(600) - 4(60) = 930$ units.
   b. Notice that although $Q_x^s = -30 + 2(80) - 4(60) = -110$, negative output is impossible. Thus, quantity supplied is zero.
   c. To find the supply function, insert $P_z = 60$ into the supply equation to obtain $Q_x^s = -30 + 2P_x - 4(60) = -270 + 2P_x$. Thus, the supply equation is $Q_x^s = -270 + 2P_x$. To obtain the inverse supply equation, simply solve this equation for P_x to obtain $P_x = 135 + 0.5Q_x^s$. The inverse supply function is graphed in Figure 2-1.
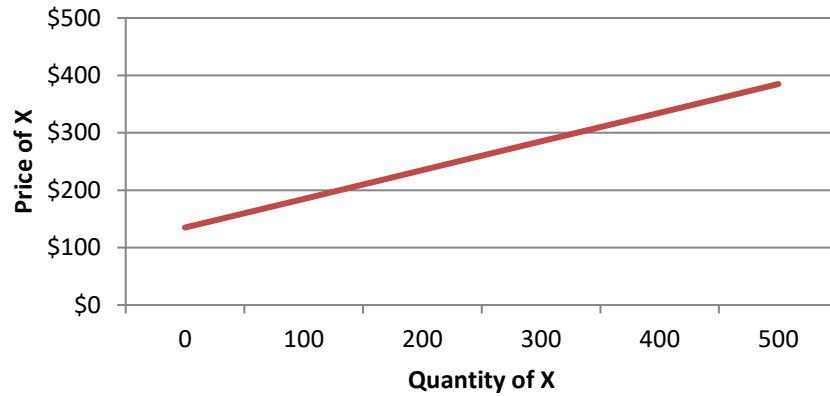
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Figure 2-1

4.
    a. Good Y is a complement for X, while good Z is a substitute for X.

    b. X is a normal good.

    c. $Q_x^d = 6{,}000 - \frac{1}{2}(\$5{,}230) - \$6{,}500 + 9(\$100) + \frac{1}{10}(\$70{,}000) = 4{,}785$

    d. For the given income and prices of other goods, the demand function for good X
        is $Q_x^d = 6{,}000 - \frac{1}{2}P_x - \$6{,}500 + 9(\$100) + \frac{1}{10}(\$70{,}000)$ which simplifies to
        $Q_x^d = 7{,}400 - \frac{1}{2}P_x$. To find the inverse demand equation, solve for price to obtain
        $P_x = 14{,}800 - 2Q_x^d$. The demand function is graphed in Figure 2-2.
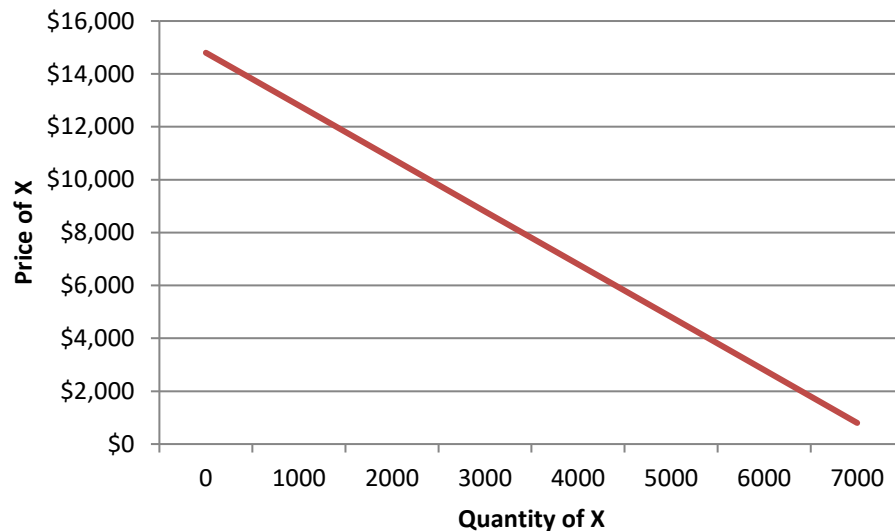

Figure 2-2

5.
   a. Solve the demand function for P_x to obtain the following inverse demand function: $P_x = 150 - \frac{1}{2}Q_x^d$.
   b. Notice that when $P_x = \$45$, $Q_x^d = 300 - 2(45) = 210$ units. Also, from part a, we know the vertical intercept of the inverse demand equation is 150. Thus, consumer surplus is $11,025 (computed as (0.5)($150-$45)210 = $11,025).
   c. When price decreases to $30, quantity demanded increases to 240 units, so consumer surplus increases to $14,400 (computed as (0.5)($150-$30)240 = $14,400).
   d. So long as the law of demand holds, a decrease in price leads to an increase in consumer surplus, and vice versa. In general, there is an inverse relationship between the price of a product and consumer surplus.

6.
   a. Equating quantity supplied and quantity demanded yields the equation $60 - P = P - 20$. Solving for P yields the equilibrium price of $40 per unit. Plugging this into the demand equation yields the equilibrium quanity of 20 units (since quantity demanded at the equilibrium price is $Q^d = 60 - (40) = 20$).
   b. A price floor of $50 is effective since it is above the equilibrium price of $40. As a result, quantity demanded will fall to 10 units ($Q^d = 60 - 50$), while quantity supplied will increase to 30 units ($Q^s = 50 - 20$). That is, firms produce 30 units but consumers are willing and able to purchase only 10 units. Therefore, at a price floor of $50, 10 units will be exchanged. Since $Q^d < Q^s$ there is a surplus amounting to 30-10 = 20 units.
   c. A price ceiling of $32 per unit is effective since it is below the equilibrium price of $40 per unit. As a result, quantity demanded will increase to 28 units ($Q^d = 60 - 32 = 28$), while quantity supplied will decrease to 12 units ($Q^s = 32 - 20 = 12$). That is, while firms are willing to produce only 12 units consumers want to buy 28 units at the ceiling price. Therefore, at the price ceiling of $32, only 12 units will be available to purchase. Since $Q^d > Q^s$, there is a shortage amounting to 28-12 = 16 units. Since only 12 units are available at a price of $32, the full economic price is the price such that quantity demanded equals the 12 available units: $12 = 60 - P^F$. Solving yields the full economic price of $48.

7.
   a. Equate quantity demanded and quantity supplied to obtain $14 - \frac{1}{2}P_x = \frac{1}{4}P_x - 1$. Solve this equation for P_x to obtain the equilibrium price of $P_x = 20$. The equilibrium quantity is 4 units (since at the equilibrium price quantity demanded is $Q^d = 14 - \frac{1}{2}(20) = 4$). The equilibrium is shown in Figure 2-3.

Figure 2-3

b. A $12 excise tax shifts the supply curve up by the amount of the tax. Mathematically, this means that the intercept of the inverse supply function increases by $12. Before the tax, the inverse supply function is $P = 4 + 4Q^s$. After the tax the inverse supply function is $P = 16 + 4Q^s$, and the after tax supply function (obtained by solving for Q^s in terms of P) is given by $Q^s = \frac{1}{4}P - 4$. Equating quantity demanded to after-tax quantity supplied yields $14 - \frac{1}{2}P = \frac{1}{4}P - 4$. Solving for P yields the new equilibrium price of $24. Plugging this into the demand equation yields the new equilibrium quantity, which is 2 units.

c. Since two units are sold after the tax and the tax rate is $12 per unit, total tax revenue is $24.

8.

a. The shortage is 3 units (since at a price of $6, $Q^d - Q^s = 4 - 1 = 3$ units). The full economic price is $12.

b. The surplus is 1.5 units (since at a price of $12, $Q^s - Q^d = 2.5 - 1 = 1.5$ units. The cost to the government is $18 (computed as ($12)(1.5) = $18).

c. The excise tax shifts supply vertically by $6. Thus, the new supply curve is S^1 and the equilibrium price increases to $12. The price paid by consumers is $12 per unit, while the amount received by producers is this $12 minus the per unit tax. Thus, producers receive $6 per unit. After the tax, the equilibrium quantity sold is 1 unit.

d. At the equilibrium price of $10, consumer surplus is $.5(\$14 - \$10)2 = \$4$.

Producer surplus is $.5(\$10 - \$2)2 = \$8$.

e. No. At a price of $2 no output is produced.

9.
    a. The inverse supply curve is $P = 26 + 0.05Q$.
    b. When $Q_x = 400$, producer surplus is (46-26)*400/2 = $4,000. When $Q_x = 1200$, producer surplus is (86-26)*1200/2 = $36,000.

10.
    a. The cost of purchasing the surplus is $40*(24-12) = $480.
    b. The deadweight loss resulting from a $40 price floor is $0.5 * (40 - 28) * (20 - 12) = \$48.00$.

11. Rising input prices that increase production costs will lead to a leftward shift in the supply curve for RAM chips, resulting in a higher equilibrium price of RAM chips. If in addition, income falls, the demand for RAM chips will decrease since they are a normal good. This decrease in demand would tend to decrease the price of RAM chips. The ultimate effect of both of these changes in supply and demand on the equilibrium price of RAM chips is indeterminate. Depending on the relative magnitude of the decreases in supply and demand, the price you will pay for chips may rise or fall.

12. The tariff reduces the supply of raw sugar, resulting in a higher equilibrium price of sugar. Since sugar is an input in making generic soft drinks, this increase in input prices will decrease the supply of generic soft drinks (putting upward pressure on the price of generic soft drinks and tend to reduce quantity). Coke and Pepsi's advertising campaign will decrease the demand for generic soft drinks (putting downward pressure on the price of generic soft drinks and further reducing the quantity). For these reasons, the equilibrium quantity of generic soft drinks sold will decrease. However, the equilibrium price may rise or fall, depending on the relative magnitude of the shifts in demand and supply.

13. No. this confuses a change in demand with a change in quantity demanded. Higher cigarette prices will not reduce (shift to the left) the demand for cigarettes.

14. To find the equilibrium price and quantity, equate quantity demanded and quantity supplied to obtain 210 – 1.5P = 2.5P – 150. Solving yields the new equilibrium price of $90 per pint. The equilibrium quantity is 75 units (since Q^d = 210 – 1.5*90 = 75

units at that price). Consumer surplus is $\frac{1}{2}($140 − $90) * 75 = $1,875$. Producer surplus is $\frac{1}{2}($90 − $60) * 75 = $1,125$. See Figure 2-4.
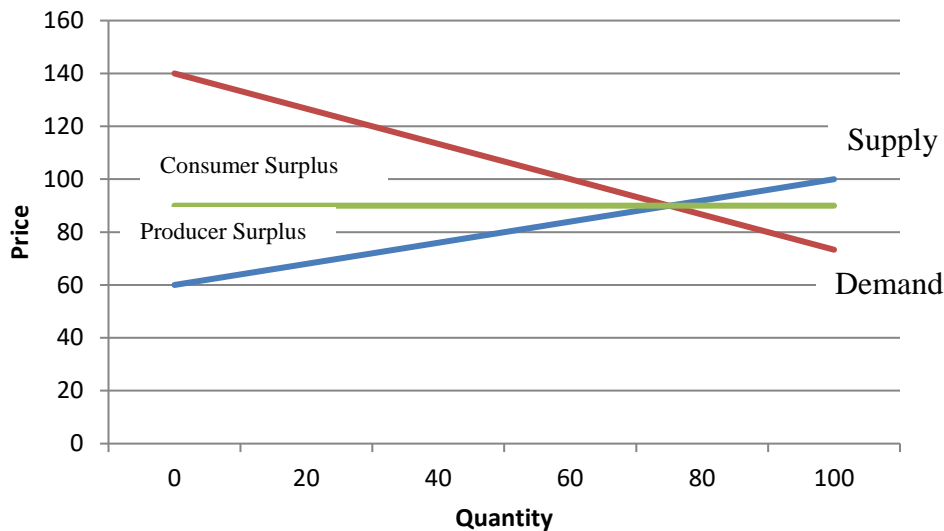

Figure 2-4

15.   This decline represents a leftward shift in the supply curve for oil, and will result in an increase in the equilibrium price of crude oil. Since oil is an input in producing gasoline, this will decrease the supply of gasoline, resulting in a higher equilibrium price of gasoline and a lower equilibrium quantity. Furthermore, the higher price of gasoline will increase the demand for substitutes, such as small cars. The equilibrium price of small cars is likely to increase, as is the equilibrium quantity of small cars.

16.   Equating the initial quantity demanded and quantity supplied gives the equation: 300 – 4P = 3P – 120. Solving for price, we see that the initial equilibrium price is $60 per month. When the tax rate is reduced, equilibrium is determined by the following equation: 300 – 4P = 3.2P - 120. Solving, we see that the new equilibrium price is about $58.33 per month. In other words, a typical subscriber would save about $1.67 (the difference between $60.00 and $58.33).

17.   Dry beans and rice are probably inferior goods. If so, an increase in income shifts demand for these goods to the left, resulting in a lower equilibrium price. Therefore, G.R. Dry Foods will likely have to sell its products at a lower price.

18.   Figure 2-5 illustrates the relevant situation. The equilibrium price is $3.00, but the ceiling price is $1.25. Notice that, given the shortage of 14 million transactions caused by the ceiling price of $1.25, the average consumer spends an extra 14 minutes traveling to another ATM machine. Since the opportunity cost of time is $24 per hour, the non-pecuniary price of an ATM transaction is $5.60 (the $24 per hour

wage times the fractional hour, 14/60, spent searching for another machine). Thus, the full economic price under the price ceiling is $6.85 per transaction.
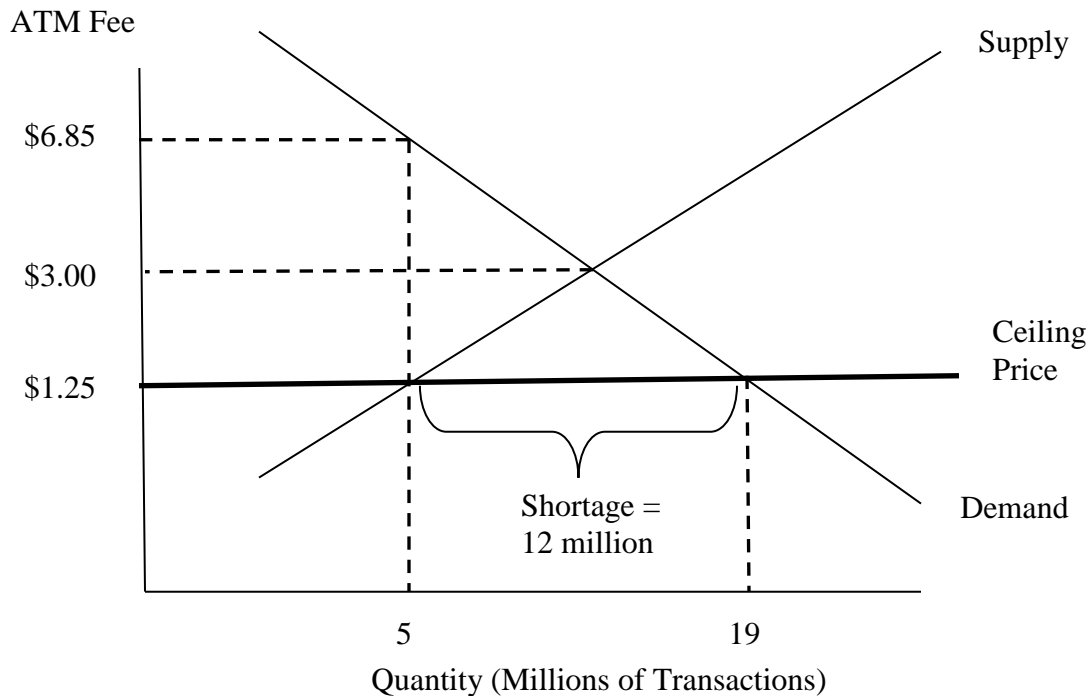

Figure 2-5

19. The unusually cold temperatures have caused a decrease in the supply of grapes used to produce Chilean wine, resulting in higher prices. These grapes are an input in making wine, so the supply of Chilean wine decreases and its price increases. Since California and Chilean wines are substitutes, an increase in the price of Chilean wine will increase the demand for Californian wines causing an increase in both the price and quantity of Californian wines.

20. Substituting $P_{desktop} = 980$ into the demand equation yields $Q^d_{memory} = 9240 - 100P_{memory}$. Similarly, substituting $N = 100$ into the supply equation yields $Q^s_{memory} = 1100 + 25P_{memory}$. The competitive equilibrium level of industry output and price occurs where $Q^d_{memory} = Q^s_{memory}$, which occurs when industry output $Q^*_{memory} = 2728$ (in thousands) and the market price is $P^*_{memory} = \$65.12$ per unit. Since 100 competitors are assumed to equally share the market, Viking should produce 27.28 thousand units. If $P_{desktop} = \$1,080$, $Q^d_{memory} = 9040 - 100P_{memory}$. Under this condition, the new competitive equilibrium occurs when industry output is 2688 thousand units and the per-unit market price is $63.52. Therefore, Viking should produce 26.88 thousand units. Since demand decreased (shifted left) when the price of desktops increased, memory modules and desktops are complements.

21. Mid Towne IGA aimed to educate consumers that its contract with Local 655 union members was different than its rivals, so it engaged in informative advertising. Mid Towne IGA's informative advertising increases demand (demand shifts rightward) resulting from (1) Local 655 union members locked out of rival supermarkets (2) consumers who are sympathetic to the Local 655 union, and (3) consumers who do not like the aggravation of picketing employees and other disruptions at the supermarket. This shift is depicted in Figure 2-6, where the equilibrium price and quantity both increase. It is unlikely that demand will remain high for Mid Towne IGA. As contracts are renegotiated and Local 655 union members are back to work, demand will likely settle back around its original level.
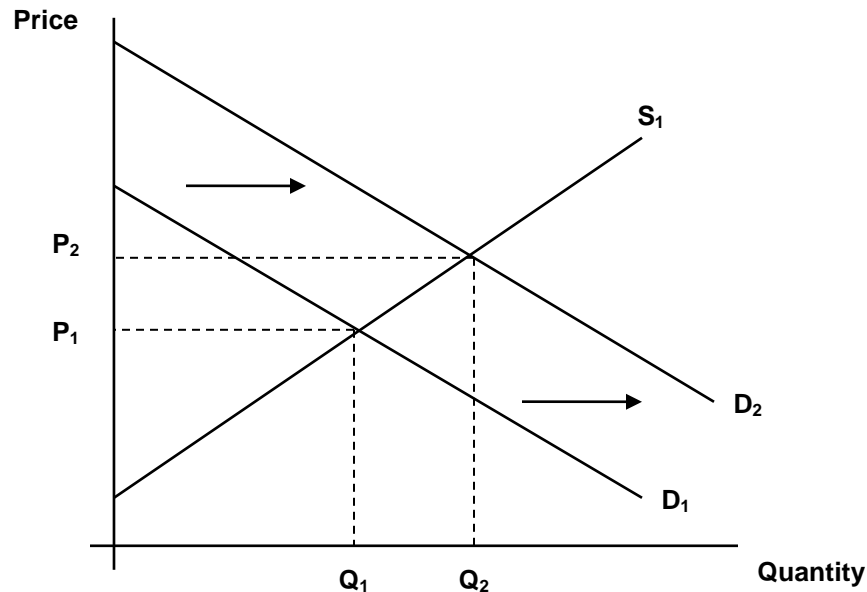

Figure 2-6

22. The price gouging statute imposes an effective price ceiling on necessary commodities during times of emergencies; legally retailers cannot raise prices by a significant amount. When a natural disaster occurs, the demand for necessary commodities such as food and water can dramatically increase, as people want to be stocked-up on emergency items. In addition, since it can be difficult for retailers to receive shipments during emergency periods, the supply of these items is often reduced. Given the simultaneous reduction in supply and increase in demand, one would expect the price to increase during times of emergencies. However, since the price gouging statute acts as a price ceiling, the price will probably remain at its normal level, and a shortage will result.

23. While there is undoubtedly a link between unemployment and crime, the governor's plan is likely flawed since it only examines one side of the market. Raising the minimum wage will make the prospect of working more appealing for teenagers, but it will also have an effect on business owners and managers in the state. The

    minimum wage is a price floor. Raising the minimum wage will reduce the quantity demand for labor within the state, and result in a labor surplus. More teenagers will seek jobs, but fewer businesses will hire teenagers. It is very likely that the governor's plan will result in greater juvenile delinquency.