# SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. A price ceiling is a legal maximum on the price at which a good can be sold. Examples of price ceilings include rent control, price controls on gasoline in the 1970s, and price ceilings on water during a drought. A price floor is a legal minimum on the price at which a good can be sold. Examples of price floors include the minimum wage and farm-support prices. A price ceiling leads to a shortage, if the ceiling is binding, because suppliers won't produce enough goods to meet demand unless the price is allowed to rise above the ceiling. A price floor leads to a surplus, if the floor is binding, because suppliers produce more goods than are demanded unless the price is allowed to fall below the floor.

2. With no tax, as shown in Figure 1, the demand curve is D_1 and the supply curve is S. The equilibrium price is P_1 and the equilibrium quantity is Q_1. If the tax is imposed on car buyers, the demand curve shifts down by the amount of the tax ($1000) to D_2. The downward shift in the demand curve leads to a decline in the equilibrium price to P_2 (the amount received by sellers from buyers) and a decline in the equilibrium quantity to Q_2. The price received by sellers declines by $P_1 - P_2$, shown in the figure as ΔP_S. Buyers pay a total of $P_2 + \$1,000$, an increase in what they pay of $P_2 + \$1,000 - P_1$, shown in the figure as ΔP_B.
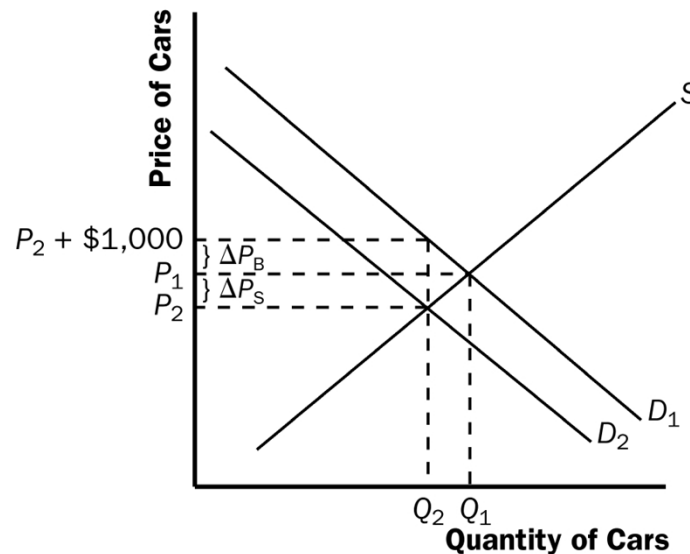
Figure 1

If the tax is imposed on car sellers, as shown in Figure 2, the supply curve shifts up by the amount of the tax ($1000) to S_2. The upward shift in the supply curve leads to a rise in the equilibrium price to P_2 (the amount received by sellers from buyers) and a decline in the equilibrium quantity to Q_2. The price paid by buyers declines by $P_1 - P_2$, shown in the figure as ΔP_B. Sellers receive P_2 and pay taxes of $1,000, receiving on net $P_2 - \$1,000$, a decrease in what they receive by $P_1 - (P_2 - \$1,000)$, shown in the figure as ΔP_S.
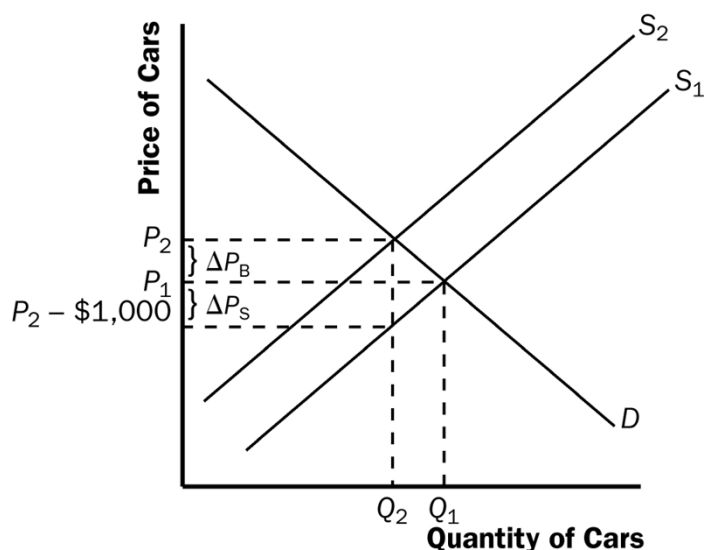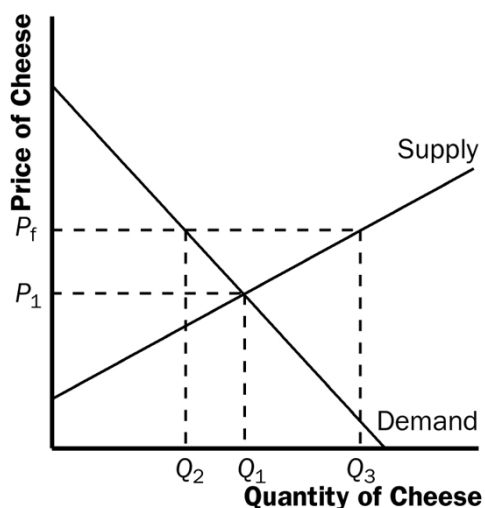
Figure 2

Questions for Review

1.   An example of a price ceiling is the rent control system in New York City.   An example of a price floor is the minimum wage.   Many other examples are possible.

2.   A shortage of a good arises when there is a binding price ceiling.   A surplus of a good arises when there is a binding price floor.

3.   When the price of a good is not allowed to bring supply and demand into equilibrium, some alternative mechanism must allocate resources.   If quantity supplied exceeds quantity demanded, so that there is a surplus of a good as in the case of a binding price floor, sellers may try to appeal to the personal biases of the buyers.   If quantity demanded exceeds quantity supplied, so that there is a shortage of a good as in the case of a binding price ceiling, sellers can ration the good according to their personal biases, or make buyers wait in line.

4.   Economists usually oppose controls on prices because prices have the crucial job of coordinating economic activity by balancing demand and supply.   When policymakers set controls on prices, they obscure the signals that guide the allocation of society's resources.   Further, price controls often hurt those they are trying to help.

5.   A tax paid by buyers shifts the demand curve, while a tax paid by sellers shifts the supply curve. However, the outcome is the same regardless of who pays the tax.

6.   A tax on a good raises the price buyers pay, lowers the price sellers receive, and reduces the quantity sold.

7.   The burden of a tax is divided between buyers and sellers depending on the elasticity of demand and supply.   Elasticity represents the willingness of buyers or sellers to leave the market, which in turns depends on their alternatives.   When a good is taxed, the side of the market with fewer good alternatives cannot easily leave the market and thus bears more of the burden of the tax.
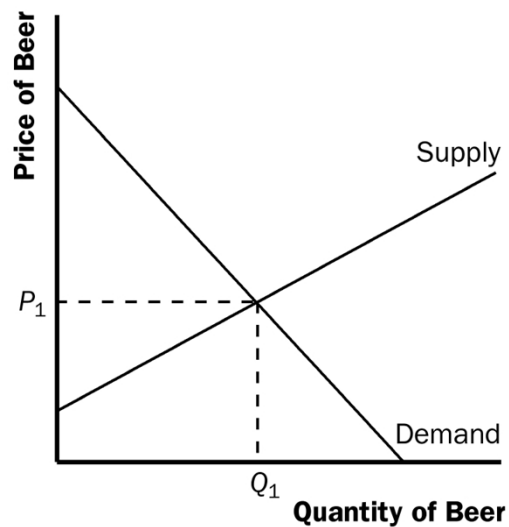
Problems and Applications

1. If the price ceiling of $40 per ticket is below the equilibrium price, then quantity demanded exceeds quantity supplied, so there will be a shortage of tickets. The policy decreases the number of people who attend classical music concerts, since the quantity supplied is lower because of the lower price.

2. a. The imposition of a binding price floor in the cheese market is shown in Figure 3. 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 $Q_3 - Q_2$.

    b. The farmers' 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. If the government purchases all the surplus cheese at the price floor, producers benefit and taxpayers lose. Producers would produce quantity Q_3 of cheese, and their total revenue would increase substantially. But consumers would buy only quantity Q_2 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.
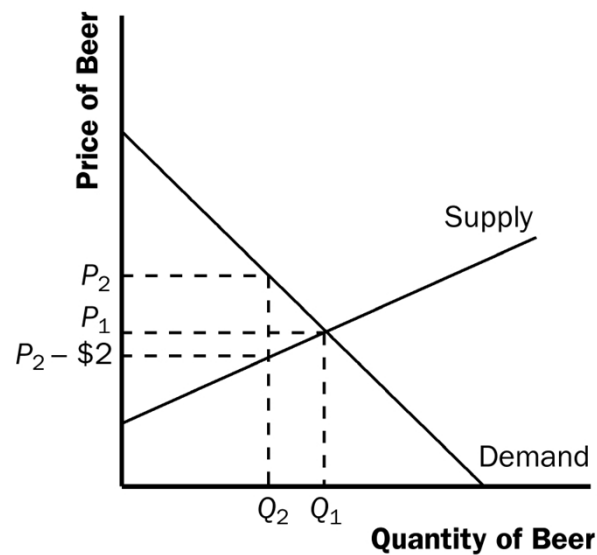

Figure 3

3. a. The equilibrium price of Frisbees is $8 and the equilibrium quantity is 6 million Frisbees.

    b. With a price floor of $10, the new market price is $10 since the price floor is binding. At that price, only 2 million Frisbees are sold, since that's the quantity demanded.

    c. If there's a price ceiling of $9, it has no effect, since the market equilibrium price is $8, below the ceiling. So the equilibrium price is $8 and the equilibrium quantity is 6 million Frisbees.

4. a. Figure 4 shows the market for beer without the tax. The equilibrium price is P_1 and the equilibrium quantity is Q_1. The price paid by consumers is the same as the price

received by producers.

Price of Beer (y-axis) vs **Quantity of Beer** (x-axis)

Supply

P_1

Demand

Q_1

Figure 4

Price of Beer (y-axis) vs **Quantity of Beer** (x-axis)

Supply

P_2
P_1
$P_2 - \$2$

Demand

Q_2 Q_1
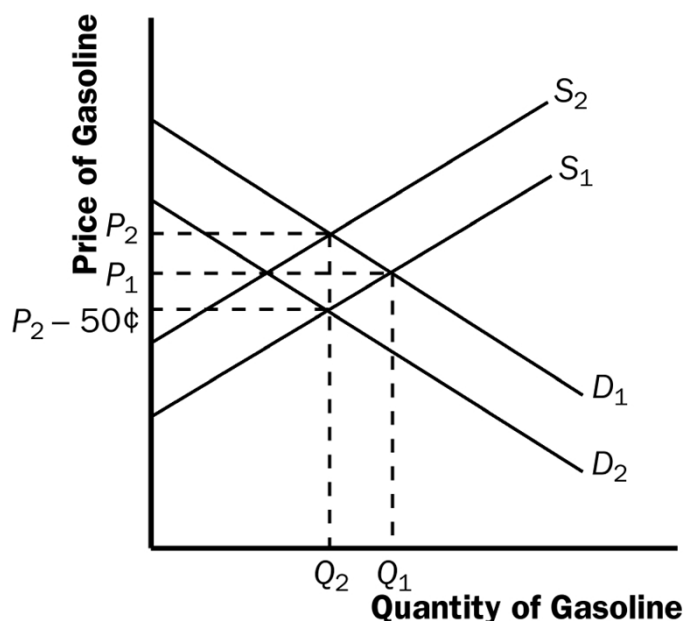
Figure 5

b.   When the tax is imposed, it drives a wedge of $2 between supply and demand, as shown in Figure 5.   The price paid by consumers is P_2, while the price received by producers is $P_2 - \$2$.   The quantity of beer sold declines to Q_2.

5.   Reducing the payroll tax paid by firms and using part of the extra revenue to reduce the payroll tax paid by workers would not make workers better off, because the division of the burden of a tax depends on the elasticity of supply and demand and not on who must pay the tax.   Since the tax wedge would be larger, it is likely that both firms and workers, who share the burden of any tax, would be worse off.

6.   If the government imposes a $500 tax on luxury cars, the price paid by consumers will rise less than $500, in general.   The burden of any tax is shared by both producers and consumers—the

price paid by consumers rises and the price received by producers falls, with the difference between the two equal to the amount of the tax. The only exceptions would be if the supply curve were perfectly elastic or the demand curve were perfectly inelastic, in which case consumers would bear the full burden of the tax and the price paid by consumers would rise by exactly $500.

7.   a.   It doesn't matter whether the tax is imposed on producers or consumers—the effect will be the same. With no tax, as shown in Figure 6, the demand curve is D_1 and the supply curve is S_1. If the tax is imposed on producers, the supply curve shifts up by the amount of the tax (50 cents) to S_2. Then the equilibrium quantity is Q_2, the price paid by consumers is P_2, and the price received (after taxes are paid) by producers is $P_2 - 50$ cents. If the tax is instead imposed on consumers, the demand curve shifts down by the amount of the tax (50 cents) to D_2. The downward shift in the demand curve (when the tax is imposed on consumers) is exactly the same magnitude as the upward shift in the supply curve when the tax is imposed on producers. So again, the equilibrium quantity is Q_2, the price paid by consumers is P_2 (including the tax paid to the government), and the price received by producers is $P_2 - 50$ cents.

Figure 6

b.   The more elastic is the demand curve, the more effective this tax will be in reducing the quantity of gasoline consumed. Greater elasticity of demand means that quantity falls more in response to the rise in the price of gasoline. Figure 7 illustrates this result. Demand curve D_1 represents an elastic demand curve, while demand curve D_2 is more inelastic. To get the same tax wedge between demand and supply requires a greater reduction in quantity with demand curve D_1 than for demand curve D_2.
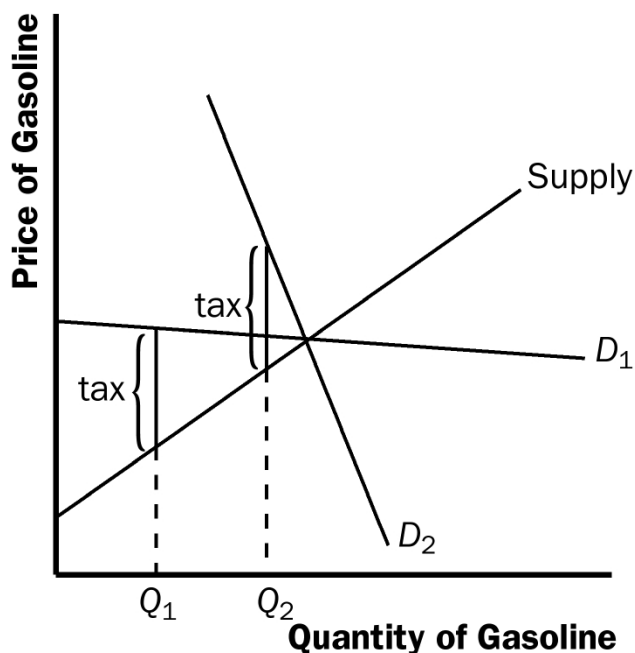
Figure 7

c. The consumers of gasoline are hurt by the tax because they get less gasoline at a higher price.

d. Workers in the oil industry are hurt by the tax as well. With a lower quantity of gasoline being produced, some workers may lose their jobs. With a lower price received by producers, wages of workers might decline.

8. a. Figure 8 shows the effects of the minimum wage. In the absence of the minimum wage, the market wage would be w_1 and Q_1 workers would be employed. With the minimum wage (w_m) imposed above w_1, the market wage is w_m, the number of employed workers is Q_2, and the number of workers who are unemployed is Q_3 - Q_2. Total wage payments to workers are shown as the area of rectangle ABCD, which equals w_m times Q_2.
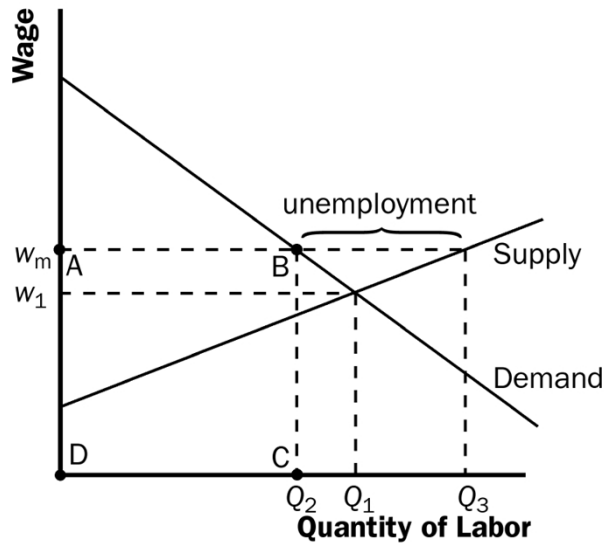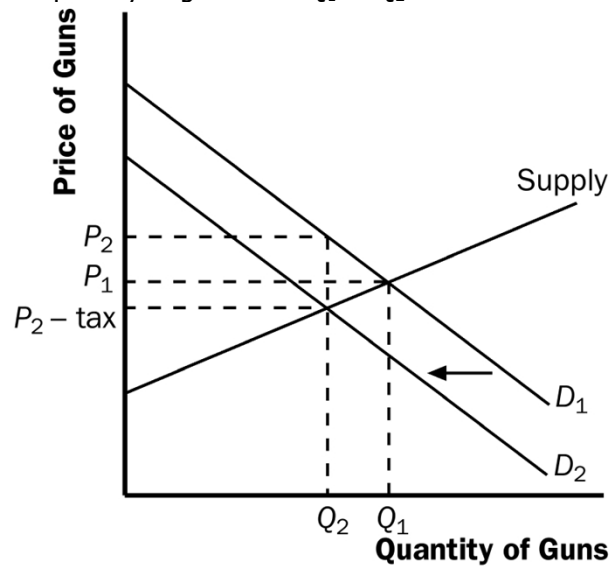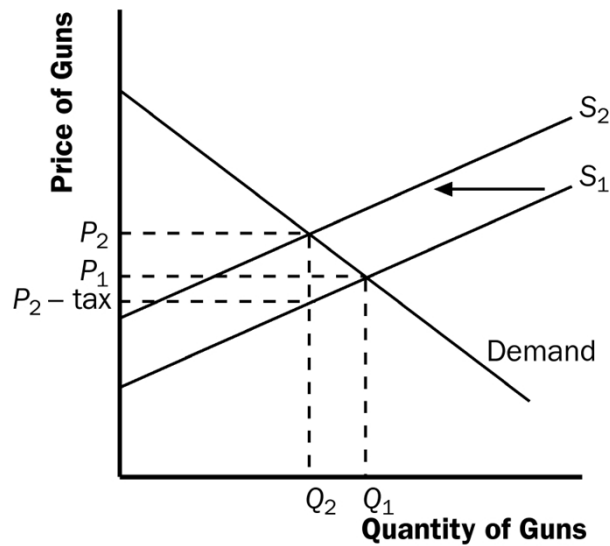
Figure 8

b.   An increase in the minimum wage would decrease employment.   The size of the effect on employment depends only on the elasticity of demand.   The elasticity of supply doesn't matter, because there's a surplus of labor.

c.   The increase in the minimum wage would increase unemployment.   The size of the rise in unemployment depends on both the elasticities of supply and demand.   The elasticity of demand determines the quantity of labor demanded, the elasticity of supply determines the quantity of labor supplied, and the difference between the quantity supplied and demanded of labor is the amount of unemployment.

d.   If the demand for unskilled labor were inelastic, the rise in the minimum wage would increase total wage payments to unskilled labor.   With inelastic demand, the percentage decline in employment would be less than the percentage increase in the wage, so total wage payments increase.   However, if the demand for unskilled labor were elastic, total wage payments would decline, since then the percentage decline in employment would exceed the percentage increase in the wage.

9.   a.   Figure 9 shows the effect of a tax on gun buyers.   The tax reduces the demand for guns from D_1 to D_2.   The result is a rise in the price buyers pay for guns from P_1 to P_2, and a decline in the quantity of guns from Q_1 to Q_2.
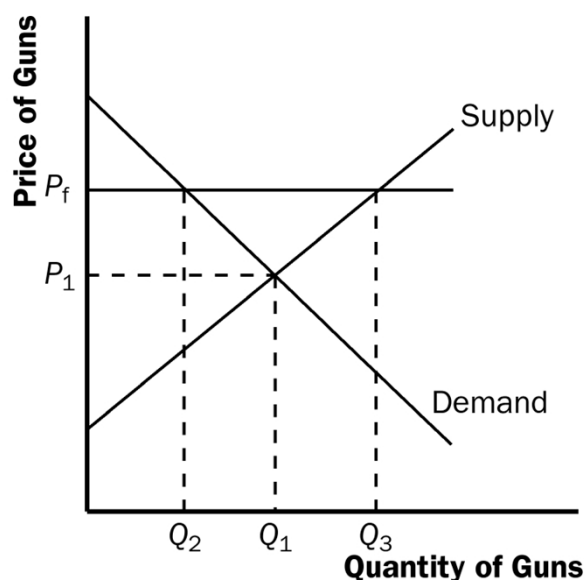

Figure 9

b.   Figure 10 shows the effect of a tax on gun sellers.   The tax reduces the supply of guns from S_1 to S_2.   The result is a rise in the price buyers pay for guns from P_1 to P_2, and a decline in the quantity of guns from Q_1 to Q_2.
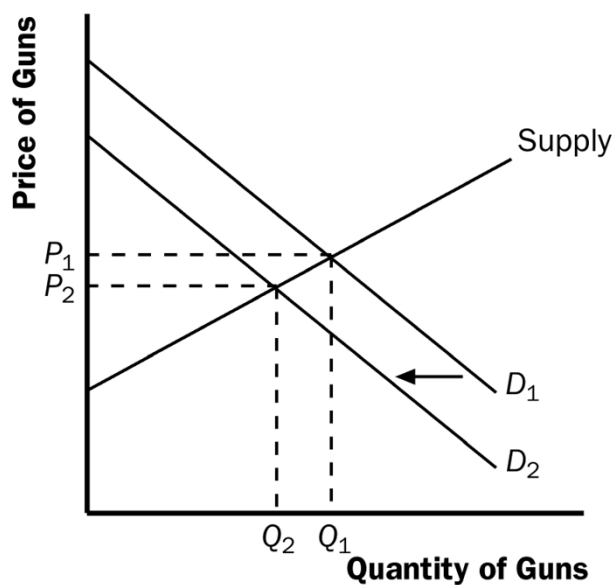

Figure 10

c. Figure 11 shows the effect of a binding price floor on guns. The increase in price from P_1 to P_f leads to a decline in the quantity of guns from Q_1 to Q_2. There is excess supply in the market for guns, since the quantity supplied (Q_3) exceeds the quantity demanded (Q_2) at the price P_f.
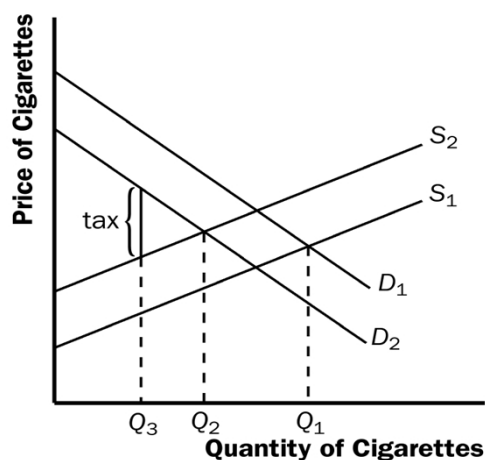

Figure 11

d. Figure 12 shows the effect of a tax on ammunition. The tax on ammunition reduces the demand for guns from D_1 to D_2, because ammunition and guns are complements. The result is a decline in the price of guns from P_1 to P_2, and a decline in the quantity of guns from Q_1 to Q_2.
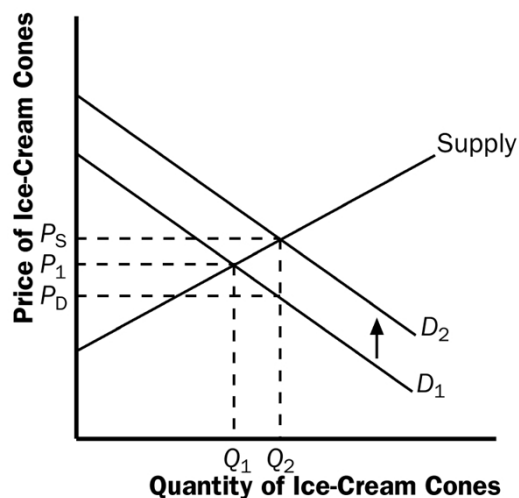

Figure 12

10. a. Programs aimed at making the public aware of the dangers of smoking reduce the demand for cigarettes, shown in Figure 13 as a shift from demand curve D_1 to D_2. The

price support program increases the price of tobacco, which is the main ingredient in cigarettes. As a result, the supply of cigarettes shifts to the left, from S_1 to S_2. The effect of both programs is to reduce the quantity of cigarette consumption from Q_1 to Q_2.

Figure 13

    b. The combined effect of the two programs on the price of cigarettes is ambiguous. The education campaign reduces demand for cigarettes, which tends to reduce the price. The tobacco price supports raise the cost of production of cigarettes, which tends to increase the price.

    c. The taxation of cigarettes further reduces cigarette consumption, since it increases the price to consumers. As shown in the figure, the quantity falls to Q_3.

11.   a. The effect of a $0.50 per cone subsidy is to shift the demand curve up by $0.50 at each quantity, since at each quantity a consumer's willingness to pay is $0.50 higher. The effects of such a subsidy are shown in Figure 14. Before the subsidy, the price is P_1. After the subsidy, the price received by sellers is P_S and the effective price paid by consumers is P_D, which equals P_S minus 50 cents. Before the subsidy, the quantity of cones sold is Q_1; after the subsidy the quantity increases to Q_2.

Figure 14

b.   Because of the subsidy, consumers are better off, since they consume more at a lower price.   Producers are also better off, since they sell more at a higher price.   The government loses, since it has to pay for the subsidy.