



Chapter

3 DEMAND AND SUPPLY

Answers to the Review Quizzes

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1. What is the distinction between a money price and a relative price?

The money price of a good is the dollar amount that must be paid for it. The relative price of a good is its money price expressed as a ratio to the money price of another good. Thus the relative price is the amount of the other good that must be foregone to purchase a unit of the first good.

2. Explain why a relative price is an opportunity cost.

The relative price of a good is the opportunity cost of buying that good because it shows how much of the next best alternative good must be forgone to buy a unit of the first good.

3. Think of examples of goods whose relative price has risen or fallen by a large amount.

Some examples of items where both the money price and the relative price have risen over time are gasoline; college tuition; food. Some examples of items where both the money price and the relative price have fallen over time are personal computers; HD televisions; calculators.

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1. Define the quantity demanded of a good or service.

The *quantity demanded* of a good or service is the amount that consumers plan to buy during a given time period at a particular price.

2. What is the law of demand and how do we illustrate it?

The *law of demand* states: "Other things remaining the same, the higher the price of a good, the smaller is the quantity demanded; and the lower the price of a good, the greater is the quantity demanded." The law of demand is illustrated by a downward-sloping demand curve drawn with the quantity demanded on the horizontal axis and the price on the vertical axis. The slope is negative to show that the higher the price of a good, the lower is the quantity demanded and the lower the price of a good, the higher is the quantity demanded.

3. What does the demand curve tell us about the price that consumers are willing to pay?

For any fixed quantity of a good available, the height of the demand curve shows the *maximum price* that consumers are willing to pay for that quantity of the good. The price on the demand curve at this quantity indicates the marginal benefit to consumers of the last unit consumed at that quantity.

4. List all the influences on buying plans that change demand, and for each influence, say whether it increases or decreases demand.

Influences that *change the demand* for a product include:

- *The prices of related goods.* A rise (fall) in the price of a substitute increases (decreases) the demand for the first good. A rise (fall) in the price of a complement decreases (increases) the demand for the first good.

- *The expected future price of the good.* A rise (fall) in the expected future price of a good increases (decreases) the demand in the current period.
- *Income.* For a normal good, an increase (decrease) in income increases (decreases) the demand. For an inferior good, an increase in income decreases (increases) the demand.
- *Expected future income and credit.* An increase (decrease) in expected future income or credit might increase (decrease) the demand.
- *The population.* An increase (decrease) in population in the market increases (decreases) the demand
- *People's preferences.* If people's preferences for a good rise (fall), the demand increases (decreases).

5. Why does demand not change when the price of a good changes with no change in the other influences on buying plans?

If the price of a good falls and nothing else changes, then the *quantity of the good demanded* increases and there is a movement upward along the demand curve, but the *demand* for the good remains unchanged and the demand curve does not shift.

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1. Define the quantity supplied of a good or service.

The quantity supplied of a good or service is the amount of the good or service that firms plan to sell in a given period of time at a specified price.

2. What is the law of supply and how do we illustrate it?

The law of supply states that "other things remaining the same, the higher the price of a good, the greater is the quantity supplied; and the lower the price of a good, the smaller is the quantity supplied." The law of supply is illustrated by an upward-sloping supply curve drawn with the quantity supplied on the horizontal axis and the price on the vertical axis. The slope is positive to show that the higher the price of a good, the greater is the quantity supplied and the lower the price of a good, the smaller is the quantity supplied.

3. What does the supply curve tell us about the producer's minimum supply price?

For any quantity, the height of the supply curve shows the *minimum price* that suppliers must receive to produce that quantity of output. As a result, the price is the marginal cost of the last unit produced at this level of output.

4. List all the influences on selling plans, and for each influence, say whether it changes supply.

Influences that *change the supply* of a good include:

- *Prices of factor of production.* A rise (fall) in the price of a factor of production increases firms' costs of production and decreases (increases) the supply of the good.
- *Prices of related goods produced.* If the price of a substitute in production rises (falls), firms decrease their sales of the original good and the supply for the original good decreases (increases). A rise (fall) in the price of a complement in production increases (decreases) production of the original good, causing the supply of the original good to increase (decrease).
- *The expected future price of the product.* A rise (fall) in the expected future price of the good causes suppliers to reduce (increase) the amount they sell today. This change in expectations decreases (increases) the supply in the current period.
- *The number of sellers.* An increase (decrease) in the number of sellers in a market increases the quantity of the good available at every price, and increases (decreases) the supply.
- *Technology.* An advance in technology increases the supply.

- *The state of nature.* A good (bad) state of nature, such as good (bad) weather for agricultural products, increases (decreases) the supply.

5. What happens to the quantity of cell phones supplied and the supply of cell phones if the price of a cell phone falls?

If the price of cell phones falls and nothing else changes, then the *quantity of cell phones supplied* will decrease and there will be a movement downward along the supply curve for cell phones. The *supply* of cell phones, however, will remain unchanged and the supply curve does not shift.

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1. What is the equilibrium price of a good or service?

The *equilibrium price* is the price at which the quantity demanded by the buyers is equal to the quantity supplied by the sellers.

2. Over what range of prices does a shortage arise?

A shortage arises at market prices below the equilibrium price.

3. Over what range of prices does a surplus arise?

A surplus arises at market prices above the equilibrium price.

4. What happens to the price when there is a shortage?

A *shortage* causes the price to rise, decreasing quantity demanded and increasing quantity supplied until the equilibrium price is attained.

5. What happens to the price when there is a surplus?

A *surplus* causes the price to fall, decreasing quantity supplied and increasing quantity demanded until the equilibrium price is attained.

6. Why is the price at which the quantity demanded equals the quantity supplied the equilibrium price?

At the equilibrium price, the quantity demanded by consumers equals the quantity supplied by producers. At this price, the plans of producers and consumers are coordinated and there is no influence on the price to move away from equilibrium.

7. Why is the equilibrium price the best deal available for both buyers and sellers?

The equilibrium price reflects that the highest price consumers are willing to pay for that amount of the good or service and is just equal to the minimum price that suppliers would require for delivering it. Demanders would prefer to pay a lower price, but suppliers are unwilling to supply that quantity at a lower price. Suppliers would prefer a higher price, but demanders are unwilling to pay a higher price for that quantity. Hence neither demanders nor suppliers can do business at a better price.

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What is the effect on the price of an MP3 player (such as the iPod) and the quantity of MP3 players if

1. The price of a PC falls or the price of an MP3 download rises? (Draw the diagrams!)

A fall in the price of a PC decreases the demand for MP3 players because a PC is a *substitute* for an MP3 player. The demand curve for MP3 players shifts leftward. Supply remains unchanged. The price of an MP3 player falls and the quantity of MP3 players decreases. You can illustrate this outcome by drawing a diagram like Figure 3.10g on page 74.

A rise in the price of an MP3 download decreases the demand for MP3 players because an MP3 download is a *complement* of an MP3 player. The demand curve for MP3 players shifts leftward. Supply remains unchanged. The price of an MP3 player falls and the quantity of MP3 players decreases. You can illustrate this outcome by drawing a diagram like Figure 3.10c on page 72.

2. More firms produce MP3 players or electronics workers' wages rise? (Draw the diagrams!)

An increase in the number of firms that produce MP3 players increases the supply of MP3 players. The supply curve of MP3 players shifts rightward. Demand remains unchanged. The price of an MP3 player falls and the quantity of MP3 players increases. You can illustrate this outcome by drawing a diagram like Figure 3.10d on page 72.

A rise in the wages of MP3 player producers decreases the supply of MP3 players because it increases the cost of producing MP3 players. The supply curve of MP3 players shifts leftward. Demand remains unchanged. The price of an MP3 player rises and the quantity of MP3 players decreases. You can illustrate this outcome by drawing a diagram like Figure 3.10g on page 72.

3. Any two of these events in questions 1 and 2 occur together? (Draw the diagrams!)

There are six combinations:

- (1) If (1) and (2) occur together, demand decreases, supply is unchanged, so the price falls and the quantity decreases.
- (2) If (1) and (3) occur together, demand decreases and supply increases so the price falls and the quantity might increase, decrease, or not change.
- (3) If (1) and (4) occur together, demand decreases and supply decreases so the quantity decreases and the price might rise, fall, or not change.
- (4) If (2) and (3) occur together, demand decreases and supply increases so the price falls and quantity might increase or decrease or remain the same.
- (5) If (2) and (4) occur together, demand decreases and supply decreases so the quantity decreases and the price might rise or fall or remain the same.
- (6) If (3) and (4) occur together, supply might increase or decrease or remain unchanged, demand is unchanged, so the outcome cannot be predicted.

Answers to the Problems and Applications

1. William Gregg owned a mill in South Carolina. In December 1862, he placed a notice in the *Edgehill Advertiser* announcing his willingness to exchange cloth for food and other items. Here is an extract:
 - 1 yard of cloth for 1 pound of bacon
 - 2 yards of cloth for 1 pound of butter
 - 4 yards of cloth for 1 pound of wool
 - 8 yards of cloth for 1 bushel of salt
 - a. What is the relative price of butter in terms of wool?

1 pound of butter exchanged for 2 yards of cloth and 4 yards of cloth exchanged for 1 pound of wool. Hence 1 pound of butter exchanged for 2 yards of cloth and 2 yards of cloth exchanged for 1/2 pound of wool. So the relative price of butter in terms of wool was 1/2 pound of wool per pound of butter.
 - b. If the money price of bacon was 20¢ a pound, what do you predict was the money price of butter?

1 pound of bacon exchanged for 1 yard of cloth and 2 yards of cloth exchanged for 1 pound of butter. Hence it took 2 pounds of bacon to exchange for 1 pound of butter. As a result, if the money price of a pound of bacon was 20¢ the money price of 1 pound of butter was 40¢.
 - c. If the money price of bacon was 20¢ a pound and the money price of salt was \$2.00 a bushel, do you think anyone would accept Mr. Gregg's offer of cloth for salt?

If the money price of bacon is 20¢ a pound, Mr. Gregg's offer to exchange 1 pound of bacon for 1 yard of cloth means that anyone could obtain 1 yard of cloth for a money price of 20¢. Mr. Gregg's further offer to exchange 8 yards of cloth for 1 bushel of salt means that anyone could acquire 1 bushel of salt for \$1.60, the price of 8 yards of cloth. If the money price of salt is \$2.00 a bushel, many people would accept Mr. Gregg's offer of cloth for salt because it enables them to obtain salt at a money price of only \$1.60 a bushel.
2. The price of food increased during the past year.
 - a. Explain why the law of demand applies to food just as it does to all other goods and services.

The law of demand applies to food because there is both a substitution and an income effect that reinforce each other. When the price rises, people substitute to different foods. For instance, some might substitute home cooked meals for dining at a restaurant. And when the price rises, there is a negative income effect, so people they buy less of food overall and less food with the rising price. On both counts, the higher price of food decreases the quantity of food demanded.
 - b. Explain how the substitution effect influences food purchases and provide some examples of substitutions that people might make when the price of food rises and other things remain the same.

People substitute in two ways: They substitute cheaper foods for more expensive foods and also substitute diets for food.
 - c. Explain how the income effect influences food purchases and provide some examples of the income effect that might occur when the price of food rises and other things remain the same.

Food is a normal good so a rise in the price, which decreases people's real incomes, decreases the quantity of food demanded. In the United States, restaurants suffer as the negative income effect from a higher price of food leads people to cut back their trips to restaurants. In poor countries, people literally eat less when the price of food rises and in extremely poor countries starvation increases.

3. Place the following goods and services into pairs of likely substitutes and into pairs of likely complements. (You may use an item in more than one pair.) The goods and services are:

coal, oil, natural gas, wheat, corn, rye, pasta, pizza, sausage, skateboard, roller blades, video game, laptop, iPod, cell phone, text message, email, phone call, voice mail

Substitutes include: coal and oil; coal and natural gas; oil and natural gas; wheat and corn; wheat and rye; corn and rye; pasta and pizza; pasta and sausage; pizza and sausage (they type of sausage that cannot be used as a topping on pizza); skateboard and roller blades; skateboard and video game; roller blades and video game; text message and email; text message and phone call; and, email and phone call.

Complements include: pizza and sausage (the type of sausage that can be used as a topping on pizza); skateboard and iPod; roller blades and iPod; video game (the type played on a computer) and laptop; cell phone and text message; cell phone and phone call; cell phone and voice mail; and, phone call and voice mail.

4. During 2008, the average income in China increased by 10 percent. Compared to 2007, how do you expect the following would change:

- a. The demand for beef? Explain your answer.

Beef is a normal good. The increase in income increases the demand for beef.

- b. The demand for rice? Explain your answer.

Rice is probably an inferior good. The increase in income decreases the demand for rice.

5. In January 2007, the price of gasoline was \$2.38 a gallon. By May 2008, the price had increased to \$3.84 a gallon. Assume that there were no changes in average income, population, or any other influence on buying plans. How would you expect the rise in the price of gasoline to affect

- a. The demand for gasoline? Explain your answer.

The rise in the price of gasoline does not change the demand for gasoline. The *demand for gasoline* changes *only* when some other relevant factor other than the price of the good changes.

- b. The quantity of gasoline demanded? Explain your answer.

The rise in the price of gasoline decreases the quantity of gasoline demanded. A rise in the price of a good or service decreases the quantity of that good or service demanded.

6. In 2008, the price of corn increased by 35 percent and some cotton farmers in Texas stopped growing cotton and started to grow corn.

- a. Does this fact illustrate the law of demand or the law of supply? Explain your answer.

This fact illustrates the law of supply: the higher price of corn lead some farmers to increase the quantity of corn they grow.

- b. Why would a cotton farmer grow corn?

A cotton farmer would switch to corn because the profit from growing corn exceeds that from growing cotton. Cotton and corn are substitutes in production. A farmer making his or her decisions based on his or her self interest will respond to a rise in the price of corn by producing corn rather than cotton.

7. American to cut flights, charge for luggage

American Airlines announced yesterday that it will begin charging passengers \$15 for their first piece of checked luggage, in addition to raising other fees and cutting domestic flights as it grapples with record-high fuel prices.

Boston Herald, May 22, 2008

- a. How does this news clip illustrate a change in supply? Explain your answer.

Fuel prices are a cost of a factor of production. As the cost rises, the supply decreases. American Airlines is decreasing the supply of its flights by cutting domestic flights.

- b. **What is the influence on supply identified in the news clip? Explain your answer.**

The influence is the cost of a factor of production, in particular, the cost of fuel.

- c. **Explain how supply changes.**

The increase in the cost of the factor of production decreases the supply and shifts the supply curve leftward.

8. Oil soars to new record over \$135

The price of oil hit a record high above \$135 a barrel on Thursday—more than twice what it cost a year ago ... OPEC has so far blamed price rises on speculators and says there is no shortage of oil.

BBC News 22 May 2008

- a. **Explain how the price of oil can rise even though there is no shortage of oil.**

There is a shortage of oil if the price of oil is less than the equilibrium price. The equilibrium price of oil rises if the demand for oil increases and/or the supply decreases. So in these cases if the price of oil equals the equilibrium price, the price of oil rises and there is no shortage.

- b. **If a shortage of oil does occur, what does that imply about price adjustments and the role of price as a regulator in the market for oil?**

If a persisting shortage of oil occurs, the implication is that price adjustments are slow so that the price is not an efficient regulator in the market for oil.

- c. **If OPEC is correct, what factors might have changed demand and/or supply and shifted the demand curve and/or the supply curve to cause the price to rise?**

If OPEC is correct, speculators affect the current price of oil because they expect the price will be higher in the future. In this case the current demand for oil increases (as speculators buy oil to store for the future when the price is expected to be higher) and the current supply decreases (as speculators who already own oil store it to wait for the higher price expected in the future). The increase in current demand combined with the decrease in current supply raises the current price of oil.

9. “As more people buy computers, the demand for Internet service increases and the price of Internet service decreases. The fall in the price of Internet service decreases the supply of Internet service.” Is this statement true or false? Explain.

The statement is false for several reasons. First, if the demand for Internet services increases and nothing else changes, the price of Internet service will rise *not* fall. Second, if the price of Internet services falls, the supply of Internet services does not change. Rather, there is a decrease in the quantity supplied, that is, a movement along the supply curve rather than a shift of the supply curve.

10. The following events occur one at a time:

- (i) **The price of crude oil rises.**
- (ii) **The price of a car rises.**
- (iii) **All speed limits on highways are abolished.**
- (iv) **Robots cut car production costs.**

Which of these events will increase or decrease (state which occurs)

- a. **The demand for gasoline?**

(ii) and (iii) and (iv) change the demand for gasoline.

The demand for gasoline will change if the price of a car rises, all speed limits on highways are abolished, or robot production cuts the cost of producing a car. If the price of a car rises, the quantity of cars bought decrease and the demand for gasoline decreases. If all speed limits on highways are abolished, people will drive faster and use more gasoline. The demand for gasoline increases. If robot production plants lower the cost of producing a car, the supply of cars will increase. With no change in

the demand for cars, the price of a car will fall and more cars will be bought. The demand for gasoline increases.

b. The supply of gasoline?

(i) changes the supply of gasoline.

The supply of gasoline will change if the price of crude oil (a factor of production used in the production of gasoline) changes. If the price of crude oil rises, the cost of producing gasoline rises and the supply of gasoline decreases.

c. The quantity of gasoline demanded?

(i) changes the quantity of gasoline demanded.

If the price of crude oil rises, the cost of producing gasoline rises and the supply of gasoline decreases. The demand for gasoline does not change. The price of gasoline rises and there is a movement up the demand curve for gasoline. The quantity of gasoline demanded decreases.

d. The quantity of gasoline supplied?

(ii) and (iii) and (iv) change the quantity of gasoline supplied.

If the price of a car rises, the quantity of cars bought decrease so the demand for gasoline decreases. The supply of gasoline does not change. The price of gasoline falls and there is a movement down the supply curve of gasoline. The quantity of gasoline supplied decreases.

If all speed limits on highways are abolished, people will drive faster and use more gasoline. The demand for gasoline increases. The supply of gasoline does not change, so the price of gasoline rises and there is a movement up along the supply curve. The quantity of gasoline supplied increases.

If robot production plants lower the cost of producing a car, the supply of cars will increase. With no change in the demand for cars, the price of a car will fall and more cars will be bought. The demand for gasoline increases. The supply of gasoline does not change, so the price of gasoline rises and the quantity of gasoline supplied increases.

11. The demand and supply schedules for gum are given in the table.

a. Draw a graph of the gum market, label the axes and the curves, and mark in the equilibrium price and quantity.

Figure 3.1, on the next page, shows the demand and supply curves. The equilibrium price is 50 cents a pack, and the equilibrium quantity is 120 million packs a week. The price of a pack adjusts

until the quantity demanded equals the quantity supplied. At 50 cents a pack, the quantity demanded is 120 million packs a week and the quantity supplied is 120 million packs a week.

b. Suppose that the price of gum is 70¢ a pack. Describe the situation in the gum market and explain how the price adjusts.

At 70 cents a pack, there is a surplus of gum and the price falls. At 70 cents a pack, the quantity demanded is 80 million packs a week and the quantity supplied is 160 million packs a week. There is a surplus of 80 million packs a week. The price falls until market equilibrium is restored at a price of 50 cents a pack.

Price (cents per pack)	Quantity demanded (millions of packs a week)	Quantity supplied (millions of packs a week)
20	180	60
40	140	100
60	100	140
80	60	180
100	20	220

- c. Suppose that the price of gum is 30¢ a pack. Describe the situation in the gum market and explain how the price adjusts.

At 30 cents a pack, there is a shortage of gum and the price rises. At 30 cents a pack, the quantity demanded is 160 million packs a week and the quantity supplied is 80 million packs a week. There is a shortage of 80 million packs a week. The price rises until market equilibrium is restored at a price of 50 cents a pack.

- d. A fire destroys some factories that produce gum and the quantity of gum supplied decreases by 40 million packs a week at each price. Explain what happens in the market for gum and illustrate the changes on your graph.

As the number of gum-producing factories decreases, the supply of gum decreases. There is a new supply schedule and, in Figure 3.2, the supply curve shifts leftward by 40 million packs at each price to the new supply curve S_1 . After the fire, the quantity supplied at 50 cents is now only 80 million packs, and there is a shortage of gum. The price rises to 60 cents a pack, at which the new quantity supplied equals the quantity demanded (100 million packs a week). So the new equilibrium price is 60 cents and the new equilibrium quantity is 100 million packs a week.

FIGURE 3.1
Problem 11a

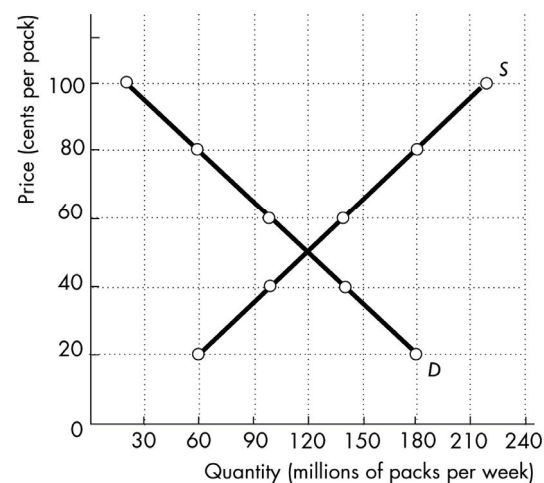
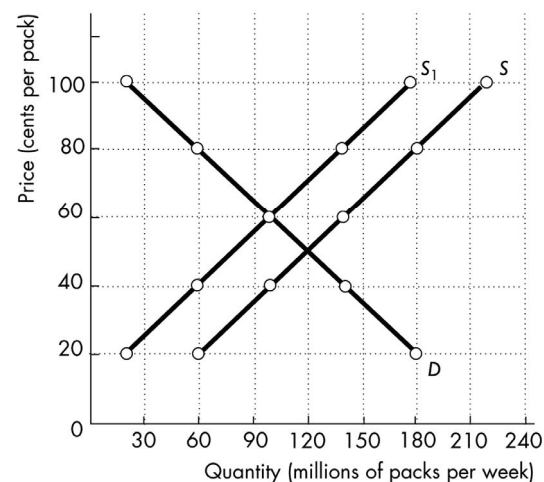


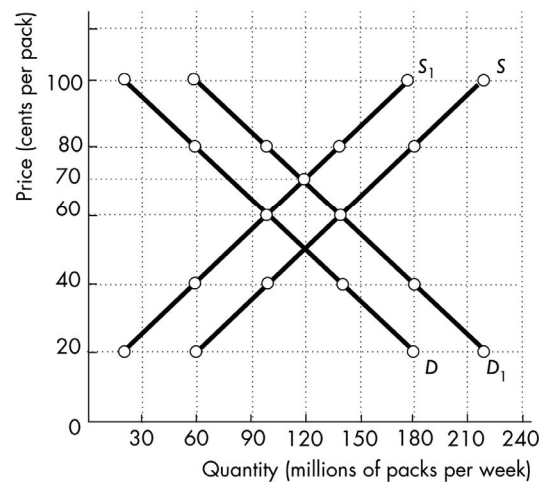
FIGURE 3.2
Problem 11d



- e. If at the time the fire occurs in d, there is an increase in the teenage population, which increases the quantity of gum demanded by 40 million packs a week at each price. What are the new equilibrium price and quantity of gum? Illustrate these changes in your graph.

The new price is 70 cents a pack, and the quantity is 120 million packs a week. The demand for gum increases and the demand curve shifts rightward by 40 million packs at each price. Supply decreases by 40 million packs a week and the supply curve shifts leftward by 40 million packs at each price. These changes are shown in Figure 3.3 by the shift of the demand curve from D to D_1 and the shift of the supply curve from S to S_1 . At any price below 70 cents a pack there is a shortage of gum. The price of gum rises until the shortage is eliminated.

FIGURE 3.3
Problem 11e



12. **Eurostar boosted by Da Vinci Code**
Eurostar, the train service linking London to Paris. . . , said on Wednesday first-half sales rose 6 per cent, boosted by devotees of the blockbuster Da Vinci movie.

CNN, July 26, 2006

- a. Explain how Da Vinci Code fans helped to raise Eurostar's sales.

The *Da Vinci Code* was placed in France and the United Kingdom and the movie was filmed in France and in the United Kingdom. Many fans celebrated the movie and took a holiday in France and the United Kingdom in order to trace the path of the protagonists. These tourists increased the demand for train travel between London and Paris.

- b. CNN commented on the "fierce competition from budget airlines." Explain the effect of this competition on Eurostar's sales.

Travel by budget airlines is a substitute for travel by Eurostar. Fierce competition from budget airlines means that the budget airlines have lowered the price of their fares. This fall in the price of a substitute decreases the demand for travel by Eurostar. Taken by itself, this factor decreased Eurostar's sales.

- c. What markets in Paris do you think these fans influenced? Explain the influence on three markets.

The *Da Vinci Code* movie fans were tourists in Paris and so increased the demand for tourist activities. The increase in tourists in Paris increased the demand for restaurant meals, increased the demand for lodging, and increased the demand for transportation within Paris.

13. **Of gambling, grannies and good sense**

Nevada has the fastest growing elderly population of any state. . . . Las Vegas has . . . plenty of jobs for the over 50s.

The Economist, July 26, 2006

Explain how grannies have influenced the

- a. Demand side of some Las Vegas markets.

On the average, elderly people require more health care services than younger people. So the influx of older people into Las Vegas increased the demand for medical services and pharmaceutical drugs and services. Older people also eat out more often and do less yard work. So the demand for restaurant meals and yard care maintenance increased.

b. Supply side of other Las Vegas markets.

Older but not-yet retired people work, so the increase in “grannies” increased the supply of labor.

14. Use the link on MyEconLab (Textbook Resources, Chapter 3, Web Links) to obtain data on the prices and quantities of bananas in 1985 and 2002.

a. Make a graph to illustrate the market for bananas in 1985 and 2002.

Between 1985 and 2002, according to the FAO in *The World Banana Economy, 1985-2002* the quantity of dessert bananas increased from 40,088,000 MT to 69,832,000 MT while the real U.S. retail price fell from \$1.13 per kg to \$0.95 per kg. The students' graphs should be similar to Figure 3.4 by showing the demand for and supply of bananas intersecting at their equilibrium price and quantity of bananas in 1985 and 2002.

b. On the graph, show the changes in demand and supply and the changes in the quantity demanded and the quantity supplied that are consistent with the price and quantity data.

Likely both the demand and supply increased, but the increase in supply was larger than the increase in demand.

c. Why do you think the demand for and supply of bananas changed?

Most likely demand increased because bananas are a normal good and income generally increased over this period. The supply of bananas increased for two reasons. First, more acreage was cultivated, particularly in Ecuador. Second, significant technological advances have occurred in transporting bananas (better refrigeration) and in ripening bananas (the use of ethylene to trigger the ripening process).

15. Use the link on MyEconLab (Textbook Resources, Chapter 3, Web Links) to obtain data on the price of oil since 2000.

a. Describe how the price of oil changed.

Through at least the summer of 2008, the price of oil has generally risen since 2000.

b. Use a demand-supply graph to explain what happens to the price when supply increases or decreases and demand is unchanged.

When supply increases, the supply curve shifts rightward. The price falls. When supply decreases, the supply curve shifts leftward. The price rises.

c. What do you predict would happen to the price of oil if a new drilling technology permitted deeper ocean sources to be used?

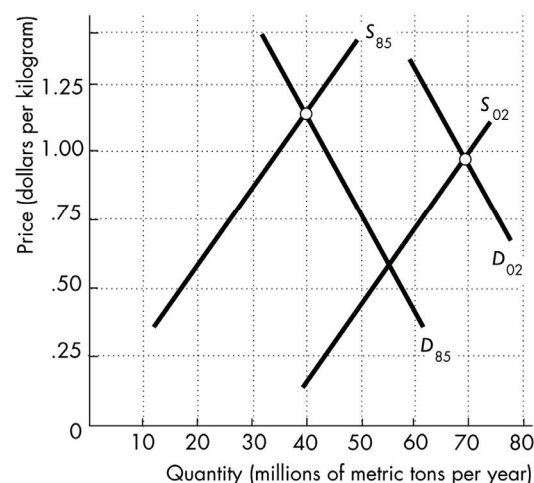
If new drilling technology is developed, the supply of oil would increase and the supply curve would shift rightward. The price of oil would fall.

d. What do you predict would happen to the price of oil if a clean and safe nuclear technology were developed?

Energy produced using nuclear power is a substitute for energy produced using oil. If clean and safe nuclear technology is developed, the demand for oil would decrease and the demand curve would shift leftward. The price of oil would fall.

FIGURE 3.4

Problem 11e



- e. **How does a higher price of oil influence the market for ethanol?**
Alternative fuels, such as ethanol, are a substitute for oil. A higher price of oil increases the demand for ethanol (refiners will produce more ethanol blended gasoline). The increase in demand for ethanol raises the price of ethanol and increases the quantity of ethanol.
 - f. **How does an increase in the supply of ethanol influence the market for oil?**
Alternative fuels, such as ethanol, are a substitute for oil. An increase in the supply of ethanol lowers the price of ethanol. As a result more drivers use ethanol blended fuels so the demand for oil decreases. The price of oil falls and the quantity decreases.
16. **What features of the world market for crude oil make it a competitive market?**
The world oil market is a competitive because there are a large number of suppliers and a large number of buyers. There are so many sellers and so many buyers that no individual seller or individual buyer can control the price of oil.
 17. **The money price of a textbook is \$90 and the money price of the Wii game *Super Mario Galaxy* is \$45.**
 - a. **What is the opportunity cost of a textbook in terms of the Wii game?**
A textbook costs \$90 and a Wii game costs \$45. Purchasing 1 textbook forces the buyer to forego 2 Wii games. So the opportunity cost of a textbook in terms of Wii games is 2 Wii games per textbook.
 - b. **What is the relative price of the Wii game in terms of textbooks?**
The relative price of a Wii game in terms of textbooks ($\$45 \text{ per Wii} / \90 per textbook), which is $1/2$ of a textbook per Wii game.
 18. **The price of gasoline has increased during the past year.**
 - a. **Explain why the law of demand applies to gasoline just as it does to all other goods and services.**
When the price of gasoline rises, people decrease the quantity of gasoline they demand. Both the substitution effect and the income effect lead consumers to decrease the quantity of gasoline demanded.
 - b. **Explain how the substitution effect influences gasoline purchases and provide some examples of substitutions that people might make when the price of gasoline rises and other things remain the same.**
When the price of gasoline rises, people substitute other goods and services for gasoline. For instance, people substitute public transport (such as buses), carpools, motorcycles, walking, and bicycles for driving alone in a car to work.
 - c. **Explain how the income effect influences gasoline purchases and provide some examples of the income effects that might occur when the price of gasoline rises and other things remain the same.**
When the price of gasoline rises, people's real incomes fall. People respond by decreasing their demand for normal goods, such as gasoline. In the gasoline market, some people trade in large, fuel guzzling cars because they can no longer afford to fuel the large vehicle. Others will not purchase a car or truck because they are not able to afford the gasoline necessary to use it.
 19. **Classify the following pairs of goods and services as substitutes, complements, substitutes in production, or complements in production.**
 - a. **Bottled water and health club memberships**
Bottled water and health club memberships are complements because people in health clubs drink a lot of bottled water.

- b. French fries and baked potatoes**
For a consumer, French fries and baked potatoes are substitutes. For a restaurant that produces both French fries and baked potatoes, they are substitutes in production.
 - c. Leather purses and leather shoes**
Leather purses and leather shoes are substitutes in production.
 - d. SUVs and pickup trucks**
For a consumer, SUVs and pickup trucks are substitutes. For an auto company that produces both on the same assembly line, they are substitutes in production.
 - e. Diet coke and regular coke**
For a consumer, Diet coke and regular coke are substitutes. For a soda company that produces both on the same assembly line, they are substitutes in production.
 - f. Low-fat milk and cream**
Low-fat milk and cream are complements in production.
- 20. Think about the demand for the three popular game consoles: Xbox, PS3, and Wii. What is the effect on the demand for Xbox games and the quantity of Xbox games demanded if, other things remaining the same:**
- a. The price of an Xbox falls?**
An Xbox and an Xbox game are complements. When the price of an Xbox falls, consumers respond by increasing the quantity of Xboxes demanded so the equilibrium quantity of Xboxes increases. Consumers increase their demand for Xbox games because an Xbox console is useless without Xbox games.
 - b. The prices of a PS3 and a Wii fall?**
A PS3 and a Wii are substitutes for an Xbox. When these game consoles falls in price, the demand for Xbox consoles decreases and so the equilibrium quantity of Xboxes decreases. Consumers decrease their demand for Xbox games because an Xbox game is useless without an Xbox console.
 - c. The number of people writing and producing Xbox games increases?**
The increase in the number of people writing Xbox games increases the supply of Xbox games. The demand for Xbox games does not change but the increase in the supply lowers the price of an Xbox game. The fall in the price of Xbox games increases the quantity of Xboxes demanded.
 - d. Consumers' incomes increase?**
Xbox games are surely a normal good. So an increase in consumers' incomes increases the demand for Xbox games.
 - e. Programmers who write code for Xbox games become more costly to hire?**
The increase in cost of programmers decreases the supply of Xbox games. When the supply of a good or service decreases, the price of that good or service rises. Xbox games are not an exception, so the price of an Xbox game rises. The rise in the price of an Xbox game decreases the quantity of Xbox games demanded.
 - f. The price of an Xbox game is expected to fall?**
When the price of an Xbox game is expected to fall, the (current) demand for Xbox games decreases.
 - g. A new game console comes onto the market, which is a close substitute for Xbox.**
The new game console decreases the demand for Xbox consoles. As a result, the equilibrium quantity of Xbox consoles decreases. Consumers decrease their demand for Xbox games because an Xbox game is useless without an Xbox console.

21. In 2008, as the prices of homes fell across the United States, the number of homes offered for sale decreased.

- a. Does this fact illustrate the law of demand or the law of supply? Explain your answer.

This fact illustrates the law of supply: As the price falls, the quantity supplied decreases.

- b. Why would home owners hold off trying to sell?

Home owners delay selling their homes because they believe the price they would receive is too low and the price they will receive in the future will be higher.

22. G.M. Cuts Production for Quarter

General Motors cut its fourth-quarter production schedule by 10 percent on Tuesday as a tightening credit market caused sales at the Ford Motor Company, Chrysler and even Toyota to decline in August. ... Bob Carter, group vice president for Toyota Motor Sales USA, said ... dealerships were still seeing fewer potential customers browsing the lots.

The New York Times, September 5, 2007

Explain whether this news clip illustrates

- a. A change in supply

The news clip does not illustrate a change in supply. None of the factors that change supply are mentioned in the story.

- b. A change in the quantity supplied

The news clip illustrates a change in the quantity supplied. G.M. faces a lower price for its vehicles and responded to that by decreasing the quantity of vehicles it produces.

- c. A change in demand

The news clip illustrates a change in demand. In particular the tightening credit market decreases the demand for big ticket items, such as automobiles.

- d. A change in the quantity demanded

The news clip does not illustrate a change in the quantity demanded. Consumers are reported as responding to the credit market not to a change in the price of vehicles.

23. Figure 3.5 illustrates the market for pizza.

- a. Label the curves. Which curve shows the willingness to pay for a pizza?

The demand curve is the downward sloping curve and the supply curve is the upward sloping curve. The demand curve shows the willingness to pay for a pizza.

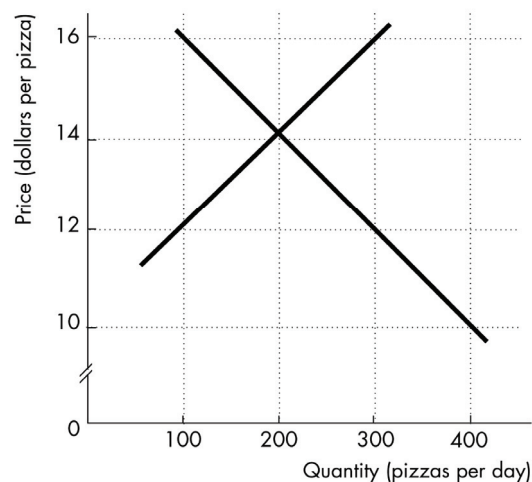
- b. If the price of a pizza is \$16, is there a shortage or a surplus and does the price rise or fall?

If the price of a pizza is \$16, there is a surplus of pizza; the quantity supplied of pizzas exceeds the quantity demanded. The surplus forces the price lower to the equilibrium price of \$14 a pizza.

- c. Sellers want to receive the highest possible price, so why would they be willing to accept less than \$16 a pizza?

Sellers are willing to accept less than \$16 because if they charge \$16 the surplus means that some sellers have unsold pizzas. From their perspective it is

FIGURE 3.5
Problem 23



better to have a lower price for the pizza and sell the (decreased) quantity they produce than to keep the price at \$16 and be left with unsold pizza.

d. If the price of a pizza is \$12, is there a shortage or a surplus and does the price rise or fall?

If the price of a pizza is \$12, there is a shortage of pizza; the quantity demanded of pizzas exceeds the quantity supplied. The shortage forces the price higher to the equilibrium price of \$14 a pizza.

e. Buyers want to pay the lowest possible price, so why would they be willing to pay more than \$12 for a pizza?

If the price of a pizza is \$12 the shortage means that not all buyers can buy a pizza. From their perspective they would rather pay more than \$12 and be able to purchase a pizza than to keep the price at \$12 and leave them without a pizza.

24. Plenty of “For Sale” Signs but Actual Sales Lagging

Like spring flowers, the “For Sale” signs are sprouting in front yards all over the country. But anxious sellers are facing the most brutal environment in decades, with a slumping economy, falling home prices, and rising mortgage foreclosures.

The New York Times, May 26, 2008

a. Describe the changes in demand and supply in the market for homes in the United States.

The supply of homes for sale seasonally increases in the spring. In the spring of 2008, however, the demand for homes decreased because the slumping economy meant that consumers' incomes were falling and the rising mortgage foreclosures meant that credit conditions were becoming adverse. As a result of the increase in supply and decrease in demand the prices of homes fell.

b. Is there a surplus of homes?

The equilibrium price of a home falls. If the market price falls in line with the equilibrium price there is not a surplus of homes.

c. What does the information in the news clip imply about price adjustments and the role of price as a regulator in the market for homes?

The information in the news item suggests that there are more unsold homes than usual. If this interpretation of the story is correct and there is a larger inventory of unsold homes than normal, the market price might be sluggish in adjustment and be greater than the equilibrium price. In this case the price is not a totally efficient regulator in the market for homes.

25. ‘Popcorn Movie’ Experience Gets Pricier ... cinemas are raising ... prices. ... Demand for field corn, used for animal feed, ... corn syrup and ... ethanol, has caused its price to explode. That’s caused some farmers to shift from popcorn to easier-to-grow field corn, cutting supply and pushing its price higher, too....

USA Today, May 24, 2008

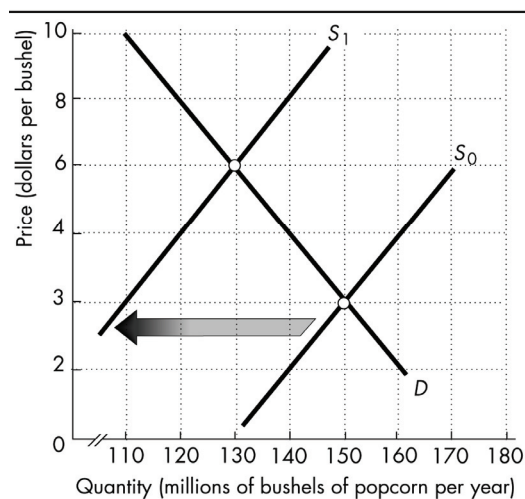
Explain and illustrate graphically the events described in the news clip in the markets for

a. Popcorn.

As illustrated in Figure 3.6, the farmers' actions decrease the supply of popcorn and the supply curve of popcorn shifts leftward. The demand curve does not shift. The equilibrium price of popcorn rises and the quantity decreases.

FIGURE 3.6

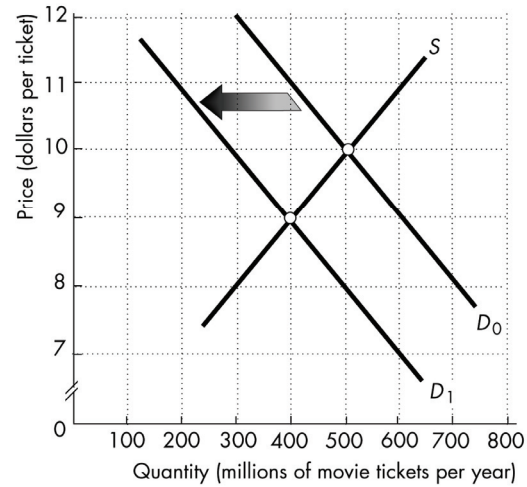
Problem 25a



b. Viewing movies in the theater.

In the market for viewing movies in the theater, popcorn and viewing movies are complements. The increase in the price of popcorn decreases the demand for attending movies in the theater. As a result, Figure 3.7 shows the demand curve shifting leftward. The equilibrium price of attending a movie in the theater falls and the equilibrium quantity decreases.

FIGURE 3.7
Problem 25b



26. The table sets out the demand and supply schedules for potato chips.

a. Draw a graph of the potato chip market and mark in the equilibrium price and quantity.

Figure 3.8 draws the supply and demand curves for this market. The equilibrium price is 65¢ a bag, and the equilibrium quantity is 145 million bags a week.

b. Describe the situation in the market for chips and explain how the price adjusts if chips are 60¢ a bag.

At 60¢ a bag, there is a shortage of potato chips and the price rises. At 60¢ a bag, the quantity demanded is 150 million bags a week and the quantity supplied is 140 million bags a week. The difference is a shortage of 10 million bags a week. The price rises until market equilibrium is restored—65¢ a bag and 145 million bags a week.

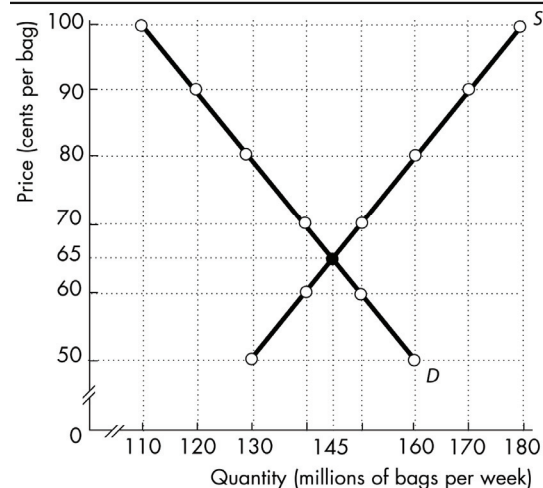
c. If a new dip increases the quantity of potato chips that people want to buy by 30 million bags per week at each price, how does the demand and/or supply of chips change?

As the new dip comes onto the market, the demand for potato chips increases and the demand curve shifts rightward. Supply does not change.

d. If a new dip has the effect described in c, how does the price and quantity of chips change?

Price (cents per bag)	Quantity demanded (millions of bags a week)	Quantity supplied (millions of bags a week)
50	160	130
60	150	140
70	140	150
80	130	160
90	120	170
100	110	180

FIGURE 3.8
Problem 26a



Demand increases by 30 million bags a week. That is, the quantity demanded at each price increases by 30 million bags. The quantity demanded at 65¢ is now 175 million bags a week of potato chips. The price rises to 80¢ a bag, at which the quantity supplied equals the quantity demanded (160 million bags a week). Hence the new equilibrium price is 80¢ per bag and the new equilibrium quantity is 160 million bags.

- e. **If a virus destroys potato crops and the quantity of potato chips produced decreases by 40 million bags a week at each price, how does the supply of chips change?**

The supply of potato chips decreases, and the supply curve shifts leftward. The quantity supplied at each price decreases by 40 million bags.

- f. **If the virus that destroys the potato crops in d hits just as the new dip in c comes onto the market, how does the price and quantity of chips change?**

The result by itself of the new dip entering the market is a price of 80¢ a bag and a quantity of 160 million bags. But now with the virus affecting the market, at this price there is a shortage of potato chips. The price of potato chips rises until the shortage is eliminated. The new equilibrium price is 100¢ a bag, and the new equilibrium quantity is 140 million bags a week.

27. **Sony's Blu-Ray Wins High-Definition War**

Toshiba Corp. yesterday raised the white flag in the war over the next-generation home movie format, announcing the end of its HD DVD business in a victory for Sony Corp.'s Blu-ray technology. The move could finally jump-start a high-definition home DVD market that has been hamstrung as consumers waited on the sidelines for the battle to play out in a fight reminiscent of the VHS-Betamax videotape war of the 1980s.

The Washington Times, February 20, 2008

How would you expect the end of Toshiba's HD DVD format to influence

- a. **The price of a used Toshiba player on eBay? Would the outcome that you predict result from a change in demand or a change in supply or both, and in which directions?**

The price of a used-Toshiba player falls. The price falls because the demand for these players decreases as potential buyers switch to Blu-ray players. The price also falls because the supply of these players increases as current owners move to discard their now semi-obsolete players.

- b. **The price of a Blu-ray player?**

The price of a Blu-ray player rises as people in the market for high definition DVD players now demand only Blu-ray players.

- c. **The demand for Blu-ray format movies?**

The demand for Blu-ray format movies increases because the quantity of Blu-ray players increases.

- d. **The supply of Blu-ray format movies?**

In the short run there is no change in the supply of Blu-ray movies, just a movement along the supply curve. But in the longer run movie studios that had previously been supporting only the Toshiba format will switch to the Blu-ray format and at that time the supply of Blu-ray movies will increase.

- e. **The price of Blu-ray format movies?**

In the short run, the price of Blu-ray format movies increases as a result of the increase in demand. In the longer run the effect on the price is ambiguous because the longer-run increase in supply lowers the price and thereby counters the initial effect of the increase in demand.

- f. **The quantity of Blu-ray format movies?**

The quantity of Blu-ray movies increases in the short run and even more so in the longer run.

28. After you have studied *Reading Between the Lines* on pp. 76–77, answer the following questions:

a. **How high did the retail price of gasoline go in April 2008?**

The price rose to as high as \$3.51 a gallon.

b. **What substitutions did drivers make to decrease the quantity of gasoline demanded?**

Drivers decreased the quantity of gasoline they demanded by slowing when going downhill and thereby substituting more time spent on the trip for less gasoline. They also substituted alternative means of transportation, including hybrid vehicles, the bus, a bicycle, and even a skateboard.

c. **Why would the switch to summer-grade fuel and the seasonal increase in travel normally raises the price of gasoline in the spring?**

Summer-grade fuel is more costly to blend and so it decreases the supply of gasoline. The seasonal increase in travel increases the demand for gasoline. Both changes—the decrease in supply and the increase in demand—raise the price of gasoline.

d. **What were the two main factors that influenced the demand for gasoline in 2008 and how did they change demand?**

The first factor was an increase in income. Higher incomes increased the demand for gasoline. But the increase in incomes was small and so the increase in demand also was small. The second factor was the gradual move toward hybrids and increased use of ethanol. These decreased the demand for gasoline. But these effects were also small. The two main factors offset each other so, on net, the demand for gasoline did not change.

e. **What was the main influence on the supply of gasoline during 2007 and 2008 and how did supply change?**

The main influence on the supply of gasoline was the soaring price of crude oil. This higher cost decreased the supply of gasoline.

f. **How did the combination of the factors you have noted in d and e influence the price and quantity of gasoline?**

The supply decreased while the demand did not change. Hence the supply curve shifted leftward and the demand curve did not shift. As a result, the equilibrium price of gasoline rose and the equilibrium quantity decreased.

g. **Was the change in quantity a change in the quantity demanded or a change in the quantity supplied?**

The supply of gasoline decreased while the demand did not change. As a result there was a decrease in the quantity of gasoline demanded.

Additional Problems

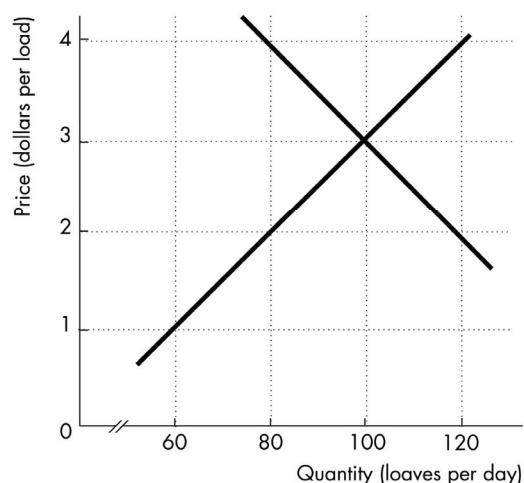
1. What is the effect on the price of hotdogs and the quantity of hotdogs sold if
 - a. The price of a hamburger rises?
 - b. The price of a hotdog bun rises?
 - c. The supply of hotdog sausages increases?
 - d. Consumers' incomes increase if hot dogs are a normal good?
 - e. The wage rate of a hotdog seller increases?
 - f. If the wage rate of the hotdog seller rises and at the same time prices of ketchup, mustard, and relish fall?
2. Suppose that one of the following events occurs:
 - (i) The price of wool rises.
 - (ii) The price of sweaters falls.
 - (iii) A close substitute for wool is invented.
 - (iv) A new high-speed loom is invented.

Which of the above events increases or decreases (state which)

- a. The demand for wool?
 - b. The supply of wool?
 - c. The quantity of wool demanded?
 - d. The quantity of wool supplied?
3. The figure illustrates the market for bread.
 - a. Label the curves in the figure.
 - b. What are the equilibrium price of bread and the equilibrium quantity of bread?

FIGURE 3.9

Additional problem 3



4. The demand and supply schedules for potato chips are in the table.

Price (cents per bag)	Quantity demanded (millions of bags a week)	Quantity supplied (millions of bags a week)
40	170	90
50	160	100
60	150	110
70	140	120
80	130	130
90	120	140
100	110	150
110	100	160

- a. What are the equilibrium price and equilibrium quantity of potato chips?
 - b. If chips were 60 cents a bag, describe the situation in the market for potato chips and explain what would happen to the price of a bag of chips.
5. In problem 4, suppose a new snack food comes onto the market and as a result the demand for potato chips decreases by 40 million bags per week.
- a. Has there been a shift in or a movement along the supply curve of chips?
 - b. Has there been a shift in or a movement along the demand curve for chips?
 - c. What is the new equilibrium price and quantity of chips?
6. In problem 5, suppose that a flood destroys several potato farms and as a result supply decreases by 20 million bags a week at the same time as the new snack food comes onto the market. What is the new equilibrium price and quantity of chips?

Solutions to Additional Problems

1.
 - a. The price of a hot dog rises, and the quantity of hot dogs sold increases. Hot dogs and hamburgers are substitutes. If the price of a hamburger rises, people buy more hot dogs and fewer hamburgers. The demand for hot dogs increases. The price of a hot dog rises, and more hot dogs are sold.
 - b. The price of a hot dog falls, and fewer hot dogs are sold. Hot dog buns and hot dogs are complements. If the price of a hot dog bun rises, fewer hot dog buns are bought. The demand for hot dogs decreases. The price of a hot dog falls, and people buy fewer hot dogs.
 - c. The price of a hot dog falls and more hot dogs are sold. The increase in the supply of hot dog sausages lowers the price of hot dog sausages. Hot dog sausages are a factor used in the production of hot dogs. With the lower priced factor, the supply of hot dogs increases. The price of a hot dog falls and people buy more hot dogs.
 - d. The price of a hot dog rises, and the quantity sold increases. An increase in consumers' income increases the demand for hot dogs. As a result, the price of a hot dog rises and the quantity bought increases.
 - e. The price of a hot dog rises, and the quantity sold decreases. If the wage of the hot dog seller increases, the cost of producing a hot dog increases and the supply of hot dogs decreases. The price rises, and people buy fewer hotdogs.
 - f. The price of a hot dog rises, but the quantity might increase, decrease, or remain the same. Ketchup, mustard, and relish are complements of hot dogs. If the price of ketchup, mustard, and relish fall, more ketchup, mustard, and relish are bought and the demand for hot dogs increases. The price of a hot dog rises, and people buy more hot dogs. If the wage of the hot dog seller increases, the cost of producing a hot dog increases and the supply of hot dogs decreases. The price rises, and people buy fewer hotdogs. Taking the two events together, the price of a hot dog rises, but the quantity might increase, decrease, or remain the same.
2.
 - a. (ii) and (iii) Wool is used in the production of sweaters. If the price of a sweater falls because the supply of sweaters has increased, then the equilibrium quantity of sweaters increases and the demand for wool increases. If the price of a sweater falls because the demand for sweaters has decreased, then the equilibrium quantity of sweaters decreases and the demand for wool decreases. If a close substitute for wool is invented, some sweater producers will switch from wool to the substitute. When they do, the demand for wool decreases.
 - b. (iv) If a new high-speed loom is invented, the cost of making wool will fall and the supply of wool will increase.
 - c. (i) and (iv) If the price of wool rises there is a movement up along the demand curve. The quantity demanded of wool decreases. If a new high-speed loom is invented, the cost of producing wool will fall. So the supply of wool increases. With no change in the demand for wool, the price of wool will fall and there is a movement down along the demand curve for wool. The quantity demanded of wool increases.
 - d. (i), (ii), and (iii) If the price of wool rises there is a movement up along the supply curve. The quantity supplied of wool increases. If the price of a sweater falls because the supply of sweaters has increased, then the equilibrium quantity of sweaters increases and the demand for wool increases. With no change in the supply of wool, the price of wool rises and the quantity of wool supplied increases. If the price of a sweater falls because the demand for sweaters has decreased, then the equilibrium quantity of sweaters decreases and the demand for wool decreases. With no change in the supply of wool, the price of wool falls and the quantity of wool supplied decreases. If some sweater producers switch to using the new close substitute for wool, the demand for wool will decrease. With no change in the supply of wool, the price of wool falls and the quantity of wool supplied decreases.

3.
 - a. The demand curve is the curve that slopes down toward to the right. The supply curve is the curve that slopes up toward to the right.
 - b. The equilibrium price is \$3 a loaf, and the equilibrium quantity is 100 loaves a day. Market equilibrium is determined at the intersection of the demand curve and supply curve.
4.
 - a. The equilibrium price is 80 cents a bag, and the equilibrium quantity is 130 million bags a week. The price of a bag adjusts until the quantity demanded equals the quantity supplied. At 80 cents a bag, the quantity demanded is 130 million bags a week and the quantity supplied is 130 million bags a week.
 - b. At 60 cents a bag, there will be a shortage of potato chips and the price will rise. At 60 cents a bag, the quantity demanded is 150 million bags a week and the quantity supplied is 110 million bags a week. There is a shortage of 40 million bags a week. The price will rise until market equilibrium is restored—80 cents a bag.
5.
 - a. There has been a movement along the supply curve. The demand for potato chips decreases, and the demand curve shifts leftward. Supply does not change, so the price falls along the supply curve.
 - b. The demand curve has shifted leftward. As the new snack food comes onto the market, the demand for potato chips decreases. There is a new demand schedule, and the demand curve shifts leftward.
 - c. The equilibrium price is 60 cents, and the equilibrium quantity is 110 million bags a week. Demand decreases by 40 millions bags a week. That is, the quantity demanded at each price decreases by 40 million bags. The quantity demanded at 80 cents is now 90 million bags, and there is a surplus of potato chips. The price falls to 60 cents a bag, at which the quantity supplied equals the quantity demanded (110 million bags a week).
6. The new price is 70 cents a bag, and the quantity is 100 million bags a week. The supply of potato chips decreases, and the supply curve shifts leftward. The quantity supplied at each price decreases by 20 million bags. The result of the new snack food entering the market is a price of 60 cents a bag. At this price, there is now a shortage of potato chips. The price of potato chips will rise until the shortage is eliminated.