Chapter 3

DEMAND AND SUPPLY

Key Concepts

Markets and Prices

A **competitive market** is one that has so many buyers and sellers so that no single buyer or seller can influence the price. The ratio of the money price of one good to the money price of another good is the **relative price**. The relative price of a product is the product's opportunity cost. The demand for and supply of a product depend, in part, on its relative price.

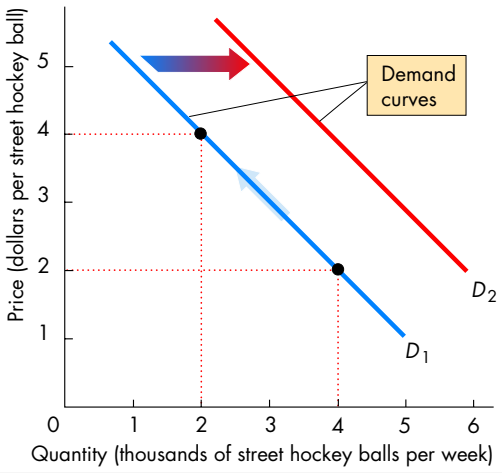
Demand

The **quantity demanded** of a good is the amount that consumers plan to buy during a time period at a particular price. The *law of demand* states that "other things remaining the same, the higher the price of a good, the smaller is the quantity demanded." Higher prices decrease the quantity demanded for two reasons:

- **Substitution effect** — a higher relative price raises the opportunity cost of buying a good and so people buy less of it.
- **Income effect** — a higher relative price reduces the amount of goods people can buy. Usually this effect decreases the amount people buy of the product that rose in price.

Demand is the entire relationship between the price of a good and the quantity demanded. A **demand curve** shows the inverse relationship between the quantity demanded and price, everything else remaining the same. For each quantity, a demand curve shows the highest price someone is willing to pay for that unit. This highest price is the *marginal benefit* a consumer receives for that unit of output.

FIGURE **3.1**
Demand Curves



- Demand curves are negatively sloped, as illustrated in Figure 3.1.
- A change in the price of the product leads to a **change in the quantity demanded** and *a movement along the demand curve*. The higher the price of a good, the lower is the quantity demanded. This relationship is shown in Figure 3.1 with the movement along D_1 from 4,000 to 2,000 street hockey balls demanded per week in response to a rise in price from $2 to $4 for a street hockey ball.

A **change in demand** and *a shift in the demand curve*, occur when any factor that affects buying plans, other than the price of the product changes. An increase in demand means that the demand curve shifts rightward, such as the shift from D_1 to D_2 in Figure 3.1; a de-

crease in demand refers to a shift leftward. The demand curve shifts from changes in the following:

- *prices of related goods* — a rise in the price of a **substitute** increases demand and the demand curve shifts rightward; a rise in the price of a **complement** decreases demand and the demand curve shifts leftward.
- *expected future prices* — if a product's price is expected to rise in the future, the current demand for it increases and the demand curve shifts rightward.
- *income* — for a **normal good**, an increase in income increases demand and the demand curve shifts rightward; for an **inferior good** an increase in income decreases demand and the demand curve shifts leftward.
- *population* — an increase in population increases demand and the demand curve shifts rightward.
- *preferences* — if people decide they like a good more, its demand increases and the demand curve shifts rightward.

Supply

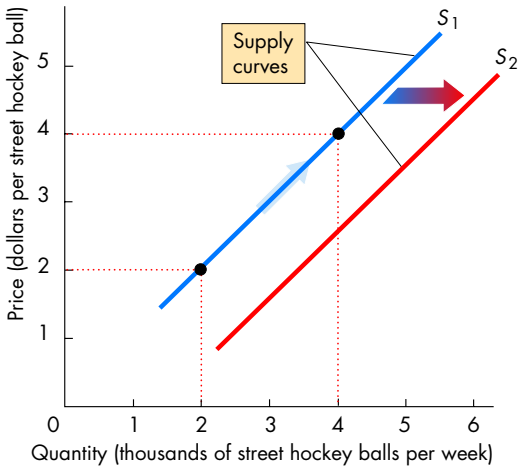
The **quantity supplied** is the amount of a good that producers plan to sell at a particular price during a given time period.

The *law of supply* states that "other things remaining the same, the higher the price of a good, the greater is the quantity supplied." **Supply** is the entire relationship between the price of a good and the quantity supplied. A **supply curve** shows the positive relationship between the price and the quantity supplied. For each quantity, the supply curve shows the minimum price a supplier must receive in order to produce that unit of output.

- Supply curves are positively sloped, as shown in Figure 3.2.
- A change in the price of the product leads to a **change in the quantity supplied** and a *movement along the supply curve*. It is illustrated in Figure 3.2 as the movement along S_1 from 2,000 street hockey balls supplied per week to 4,000 balls when the price rises from $2 for a ball to $4.

A **change in supply** is illustrated *as a shift in the supply curve*. An increase in supply is equivalent to a shift rightward in the supply curve, shown in Figure 3.2 as the shift from S_1 to S_2; a decrease in supply is a leftward shift in the supply curve. There is a change in

FIGURE **3.2**
Supply Curves



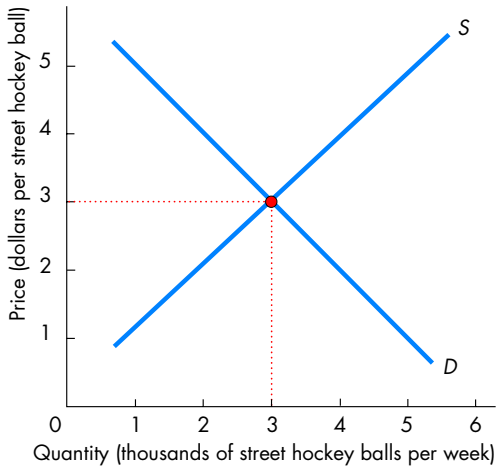
supply and a shift in the supply curve in response to changes in the following:

- *prices of productive resources* — a rise in the price (cost) of an input decreases supply and the supply curve shifts leftward.
- *prices of related goods produced* — a rise in the price of a *substitute in production* decreases supply and the supply curve shifts leftward; a rise in the price of a *complement in production* increases supply and the supply curve shifts rightward.
- *expected future prices* — if the price is expected to rise in the future, the current supply decreases and the supply curve shifts leftward.
- *number of suppliers* — an increase in the number of suppliers increases the supply and the supply curve shifts rightward.
- *technology* — an advance in technology increases supply and the supply curve shifts rightward.

Market Equilibrium

The **equilibrium price** is determined by the intersection of the demand and supply curves. It is the price at which the quantity demanded equals the quantity supplied. The **equilibrium quantity** is the quantity bought and sold at the equilibrium price. Figure 3.3 shows the equilibrium price, $3, and the equilibrium quantity, 3,000 street hockey balls per week. At a price below the equilibrium price, a shortage exists and the

FIGURE **3.3**
The Equilibrium Price and Quantity



price will rise. At a price above the equilibrium price, a surplus exists and the price will fall. Only at the equilibrium price does the price not change.

Predicting Changes in Price and Quantity

When either the demand *or* supply changes so that *one* of the demand or supply curves shifts, the effect on both the price (P) and quantity (Q) can be determined:

- An increase in demand (a rightward shift in the demand curve) raises P and increases Q.
- A decrease in demand (a leftward shift in the demand curve) lowers P and decreases Q.
- An increase in supply (a rightward shift in the supply curve) lowers P and increases Q.
- A decrease in supply (a leftward shift in the supply curve) raises P and decreases Q.

When both the demand and supply change so that both the demand and supply curves shift, the effect on the price *or* the quantity can be determined, but without information about the relative sizes of the shifts, the effect on the other variable is ambiguous.

- If both demand and supply increases (both curves shift rightward), the quantity increases but the price might rise, fall, or remain the same.
- If demand decreases (the demand curve shifts leftward) and supply increases (the supply curve shifts rightward), the price falls but the quantity might increase, decrease, or not change.

Helpful Hints

1. **Developing Intuition About Demand:** When you are first learning about demand and supply, think in terms of concrete examples. Have some favorite examples in the back of your mind. For instance, when you hear "complementary goods" (goods used together), think about hot dogs and hot dog buns because few people eat hot dogs without using a hot dog bun. For "substitute goods" (things that take each other's place) think about hot dogs and hamburgers because they are obvious substitutes.
2. **Developing Intuition About Supply:** An easy and concrete way to identify with suppliers is to think of "profit": Anything that increases the profit from producing a product (except for the price of the good itself) increases the supply and shifts the supply curve rightward, whereas anything that decreases profit decreases the supply and shifts the supply curve leftward.
3. **Shift in a Curve Versus a Movement Along a Curve:** Failing to distinguish correctly between a shift in a curve and a movement along a curve can lead to error and lost points on examinations. The difference applies equally to both demand and supply curves.

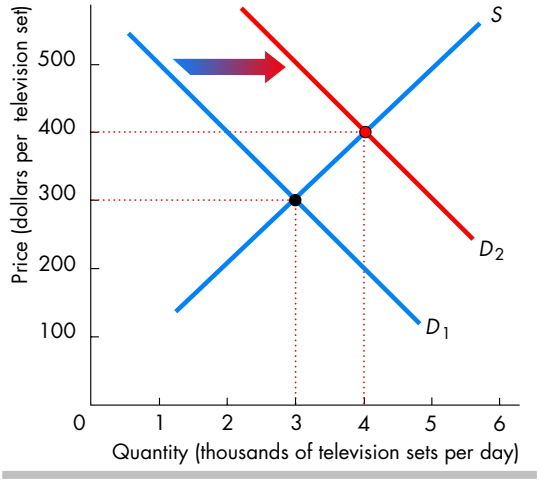
   The important point to remember is *that a change in the price of a good does not shift its demand curve;* it leads to a movement along the demand curve. If one of the other factors affecting demand changes, the demand curve itself shifts.

   Similarly, the supply curve shifts if some relevant factor that affects the supply, *other than the price of the good,* changes. A change in the price of the good leads to a movement along the supply curve.
4. **Rules for Using a Supply/Demand Diagram:** The safest way to solve any demand and supply problem is always to draw a graph. A few mechanical rules can make using supply and demand graphs easy. First, when you draw the graph, be sure to label the axes. As the course progresses, you will encounter many graphs with different variables on the axes. You can become confused if you do not develop the habit of labeling the axes. Second, draw the supply and demand curves as straight lines. Third, be sure to indicate and label the initial equilibrium price and quantity.

Now come two more difficult parts that you must practice. Suppose that you are dealing with a situation in which one influence changes. First, determine whether the influence shifts the demand or the supply curve. Aside from the effect of the expected future price, most factors generally shift only one curve and you must decide which one. Second, determine whether the curve that is affected shifts rightward (increases) or shifts leftward (decreases). From here on, it's more straightforward: Take the figure you have already drawn, shift the appropriate curve, and read off the answer!

FIGURE **3.4**

The Effect of an Increase in Demand



5. **CHANGES IN DEMAND DO NOT CAUSE CHANGES IN SUPPLY; CHANGES IN SUPPLY DO NOT CAUSE CHANGES IN DEMAND:** Do not make the common error of believing that an increase in demand, that is, a rightward shift in the demand curve, causes an increase in supply, a rightward shift in the supply curve. Use Figure 3.4, which illustrates the market for television sets, as an example. An increase in demand shifts the demand curve rightward, as shown. This shift means the equilibrium price of a television rises (from $300 for a set to $400) and the equilibrium quantity increases (from 3,000 sets per day to 4,000). But the shift in the demand curve does not cause the supply curve to *shift*. Instead, there is a *movement along* the unchanging supply curve.

Questions

True/False and Explain

Markets and Prices

1. A good with a high relative price must have a low opportunity cost.
2. A product's relative price can fall even though its money price rises.

Demand

3. The law of demand states that, if nothing else changes, as the price of a good rises, the quantity demanded decreases.
4. A decrease in income decreases the demand for all products.
5. "An increase in demand" means a movement down and rightward along a demand curve.
6. New technology for manufacturing computer chips shifts the demand curve for computer chips.

Supply

7. A supply curve shows the maximum price required in order to have the last unit of output produced.
8. A rise in the price of chicken feed decreases the supply of chickens.
9. A rise in the price of orange juice shifts the supply curve of orange juice rightward.

Market Equilibrium

10. Once a market is at its equilibrium price, unless something changes, the price will not change.
11. If there is a surplus of a good, its price falls.

Predicting Changes in Price and Quantity

12. If the expected future price of a good rises, its current price rises.
13. A rise in the price of a product decreases the quantity demanded, so there can never be a situation with both the product's equilibrium price rising and equilibrium quantity increasing.
14. If both the demand and supply curves shift rightward, the equilibrium quantity definitely increases.
15. If both the demand and supply curves shift rightward, the equilibrium price definitely rises.

Multiple Choice

Markets and Prices

1. The opportunity cost of a product is the same as its
   a. money price.
   b. relative price.
   c. price index.
   d. None of the above.

2. The money price of a pizza is $12 per pizza and the money price of a taco is $2 per taco. The relative price of a pizza is
   a. $12 per pizza.
   b. $24 per pizza.
   c. 6 tacos per pizza.
   d. 1/6 pizza.

Demand

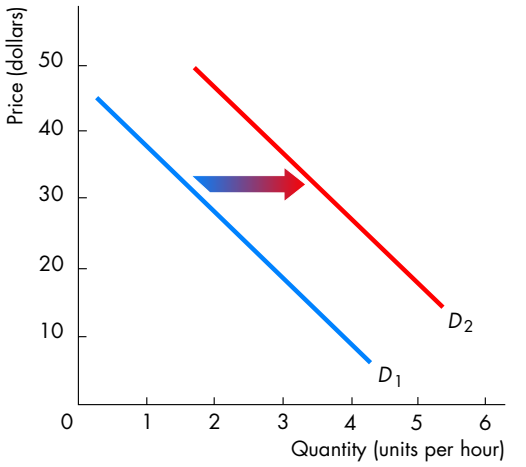
3. The law of demand concludes that a rise in the price of a golf ball ____ the quantity demanded and ____.
   a. increases; shifts the demand curve rightward.
   b. decreases; shifts the demand curve leftward.
   c. decreases; creates a movement upward along the demand curve.
   d. increases; creates a movement downward along the demand curve.

4. If a rise in the price of gasoline decreases the demand for large cars,
   a. gasoline and large cars are substitutes in consumption.
   b. gasoline and large cars are complements in consumption.
   c. gasoline is an inferior good.
   d. large cars are an inferior good.

5. A normal good is one
   a. with a downward sloping demand curve.
   b. for which demand increases when the price of a substitute rises.
   c. for which demand increases when income increases.
   d. None of the above.

6. Some sales managers are talking shop. Which of the following quotations refers to a movement along the demand curve?
   a. "Since our competitors raised their prices our sales have doubled."
   b. "It has been an unusually mild winter; our sales of wool scarves are down from last year."
   c. "We decided to cut our prices, and the increase in our sales has been remarkable."
   d. None of the above.

FIGURE **3.5**
Multiple Choice Question 7



7. Which of the following could result in the shift in the demand curve illustrated in Figure 3.5?
   a. An increase in the quantity demanded
   b. A rise in the price of a substitute good
   c. A rise in the price of a complement
   d. A fall in the price of the product

Supply

8. A fall in the price of a good leads to producers decreasing the quantity of the good supplied. This result illustrates
   a. the law of supply.
   b. the law of demand.
   c. a change in supply.
   d. the nature of an inferior good.

9. Which of the following influences does NOT shift the supply curve?
   a. A rise in the wages paid workers
   b. Development of new technology
   c. People deciding that they want to buy more of the product
   d. A decrease in the number of suppliers

10. The price of jet fuel rises, causing the
   a. demand for airplane trips to increase.
   b. demand for airplane trips to decrease.
   c. supply of airplane trips to increase.
   d. supply of airplane trips to decrease.

11. In addition to showing the quantity that will be supplied at different prices, a supply curve can be viewed as the
   a. willingness-and-ability-to-pay curve.
   b. marginal benefit curve.
   c. minimum-supply price curve.
   d. maximum-supply price curve.

12. An increase in the number of producers of gruel ____ the supply of gruel and shifts the supply curve of gruel ____.
   a. increases; rightward
   b. increases; leftward
   c. decreases; rightward
   d. decreases; leftward

13. An increase in the cost of producing video tape shifts the supply curve of video tape ____ and shifts the demand curve for video tape ____.
   a. rightward; leftward
   b. leftward; leftward
   c. leftward; not at all
   d. not at all; leftward

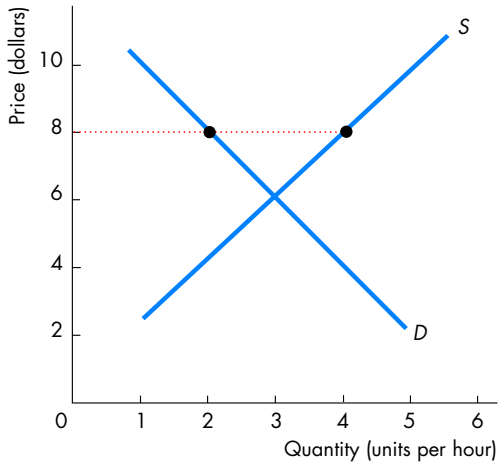
14. To say that "supply increases" for any reason, means there is a
   a. movement rightward along a supply curve.
   b. movement leftward along a supply curve.
   c. shift rightward in the supply curve.
   d. shift leftward in the supply curve.

Market Equilibrium

15. If the market for Twinkies is in equilibrium, then
   a. Twinkies must be a normal good.
   b. producers would like to sell more at the current price.
   c. consumers would like to buy more at the current price.
   d. the quantity supplied equals the quantity demanded.

16. If there is a shortage of a good, the quantity demanded is ____ than the quantity supplied and the price will ____.
   a. less; rise
   b. less; fall
   c. greater; rise
   d. greater; fall

FIGURE **3.6**
Multiple Choice Question 17



17. In Figure 3.6 at the price of $8 there is a
   a. shortage and the price will rise.
   b. shortage and the price will fall.
   c. surplus and the price will rise.
   d. surplus and the price will fall.

18. In a market, at the equilibrium price,
    a. neither buyers nor sellers can do business at a better price.
    b. buyers are willing to pay a higher price, but sellers do not ask for a higher price.
    c. buyers are paying the minimum price they are willing to pay for any amount of output and sellers are charging the maximum price they are willing to charge for any amount of production.
    d. None of the above is true.

Predicting Changes in Price and Quantity

19. For consumers, pizza and hamburgers are substitutes. A rise in the price of pizza ____ the price of a hamburger and ____ in the quantity of hamburgers.
    a. raises; increases
    b. raises; decreases
    c. lowers; increases
    d. lowers; decreases

20. How does an unusually cold winter affect the equilibrium price and quantity of anti-freeze?
    a. It raises the price and increases the quantity.
    b. It raises the price and decreases the quantity.
    c. It lowers the price and increases the quantity.
    d. It lowers the price and decreases the quantity.

21. You notice that the price of wheat rises and the quantity of wheat increases. This set of observations can be the result of the
    a. demand for wheat curve shifting rightward.
    b. demand for wheat curve shifting leftward.
    c. supply of wheat curve shifting rightward.
    d. supply of wheat curve shifting leftward.

22. A technological improvement lowers the cost of producing coffee. As a result, the price of a pound of coffee ____ and the quantity of coffee ____.
    a. rises; increases
    b. rises; decreases
    c. falls; increases
    d. falls; decreases

23. The number of firms producing computer memory chips decreases. As a result, the price of a memory chip ____ and the quantity of memory chips ____.
    a. rises; increases
    b. rises; decreases
    c. falls; increases
    d. falls; decreases

For the next five questions, suppose that the price of paper used in books rises and simultaneously (and independently) more people decide they want to read books.

24. The rise in the price of paper shifts the
    a. demand curve rightward.
    b. demand curve leftward.
    c. supply curve rightward.
    d. supply curve leftward.

25. The fact that more people want to read books shifts the
    a. demand curve rightward.
    b. demand curve leftward.
    c. supply curve rightward.
    d. supply curve leftward.

26. The equilibrium quantity of books
    a. definitely increases.
    b. definitely does not change.
    c. definitely decreases.
    d. might increase, not change, or decrease.

27. The equilibrium price of a book
    a. definitely rises.
    b. definitely does not change.
    c. definitely falls.
    d. might rise, not change, or fall.

28. Suppose that the effect from people deciding they want to read more books is larger than the effect from the increase in the price of paper. In this case, the equilibrium quantity of books
    a. definitely increases.
    b. definitely does not change.
    c. definitely decreases.
    d. might increase, not change, or decrease.

29. Which of the following definitely raises the equilibrium price?
    a. An increase in both demand and supply.
    b. A decrease in both demand and supply.
    c. An increase in demand combined with a decrease in supply.
    d. A decrease in demand combined with an increase in supply.

30. Is it possible for the price of a good to stay the same while the quantity increases?
    a. Yes, if both the demand and supply of the good increase by the same amount.
    b. Yes, if the demand increases by the same amount the supply decreases.
    c. Yes, if the supply increases and the demand does not change.
    d. No, it is not possible.

Short Answer Problems

1. a. This year the price of a hamburger is $2 and the price of a compact disc is $12. In terms of hamburgers, what is the relative price of a compact disc? In terms of hamburgers, what is the opportunity cost of buying a compact disc? How are the two answers related?
   b. Next year the (money) price of a compact disc doubles to $24 and the (money) price of a hamburger remains at $2. Now what is the relative price of a compact disc?
   c. The following year the (money) price of a compact disc stays at $24 and the (money) price of a hamburger doubles to $4. What is the relative price of a compact disc?
   d. In the next year, the (money) price of a compact disc doubles to $48 and the money price of a hamburger triples to $12. What is the relative price of a compact disc?
   e. Can a product's relative price fall even though its money price has risen? Why or why not?
2. a. When drawing a demand curve, what five influences are assumed not to change?
   b. If any of these influences change, what happens to the demand curve?
   c. When drawing a supply curve, what five influences are assumed not to change?
   d. If any of these influences change, what happens to the supply curve?
3. a. Table 3.1 presents the demand and supply schedules for comic books. Graph these demand and supply schedules in Figure 3.7. What is the equilibrium price? The equilibrium quantity?
   b. What is the marginal benefit received by the consumer of the 12,000,000th comic book? What is the minimum price for which a producer is willing to produce the 12,000,000th comic book?

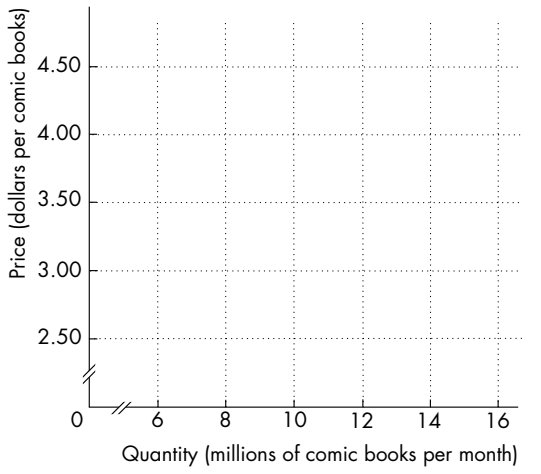
TABLE **3.1**

Demand and Supply Schedules

Price (per comic book)	Quantity demanded (per month)	Quantity supplied (per month)
$2.50	14,000,000	8,000,000
3.00	13,000,000	10,000,000
3.50	12,000,000	12,000,000
4.00	11,000,000	13,000,000
4.50	10,000,000	14,000,000

FIGURE **3.7**

Short Answer Problem 3



   c. Suppose that the price of a movie, a substitute for comic books, rises so that at every price of a comic book consumers now want to buy 2,000,000 more comic books than before. That is, at the price of $2.50, consumers now will buy 16,000,000 comics; and so on. Plot this new demand curve in Figure 3.7. What is the new equilibrium price? The new equilibrium quantity?

4. New cars are a normal good. Suppose that the economy enters a period of strong economic expansion so that people's incomes increase substantially. Use a supply and demand diagram to determine what happens to the equilibrium price and quantity of new cars.
5. Used records and used compact discs are substitutes. Use a supply and demand diagram to determine what happens to the equilibrium price and quantity of used records when the price of a used compact disc falls because of an increase in the supply of used discs.
6. Suppose we observe that the consumption of peanut butter increases at the same time its price rises. What must have happened in the market for peanut butter? Is the observation that the price rose and the quantity increased consistent with the law of demand? Why or why not?
7. Suppose that the wages paid oil workers fall. Use a supply and demand diagram to determine the effect this action has on the equilibrium price and quantity of gasoline.
8. Chemical companies discover a new, more efficient technology for producing benzene. Use a supply and demand model to determine the impact that this new method has on the equilibrium price and quantity of benzene.
9. The price of a personal computer has continued to fall in the face of increasing demand. Explain.
10. a. The market for chickens initially is in equilibrium. Suppose that eating buffalo wings (which, contrary to the name, are made from chicken wings) becomes so stylish that people eat them for breakfast, lunch, and dinner. Use a supply and demand diagram to determine how the equilibrium price and quantity of chicken change.
    b. Return to the initial equilibrium, before eating buffalo wings became stylish. Now suppose that a heat wave occurred and caused tens of thousands of chickens to die or commit suicide. Keeping in mind that dead chickens cannot be marketed, use a supply and demand diagram to determine what happens to the equilibrium price and quantity of chicken.
    c. Now assume that both the heat wave and fad strike at the same time. Use a supply and demand diagram to show what happens to the equilibrium price and quantity of chicken. (Hint: Can you tell for sure what happens to the price? The quantity?)

You're the Teacher

1. When you and a friend are studying Chapter 3, the friend says to you, "I really don't understand the difference between a 'shift in a curve' and a 'movement along' a curve. Can you help me? It's probably important to understand this, so what's the difference?" Explain the difference to your friend.
2. "This supply and demand model is nonsense. It says that if demand for some product decreases, the price of that good falls. But, come on — except for computers, how many times have you actually seen a price fall? Prices *always* rise, so don't try telling me that that they fall." The supply and demand model is sound; it is this statement that is nonsense. Show the speaker the error in that analysis.

Answers

True/False Answers

Markets and Prices

1. **F** A product's relative price is its opportunity cost.
2. **T** A good's relative price will fall if its money price rises less than the money prices of other goods.

Demand

3. **T** The law of demand points out the negative relationship between a product's price and the quantity demanded.
4. **F** Demand decreases for normal goods but increases for inferior goods.
5. **F** The term "increase in demand" refers to a rightward shift in the demand curve.
6. **F** Changes in technology are not a factor that shifts the demand curve. (Changes in technology will shift the supply curve.)

Supply

7. **F** The supply curve shows the *minimum* price that suppliers must receive in order to produce the last unit supplied.
8. **T** Chicken feed is a resource used to produce chickens, so a rise in its price shifts the supply curve of chickens leftward.
9. **F** The rise in the price of orange juice creates a movement along the supply curve to a larger quantity supplied (that is, upward and rightward), but it does not shift the supply curve.

Market Equilibrium

10. **T** Once at the equilibrium price, because the opposing forces of supply and demand are in balance, the situation can persist indefinitely until something changes.
11. **T** A surplus of a product results in its price falling until it reaches the equilibrium price.

Predicting Changes in Price and Quantity

12. **T** The rise in the future price shifts the demand curve rightward and the supply curve leftward, unambiguously raising the current price.
13. **F** The inverse relationship between the price and quantity demanded holds along a fixed demand curve. But if the demand curve shifts rightward, the equilibrium price rises and the equilibrium quantity increases.
14. **T** The equilibrium quantity definitely increases when both the demand and supply increase.
15. **F** The price rises if the shift in the demand curve is larger than that in the supply curve; but if the shifts are the same size, the price does not change and if the supply shift is larger, the price falls.

Multiple Choice Answers

Markets and Prices

1. **b** A product's relative price tells how much of another good must be foregone to have another unit of the product, which is the opportunity cost of the product.
2. **c** The relative price of the pizza is its money price relative to the money price of a taco, which equals ($12 per pizza)/($2 per taco) or 6 tacos per pizza.

Demand

3. **a** The law of demand points out that a higher price decreases the quantity demanded and creates a movement upward along the demand curve.
4. **b** The definition of complementary goods is that a rise in the price of one decreases the demand for the other.
5. **c** This is the definition of a "normal good."
6. **c** A reduction in the price of the product leads to a movement along its demand curve.
7. **b** A rise in the price of a substitute shifts the demand curve rightward.

Supply

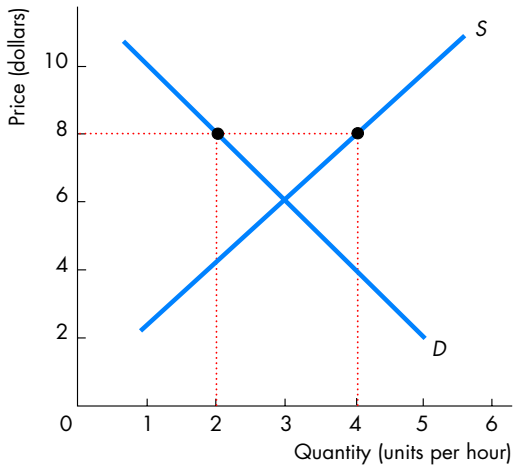
8. **a** The law of supply points out the positive relationship between the price of a product and the quantity supplied.
9. **c** A change in preferences shifts the demand curve, not the supply curve.
10. **d** Jet fuel is a resource used to produce airplane trips, so a rise in the price (cost) of this resource decreases the supply of airplane trips.
11. **c** For any unit of output, the supply curve shows the minimum price for which a producer is willing to produce and sell that unit of output.

12. **a** An increase in supply is reflected by a rightward shift of the supply curve.
13. **c** A change in the cost to produce a product shifts the supply curve but does not shift the demand curve.
14. **c** An "increase in supply" means that the supply curve shifts rightward; a "decrease in supply" means the supply curve shifts leftward.

Market Equilibrium

15. **d** At equilibrium, consumers and suppliers are simultaneously satisfied insofar as the quantity consumers are willing to buy matches the quantity producers are willing to sell.
16. **c** A shortage occurs when the price is below the equilibrium price. The quantity demanded exceeds the quantity supplied and the resulting shortage means the price rises until it reaches its equilibrium.

FIGURE **3.8**
Multiple Choice Question 17

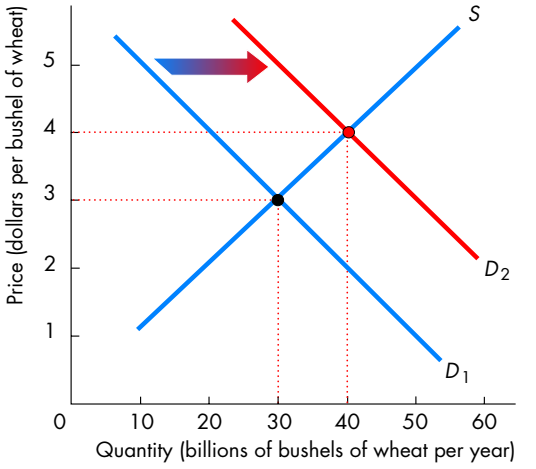


17. **d** There is surplus because, as illustrated in Figure 3.8, the quantity supplied at the price of $8 is 4. This quantity exceeds 2, the quantity demanded.
18. **a** Buyers cannot find anyone willing to sell to at a lower price and sellers cannot find anyone willing to buy at a higher price.

Predicting Changes in Price and Quantity

19. **a** The rise in the price of a pizza increases the demand for hamburgers, which results in a rise in the price of a hamburger and an increase in the quantity of hamburgers.
20. **a** The cold winter shifts the demand curve rightward, as consumers increase their demand for antifreeze; the supply curve does not shift. As a result, the equilibrium price rises and the quantity increases.

FIGURE **3.9**
Multiple Choice Question 21

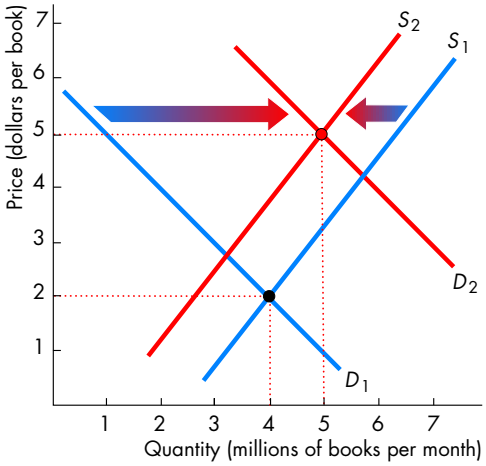


21. **a** Figure 3.9 shows that an increase in the demand for wheat, so that the demand curve shifts from D_1 to D_2, raises the price of wheat from $3 a bushel to $4 and increases its quantity from 30 billion bushels of wheat a year to 40 billion.
22. **c** The technological improvement increases the supply, that is, the supply curve shifts rightward. As a result, the quantity increases and the price falls.
23. **b** The decrease in the number of firms producing memory chips decreases the supply of memory chips, which raises the price and decreases the quantity of chips.
24. **d** Paper is a resource used in the manufacture of books, so a rise in the price of paper shifts the supply curve of books leftward.
25. **a** When people's preferences change so that they want to read more books, the demand curve for books shifts rightward.
26. **d** The equilibrium quantity increases if the increase in demand is larger than the decrease in

supply, decreases if the change in supply is larger, and does not change if the changes are the same size.

27. **a** Both the increase in demand and decrease in supply lead to a rise in the price, so the equilibrium price unambiguously rises.

FIGURE **3.10**
Multiple Choice Question 28

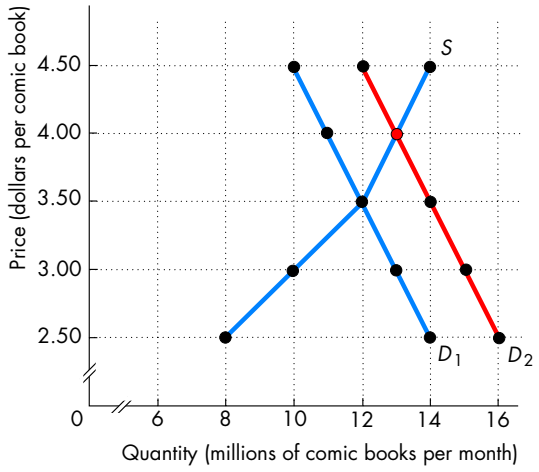


28. **a** If the shift in the demand curve exceeds the shift in the supply curve, the equilibrium quantity increases. This result is illustrated in Figure 3.10, where the quantity increases from 4 to 5 million.
29. **c** Separately, the increase in demand and decrease in supply both raise the price, so the two of them occurring together definitely raise the price.
30. **a** If both the demand and supply increase by the same amount, the price will not change and the quantity will increase.

Answers to Short Answer Problems

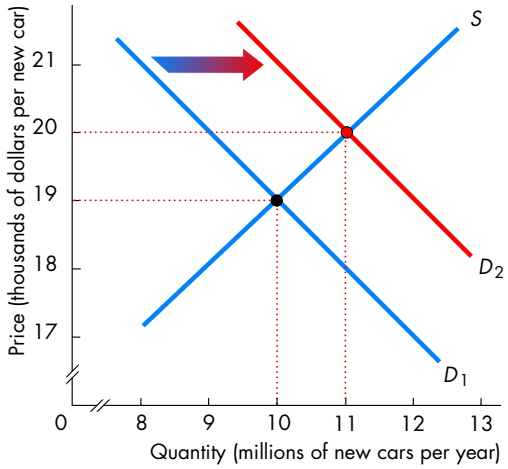
1. a. The money price of a compact disc is \$12 per compact disc; the money price of a hamburger is \$2 per hamburger. The relative price of a compact disc is the ratio of the money prices, \$12 per compact disc/\$2 per hamburger, or 6 hamburgers per compact disc. For the opportunity cost, buying 1 compact disc means using the funds that otherwise could purchase 6 hamburgers. Hence the opportunity cost of buying 1 compact disc is 6 hamburgers. The relative price and the opportunity cost are identical.
   b. The relative price of a compact disc is \$24 per compact disc/\$2 per hamburger or 12 hamburgers per compact disc.
   c. The relative price of a compact disc is \$24 per compact disc/\$4 per hamburger, or 6 hamburgers per compact disc.
   d. The relative price of a compact disc is \$48 per compact disc/\$12 per hamburger, or 4 hamburgers per compact disc.
   e. Yes, a product's relative price can fall even though its money price rises. Part (d) gives an example of how that can occur: If a good's money price rises by a smaller percentage than the money price of other goods, then the product's relative price falls. Keep this result in mind when you use the supply and demand model because when the model predicts that the equilibrium price will fall, it means that the *relative* price, and not necessarily the money price, falls.
2. a. The five influences that do not change along a demand curve are prices of related goods, income, the expected future price, population, and preferences.
   b. If any of these factors change, the demand curve shifts.
   c. The five influences that are held constant when you draw a supply curve are prices of productive resources, technology, number of suppliers, prices of related goods produced, and the expected future price.
   d. If any of these influences change, the supply curve shifts. It is very important to remember what influences shift a supply curve and what shift a demand curve.
3. a. Figure 3.11 (on the next page) shows the graph of the supply and demand schedules as S and D_1. The equilibrium price is \$3.50 a comic book, and the equilibrium quantity is 12,000,000 comic books.
   b. The person who buys the 12,000,000th comic book pays \$3.50 for the comic book, and so \$3.50 is the benefit this person receives from this comic book. The firm that produces the 12,000,000th comic book receives \$3.50 for the book, and the supply curve shows that \$3.50 is the minimum price for which this firm is willing to produce and sell the comic book.

FIGURE **3.11**
Short Answer Problem 3



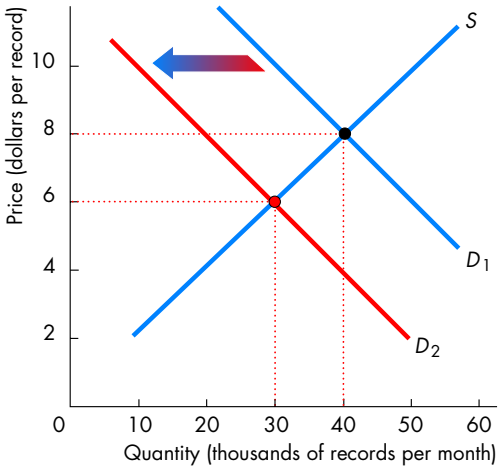
c. The new demand curve is plotted in Figure 3.11 as D_2. The new equilibrium price is \$4, and the new equilibrium quantity is 13 million.

FIGURE **3.12**
Short Answer Problem 4



4. Because new cars are a normal good, an increase in income increases the demand for them. Hence the demand curve shifts rightward, as shown in Figure 3.12. As a result, the equilibrium price rises (from \$19,000 to \$20,000 in the figure) and the equilibrium quantity also increases (from 10 million a year to 11 million in the figure).

FIGURE **3.13**
Short Answer Problem 5

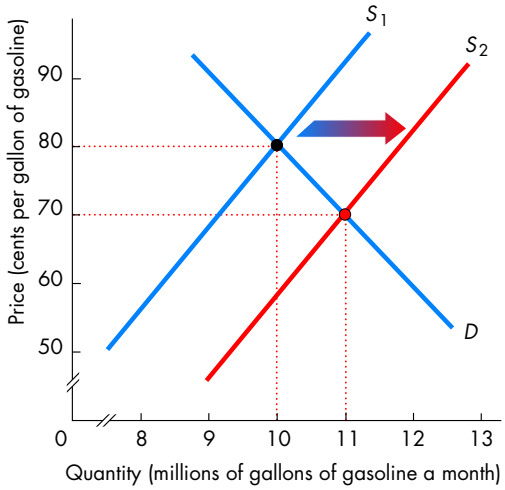


5. The fall in the price of a used compact disc, a substitute for used records, decreases the demand for used records. This change means the demand curve for used records shifts leftward, as shown in Figure 3.13. As a result, the price of a used record falls, (from \$8 a record to \$6 in the figure) and the quantity decreases (from 40,000 per month to 30,000 in the figure). Note that it is the shift in the demand curve that changed the price and that the shift in the demand curve did *not* shift the supply curve.

6. In order for both the equilibrium price and quantity of peanut butter to increase, the demand for peanut butter must have increased. The increase in demand leads to a rise in the price and an increase in the quantity of peanut butter.

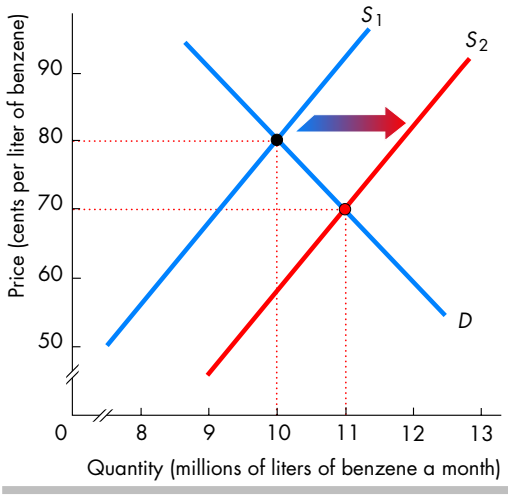
   The observation that both the price rose and the quantity increased is not at all inconsistent with the law of demand. The law of demand states that "other things remaining the same, the higher the price of a good, the smaller is the quantity demanded." A key part of this law is the "other things remaining the same" clause. When the demand curve for peanut butter shifts rightward, something else that increased the demand for peanut butter changed. Hence "other things" have not remained the same and by changing have resulted in a higher price and increased quantity of peanut butter.

FIGURE **3.14**
Short Answer Problem 7



7. Lower wages reduce the price of a resource (labor) used to produce gasoline. As a result, the supply of gasoline increases. This change is illustrated in Figure 3.14, where the supply curve shifts rightward from S_1 to S_2. The increase in supply lowers the price of gasoline (from 80 cents a gallon to 70 cents in the figure) and increases the quantity (from 10 million gallons a month to 11 million).

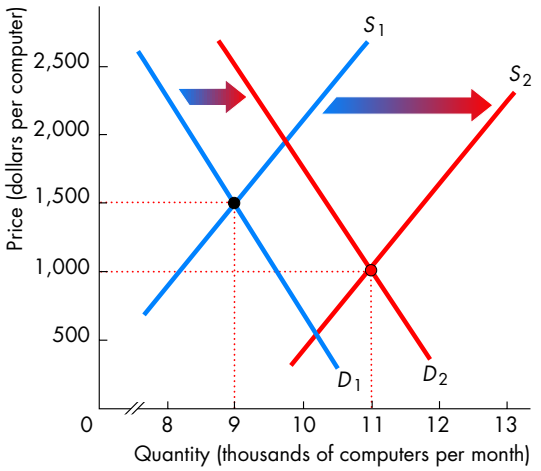
FIGURE **3.15**
Short Answer Problem 8



8. New technology increases the supply, so the supply curve shifts rightward. Then, as Figure 3.15 shows, the price falls (from 80 cents a liter to 70 cents in the figure) and the equilibrium quantity increases from (10 million liters of benzene a month to 11 million).

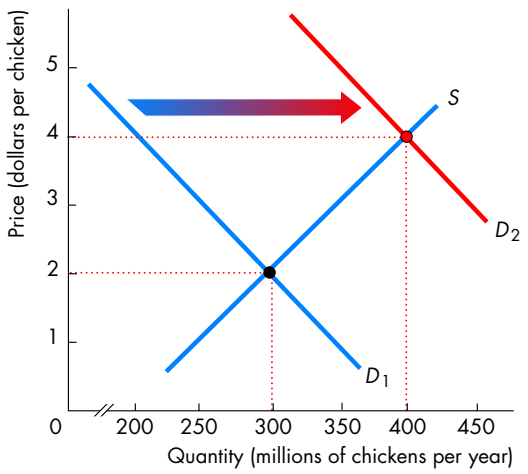
   This answer and the figure are virtually the same as those in problem 7. Even though a fall in wages and the development of new technology appear dissimilar, the demand and supply model reveals that both have the same effect on the price and quantity of the product. This model can easily accommodate these quite different changes. For this reason the demand and supply model is a very important economic tool.

FIGURE **3.16**
Short Answer Problem 9



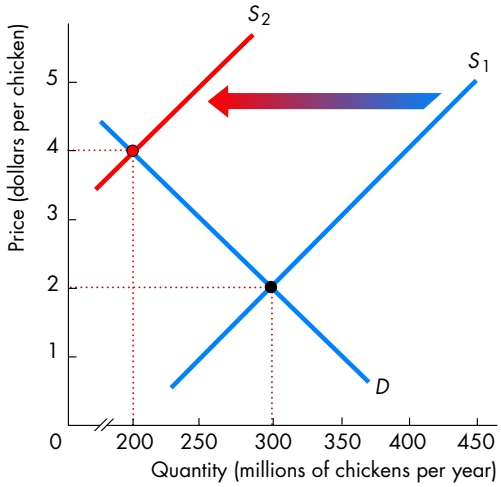
9. Personal computers have fallen in price although the demand for them has increased because the supply has increased even more rapidly. Figure 3.16 illustrates this situation. From one year to the next the demand curve shifted from D_1 to D_2. But over the year the supply curve shifted from S_1 to S_2. Because the supply has increased more than the demand, the price of a personal computer fell (in the figure, from $1,500 for a personal computer to $1,000). The quantity increased (from 9,000 personal computers a month to 11,000 in the figure).
10. a. With the change in people's preferences — so that they want more chicken wings and hence more chickens — the demand for chickens increases. The increase in the demand for chickens means that the demand curve for chickens shifts rightward. Figure 3.17 (on the next page) shows this change. As it demonstrates, the equilibrium

FIGURE **3.17**
Short Answer Problem 10 (a)



price rises (from $2 to $4 per chicken) and the equilibrium quantity of chickens increase (from 300 million to 400 million). Note that the change in people's preferences does not affect the supply of chicken, so the supply curve does *not* shift.

FIGURE **3.18**
Short Answer Problem 10 (b)



b. The heat wave decreases the number of chickens that can be supplied. This change shifts the supply curve for chickens leftward, as Figure 3.18 shows. As a result, the heat wave raises the price

FIGURE **3.19**
Short Answer Problem 10 (c)

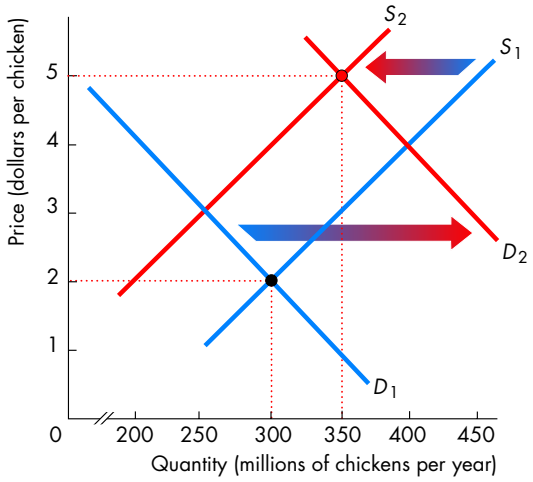
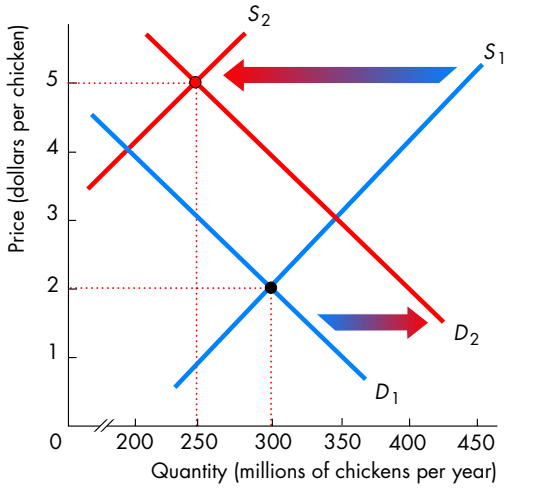


FIGURE **3.20**
Short Answer Problem 10 (c)



of a chicken (from $2 to $4) and decreases the quantity (from 300 million to 200 million).

c. If the demand increases *and* the supply decreases, the equilibrium price of a chicken rises. But the effect on the quantity is ambiguous. Figures 3.19 and 3.20 reveal the nature of this ambiguity. In Figure 3.19, the demand shift is larger than the supply shift, and the equilibrium quantity increases to 350 million chickens. But in Figure 3.20, the magnitude of the shifts is reversed, and the supply shift exceeds the demand

shift. Because the supply shift is larger, the equilibrium quantity decreases to 250 million chickens. So unless you know which shift is larger, you cannot determine whether the quantity increases (when the demand shift is larger); decreases (when the supply shift is larger); or stays the same (when both shifts are the same size). However, regardless of the relative sizes, Figures 3.19 and 3.20 show that the price will unambiguously rise, coincidentally to $5 in both figures.

You're the Teacher

1. "The distinction between a 'shift in a curve' and a 'movement along a curve' is really crucial. Let's think about the demand curve; once you understand the difference for the demand curve, understanding it for the supply curve is easier. Take movies, OK? A lot of things affect how many movies we see in a month: the ticket price, our income, and so on. Start with the price. Obviously, if the price of a movie ticket rises, we'll buy fewer. The slope of a demand curve shows this effect. For the demand curve in Figure 3.21, when the price rises from $5 to $6 for a movie, the movement is from point *a* on the demand curve to point *b*. Our quantity demanded decreases from 5 movies a month to 4. So the rise in the price of the product has lead to a movement along the demand curve. The negative slope of the demand curve shows the negative effect that higher prices have on the quantity demanded.

   "Now, let's suppose that our incomes fall and that as a result we're going to go to fewer movies. The demand curve's slope can't show us this effect because the slope indicates the relationship between the price and the quantity demanded. Instead, the whole demand curve is going to shift. That is, at any price we'll buy fewer tickets. Look at Figure 3.22 for instance. If the price stays at $6 a movie, the quantity we demand decreases from 4 movies a month to 2.

   "But the same is true if the price is $5: If the price stays at $5 the quantity we demand decreases from 5 movies a month to only 3. Now, I don't mean to say that the price has to stay at $6 or at $5. All I'm saying is that at any possible price, the number of movies we'll see has decreased and I'm just using $6 and $5 as examples. So we're going to decrease the quantity demanded at $6 and at $5, *and* at every other possible price. That means that we can draw a new demand curve (D_2) to show how much we demand at every price after our incomes fall. So, the drop in income has shifted the demand curve from D_1 to D_2. And, that's all there is to the difference between a 'movement along the demand curve' and a 'shift in the demand curve.' "

2. "You're missing a key point about the demand and supply model. This model predicts what happens to *relative* prices, not *money* prices. You're certainly right when you say that we don't often see a money

FIGURE **3.21**
You're the Teacher Question 1

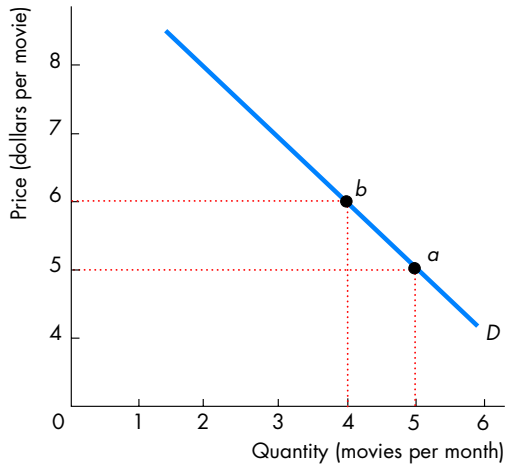
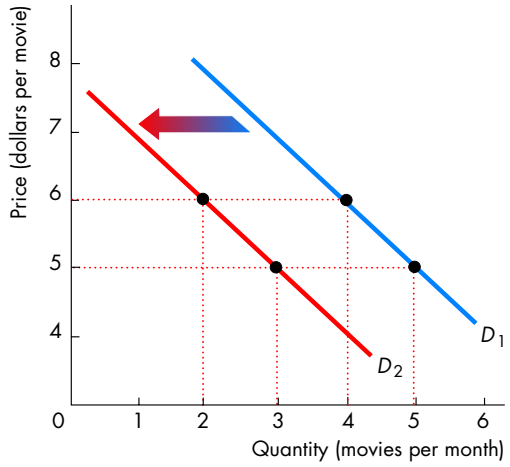


FIGURE **3.22**
You're the Teacher Question 1



price fall. We live in inflationary times and most money prices usually rise. But when the demand and supply model says that the price falls, it means that the *relative* price falls. A good's relative price can fall even though its money price rises. For instance, if the money price of some product rises by 2 percent when the money prices of all other goods are rising by 4 percent, the first product's relative price has fallen. That is, its money price relative to every other money price is lower. If you think about it, relative prices change all the time, and at least half the time relative prices fall. Drops in relative prices aren't rare; they're common. So, don't be too hasty to throw away the demand and supply model. Not only are we going to see it on tests in this class, but it also works well to help us understand what happens to a product's (relative) price and quantity whenever there's a change in a relevant factor."

Chapter Quiz

1. When demand increases
   a. price falls and quantity decreases.
   b. price falls and quantity increases.
   c. price rises and quantity decreases.
   d. price rises and quantity increases.

2. Wants differ from demands insofar as
   a. wants are limited by income but demands are unlimited.
   b. wants require a plan to acquire a good, while demands require no such plan.
   c. wants imply a decision about which demands to satisfy, while demands require no such specific plans.
   d. wants are unlimited and involve no specific plan to acquire the good, while demands reflect a decision about which wants to satisfy and a plan to buy the good(s).

3. A complement is a good
   a. that can be used in place of another good.
   b. that is used with another good.
   c. of lower quality than another.
   d. of higher quality than another.

4. Suppose that people buy less of good 1 when the price of good 2 falls. These goods are
   a. complements.
   b. substitutes.
   c. normal.
   d. inferior.

5. A change in the price of a good ____ its supply curve and ____ a movement along its supply curve.
   a. shifts; results in
   b. shifts; does not result in
   c. does not shift; results in
   d. does not shift; does not result in

6. Which of the following will shift the supply curve for good X leftward?
   a. A situation in which the quantity demanded of good X exceeds the quantity supplied.
   b. An increase in the price of machinery used to produce X.
   c. A technological improvement in the production of X.
   d. A decrease in the wages of workers employed to produce X.

7. A surplus results in the
   a. demand curve shifting rightward.
   b. supply curve shifting rightward.
   c. price falling.
   d. price rising.

8. If a product is a normal good and people's incomes rise, then the new equilibrium quantity is ____ the initial equilibrium quantity.
   a. greater than
   b. equal to
   c. less than
   d. perhaps greater than, less than, or equal to depending on how suppliers react to the change in demand.

9. In the market for oil, the development of a new deep sea drilling technology ____ the demand curve for oil and ____ the supply curve of oil.
   a. shifts rightward; shifts rightward
   b. does not shift; shifts rightward
   c. shifts leftward; shifts leftward
   d. does not shift; shifts leftward

10. Taken by itself, an increase in supply results in
    a. the price rising.
    b. the price falling.
    c. the demand curve shifting rightward.
    d. the demand curve shifting leftward.

The answers for this Chapter Quiz are on page 309