6.1 The Price Elasticity of Demand and Its Measurement (pages 172–178)

Define price elasticity of demand and understand how to measure it. Elasticity measures how much one economic variable responds to changes in another economic variable. The price elasticity of demand measures how responsive quantity demanded is to changes in price. The price elasticity of demand is equal to the percentage change in quantity demanded divided by the percentage change in price. If the quantity demanded changes more than proportionally when price changes, then the price elasticity of demand is greater than 1 in absolute value, and demand is elastic. If the quantity demanded changes less than proportionally when price changes, then the price elasticity of demand is less than 1 in absolute value, and demand is inelastic. If the quantity demanded changes proportionally when price changes, then the price elasticity of demand is equal to 1 in absolute value, and demand is unit elastic. Perfectly inelastic demand curves are vertical lines, and perfectly elastic demand curves are horizontal lines. Relatively few products have perfectly elastic or perfectly inelastic demand curves.

6.2 The Determinants of the Price Elasticity of Demand (pages 178–181)

Understand the determinants of the price elasticity of demand. The main determinants of the price elasticity of demand for a product are the availability of close substitutes, the passage of time, whether the good is a necessity or a luxury, how narrowly the market for the good is defined, and the share of the good in the consumer’s budget.

6.3 The Relationship between Price Elasticity of Demand and Total Revenue (pages 181–185)

Understand the relationship between the price elasticity of demand and total revenue. Total revenue is the total amount of funds received by a seller of a good or service. When demand is inelastic, a decrease in price reduces total revenue, and an increase in price increases total revenue. When demand is elastic, a decrease in price increases total revenue, and an increase in price decreases total revenue. When demand is unit elastic, an increase or a decrease in price leaves total revenue unchanged.

6.4 Other Demand Elasticities (pages 185–187)

Define cross-price elasticity of demand and income elasticity of demand and understand their determinants and how they are measured. In addition to the elasticities already discussed, other important demand elasticities are the cross-price elasticity of demand, which is equal to the percentage change in quantity demanded of one good divided by the percentage change in the price of another good, and the income elasticity of demand, which is equal to the percentage change in the quantity demanded divided by the percentage change in income.
6.5 Using Elasticity to Analyze the Disappearing Family Farm (pages 188–190)

Use price elasticity and income elasticity to analyze economic issues. Price elasticity and income elasticity can be used to analyze many economic issues. One example is the disappearance of the family farm in the United States. Because the income elasticity of demand for food is low, the demand for food has not increased proportionally as incomes in the United States have grown. As farmers have become more productive, they have increased the supply of most foods. Because the price elasticity of demand for food is low, increasing supply has resulted in continually falling food prices.

6.6 The Price Elasticity of Supply and Its Measurement (pages 190–194)

Define price elasticity of supply and understand its main determinants and how it is measured. The price elasticity of supply is equal to the percentage change in quantity supplied divided by the percentage change in price. The supply curves for most goods are inelastic over a short period of time, but they become increasingly elastic over longer periods of time. Perfectly inelastic supply curves are vertical lines, and perfectly elastic supply curves are horizontal lines. Relatively few products have perfectly elastic or perfectly inelastic supply curves.

Chapter Review

Chapter Opener: Do People Respond to Changes in the Price of Gasoline? (page 171)

Higher prices reduce the quantity demanded in almost any market, including the market for gasoline. Even though many think of gasoline as a necessity, changes in the price definitely have an impact on the quantity of gasoline consumers purchase. The high gas prices in the spring and summer of 2011 provide a recent example.

6.1 The Price Elasticity of Demand and Its Measurement (pages 172–178)

Learning Objective: Define price elasticity of demand and understand how to measure it.

Elasticity is a measure of how much one economic variable responds to changes in another economic variable. The price elasticity of demand is the responsiveness of the quantity demanded to a change in price, measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product’s price. All elasticity formulas are stated as ratios of two percentage change values. Because of the law of demand, the sign of the price elasticity of demand is always negative. When economists refer to one elasticity being “larger” than another, they mean larger in absolute value (with the negative value turned into a positive value). So, for example, an elasticity of −3 is larger than an elasticity of −2.

Elastic demand means the percentage change in quantity demanded is greater than the percentage change in price, so price elasticity is greater than 1 in absolute value. Inelastic demand means the percentage change in quantity demanded is less than the percentage change in price, so price elasticity is less than 1 in absolute value. Unit-elastic demand means the percentage change in quantity demanded is equal to the percentage change in price, so price elasticity is equal to 1 in absolute value.

Because the value of the price elasticity of demand is different for each price and quantity combination, the midpoint formula is used to calculate elasticity values. In this formula, the change in quantity that results from a price change, \((Q_2 - Q_1)\) or \(\Delta Q\), is divided by the average of the quantities
(Q₂ + Q₁)/2 to calculate the percentage change in quantity demanded. The percentage change in price is calculated by dividing the change in price, (P₂ – P₁) or ΔP, by the average of these prices (P₂ + P₁)/2. The elasticity values obtained with the midpoint formula are the same for either a price increase or price decrease between P₂ and P₁.

There are two extreme cases of elasticity. A perfectly inelastic demand curve is vertical. If price elasticity of demand is 0, a change in price will not cause quantity demanded to change. A perfectly elastic demand curve is horizontal. If price elasticity of demand is very large (approaching infinity), even the smallest change in price will cause a very large change in quantity demanded (also approaching infinity).

Study Hint
Your understanding of elasticity may be increased by rewriting the formula given in the textbook as:

\[
E(\text{elasticity}) = \frac{\Delta Q}{\Delta P} = \frac{\Delta Q}{Q₁ + Q₂} \times \frac{P₁ + P₂}{P₁ + P₂}
\]

Because the slope of a linear, or straight-line, demand curve is constant and can be written ΔP/ΔQ, the elasticity formula can be rewritten as:

\[
E = (1/\text{slope}) \times \frac{P₁ + P₂}{Q₁ + Q₂}
\]

This formula illustrates several important points: (1) Elasticity is not equal to the slope of a linear demand curve. (2) Although a linear demand curve has a constant slope, the elasticity will be different for every segment of the demand curve. (3) Because relatively high values for price are associated with relatively low values for quantity demanded (and vice versa), the absolute values for elasticity will be high at high prices (demand is elastic) and relatively low at low prices (demand is inelastic). This can be shown by substituting price and quantity values for a given demand curve into the rewritten formula and observing the change in the ratio of (P₂ + P₁) to (Q₂ + Q₁).

Solved Problem 6.1 in the textbook gives you an opportunity to practice calculating the price elasticity of demand using an example of a Harry Potter book. If the price elasticity of demand is greater than 1 in absolute value, then demand is price elastic. If the price elasticity of demand is less than 1 in absolute value, then demand is price inelastic. Related end-of-chapter problem 1.6 in the textbook also offers more practice with demand elasticity calculations.

6.2 The Determinants of the Price Elasticity of Demand (pages 178–181)
Learning Objective: Understand the determinants of the price elasticity of demand.

There are five key determinants of the price elasticity of demand: (1) The availability of close substitutes, (2) the passage of time, (3) whether the product is a necessity or luxury, (4) the definition of the market, and (5) the share of the good in the consumer’s budget.

The availability of close substitutes is the most important determinant of price elasticity of demand. In general, the price elasticity of demand for a product will be more elastic the more substitutes there are for
the product or the closer the substitutes are to the product. Time is an important factor because consumers do not adjust their buying habits immediately following a price change. The more time that passes, the more elastic the demand for a product becomes. The demand for a luxury is more elastic than the demand for a necessity. The more narrowly the market for a product is defined, the more elastic the demand will be. The larger the portion of a consumer’s budget that a good accounts for, the more elastic the demand for a good is.

**Study Hint**

Two important points to keep in mind: First, you should consider each of the five determinants separately from the others. A product that consumes a small part of a consumer’s budget (this suggests demand would be relatively inelastic) may have several good substitutes (this suggests demand would be relatively elastic). Second, changes in the market price of any product will result in different values for price elasticity because each point on a demand curve will have a different price elasticity. Estimates of the price elasticity of demand, such as those cited in the text for breakfast cereals, use market prices for products at a particular time. Different market prices will usually result in different elasticity estimates.

Look at **Making the Connection** “The Price Elasticity of Demand for Breakfast Cereal.” You can see how the definition of the market affects the price elasticity of demand for the good. Post Raisin Bran is a very narrowly defined good and has an estimated price elasticity of demand of –2.5, which means it is very elastic. All family breakfast cereals are part of a more broadly defined market and have a less elastic demand. The market for all breakfast cereals is price inelastic and is the broadest of the markets for breakfast cereals discussed in the article.

**Extra Solved Problem 6.2**

**Hailing a Cab in the Big Apple**

Supports Learning Objective 6.2: Understand the determinants of the price elasticity of demand.

In New York City, the government sets the fares that taxi drivers can charge. In early 2002, Mayor Michael Bloomberg proposed a fare increase. As a result, some taxi drivers were upset. One driver was quoted as saying, “I get scared that we will start to lose passengers if rates go up and not gain a cent.”

a. What was the driver assuming about the price elasticity of demand for taxi rides?

b. Which of the five determinants of elasticity would be the most important determinant of the price elasticity of demand for taxi rides in New York City?

**Solving the Problem**

**Step 1:** Review the chapter material.

This problem is about the price elasticity of demand, so you may want to review the section “The Determinants of the Price Elasticity of Demand,” which begins on page 178 in the textbook.

**Step 2:** Interpret the taxi-cab driver’s assumption regarding the price elasticity of demand for taxi rides.

The driver asserted that if the price of a cab ride rose, then the quantity demanded of rides would fall (“. . . we will start to lose passengers . . .”), but that the revenue he would receive from fares would be constant (“. . . we will . . . not gain a cent”). Therefore, the driver is assuming demand for cab rides is unit elastic. Or if by “not gain a cent” the driver was actually predicting his revenues would fall, then he is assuming the demand for cab rides is elastic.
Step 3: Determine which of the determinants of the elasticity of taxi-cab rides in New York City is the most important.

The most important determinant of the price elasticity of demand is typically the availability of substitutes. On most occasions consumers can choose to travel by subway, bus, or taxi. Some consumers may drive their own automobiles. For many residents and tourists, driving their own cars is impractical or more expensive than the others because of the difficulty and expense associated with finding parking spaces.


### 6.3 The Relationship between Price Elasticity of Demand and Total Revenue (pages 181–185)

Learning Objective: Understand the relationship between the price elasticity of demand and total revenue.

Changes in price and quantity demanded cause changes in the total revenue received by firms. Total revenue is the total amount of funds received by the seller of a good or service, calculated by multiplying price per unit by the number of units sold. This is also total spending on the product by consumers. Changes in total revenue are related to the price elasticity of demand. If demand is elastic, a change in price (increase or decrease) will result in a change in total revenue in the opposite direction. If demand is inelastic, a change in price will result in a change in total revenue in the same direction as the change in price. When demand is unit elastic, a change in price (increase or decrease) results in no change in total revenue.

#### Study Hint

The relationship between elasticity and changes in revenue is very important. Setting and changing the price of a product are among the most important decisions firms make. But firms may not know the elasticity of demand for a product before a pricing decision is made. One way to estimate the elasticity is through a market experiment. Making the Connection “Determining the Price Elasticity of Demand through Market Experiments” describes how variations in the prices of DVDs can be used to help determine the price elasticity. This experimentation is especially important for new products where a firm cannot rely on the past relationship between price and quantity demanded.

Solved Problem 6.3 explains how price and total revenue do not always move in the same direction. If demand is price inelastic, then price and total revenue do move together. However, if the demand is price elastic, then price and total revenue will move in the opposite direction from one another, with revenue falling when price increases and rising when price decreases.

### 6.4 Other Demand Elasticities (pages 185–187)

Learning Objective: Define cross-price elasticity of demand and income elasticity of demand and understand their determinants and how they are measured.

The cross-price elasticity of demand is the percentage change in quantity demanded of one good divided by the percentage change in price of the other good. Because substitutes are products that can be used for the same purpose, an increase in the price of one of the products will lead to an increase in the quantity demanded of the substitute product. Therefore, the cross-price elasticity of demand will be positive when two goods are substitutes. Complements are products that are used together. An increase in the price of a product will lead to a decrease in the quantity demanded of its complement. Therefore, the cross-price elasticity of demand for these goods will be negative.
Study Hint

Students often have trouble remembering that the cross-price elasticity of demand for goods that are substitutes is positive and negative for goods that are complements. “But two goods that are complements go together, so shouldn’t they be positively related and have a positive cross-price elasticity?” is an example of the kind of confusion that sometimes results. The intuition that complementary goods go together in some way is correct. That implies that the quantities of the two goods will be positively related. However, the cross-price elasticity doesn’t measure how the quantities of the two goods are related. Rather, the cross-price elasticity measures how the quantity of one good responds to a change in price of the other good. Keep that in mind when thinking about the rationale for the cross-price elasticity of demand for substitute and complementary goods.

The income elasticity of demand is a measure of the responsiveness of quantity demanded to changes in income, measured by the percentage change in quantity demanded divided by the percentage change in income. An increase in income leads to an increase in the quantity demanded of a normal good. Therefore, the income elasticity of demand for a normal good is positive. A good is a luxury if the income elasticity is greater than 1. A good is a necessity if the income elasticity is positive but less than 1. A good is inferior if the quantity demanded falls when income increases. Therefore, the income elasticity of demand for an inferior good is negative.

Study Hint

Remember that, unlike the price elasticity of demand, whether cross-price or income elasticity is greater or less than 1 isn’t as important as whether it is greater or less than 0. While we focus only on the number for price elasticity of demand (and less on the negative sign in front of the number), whether cross-price and income elasticities are positive or negative numbers is crucially important.

Also, be careful not to confuse the price elasticity of demand with other elasticities like the cross-price and income elasticities. For example, if you find that the price elasticity of demand for iPads is −2.5, that finding provides no information about whether iPads are normal or inferior goods. Similarly, the finding that demand has an elasticity of −2.5 does not allow you to predict whether iPads are substitutes or complements for other goods. A price elasticity of demand equal to −2.5 tells you only that demand for iPads is elastic in response to a change in the price of iPads. How the demand for iPads changes when income or the prices of related goods change cannot be determined simply from the price elasticity of demand.

Extra Solved Problem 6.4

The Demand for Margarine

Supports Learning Objective 6.4: Define cross-price elasticity of demand and income elasticity of demand and understand their determinants and how they are measured.

Suppose that the table that follows gives the demand this month for margarine in the city of Breadville. Each of the quantity columns, (b) and (c), is a different demand schedule. Column (a) shows the price of margarine. Column (b) shows the quantity demanded of margarine for a fixed price of butter and a fixed income. Comparing columns (b) and (c), we can see that the price of butter rises.
a. Calculate the cross-price elasticity of demand for margarine using the midpoint formula given a change in the price of butter from $1.00 per pound to $1.60 per pound. (Hint: use columns (b) and (c).)

b. What can you say about the relationship between margarine and butter?

Solving the Problem

**Step 1:** Review the chapter material.
This problem is about the other elasticities of demand, so you may want to review the section “Other Demand Elasticities,” which begins on page 185 in the textbook.

**Step 2:** Calculate the cross-price elasticity of demand using the midpoint method.
You can choose to analyze any row in the table, and you will get the following results. The price of butter rises from $1.00 to $1.60 per pound, while the quantity demanded of margarine rises from 24.02 hundred pounds to 32.91 hundred pounds. The cross-price elasticity of demand is 0.68.

**Step 3:** Interpret the cross-price elasticity of demand.
Because the cross-price elasticity of demand is positive, we know that margarine and butter are substitutes. We can also see that the response of the quantity demanded of margarine to the price change in butter is relatively small, which means that an increase in the price of butter did not cause consumers to strongly switch from buying butter to buying margarine.

6.5 Using Elasticity to Analyze the Disappearing Family Farm (pages 188–190)
Learning Objective: Use price elasticity and income elasticity to analyze economic issues.

The demand for many agricultural commodities (for example, wheat) is price inelastic, while the income elasticity for these commodities is low (positive but less than one). Technological change has caused large increases in the supply of agricultural commodities over time. Because of the low income elasticity of demand for these commodities, demand has increased much less than supply. This has resulted in decreases in the relative prices of many agricultural commodities and falling revenues for farmers. At the same time, the technological improvements have meant fewer farmers are needed to produce agricultural commodities.
Study Hint
The decline in the relative price of agricultural products is an example of how knowledge of elasticity explains an important economic and social issue. *Solved Problem 6.5,* “Using Price Elasticity to Analyze Policy toward Illegal Drugs,” is another excellent application of elasticity to an economic issue. How much consumption of cocaine will be affected by a change in price depends on the price elasticity of demand for cocaine. If the price elasticity is high in absolute value, then the decrease in price that would result from legalization could nearly triple consumption. If the price elasticity is low, then there will be only a slight increase in cocaine consumption. You can test your understanding further by completing related problems 5.2 and 5.3 on page 202 in the textbook.

### 6.6 The Price Elasticity of Supply and its Measurement (pages 190–194)

**Learning Objective:** Define price elasticity of supply and understand its main determinants and how it is measured.

The *price elasticity of supply* is the responsiveness of the quantity supplied to a price change, measured by dividing the percentage change in the quantity supplied of a product by the percentage change in the product’s price. Because of the law of supply, this elasticity will have a positive numerical value. The longer the time period firms have to respond to a price change, the greater the elasticity of supply. Like demand, supply can be “perfectly” elastic or “perfectly” inelastic if it is horizontal (perfectly elastic) or vertical (perfectly inelastic).

**Study Hint**
*Making the Connection* “Why Are Oil Prices So Unstable?” explains how the elasticity of demand and supply affects the price of oil. In the short run, demand and supply are both relatively inelastic, so a reduction in the supply of oil will cause a large increase in the price of oil, but only a small change in the equilibrium quantity of oil produced and consumed. In the long run, consumers and firms have time to adjust their consumption preferences and productive capacity, so the demand and supply curves are relatively elastic. A change in the supply of oil has a smaller effect on the equilibrium price of oil in the long run. Use that analysis to help you solve part c of Extra Solved Problem 6.6 below.

### Extra Solved Problem 6.6

**Ethanol and Biodiesel**

Supports Learning Objective 6.6: Define price elasticity of supply and understand its main determinants and how it is measured.

Suppose that this summer your state government passes an immediate tax rebate to all citizens who use ethanol and biodiesel fuels in their automobiles. This causes the demand for ethanol and biodiesel to increase significantly. The main inputs for these alternative fuels are soy and corn. Because the supply of soy and corn are fixed for a given summer, the supply of these alternative fuels is fixed.

a. What is the price elasticity of supply when the supply of a good is fixed?

b. Using a graph of demand and supply in the market for alternative fuels, explain what happens to the equilibrium price and quantity of alternative fuels in the summer that this rebate is introduced.

c. How would you expect the price elasticity of supply for alternative fuels to change over time, if at all?
Solving the Problem

Step 1: Review the chapter material.
This problem is about the price elasticity of supply, so you may want to review the section “Price Elasticity of Supply and its Measurement,” which begins on page 190 in the textbook.

Step 2: Interpret the fixed supply of alternative fuels and what that means in terms of the price elasticity of supply.
If the supply is fixed, the quantity supplied is constant regardless of the market price, that is, supply is perfectly inelastic and is a vertical line. A vertical line has a price elasticity of supply of 0.

Step 3: Apply the increase in demand and the vertical supply curve to the market for alternative fuels, and consider what determinants of the price elasticity might affect elasticity of supply over time.
The equilibrium quantity will be unaffected, and the increase in demand will cause only an increase in the market price. Over time the elasticity of supply will increase, and the supply curve will become flatter, causing the quantity to increase in the long run with a smaller increase in price.

Key Terms

Cross-price elasticity of demand The percentage change in quantity demanded of one good divided by the percentage change in the price of another good.

Elastic demand Demand is elastic when the percentage change in quantity demanded is greater than the percentage change in price, so the price elasticity is greater than 1 in absolute value.

Elasticity A measure of how much one economic variable responds to changes in another economic variable.

Income elasticity of demand A measure of the responsiveness of quantity demanded to changes in income, measured by the percentage change in quantity demanded divided by the percentage change in income.

Inelastic demand Demand is inelastic when the percentage change in quantity demanded is less than the percentage change in price, so the price elasticity is less than 1 in absolute value.
Perfectly elastic demand The case where the quantity demanded is infinitely responsive to price, and the price elasticity of demand equals infinity.

Perfectly inelastic demand The case where the quantity demanded is completely unresponsive to price, and the price elasticity of demand equals zero.

Price elasticity of demand The responsiveness of the quantity demanded to a change in price, measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product’s price.

Price elasticity of supply The responsiveness of the quantity supplied to a change in price, measured by dividing the percentage change in the quantity supplied of a product by the percentage change in the product’s price.

Total revenue The total amount of funds received by a seller of a good or service, calculated by multiplying price per unit by the number of units sold.

Unit-elastic demand Demand is unit elastic when the percentage change in quantity demanded is equal to the percentage change in price, so the price elasticity is equal to 1 in absolute value.

Self-Test

(Answers are provided at the end of the Self-Test.)

Multiple-Choice Questions

1. Price elasticity of demand is
   a. a measure of responsiveness of the change in the quantity demanded of a good to the change in its price.
   b. a measure of responsiveness of the change in the quantity demanded of a good to the change in income.
   c. a measure of responsiveness of the change in the quantity demanded of a good to the change in the price of another good.
   d. none of the above.

2. If you know the value for price elasticity of demand, then which of the following can you compute?
   a. the effect of a price change on the quantity demanded
   b. the responsiveness of the quantity supplied of a good to changes in its price
   c. the price elasticity of supply
   d. all of the above

3. Fill in the blanks. Along a linear demand curve, the slope _________ while the price elasticity of demand _________.
   a. is constant; is constant
   b. changes from one point to another; is constant
   c. is constant; changes from one point to another
   d. none of the above
4. Who benefits from the concept of elasticity?
   a. business managers
   b. policymakers
   c. both business managers and policymakers
   d. neither business managers nor policymakers; only economists benefit

5. How is the price elasticity of demand measured?
   a. by dividing the percentage change in the product’s price by the percentage change in the quantity demanded of a product
   b. by multiplying the percentage change in the product’s price by the percentage change in the quantity demanded of a product
   c. by dividing the percentage change in the quantity demanded of a product by the percentage change in the product’s price
   d. by multiplying the percentage change in the quantity demanded of a product by the percentage change in the product’s price

6. As the price of the good increases, its price elasticity of demand, in absolute value, 
   a. decreases.
   b. increase.
   c. stays the same.
   d. none of the above.

7. How do economists avoid confusion over units in the computation of elasticity?
   a. by using index numbers rather than whole numbers
   b. by using percentage changes rather than simple differences
   c. by using aggregate values rather than single values
   d. by using the same number as the value of the slope of the curve

8. Which of the following statements about the slope and the price elasticity of demand is correct?
   a. The slope is calculated using percentage changes in quantity and price, whereas elasticity is calculated using simple numerical changes.
   b. The slope is calculated using changes in quantity and price, whereas elasticity is calculated using percentage changes.
   c. Both the slope and elasticity must be calculated using percentage changes.
   d. Neither the slope nor the value of elasticity can be calculated using simple numerical changes.

9. Which of the following is true about the value of the price elasticity of demand?
   a. The value is always negative.
   b. The value is always positive.
   c. The value may be positive or negative depending on the value of the slope of the demand curve.
   d. The value is positive when the slope is negative and negative when the slope is positive.

10. If we find that the price elasticity of demand for hamburgers is $-1.3$ while the price elasticity of demand for textbooks is $-0.6$, which of the following can we say is true?
    a. The law of demand is violated in both the market for hamburgers and the market for textbooks.
    b. The demand for hamburgers is more elastic than the demand for textbooks.
    c. A 10 percent increase in the price of hamburgers will result in a 13 percent increase in the quantity of hamburgers demanded.
    d. Consumers like hamburgers more than they like textbooks.
11. What happens when the quantity demanded is very responsive to changes in price?
   a. The percentage change in quantity demanded will be greater than the percentage change in price.
   b. The percentage change in quantity demanded will be less than the percentage change in price.
   c. The percentage change in quantity demanded will be equal to the percentage change in price.
   d. The percentage change in quantity demanded will be unrelated to the percentage change in price.

12. If a 10 percent increase in the price of one good leads to a 10 percent reduction in the quantity demanded, then the demand for that good is
   a. elastic.
   b. unit elastic.
   c. inelastic.
   d. none of the above.

13. Which of the following is true if quantity demanded is not very responsive to price?
   a. The percentage change in quantity demanded will be less than the percentage change in price.
   b. The price elasticity of demand will be less than 1 in absolute value.
   c. Demand is inelastic.
   d. All of the above are true.

14. If a 20 percent increase in the price of Red Bull energy drinks results in a decrease in the quantity demanded of 25 percent, the price elasticity of demand is
   a. $-25$.
   b. $-0.8$.
   c. $-1.25$.
   d. $-20$.

15. Fill in the blank. If a 20 percent increase in the price of Red Bull energy drinks results in a decrease in the quantity demanded of 25 percent, we say demand for Red Bull is ____________ in this range.
   a. inelastic
   b. elastic
   c. unit elastic
   d. vertical
16. Refer to the graph below which shows two potential demand curves in the market for photocopies at a printing company. If you start at point \( A \) on \( D_1 \), what is the percentage change in price when price falls from $30 to $20? Use the midpoint formula to calculate this percentage change.

\[
\text{Percentage change in price} = \frac{\text{Old price} - \text{New price}}{\text{Old price}} \times 100
\]

- a. price falls by 10 percent
- b. price falls by 25 percent
- c. price falls by 40 percent
- d. price falls by 45 percent

17. Refer to the graph below which shows two potential demand curves in the market for photocopies at a printing company. If you start at point \( A \) on \( D_1 \), what is the percentage change in quantity demanded when price falls from $30 to $20? Use the midpoint formula to calculate this percentage change.

\[
\text{Percentage change in quantity demanded} = \frac{\text{Old quantity} - \text{New quantity}}{\text{Old quantity}} \times 100
\]

- a. quantity demanded rises by 22 percent
- b. quantity demanded rises by 4 percent
- c. quantity demanded rises by 55 percent
- d. quantity demanded falls by 40 percent
18. Refer to the graph below which shows two potential demand curves in the market for photocopies at a printing company. When price falls from $30 to $20, demand is ________ between points A and C on $D_2$ and demand is ________ between points A and B on $D_1$.

![Graph showing two demand curves]

a. inelastic; elastic  
b. elastic; elastic  
c. inelastic; inelastic  
d. elastic; inelastic

19. Refer to the graph below which shows two potential demand curves in the market for photocopies at a printing company. Between points A and B on $D_1$, what is the price elasticity of demand?

![Graph showing two demand curves]

a. $-1.2$  
b. $-1.4$  
c. $-0.83$  
d. $-12$
20. Which of the following would occur when calculating price elasticity between two points on a demand curve if we are not using the midpoint formula?
   a. The value of elasticity we would get would be the same whether we apply it to price increases or to price decreases.
   b. We would get a different value for price increases than for price decreases.
   c. The values we would get would be the same if the demand curve is downward sloping.
   d. The values would always coincide with the value of the slope of the demand curve, especially if the demand curve is linear.

21. Along a linear demand curve, total revenue is maximized when the price elasticity of demand, in absolute value,
   a. equals to one.
   b. is greater than one.
   c. is less than one.
   d. none of the above.

22. When quantity demanded is completely unresponsive to price, what is the value of price elasticity of demand?
   a. 0
   b. 1
   c. a number between 0 and 1
   d. a negative number

23. If demand is perfectly elastic, then what is the impact of an increase in price?
   a. a decrease in quantity demanded to zero
   b. no change in quantity demanded
   c. a change in quantity demanded exactly equal to the change in price
   d. a very small change in quantity demanded

24. On the lower part of a linear demand curve, below the midpoint, the price elasticity of demand in absolute value
   a. is less than one.
   b. is greater than one.
   c. equals to one.
   d. is none of the above.

25. Which of the following is a true statement?
   a. The more substitutes available for a product, the greater the price elasticity of demand.
   b. The more time that passes, the more elastic the demand for a product becomes.
   c. The demand curve for a luxury is more elastic than the demand curve for a necessity.
   d. All of the above are true.

26. Which of the following is a true statement?
   a. The fewer substitutes available for a product, the greater the price elasticity of demand.
   b. The more time that passes, the more inelastic the demand for a product becomes.
   c. The demand curve for a luxury is less elastic than the demand curve for a necessity.
   d. The more narrowly defined a product is, the larger the price elasticity of demand.
27. The price elasticity of demand for a particular brand of raisin bran is, in absolute value,
   a. larger than the price elasticity of demand for all breakfast cereals.
   b. the same as the price elasticity of demand for all breakfast cereals.
   c. smaller than the price elasticity of demand for all types of breakfast cereals.
   d. neither larger nor smaller than the price elasticity of demand for any other type of cereal.

28. Fill in the blanks. In general, the price elasticity of demand for a good will be ________ elastic the
   __________ the share of the good in the average consumer’s budget.
   a. less; smaller
   b. more; smaller
   c. less; larger
   d. unit; larger

29. Sarah spends 2 percent of her weekly budget on chewing gum, and she spends 50 percent of her
   weekly budget on books. All else equal, we would expect her demand for chewing gum to be
   a. more elastic than her demand for books.
   b. less elastic than her demand for books.
   c. elastic.
   d. unit elastic.

30. As you move upward along a linear demand curve, the price elasticity of demand in absolute value
   a. decreases.
   b. increases.
   c. stays the same.
   d. none of the above.

31. Fill in the blanks. On the lower part of a linear demand curve below the midpoint, the demand is
   __________ and raising the price causes total revenue to __________.
   a. inelastic; increase
   b. inelastic; decrease
   c. elastic; increase
   d. elastic; decrease

32. When demand is elastic, how will an increase in price affect total revenue?
   a. Total revenue will rise.
   b. Total revenue will fall.
   c. Total revenue will be unaffected by the change in price.
   d. Total revenue may rise or fall, but the effect will depend on the size of the price change.
33. Refer to the graphs below which show two potential demand curves in the market for photocopies at a printing company. In which of the two graphs does a price decrease lead to an increase in total revenue?

![Graph A](image1.png) ![Graph B](image2.png)

a. in the graph on the left  
b. in the graph on the right  
c. in both graphs  
d. in neither graph

34. When an increase in the quantity demanded is not large enough to make up for a decrease in price, total revenue falls. Which graph is more applicable to this statement?

![Graph A](image3.png) ![Graph B](image4.png)

a. the graph on the left  
b. the graph on the right  
c. both graphs  
d. neither graph

35. What is the effect of a cut in price when demand is inelastic?

a. an increase in total revenue  
b. a decrease in total revenue  
c. no effect on total revenue  
d. a change in total revenue by an amount equal to the cut in price
36. When is a change in price exactly offset by a proportional change in quantity demanded, leaving revenue unaffected?
   a. never
   b. when demand is elastic
   c. when demand is inelastic
   d. when demand is unit elastic

37. Refer to the graph below which shows the demand for DVDs. What happens to price elasticity, in absolute value, as we move down the demand curve?
   
   ![Graph of Demand for DVDs]

   a. It rises.
   b. It falls.
   c. It remains the same.
   d. It rises up to the midpoint, and then it falls.

38. Refer to the graph below which shows the demand for DVDs. What happens to total revenue as we move down the demand curve?
   
   ![Graph of Demand for DVDs]

   a. It rises.
   b. It falls.
   c. It remains the same.
   d. It rises up to the midpoint, and then it falls.
39. In the graph of demand in the market for DVDs below, when the price is $6, demand

![Graph of demand for DVDs](image)

a. is elastic.
b. is inelastic.
c. is unit elastic.
d. cannot be determined from the graph.

40. Fill in the blanks: An increase in the price of a substitute for iPads will lead to _________ in quantity demanded of iPads, so the cross-price elasticity of demand will be _________.
   a. an increase; positive
   b. an increase; negative
   c. a decrease; positive
   d. a decrease; negative

41. Fill in the blanks: An increase in the price of a complement for DVDs will lead to _________ in the quantity demanded of DVDs, so the cross-price elasticity of demand will be _________.
   a. an increase; positive
   b. an increase; negative
   c. a decrease; positive
   d. a decrease; negative

42. What is the cross-price elasticity of demand for two products that are unrelated?
   a. 0
   b. 1
   c. infinite
   d. negative

43. If Amazon.com raises its prices by 10 percent and, as a result, the quantity of books demanded on Barnesandnoble.com increases by 35 percent, what do consumers consider the two Web sites to be?
   a. close substitutes
   b. close complements
   c. unrelated
   d. identical
44. The price elasticity of supply always has
   a. a negative value.
   b. a positive value.
   c. a zero value.
   d. none of the above.

45. If the income elasticity of SUVs is greater than 1, what is the good considered?
   a. a necessity
   b. a luxury
   c. a substitute good
   d. an inferior good

46. The income elasticity for peanut butter is −3. This defines peanut butter as what type of good?
   a. a good with elastic demand
   b. an inferior good
   c. a good that is a complement for jelly
   d. a necessity

47. What is true about quantity demanded if a good is considered a necessity?
   a. It is very responsive to changes in income.
   b. It is not very responsive to changes in income.
   c. It is unrelated to changes in income.
   d. It is always the same regardless of price changes.

48. Fill in the blanks. The income elasticity of demand for a normal good is _____ and for an inferior good is _____.
   a. positive; positive
   b. negative; negative
   c. positive; negative
   d. none of the above

49. Suppose that an innovation in harvesting technology increases the supply of corn. Corn farmers will experience an increase in total revenue when
   a. the supply of corn is inelastic.
   b. the supply of corn is elastic.
   c. the demand for corn is inelastic.
   d. the demand for corn is elastic.

50. Fill in the blanks. When demand increases, equilibrium price will rise ____________ when supply is __________ elastic.
   a. more; more
   b. less; less
   c. more; less
   d. None of the above. Supply elasticity does not affect the impact of a shift in demand on the equilibrium price.
Short Answer Questions

1. Some people believe that changes in the price of gasoline have no effect on purchases of gasoline. They see gasoline as a necessity that will be purchased in the same amounts regardless of the price. If this were truly the case, what does that imply about the shape of the demand curve for gasoline? Do you think the demand curve for gasoline really does have that shape?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

2. Phil Sanders, an economics major who recently graduated from a local college, was hired as a consultant by the Middletown City Council. A member of the Council proposed lowering fares for public transportation (buses and trolleys). He reasoned that the lower price would increase both the number of people using public transportation and revenue from fares. The increased revenue would be used to buy new buses. When he estimated price elasticities of demand, Sanders found that the price elasticity of demand for both bus and trolley service was −0.6. What advice should Sanders give the City Council?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

3. Assume that economic growth causes incomes to rise in the United States by 5 percent. Use the income elasticities of demand from Making the Connection “Price Elasticity, Cross-Price Elasticity, and Income Elasticity in the Market for Alcoholic Beverages” on page 187 in the textbook to estimate the change in the quantities demanded for beer, wine, and spirits.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

4. According to Jerry Hausman, an economist at MIT, the price elasticity of demand for Post Raisin Bran cereal is −2.5, while the price elasticity of demand for all types of breakfast cereals is −0.9. How can you explain the difference between the two elasticities?

______________________________________________________________________________
______________________________________________________________________________
5. Your friend argues that since the slope is constant along a linear demand curve so is elasticity. Is he correct? Why or why not?

____________________________
____________________________
____________________________

True/False Questions

T  F  1. The price elasticity of demand measures the responsiveness of demand for a product to a change in the product’s price.
T  F  2. The demand for all breakfast cereals is more elastic than the demand for a specific brand of cereal.
T  F  3. If the demand for a product is elastic, a decrease in price results in an increase in revenue.
T  F  4. The cross-price elasticity of demand for two complements is positive.
T  F  5. Along a linear demand curve, total revenue is maximized when the price elasticity of demand equals –1.
T  F  6. On the upper part of a linear demand curve, above its midpoint, the demand is elastic.
T  F  7. During recessions, the demand for inferior goods will rise.
T  F  8. If the quantity demanded of a good does not change as its price changes, then the demand for this good is perfectly inelastic with respect to price.
T  F  9. A supply curve that is a horizontal line is perfectly elastic.
T  F 10. The cross-price elasticity of demand is always negative.
T  F 11. The larger the share of a good in the average consumer’s budget, the more elastic demand for that good is.
T  F 12. A perfectly elastic demand curve will be a horizontal line.
T  F 13. A perfectly inelastic demand curve will have a price elasticity equal to 1 in absolute value.
T  F 14. The price elasticity of supply is always negative.
T  F 15. A good with an income elasticity of demand equal to 1.2 is a luxury good.

Answers to the Self-Test

Multiple-Choice Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a</td>
<td>Price elasticity of demand is a measure of responsiveness of the change in the quantity demanded of a good to the change in its price.</td>
</tr>
<tr>
<td>2.</td>
<td>a</td>
<td>Price elasticity of demand measures the effect of a change in price on the quantity demanded.</td>
</tr>
<tr>
<td>3.</td>
<td>c</td>
<td>The price elasticity of demand changes along a linear demand curve while the slope stays the same.</td>
</tr>
<tr>
<td>4.</td>
<td>c</td>
<td>Elasticity is an important concept not just for business managers but for policymakers as well.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Comment</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>5.</td>
<td>c</td>
<td>The responsiveness of the quantity demanded to a change in price is measured by dividing the percentage change in the quantity demanded of a product by the percentage change in the product’s price.</td>
</tr>
<tr>
<td>6.</td>
<td>b</td>
<td>As we move upward along a linear demand curve, the price increases and so does the price elasticity of demand in absolute value.</td>
</tr>
<tr>
<td>7.</td>
<td>b</td>
<td>Percentage changes are not dependent on units of measurement.</td>
</tr>
<tr>
<td>8.</td>
<td>b</td>
<td>The value we compute for the slope can change dramatically depending on the units we use for quantity and price. To avoid this confusion over units, economists use percentage changes when measuring the price elasticity of demand.</td>
</tr>
<tr>
<td>9.</td>
<td>a</td>
<td>If we calculate the price elasticity of demand for a price cut, the percentage change in price will be negative, and the percentage change in quantity demanded will be positive. Similarly, if we calculate the price elasticity of demand for a price increase, the percentage change in price will be positive and the percentage change in quantity will be negative. Therefore, the price elasticity of demand is always negative.</td>
</tr>
<tr>
<td>10.</td>
<td>b</td>
<td>In comparing elasticities, we are usually interested in their relative size. So, we often drop the minus sign and compare their absolute values. Because 1.3 is greater than 0.6, the price elasticity of demand in the market for hamburgers is greater.</td>
</tr>
<tr>
<td>11.</td>
<td>a</td>
<td>In other words, the absolute value of elasticity will be greater than 1, so the absolute value of the numerator will be greater than the absolute value of the denominator in the elasticity formula.</td>
</tr>
<tr>
<td>12.</td>
<td>b</td>
<td>If the demand is unit elastic, then a 10 percent increase in the price of a good leads to the same percentage decrease in the quantity demanded.</td>
</tr>
<tr>
<td>13.</td>
<td>d</td>
<td>When the quantity demanded is not very responsive to price, the percentage change in quantity demanded will be less than the percentage change in price, and the price elasticity of demand will be less than 1 in absolute value. In this case, demand is inelastic.</td>
</tr>
<tr>
<td>14.</td>
<td>c</td>
<td>Price elasticity of demand is calculated as the percentage change in the quantity demanded divided by the percentage change in price.</td>
</tr>
<tr>
<td>15.</td>
<td>b</td>
<td>The percentage change in quantity demanded is greater than the percentage change in price, resulting in a price elasticity of demand that is greater than 1 in absolute value. This is elastic demand.</td>
</tr>
<tr>
<td>16.</td>
<td>c</td>
<td>The percentage change in price is the change in the price divided by the average price, which is ((30 - 20)/25 = 40%).</td>
</tr>
<tr>
<td>17.</td>
<td>c</td>
<td>The decrease in price increases quantity demanded from 16 to 28. Using the midpoint formula, that is a percentage change of ((28 - 16)/22 = 55%).</td>
</tr>
<tr>
<td>18.</td>
<td>a</td>
<td>Between points (A) and (C), the percentage change in quantity demanded is smaller than the percentage change in price. Between points (A) and (B), the percentage change in quantity demanded is greater than the price.</td>
</tr>
<tr>
<td>19.</td>
<td>b</td>
<td>The percentage change in quantity demanded is 55 percent, and the percentage change in price is (-40%). The price elasticity of demand is ((55%/-40%) = -1.4).</td>
</tr>
<tr>
<td>20.</td>
<td>b</td>
<td>We could run into a problem because we get a different value for the price elasticity of demand for price increases than for price decreases. To avoid this problem, we use the midpoint formula to compute elasticity.</td>
</tr>
<tr>
<td>21.</td>
<td>a</td>
<td>On the lower part of a linear demand curve, total revenue increases as we move upward toward the midpoint. On the upper part, total revenue increases when we move downward toward the midpoint. At the midpoint, total revenue is maximized.</td>
</tr>
</tbody>
</table>
22. a If a demand curve is perfectly inelastic, an increase in price causes the quantity demanded to remain the same, so there is no (or zero) response in quantity demanded.

23. a Refer to Table 6.1 on page 177 in the textbook. If the demand is perfectly elastic, the demand curve is horizontal and any increase in price causes quantity demanded to decrease to zero.

24. a On the lower part of a linear demand curve, the demand is inelastic.

25. d All of these statements are correct. Read pages 178–181 in the textbook.

26. d The price elasticity of demand for a narrowly defined market (for example, Tide® has many substitutes) will be greater than the price elasticity of demand for a broadly defined market (laundry detergent).

27. a The more substitutes available for a product, the greater the price elasticity of demand. Also, the more narrowly defined a product is, the larger the price elasticity of demand.

28. a Goods that take only a small fraction of a consumer’s budget tend to have inelastic demand. For example, the share of the average consumer’s budget that is spent on salt is very low. As a result, even a doubling of the price of salt is likely to result in only a small decline in the quantity of salt demanded.

29. b Because Sarah spends less of her weekly budget on chewing gum, her demand for chewing gum should be less elastic than her demand for goods that take up a larger portion of her weekly budget.

30. b The price elasticity of demand in absolute value increases as we move upward along a linear demand curve since the price increases.

31. a On the lower part of the linear demand curve the demand is inelastic and therefore raising the price by any percentage causes quantity demanded to decrease by smaller percentage so total revenue increases.

32. b An increase in price reduces total revenue, and a decrease in price raises total revenue when demand is elastic.

33. b In the graph on the right the price decrease raises revenue from ($30 \times 16) = $480 to ($20 \times 28) = $560. You can also see that the increase in revenue from decreasing price equals 12 copies (28 – 16) multiplied by $20, or $240. This is greater than the decrease in revenue from decreasing price [(30 – $20) \times 16 = $160].

34. a Demand is inelastic when price falls from $30 to $20, so the decrease in price results in a decrease in revenue.

35. b When demand is inelastic, a cut in price will decrease total revenue.

36. d When demand is unit elastic, a change in price is exactly offset by a proportional change in quantity demanded, leaving revenue unaffected. Therefore, when demand is unit elastic, neither a decrease in price nor an increase in price affects revenue.

37. b At higher prices, demand is more elastic, and at lower prices, demand is less elastic and eventually becomes inelastic.

38. d Total revenue is highest at the midpoint of the demand curve and decreases as the price moves away from the midpoint price.

39. a Above the midpoint of a linear demand curve, demand is elastic.

40. a An increase in the price of a substitute will lead to an increase in demand for the substitute product, so the cross-price elasticity of demand will be positive.
Question | Answer | Comment
--- | --- | ---
41. | d | An increase in the price of a complement will lead to a decrease in quantity demanded for the complementary product, so the cross-price elasticity of demand will be negative.
42. | a | If the two products are unrelated, the cross-price elasticity of demand will be zero.
43. | a | If consumers buy more from Barnesandnoble.com when Amazon.com raises prices, then the two Web sites are considered by consumers to be close substitutes.
44. | b | Since the relationship between the price and the quantity supplied is positive so the price elasticity of supply is always positive.
45. | b | A good is a luxury if demand is very responsive to changes in income, so that a 10 percent increase in income results in more than a 10 percent increase in quantity demanded. Expensive jewelry or vacation homes are examples of luxuries.
46. | b | Any good with a negative income elasticity is an inferior good. Note that whether the income elasticity is greater or less than 1 does not predict whether the price elasticity of demand for that good is greater or less than 1 in absolute value.
47. | b | A good is a necessity if demand is not very responsive to changes in income, so that a 10 percent increase in income results in less than a 10 percent increase in quantity demanded. Food and clothing are examples of necessities.
48. | c | For a normal good as income increases so does the demand. Therefore, it has a positive income elasticity of demand. For an inferior good, as income increases, demand decreases. Therefore, it has a negative income elasticity of demand.
49. | d | An increase in supply will cause a decrease in the equilibrium price and an increase in the equilibrium quantity. For total revenue to increase as the price falls, demand must be elastic.
50. | c | When supply is less elastic (steeper), any change in demand will have a stronger effect on equilibrium price.

**Short Answer Responses**

1. If the price of gasoline really had no effect on the purchases of gasoline, then the demand for gasoline would be vertical. However, as the chapter opener points out, higher gasoline prices do affect the quantity of gasoline consumers purchase. When gas prices rose to around $3.76 per gallon in May 2011, gas purchases were nearly 5 percent lower than in the previous year.

2. Sanders should advise the City Council members to not lower price, as this would result in lower revenue from fares. In fact, if the Council wishes to increase revenue, then the proper course would be to raise fares because demand is inelastic.

3. To determine the changes in quantity demanded it is necessary to multiply the income elasticity for these three goods by the percentage change in income. The income elasticities are: beer (−0.09), wine (5.03), and spirits (1.21). Multiplying these values by 5 percent (0.05) yields the following changes in quantity demanded: beer (−0.5 percent), wine (+25.2 percent), and spirits (+6.1 percent).

4. One factor affecting the price elasticity of demand is how narrowly the good is defined. For a narrowly defined good, just as a specific brand of cereal, there are many substitutes and as a result it is more elastic. Whereas for the cereal as a whole, there are less substitutes and as a result it is inelastic. Therefore, the price elasticity of demand for a specific brand of cereal, in absolute value, is greater than the price elasticity of demand for all types of cereals.
5. Your friend is not correct. The price elasticity of demand changes along a linear demand curve. As we move down the linear demand curve, the price decreases and so does the price elasticity of demand in absolute value.

True/False Answers

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>F</td>
<td>The price elasticity of demand measures the responsiveness of quantity demanded, rather than demand, for a product to a change in the product’s price.</td>
</tr>
<tr>
<td>2.</td>
<td>F</td>
<td>The more narrowly the market is defined, the more elastic the demand for the product is.</td>
</tr>
<tr>
<td>3.</td>
<td>T</td>
<td>With an elastic demand, the price and total revenue move in the opposite direction of one another.</td>
</tr>
<tr>
<td>4.</td>
<td>F</td>
<td>Cross-price elasticity of demand is negative for complements.</td>
</tr>
<tr>
<td>5.</td>
<td>T</td>
<td>On the lower part of a linear demand curve, below its midpoint, as we move upward toward the midpoint, total revenue increases. On the upper part of a linear demand curve, above its midpoint, as we move downward toward the midpoint, total revenue increases. At the midpoint, total revenue is maximized.</td>
</tr>
<tr>
<td>6.</td>
<td>T</td>
<td>On the upper part of a linear demand curve above its midpoint, the price elasticity of demand in absolute value is greater than one, so the demand is elastic.</td>
</tr>
<tr>
<td>7.</td>
<td>T</td>
<td>As income falls, the demand for inferior goods increases.</td>
</tr>
<tr>
<td>8.</td>
<td>T</td>
<td>If demand is perfectly inelastic with respect to price, then the price elasticity of demand is zero and the quantity demanded does not respond to any changes in price.</td>
</tr>
<tr>
<td>9.</td>
<td>T</td>
<td>See Table 6.6 on page 193.</td>
</tr>
<tr>
<td>10.</td>
<td>F</td>
<td>The cross-price elasticity can be positive or negative. If the two goods are substitutes, then the cross-price elasticity is positive. If the two goods are complements, then the cross-price elasticity is positive.</td>
</tr>
<tr>
<td>11.</td>
<td>T</td>
<td>If the good is a large share of the budget, and the price increases, then we are more likely to significantly reduce our consumption of the good.</td>
</tr>
<tr>
<td>12.</td>
<td>T</td>
<td>See Table 6.1 on page 177.</td>
</tr>
<tr>
<td>13.</td>
<td>F</td>
<td>A perfectly inelastic demand curve will have a price elasticity equal to 0.</td>
</tr>
<tr>
<td>14.</td>
<td>F</td>
<td>The price elasticity is always positive as it measures the responsiveness of the change in the quantity supplied to the change in its price. Since the relationship between the price and the quantity supplied is positive, so the price elasticity of supply is always positive.</td>
</tr>
<tr>
<td>15.</td>
<td>T</td>
<td>A luxury good has an income elasticity of more than 1.</td>
</tr>
</tbody>
</table>