

ELASTICITY: DEMAND AND SUPPLY

FUNDAMENTAL QUESTIONS

1. How do we measure how much consumers alter their purchases in response to a price change?

When your favorite clothing store has a sale on jeans, do you go out and buy some? When the bookstore raised the price of required textbooks, did you buy fewer textbooks? We know from our study of demand that people usually respond to prices and price changes by changing the quantity they buy, but how big is the response? Most people respond more to changes in the price of jeans than they do to changes in the price of required textbooks. Is there any way to measure how much more?

Elasticity gives us a way to measure how people react to price changes or to changes in other variables. Specifically, the **price elasticity of demand** measures how much consumers respond to changes in price by changing the quantity demanded, *ceteris paribus*. Price elasticity of demand is calculated using this formula:

$$e_d = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

For most products, the price elasticity of demand is different at different prices. If Pepsi usually cost \$.05 a can, you would pay much less attention to a sale on Pepsi than you would if Pepsi cost \$5 a can. If we follow along a straight-line demand curve, we find that demand is *elastic* at high prices (e_d more than 1), *inelastic* at low prices (e_d less than 1), and *unit-elastic* (e_d equal to 1) in the middle.

2. Why are measures of elasticity important?

Buyers respond to price changes by changing the quantity they want to buy. Elasticity measurements give economists a way to compare consumers' responses with price changes for different products.

3. How does a business determine whether to increase or decrease the price of the product it sells in order to increase revenues?

When your favorite store has a sale on jeans, it sells more jeans but takes in less money per pair. Did it gain or lose revenue from the sale? That depends on the price elasticity of demand for the jeans. If the demand for the jeans is elastic, the percentage change in quantity is bigger than the percentage change in price, so a sale on jeans increases **total revenue**. But if the demand for jeans is inelastic, the percentage change in price is bigger than the percentage change in quantity, so a sale on jeans would decrease total revenue. When demand is inelastic, increasing the price increases total revenue.

4. Why might senior citizens or children receive price discounts relative to the rest of the population?

Senior citizens and children receive discounts because they usually have more elastic demands than the rest of the population. If children's demand for movies is elastic, giving them a discount lowers the price they pay and increases the theater's total revenue. The rest of us aren't as responsive to the price of movies, so the theater doesn't gain by giving us a discount. Whenever different groups of customers have different price elasticities of demand, firms can increase their total revenue by using **price discrimination**.

5. What determines whether consumers alter their purchases a little or a lot in response to a price change?

Three factors help determine how elastic the demand for a particular product is. First, the greater the number of close *substitutes*, the more elastic the demand. If the price of Kellogg's Corn Flakes goes up, you can find lots of other things to eat. If the price of required economics textbooks goes up, you can't just buy a cheaper anthropology text instead—not if you expect to pass economics.

Second, the greater the proportion of a household's budget a good constitutes, the more elastic the demand. For example, the demand for salt is very inelastic. We only spend pennies a week on salt, so we don't respond much to price changes. For most of us, though, a trip to Europe or the Far East would take a large chunk of our incomes, so we're much more sensitive to the price of foreign travel.

Third, the longer the period under consideration, the more elastic the demand. When the price of gasoline went up sharply in the 1970s, people didn't reduce their purchases very much at first; the demand was very inelastic. The response to the higher prices took a while to show up because it took people time to change their driving habits, to buy more-fuel-efficient cars, and so on. Over longer periods of time, the demand for gasoline became more elastic.

6. How do we measure how much income changes, changes in the prices of related goods, or changes in advertising expenditures affect consumer purchases?

The **income elasticity of demand**, the percentage change in demand divided by the percentage change in income, measures how much changes in income affect consumer purchases. The **cross-price elasticity of demand**, the percentage change in demand of one good divided by the percentage change in the price of a related good, measures how much changes in the price of related goods affect consumer purchases. The advertising elasticity of demand, the percentage change in demand divided by the percentage change in advertising expenditures, measures how much changes in advertising expenditures affect consumer purchases.

7. How do we measure how much producers respond to a price change?

We do this in the same basic way we measure whether consumers respond to a price change: we calculate the **price elasticity of supply**. The price elasticity of supply is the percentage change in the quantity supplied divided by the percentage change in price. The price elasticity of supply depends primarily on the length of time producers have to vary their output in response to changes in price.

Key Terms

price elasticity of demand
perfectly elastic demand curve
perfectly inelastic demand curve
total revenue (*TR*)

price discrimination
cross-price elasticity of demand
income elasticity of demand
normal goods
inferior goods

luxury goods
price elasticity of supply
short run
long run
tax incidence

Quick-Check Quiz

Section 1: The Price Elasticity of Demand

1. The price elasticity of demand is a measure of the degree to which
 - a. consumers alter the prices they pay for a product in response to changes in the quantities they buy of that product.
 - b. sellers alter the quantities of a product they offer for sale in response to changes in the price of that product.
 - c. consumers alter the quantities of a product they purchase in response to changes in their family income.
 - d. consumers alter the quantities of a product they purchase in response to changes in the price of that product.
 - e. sellers alter the quantities of a product they offer for sale in response to changes in the incomes of buyers.

2. Mathematically, the price elasticity of demand is a
 - a. ratio.
 - b. graph.
 - c. sum.
 - d. straight line.
 - e. curved line.

3. Which of the following is the equation for price elasticity of demand?

- a. $e_d = \frac{\text{change in quantity demanded}}{\text{change in price}}$
- b. $e_d = \frac{\text{change in price}}{\text{change in quantity demanded}}$
- c. $e_d = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$
- d. $e_d = \frac{\text{percentage change in price}}{\text{percentage change in quantity demanded}}$
- e. $e_d = \frac{\text{change in price}}{\text{percentage change in quantity demanded}}$

4. When the price elasticity of demand is greater than 1, demand is

- a. elastic.
- b. unit-elastic.
- c. inelastic.
- d. nonelastic.
- e. perfectly inelastic.

5. When the price elasticity of demand is less than 1, demand is

- a. elastic.
- b. unit-elastic.
- c. inelastic.
- d. nonelastic.
- e. perfectly elastic.

6. When the price elasticity of demand is equal to 1, demand is

- a. elastic.
- b. unit-elastic.
- c. inelastic.
- d. nonelastic.
- e. perfectly inelastic.

Section 2: The Use of Price Elasticity of Demand

1. Price times quantity is the way to calculate

- a. total revenue.
- b. the foreign exchange rate.
- c. the price elasticity of demand.
- d. price discrimination.
- e. the price elasticity of supply.

2. When elasticity is greater than 1, total revenue increases if price
 - a. decreases.
 - b. increases.
 - c. holds constant.
3. When elasticity is less than 1, total revenue increases if price
 - a. decreases.
 - b. increases.
 - c. holds constant.
4. Charging different customers different prices for the same product is called
 - a. foreign exchange exploitation.
 - b. labor exploitation.
 - c. perfect elasticity.
 - d. price discrimination.
 - e. pure price competition.
5. A business knows that it has two sets of customers, one of which has a much more elastic demand than the other. If the business uses price discrimination, which set of customers should receive a lower price?
 - a. Both sets should receive the same price.
 - b. Both sets should receive a higher price.
 - c. It doesn't matter to the business which gets a lower price.
 - d. The set with the more elastic demand should receive a lower price.
 - e. The set with the less elastic demand should receive a lower price.
6. Compared with people addicted to narcotics, potential narcotics users have a price elasticity of demand for narcotics that is
 - a. the same as addicts' demand because it is based on the same factors.
 - b. the same as addicts' demand but based on different factors.
 - c. less elastic than addicts' demand.
 - d. more elastic than addicts' demand.
 - e. more perfectly elastic than addicts' demand.

Section 3: Determinants of the Price Elasticity of Demand

1. One factor that price elasticity of demand depends on is
 - a. how elastic the budgets of consumers are.
 - b. the total revenues taken in by sellers of a particular product.
 - c. how readily consumers can switch their purchases from one product to another.
 - d. the amount of taxes paid by consumers.
 - e. the number of consumers in the market.
2. The price elasticity of demand for a product is largest when there
 - a. are no good substitutes for the product.
 - b. is only one good substitute for the product.
 - c. are two or three good substitutes for the product.
 - d. are many good substitutes for the product.

3. The price elasticity of demand for a product is largest when the
 - a. product constitutes a large portion of the consumer's budget.
 - b. product constitutes a small portion of the consumer's budget.
 - c. time period under consideration is very short.
4. The price elasticity of demand for a product is largest when the
 - a. time period under consideration is long.
 - b. time period under consideration is very short.
 - c. product constitutes a small portion of the consumer's budget.

Section 4: Other Demand Elasticities

1. The percentage change in quantity demanded of one product divided by the percentage change in the price of a related product is called the
 - a. cross-price elasticity of demand.
 - b. price elasticity of demand.
 - c. income elasticity of demand.
 - d. straight-line demand curve.
 - e. price elasticity of supply.
2. Two goods that have a positive cross-price elasticity of demand are called
 - a. substitutes.
 - b. complements.
 - c. luxuries.
 - d. necessities.
 - e. supply-oriented goods.
3. Two goods that have a negative cross-price elasticity of demand are called
 - a. substitutes.
 - b. complements.
 - c. luxuries.
 - d. necessities.
 - e. demand-oriented goods.
4. The percentage change in demand divided by the percentage change in income is called the
 - a. cross-price elasticity of demand.
 - b. price elasticity of demand.
 - c. income elasticity of demand.
 - d. straight-line demand curve.
 - e. price elasticity of supply.
5. Luxury goods have a larger income elasticity of demand than do
 - a. normal goods.
 - b. substitutes.
 - c. complements.
 - d. independents.

6. In a recent recession in East Podunk, buyers' incomes dropped 3 percent. Sales of Gucci handbags dropped 5 percent, clothing sales at Wal-Mart rose 2 percent, sales of hamburger meat rose 4 percent, and sales of hamburgers at McDonald's dropped 1 percent. Based on these figures, you conclude that
- Gucci handbags and hamburger meat are luxury goods, and hamburgers at McDonald's and clothing at Wal-Mart are normal goods.
 - Gucci handbags and hamburger meat are normal goods, and hamburgers at McDonald's and clothing at Wal-Mart are inferior goods.
 - Gucci handbags are luxury goods, hamburgers at McDonald's are normal goods, and clothing at Wal-Mart and hamburger meat are inferior goods.
 - Gucci handbags are inferior goods, hamburgers at McDonald's are normal goods, and clothing at Wal-Mart and hamburger meat are luxury goods.
 - Gucci handbags and hamburgers at McDonald's are luxury goods, and clothing at Wal-Mart and hamburger meat are inferior goods.

Section 5: Supply Elasticities

1. Which of the following is the equation for price elasticity of supply?

- $e_s = \frac{\text{change in quantity supplied}}{\text{change in price}}$
- $e_s = \frac{\text{change in price}}{\text{change in quantity supplied}}$
- $e_s = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}}$
- $e_s = \frac{\text{percentage change in price}}{\text{percentage change in quantity supplied}}$
- $e_s = \frac{\text{change in price}}{\text{percentage change in quantity supplied}}$

2. The price elasticity of supply depends in large part on
- the length of time producers have to vary their output in response to price changes.
 - how willing consumers are to buy additional units of output at the current price.
 - the number of buyers in the market.
 - the price elasticity of demand.
 - whether a good is a complement or a substitute.
3. Which of the following statements is correct?
- The short run is less than two weeks; the long run is more than two weeks.
 - The short run is less than two months; the long run is more than two months.
 - The short run is less than two years; the long run is more than two years.
 - The short run is just short enough that the quantities of all resources cannot be varied; the long run is just long enough that the quantities of all resources can be varied.
 - The short run is just short enough that the quantities of all resources can be varied; the long run is just long enough that the quantities of all resources cannot be varied.

4. Tax incidence refers to
 - a. who pays a tax.
 - b. the level of government that imposes a tax.
 - c. the form of business organization that must pay a tax.
 - d. the amount of revenue generated by a tax.
 - e. whether government agencies must pay a tax.

5. Suppose that the price elasticity of demand for lima beans is .5, while the supply elasticity of lima beans is 4. If a tax is placed on lima beans, the tax will actually be paid
 - a. mostly by the buyers of lima beans.
 - b. equally by the buyers and sellers of lima beans.
 - c. mostly by the sellers of lima beans.
 - d. by everybody who shops in grocery stores.
 - e. only by the owners of grocery stores.

Practice Questions and Problems

Section 1: The Price Elasticity of Demand

1. Elasticity is a way to measure the _____ of consumers or producers to a(n) _____ in some variable.
2. The price elasticity of demand measures the degree to which consumers alter their _____ in response to a(n) _____ change, *ceteris paribus*.
3. The equation used to calculate the price elasticity of demand is

$$e_d = \frac{\text{percentage change in } \underline{\hspace{2cm}}}{\text{percentage change in } \underline{\hspace{2cm}}}$$

4. If e_d is less than 1, demand is _____.
5. If e_d is greater than 1, demand is _____.
6. If e_d is equal to 1, demand is _____.
7. A(n) _____ demand curve shows that consumers can purchase any quantity they want at the prevailing price.
8. A(n) _____ demand curve shows no change in quantity demanded as the price changes.
9. As you move down a straight-line demand curve, the price elasticity of demand _____ (increases, decreases).
10. If a 5 percent change in the price of movies causes a 10 percent change in the number of movie tickets sold, e_d equals _____ and demand is _____ (elastic, inelastic, unit-elastic).
11. If a 6 percent change in the price of coffee causes a 3 percent change in the quantity of coffee bought, e_d equals _____ and demand is _____ (elastic, inelastic, unit-elastic).

12. If a 2 percent change in the price of wine causes a 2 percent change in the number of bottles of wine bought, e_d equals _____ and demand is _____ (elastic, inelastic, unit-elastic).
13. If a 5 percent change in the price of heroin causes no change in the amount of heroin bought, e_d equals _____ and demand is _____ (perfectly elastic, perfectly inelastic).
14. Below is a hypothetical demand for box seats at a baseball game. Fill in the blanks to calculate the elasticities for the different price ranges. Refer to Section 1.d, "Calculating Elasticity," in Chapter 6 (*Economics*, Chapter 20) if you need help.

Quantity Demanded	Change in Quantity Demanded	Price	Change in Price	Average Quantity $[(Q_1 + Q_2)/2]$	Average Price $[(P_1 + P_2)/2]$	Percent Change in Q	Percent Change in P	Elasticity
400		\$100						
500		90						
600		80						
700		70						
800		60						

15. Suppose that a movie theater knows that it will sell 450 tickets per day if it charges \$4.50 per ticket; if the ticket price goes up to \$5.50, the theater will only sell 350 tickets per day. What is the theater's price elasticity of demand for this price range?
- 1.00
 - 1.57
 - 0.80
 - 1.25
 - 1.22
16. Suppose that an airline knows that it will have 90 passengers per day on a particular route if it charges \$200 per ticket; if the fare goes down to \$180, the airline will sell 110 tickets per day. What is the airline's price elasticity of demand for this price range?
- 1.90
 - 0.53
 - 2.22
 - 1.64
 - 2.00

Section 2: The Use of Price Elasticity of Demand

- Total revenue is found by multiplying _____ by _____.
- Demand is elastic. The percentage change in _____ (quantity, price) is larger than the percentage change in _____ (quantity, price).
 - When price decreases, quantity increases and total revenue _____ (increases, decreases).
- Demand is inelastic. The percentage change in _____ (quantity, price) is larger than the percentage change in _____ (quantity, price).
 - When price decreases, quantity increases and total revenue _____ (increases, decreases).
- Complete the table below.

Demand Elasticity	Price Change	Effect on Total Revenue (Increase, Decrease, Unchanged)
Elastic	Increase	_____
Elastic	Decrease	_____
Inelastic	Increase	_____
Inelastic	Decrease	_____
Unit-elastic	Increase	_____
Unit-elastic	Decrease	_____

For questions 5 through 7, suppose that you are the president of Wonderful Widget Works, Inc. Widgets are a hypothetical product that you produce in many different colors.

- Your marketing manager tells you that you can increase total revenue for blue widgets if you lower their price from \$2.00 to \$1.80. You know that the demand for blue widgets in this price range is
 - elastic.
 - inelastic.
 - unit-elastic.
- Next, your marketing manager tells you that if you lower the price of red widgets from \$1.20 to \$1.00 you will decrease total revenue for red widgets. You know that the demand for red widgets in this price range is
 - elastic.
 - inelastic.
 - unit-elastic.
- Your marketing manager admits that he can't figure out what's happening with orange widgets. When he lowers the price from \$1.60 to \$1.40, total revenue stays the same. Because you understand elasticity, you know that the demand for orange widgets in this price range is
 - elastic.
 - inelastic.
 - unit-elastic.

8. Suppose you are the city manager of a small midwestern city. Your city-owned bus system is losing money, and you have to find a way to take in more revenue. Your staff recommends raising bus fares, but bus riders argue that reducing bus fares to attract new riders would increase revenue. You conclude that
- your staff thinks that the demand for bus service is elastic, whereas the bus riders think that demand is inelastic.
 - your staff thinks that the demand for bus service is inelastic, whereas the bus riders think that demand is elastic.
 - both your staff and the bus riders think that the demand for bus service is elastic.
 - both your staff and the bus riders think that the demand for bus service is inelastic.
 - both your staff and the bus riders think that the demand for bus service is unit-elastic.
9. Airlines know from experience that vacation travelers have an elastic demand for air travel, whereas business travelers have an inelastic demand for air travel. If an airline wants to increase its total revenue, it should
- decrease fares for both business and vacation travelers.
 - increase fares for both business and vacation travelers.
 - increase fares for business travelers and decrease fares for vacation travelers.
 - decrease fares for business travelers and increase fares for vacation travelers.
 - leave fares the same for both groups.

For questions 10 through 13, assume you are the owner of the only movie theater in a small town. From past experience, you have calculated that the price elasticity of demand for movie tickets varies with the age of the customer. At your current prices, senior citizens have a demand elasticity of 2.0, younger adults have a demand elasticity of 1.0, and teenagers have a demand elasticity of 0.5. You want to adjust your prices to increase your total revenue.

10. Should you change the ticket price for senior citizens to increase your revenues?
- No. You should leave the price where it is.
 - Yes. You should increase the price for senior citizens.
 - Yes. You should decrease the price for senior citizens.
11. Should you change the ticket price for younger adults to increase your revenues?
- No. You should leave the price where it is.
 - Yes. You should increase the price for younger adults.
 - Yes. You should decrease the price for younger adults.
12. Should you change the ticket price for teenagers to increase your revenues?
- No. You should leave the price where it is.
 - Yes. You should increase the price for teenagers.
 - Yes. You should decrease the price for teenagers.

13. Suppose you decided (correctly) to lower the ticket price for senior citizens. To get the most revenue from this set of customers, how far should you lower the ticket price?
- You should let the senior citizens in for free.
 - You should charge only a very low price.
 - You should keep cutting the price as long as each price cut increases ticket sales.
 - You should keep cutting the price as long as demand is still elastic.

Section 3: Determinants of the Price Elasticity of Demand

1. List the three determinants of the price elasticity of demand.

2. A product with _____ (many, few) good substitutes would have a more elastic demand than a product with _____ (many, few) good substitutes.
3. The demand for new cars is likely to be _____ (more, less) elastic than the demand for new Chevrolet cars.
4. The demand for paperback novels is likely to be _____ (more, less) elastic than the demand for required college textbooks.
5. A product that takes a _____ (large, small) portion of a consumer's budget has a more elastic demand than a product that takes a _____ (large, small) portion.
6. The demand for European vacations is likely to be _____ (more, less) elastic than the demand for videocassette tapes.
7. When consumers have a _____ (long, short) time to react to price changes, demand is more elastic than when consumers have a _____ (long, short) period of time to react.
8. The price elasticity of demand for gasoline in the short run is substantially lower than the price elasticity of demand for gasoline in the long run. Explain why the elasticity values are different.

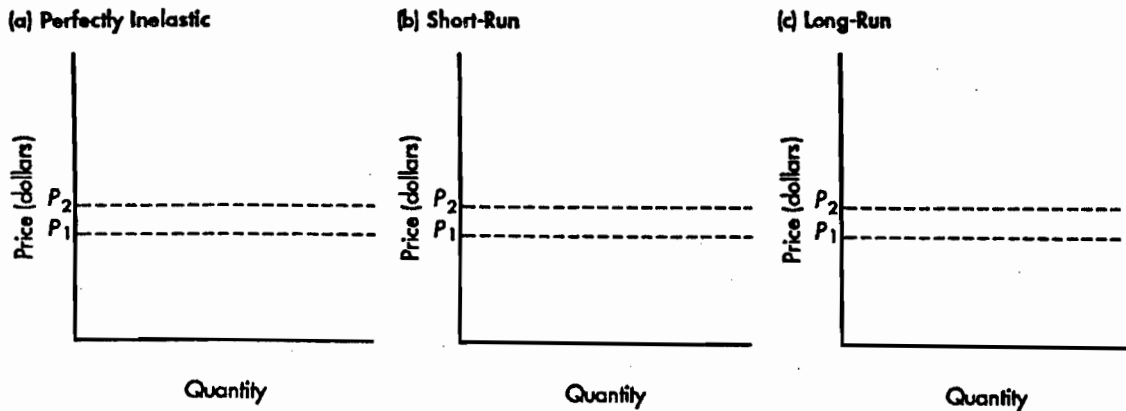
Section 4: Other Demand Elasticities

1. The _____ elasticity of demand measures how consumers adjust their purchases of a product when the price of a related product changes.

2. The _____ elasticity of demand measures how much demand for a product changes when consumers' incomes change.
3. If the cross-price elasticity of demand is positive, the two goods are _____ ; if the cross-price elasticity of demand is negative, the two goods are _____ .
4. _____ (Luxuries, Necessities) have a higher income elasticity of demand than do _____ (luxuries, necessities).
5. When the price of Kellogg's Corn Flakes increases 5 percent, the quantity demanded of Post Corn Flakes increases 20 percent. The cross-price elasticity of Post Corn Flakes with respect to Kellogg's Corn Flakes is _____. These two products are _____ .
6. When the price of milk increases 4 percent, the quantity demanded of corn flakes decreases 2 percent. The cross-price elasticity of corn flakes with respect to the price of milk is _____. These two products are _____ .
7. The income elasticity of demand is the percentage change in _____ divided by the percentage change in _____. Economists classify goods whose income elasticity of demand is positive as _____ goods, and goods whose income elasticity of demand is negative as _____ goods.
8. Suppose that the demand for Mercedes-Benz automobiles goes up 15 percent when people's incomes go up 10 percent. The income elasticity of demand for Mercedes-Benz autos is _____ ; these autos are _____ (normal, inferior) goods.
9. Suppose that the demand for ten-year-old used cars goes down 10 percent when people's incomes go up 10 percent. The income elasticity of demand for these old used cars is _____ ; they are _____ (normal, inferior) goods.
10. The _____ elasticity of demand measures how consumers adjust their purchases of a product when the amount of advertising expenditures changes.

Section 5: Supply Elasticities

- The price elasticity of supply is the percentage change in _____ divided by the percentage change in _____. The price elasticity of supply depends primarily on the _____ producers have to vary their output in response to price changes.
- a. Sketch a perfectly inelastic supply curve on graph a, a typical short-run supply curve on graph b, and a typical long-run supply curve on graph c. For prices P_1 and P_2 , mark the quantities supplied on the graphs.



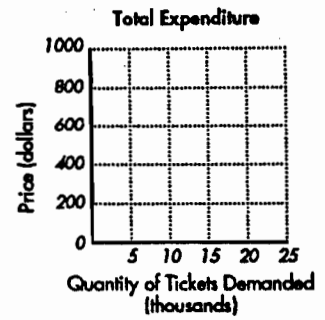
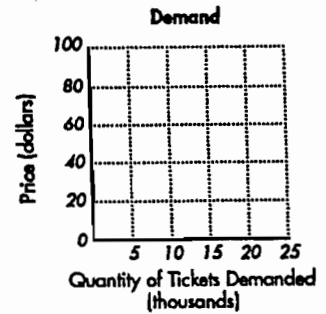
- The smallest change occurred on graph _____; this is the _____ (most, least) elastic supply curve.
 - The largest change occurred on graph _____; this is the _____ (most, least) elastic supply curve.
- Other things being equal, when demand is elastic and supply is inelastic, the incidence of a tax will fall more on _____ (consumers, businesses) and less on _____ (consumers, businesses).
 - Other things being equal, when demand is inelastic and supply is elastic, the incidence of a tax will fall more on _____ (consumers, businesses) and less on _____ (consumers, businesses).

Thinking About and Applying Elasticity: Demand and Supply

I. Elasticity and Bruce Springsteen

Great news! Bruce Springsteen is going to give a concert at the local convention center. The table below gives the demand for concert tickets.

Price per Ticket	Quantity Sold	Total Expenditure	Elasticity
\$100	0	_____	_____
90	2,500	_____	_____
80	5,000	_____	_____
70	7,500	_____	_____
60	10,000	_____	_____
50	12,500	_____	_____
40	15,000	_____	_____
30	17,500	_____	_____
20	20,000	_____	_____
10	22,500	_____	_____
0	25,000	_____	_____



- Calculate the total expenditure ($P \times Q$) at each ticket price and the demand elasticity for each of the price changes listed, and insert the amounts in the table. Then, draw the demand curve and the total expenditure curve on the appropriate graphs, and mark the segments of the demand curve that are elastic, inelastic, and unit-elastic.
- The convention center has asked you to organize the concert. Under the agreement, you can keep all the profits for yourself. Renting the convention center will cost you \$5,000, you must pay Bruce Springsteen \$100,000 for the concert, and you have \$35,000 in miscellaneous expenses. The convention center seats 22,500 customers.
 - Your total costs are _____.
 - The price you should charge per ticket to get the maximum profit (total revenue minus all costs) is _____.
 - At this price, you will sell _____ tickets.
 - Your profit would be _____.

3. Would your ticket price be any different if you had to pay Bruce \$200,000? Explain your answer.

4. Assuming you have to pay Bruce \$100,000, is there anything you could do to increase your total revenues and profits even more?

5. Suppose you decide to sell 2,500 seats at each of the prices listed between \$10 and \$90, with the seats getting better as the price goes up. If you sell all the seats, you will take in _____.

II. Taxing Tobacco

According to the law of demand, taxes that increase the price of a product are expected (*ceteris paribus*) to reduce consumption of the product. In 1988, California increased its cigarette tax by \$.25 a pack; by the middle of 1989, cigarette purchases in California had declined by 10 percent. For simplicity, assume that all of this decrease was caused by the price of cigarettes increasing \$.25 as a result of the tax increase. Use this information to answer the following questions.

- Cigarettes cost \$1 per pack before the tax increase, and \$1.25 after. The demand elasticity for cigarettes over this price range is _____. Demand for this product is _____ (elastic, inelastic).
- Use the determinants of demand elasticity discussed in Section 3 of the chapter to explain why you would expect the demand for cigarettes to be inelastic.

- One billion (1,000,000,000) packs of cigarettes were sold in California before the tax increase. After the tax went into effect, _____ packs were sold, and the state earned _____ in tax revenue.
- What do you think will happen if California raises the tax on cigarettes by \$.25 every year from now until the year 2010? Will California's tax revenue from the cigarette tax keep increasing the whole time?

III. Price Discrimination in Airline Fares

Recently, the *Wall Street Journal* published an article about one airline's 35 percent fare cuts for summer travel. The article described several restrictions:

Travel must begin on or after May 27 and be completed by September 15.
The nonrefundable tickets require 14-day advance purchase.
Travelers must stay at their destination over a Saturday night.

People taking a plane trip for a vacation usually can plan their trip far in advance and don't mind spending a weekend at their vacation destination. Business travelers, on the other hand, frequently have to travel without much advance notice and want to be back home on weekends.

1. The main customers for the discounted tickets will be _____ (business, vacation) travelers.
2. Does the airline think the demand for airline tickets for vacation travel is elastic, inelastic, or unit-elastic? Explain your answer.

3. On the basis of the restrictions it sets and the effects of those restrictions on business and vacation travelers, the airline must think that _____ (business, vacation) travelers have a higher price elasticity of demand.



Chapter 6 (*Economics Chapter 20*) Homework Problems

Name _____

1. Write the formula for the price elasticity of demand.
2. When demand is elastic, increasing the price _____ (increases, decreases) total revenue.
When demand is inelastic, increasing the price _____ (increases, decreases) total revenue.
3. What three factors determine how elastic the demand for a product is?
4. Your friend Randy Cheapskate attended a Bruce Springsteen concert in another city. Randy was absolutely amazed that the concert hadn't sold out. "Those promoters sure were dumb! If they had any business sense at all, they would have charged less for the tickets, and more people would have come," says Randy. "They could have sold out."
Were the promoters dumb, or could there be a sound business reason for setting the price of the tickets so high that they would not sell out? (*Hint:* The "Elasticity and Bruce Springsteen" problem in the Thinking About and Applying Elasticity section may give you some clues.)

5. Auld Lang Syne University is the only four-year college in a 500-square-mile area. The university estimates its price elasticity of demand to be .85. Officials at ALSU are concerned about a recent proposal to eliminate some forms of federal aid to its students. For most of ALSU's students, the proposals would have the effect of raising their tuition by 2 percent.
- The price elasticity of demand for an education at this university is _____ (elastic, unit-elastic, inelastic). Why do you think education at this university is characterized by this type of elasticity?
 - If the proposal to eliminate some forms of federal aid to ALSU's students goes into effect, the university can expect the number of students to _____ (increase, not change, decrease) by _____ percent.
 - If the proposal went into effect, ALSU's revenues would _____ (increase, decrease, not change). If ALSU needs more revenue to offset increasing costs, it should _____ (increase, not change, decrease) its tuition if the proposal goes into effect.
 - How would your answers to b and c change if ALSU's demand was elastic?

If your instructor assigns these problems, write your answers above, then tear out this page and hand it in.

Answers

Quick-Check Quiz

Section 1: The Price Elasticity of Demand

1. d; 2. a; 3. c; 4. a; 5. c; 6. b

If you missed any of these questions, you should go back and review Section 1 in Chapter 6 (*Economics*, Chapter 20).

Section 2: The Use of Price Elasticity of Demand

1. a; 2. a; 3. b; 4. d; 5. d; 6. d

If you missed any of these questions, you should go back and review Section 2 in Chapter 6 (*Economics*, Chapter 20).

Section 3: Determinants of the Price Elasticity of Demand

1. c; 2. d; 3. a; 4. a

If you missed any of these questions, you should go back and review Section 3 in Chapter 6 (*Economics*, Chapter 20).

Section 4: Other Demand Elasticities

1. a; 2. a; 3. b; 4. c; 5. a; 6. c

If you missed any of these questions, you should go back and review Section 4 in Chapter 6 (*Economics*, Chapter 20).

Section 5: Supply Elasticities

1. c; 2. a; 3. d; 4. a; 5. a

If you missed any of these questions, you should go back and review Section 5 in Chapter 6 (*Economics*, Chapter 20).

Practice Questions and Problems

Section 1: The Price Elasticity of Demand

1. responsiveness; change
2. purchases; price
3. quantity demanded; price
4. inelastic
5. elastic
6. unit-elastic
7. perfectly elastic
8. perfectly inelastic
9. decreases

10. 2; elastic (Remember the equation for the price elasticity of demand:

$$e_d = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

The change in quantity demanded is 10 percent, and the change in price is 5 percent, so $e_d = 10/5 = 2$. This is more than 1, so demand must be elastic.)

11. 0.5; inelastic (Refer to the equation for the price elasticity of demand above. In this problem, the change in quantity demanded is 3 percent, and the change in price is 6 percent, so $e_d = 3/6 = 0.5$. This is less than 1, so demand must be inelastic.)
12. 1; unit-elastic (Refer to the equation for the price elasticity of demand above. In this problem, the change in quantity demanded is 2 percent, and the change in price is 2 percent, so $e_d = 2/2 = 1$. Therefore, demand must be unit-elastic.)
13. 0; perfectly inelastic (Refer to the equation for the price elasticity of demand above. In this problem, the percentage change in quantity demanded is 0 percent, and the change in price is 5 percent, so $e_d = 0/5 = 0$. Therefore, demand must be perfectly inelastic.)
- 14.

Quantity Demanded	Change in Quantity Demanded	Price	Change in Price	Average Quantity $[(Q_1 + Q_2)/2]$	Average Price $[(P_1 + P_2)/2]$	Percent Change in Q	Percent Change in P	Elasticity
400		\$100						
	100		\$10	450	\$95	0.2222	0.1053	2.11
500		90						
	100		10	550	85	0.1818	0.1176	1.55
600		80						
	100		10	650	75	0.1538	0.1333	1.15
700		70						
	100		10	750	65	0.1333	0.1538	0.87
800		60						

15. d (If you don't know how to do this problem, use the same process you went through in question 14 above. If you chose answer a, b, or e, you didn't remember to use the *average* quantity and *average* price. Reread Section 1.d in Chapter 6 [*Economics*, Chapter 20], and then try it again. If you chose answer c, you had the equation upside down: the percentage change in *quantity* is on top, and the percentage change in *price* is on the bottom. Reread Section 1.d in Chapter 6 [*Economics*, Chapter 20], and then try it again.)
16. a (If you don't know how to do this problem, use the same process you went through in questions 14 and 15 above. If you chose answer b, you had the equation upside down: the percentage change in *quantity* is on top, and the percentage change in *price* is on the bottom. Reread Section 1.d in Chapter 6 [*Economics*, Chapter 20], and then try it again. If you chose answer c, d, or e, you didn't remember to use the *average* quantity and *average* price. Reread Section 1.d in Chapter 6 [*Economics*, Chapter 20], and then try it again.)

Section 2: The Use of Price Elasticity of Demand

1. price; quantity sold
2. a. quantity; price
b. increases
3. a. price; quantity
b. decreases
- 4.

Demand Elasticity	Price Change	Effect on Total Revenue (Increase, Decrease, Unchanged)
Elastic	Increase	Decrease
Elastic	Decrease	Increase
Inelastic	Increase	Increase
Inelastic	Decrease	Decrease
Unit-elastic	Increase	Unchanged
Unit-elastic	Decrease	Unchanged

5. a (Decreasing the price increases total revenue. Because price and revenue move in opposite directions, the quantity change must be larger than the price change, so demand must be elastic.)
6. b (Decreasing the price decreases total revenue. Because price and revenue move in the same direction, the price change must be larger than the quantity change, so demand must be inelastic.)
7. c (If total revenue is unchanged, the percentage change in quantity must be the same size as the percentage change in price, so the price elasticity of demand must be 1, or unit-elastic.)
8. b (Your staff thinks that increasing the price will increase total revenue; this will happen only if demand is inelastic. The bus riders think that decreasing the price will increase total revenue; this will happen only if demand is elastic.)
9. c (When demand is elastic [vacationers], reducing the price increases total revenue. When demand is inelastic [business travelers], increasing the price increases total revenue.)
10. c (Senior citizens have an elastic demand [$e_d = 2.0$, which is greater than 1], so decreasing the price increases total revenue.)
11. a (With unit-elastic demand, total revenue is as high as possible.)
12. b (Teenagers have an inelastic demand [$e_d = 0.5$, which is less than 1], so increasing the price increases total revenue.)
13. d (As price decreases, demand usually becomes less elastic. As long as the senior citizens' demand is still elastic, decreases in price will increase total revenue. When demand becomes unit-elastic, you have reached the maximum total revenue and shouldn't reduce price any further. [See Figure 2 in the text for further help.] Answer a can't be correct. If tickets are free, total revenue from senior citizens will be zero. Answer b isn't likely to be correct. If the ticket price is very low, demand is probably inelastic, and you should raise the price some to increase total revenue. Answer c isn't correct. Even when prices are very low, a further cut usually increases sales. But because demand is usually inelastic at low prices, further price cuts would reduce total revenue.)

Section 3: Determinants of the Price Elasticity of Demand

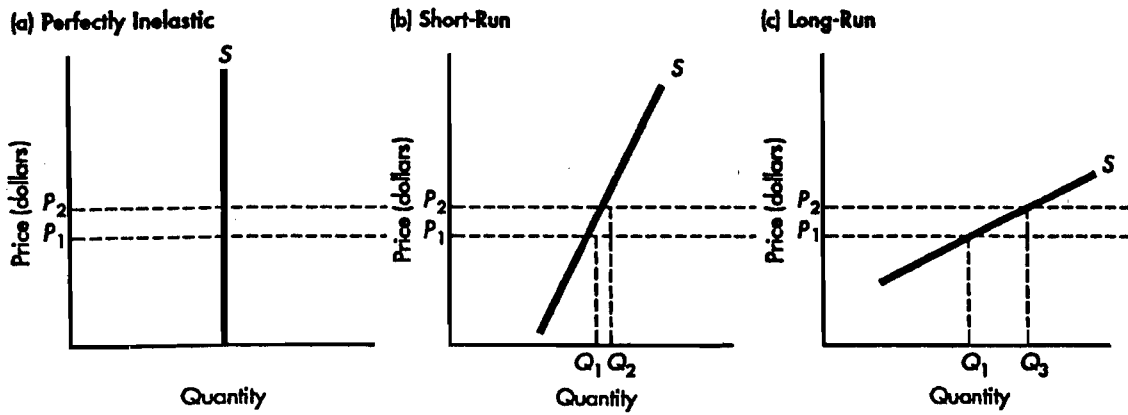
1. existence of substitutes
importance of the product in the consumer's total budget
the time period under consideration
2. many; few
3. less (For most people, there are many good substitutes for Chevrolets: Fords, Plymouths, Toyotas, Volkswagens, and so on. The demand for a particular brand of a product is usually more elastic than the demand for the product itself.)
4. more (There are few, if any, good substitutes for required texts, but many other forms of literature, and entertainment in general, are available as substitutes for paperback novels.)
5. large; small
6. more (Videocassettes are relatively inexpensive; for most of us, a European vacation would take a large share of our budgets.)
7. long; short
8. It is difficult to change gasoline consumption in a short period of time. The number of miles you drive depends on where you live relative to where you must go to attend class, work, and shop, and the miles per gallon depend on your car's efficiency. None of these factors is easy to change quickly. Over a longer period, you can take gasoline prices into account when deciding where to live and work and what kind of car to buy.

Section 4: Other Demand Elasticities

1. cross-price
2. income
3. substitutes; complements
4. Luxuries; necessities
5. +4; substitutes (Cross-price elasticity is the percentage change in the quantity demanded of one good divided by the percentage change in the price of another good. The quantity demanded of Post Corn Flakes increases 20 percent when the price of Kellogg's Corn Flakes increases by 5 percent, so the cross-price elasticity is $+20\%/+5\% = +4$. Because Post's quantity increases when Kellogg's price increases, the two goods are substitutes: people will switch from Kellogg's to Post's when the price of Kellogg's goes up.)
6. -0.5; complements (The cross-price elasticity is $-2\%/+4\% = -0.5$. Milk and corn flakes are complements [most people put milk on their corn flakes], so an increase in the price of milk makes corn flakes with milk more expensive, reducing the amount of corn flakes bought.)
7. demand; income; normal; inferior
8. +1.5; normal (The income elasticity of demand is $+15\%/+10\% = +1.5$. Because demand increases when income increases, the income elasticity of demand is positive [greater than zero], so Mercedes-Benz autos are normal goods.)
9. -1; inferior (The income elasticity of demand is $-10\%/+10\% = -1$. Because demand decreases when income increases, the income elasticity of demand is negative [less than zero], so ten-year-old used cars are inferior goods. If you could afford it, wouldn't you buy a Mercedes rather than an old used car? The higher your income, the more likely you are to buy a Mercedes and the less likely you are to buy an old used car.)
10. advertising

Section 5: Supply Elasticities

1. quantity supplied; price; length of time
2. a.



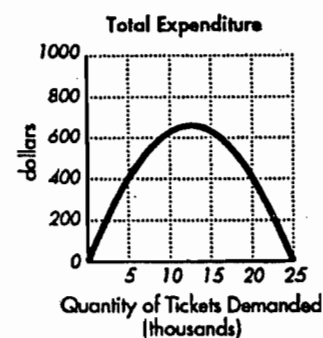
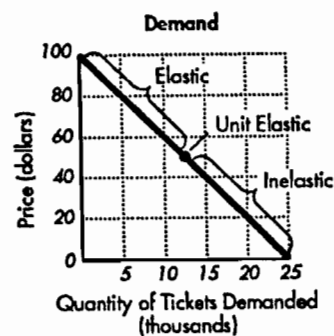
- b. a; least
- c. c; most
3. businesses; consumers
4. consumers; businesses

Thinking About and Applying Elasticity: Demand and Supply

I. Elasticity and Bruce Springsteen

1. If you had problems with the graphs or the calculations, refer to Section 1.d, "Calculating Elasticity," in Chapter 6 (Economics, Chapter 20).

Price per Ticket	Quantity Sold	Total Expenditure	Elasticity
\$100	0	\$ 0	18.99
90	2,500	225,000	5.67
80	5,000	400,000	3.00
70	7,500	525,000	1.86
60	10,000	600,000	1.22
50	12,500	625,000	0.82
40	15,000	600,000	0.54
30	17,500	525,000	0.33
20	20,000	400,000	0.18
10	22,500	225,000	0.18
0	22,000	0	1.05



2. a. \$150,000 (\$10,000 for donation, \$5,000 for rent, \$100,000 for Bruce, \$35,000 for miscellaneous expenses)
 b. \$50 (None of the costs will change with the number of tickets sold, so your problem is simple: you want to set the ticket price where it will give you the maximum total revenue. Of course, you could find that price by looking at the total expenditure figures; you also could find it by looking at the elasticities. If demand is elastic [as it is for all prices above \$50], you know that lowering the price will increase total revenue. If demand is inelastic [as it is for all prices below \$50], you know that raising the price will increase total revenue. At the price where demand is unit-elastic, total revenue is at its maximum.)
 c. 12,500
 d. \$475,000 (\$625,000 revenue minus \$150,000 costs)
3. No. Whatever your costs, \$50 is still the price that gives you the maximum revenue and profit. Your profit, of course, would be lower (only \$375,000) if you had to pay Bruce \$200,000 rather than \$100,000.
4. You could try price discrimination. If you raise the price of the seats closest to the stage, the people willing to pay \$90 might buy them at those prices; if you set a low price for seats farther away, people who wouldn't pay \$50 for a seat might come if the price was, say, \$30.

5. \$1,125,000.

Each set of 2,500 seats will be a separate set of consumers, and each set of consumers will have its own separate price. The calculation looks like this:

Price per Seat	Quantity Sold at That Price	Revenue from Those Seats
\$90	2,500	\$ 225,000
80	2,500	200,000
70	2,500	175,000
60	2,500	150,000
50	2,500	125,000
40	2,500	100,000
30	2,500	75,000
20	2,500	50,000
10	2,500	25,000
Total revenue =		\$1,125,000

Whenever market conditions allow price discrimination to be used, you can increase total revenue by discriminating.

II. Taxing Tobacco

- 0.45 (If cigarette prices increased from \$1 to \$1.25 per pack, this would be about a 22 percent increase relative to the average price. Because the quantity demanded decreased only 10 percent when the price increased 22 percent, the price elasticity of demand for cigarettes is $10\%/22\% = 0.45$. Remember that this calculation isn't exactly accurate. The 10 percent decrease in quantity probably was determined relative to the starting quantity rather than the average quantity.); inelastic (Because the price elasticity of demand is less than 1, demand is inelastic.)
- To people who smoke cigarettes, there are few, if any, good substitutes; many cigarette smokers consider cigarettes a necessity.
- 900,000,000 (a 10 percent decrease from 1 billion); \$225,000,000 (900,000,000 packs \times \$.25)
- Each tax increase will be reflected in an increase in the price paid by buyers. As the price paid increases, demand usually becomes more elastic. At high enough prices (and taxes) demand will become elastic; further tax increases beyond that point will decrease sales enough that tax revenues eventually will begin to fall.

III. Price Discrimination in Airline Fares

- vacation (Vacation travelers don't mind the restrictions of 14-day advance purchase and a Saturday stayover, but many business travelers do.)
- elastic (The airline reduced the price for vacation travelers, so it must think demand is elastic, that a price cut would increase revenues.)
- vacation (If the airline thought that business travelers had a higher price elasticity of demand, it would have cut the price of their tickets.)